AIR CARRIER CERTIFICATE # MT9A828W

MARTINAIRE

GENERAL OPERATIONS MANUAL

VOLUME ONE

MANUAL COPY NUMBER _____

Martinaire Aviation, L.L.C.
4553 Glenn Curtiss Drive
Addison, Texas 75001
972-349-5700

PREFACE

Martinaire Aviation, L.L.C. a Texas based corporation, is an Air Carrier engaged in the air transportation of cargo.

This manual is a statement of company flight operations policies and procedures and is directive upon all company personnel in the conduct of their duties and responsibilities.

This manual will not supersede in any way the provisions of the Federal Aviation Act of 1958, as amended and currently effective Federal Aviation Regulations, and shall not be contrary to the provisions of the Operations Specifications of Martinaire's Operating Certificate. In the event of disagreement, the Federal Aviation Regulations will apply except in cases where company rules are more restrictive or when deviation from those procedures is required in an emergency situation as required by Federal Aviation Regulations. It is recognized that circumstances may arise where safety precautions beyond those provided for by regulations will be advisable. As it is impossible to anticipate all such conditions, it is expected that company personnel will use their best judgment based on previous experience, and be prepared to substantiate the necessary action with sound reasoning.

Revisions to this manual will be submitted to the SW-FSDO-19 with a Letter of Transmittal explaining the changes for FAA acceptance.

Flight Operations
Martinaire Aviation, L.L.C.

PURPOSE

This manual has been prepared to cover the policies and procedures governing the operation of the Flight Department of Martinaire under its Air Carrier Certificate #MT9A828W. The purpose of this manual is to assure the utmost in safety of operation and in the operating efficiency of the Flight Department. It provides firm guidelines to enable all company personnel to carry out their assigned duties and responsibilities in accordance with company policies and procedures and FAA regulations.

DISTRIBUTION

A copy of this manual, or appropriate portions of the manual, will be furnished to all areas of responsibility within the company, including but not limited to:

1. Flight Crews
2. Flight Followers
3. Flight Standards District Office (FAA)

REVISION CONTROL

In accordance with FAR 135.21(a), revisions will be prepared by the Director of Operations or Chief Pilot if the Director of Operations designates him to do so. Each revision will have a revision number, date, and page numbers being revised. Revisions will be consecutively numbered.

It will be the responsibility of each manual holder to keep his manual current and record any revisions on the Log of Revisions. A Document Custody Form (see Forms) is required to be on file for those personnel issued this manual. In order to facilitate Recordkeeping and ensure that all manuals are current, a Revision Notice (see Forms) will be distributed with each revision and will instruct personnel as to which pages are to be removed or replaced. After the new or revised pages have been added and the outdated pages removed, the person responsible for this manual will complete the receipt portion of the revision notice and forward it to the Chief Pilot.

All manual revisions will be submitted to the FAA for review and approval/acceptance prior to being implemented.

REVISION CONTROL (cont.)

Revision control is accomplished in the upper right hand corner of each page. The following is an explanation of the terms found:

A-1/R-10/04-17-92

A-1	Represents Section A, Page 1.
R-10/Original	Represents Revision 10 or Original if first printing.
03-03-2003	Represents the date the revision became effective.

COMPANY FORMS

All company forms referenced in this manual will have examples in Section U of this GOM.

LOG OF REVISIONS

Rev. No.	Date	Page Numbers	Initials
Original	03-03-2003	All	Original
Revision 1	06-18-2003	Revision Page v Effective Page vi All Section C Ops Specs	
Revision 2	07-01-2003	Revision Page v Effective Page vi All Section C Ops Specs	
Revision 3	12-12-2003	Revision Page v Revision Page vi Revision Page vii Revision Page viii Revision Page xi Section R Page R-21 Section R Page R-22 Section R Page R-23 Section R Page R-24	
Revision 4	12-20-2003	Revision Page v Revision Page vi Revision Page vii Revision Page viii Section S Page 1 Section S Pages 20 thru 52	
Revision 5	05-03-2004	Cover Page Preface Page Revision Page iii Revision Page v Revision Page vi Revision Page vii Revision Page viii Table of Contents Page xi Table of Contents Page xii Section A Pages A-1,9,10,11 Section C All Pages Section D Page D-2 Section E Page E-1 Section F Page F-1 Section G Pages G-1 thru 4 Section I Pages I-4 and add I-7 Section M Page M-1 Section R Pages R-19,24 Section T Pages T-1,6,10,22,24 Section U All Pages	

LOG OF REVISIONS continued:

Rev. No.	Date	Page Numbers	Initials
Revision 6	07-01-2004	Revision Page vi Effective Page vii Effective Page viii Effective Page ix Table of Contents Page x Table of Contents Page ix Table of Contents Page x Table of Contents Page xi Table of Contents Page xii Table of Contents Page xiii Section A Page A-11 Section P Hazmat Title Page Section U Page U-3 Section U Page U-5 Section U Page U-6 Section U Page U-7 Section U Page U-8	
Revision 7	08-16-2004	Section G Pages 1 thru 3 Section R Pages 20 thru 25	
Revision 8	10-18-2004	Section S All Pages	
Revision 9	03-29-2005	Revision Page vi Revision Page vii Table of Contents Page xi Table of Contents Page xii Table of Contents Page xiii Table of Contents Page xiv Section P Pages 1, 2, 3, Section P FAA Hazmat Manual Hazmat Incident Reporting Form Section R Pages 25, 26 Section U Page 12	
Revision 10	08-01-2005	Revision Page vi Revision Page viii Section P FAA Hazmat Manual Section P Hazmat Incident Reporting Form	
Revision 11	09-01-2005	Revision Page vi, vii Section B Pages 1, 2 and 3 Section Ops Specs TOC Pages Part A, A004-1thru 7, A011-1, A096-1, 2	

LOG OF REVISIONS continued:

Rev. No.	Date	Page Numbers	Initials
Revision 12	10-18-2005	Revision Page vii Effective Page viii Effective Page ix Effective Page x Table of Contents Page xi Table of Contents Page xii Table of Contents Page xiii Table of Contents Page xiv Section S Pages 1 thru 31 Section S Insert 3 Section S Insert 4 Section S Insert 5	
Revision 13	10-02-2006	Cover Page (cover pocket insert) Cover Page Preface Revision Page vii Effective Page viii Effective Page ix Effective Page x Section A Page A2 Section A Page A6 Section A Page A12 Section C Ops Specs (A-C) Section P DG-HM Cover Page Section S Page S1 Section S Page S2 Section S Insert 3 Section T Page T1 Section T Page T2 Section T Page T6 Section T Page T22 Section T Page T24 Section U Page U2	
Revision 14	10-18-2006	Revision Page vii Effective Page viii Effective Page ix Effective Page x Section E Page E1 Section J Page J1 Section P signature page Section R Page R10 Section U Page U2 & U3	

LOG OF REVISIONS continued:

Revision 15	03-15-2007	Revision Page viii Effective Page ix Effective Page x Effective Page xi Table of Contents Page xii Table of Contents Page xiii Table of Contents Page xiv Table of Contents Page xiv Section A Pages 12 thru 16	
Revision 16	01-14-2008	Revision Page viii Effective Page ix Effective Page x Section A Page A-2 Section S Page S-1 Section S Insert 3	
Revision 17	03-17-2008	Revision Page viii Effective Page ix Effective Page x Effective Page xiii Section P all pages (except DOT Chart 12)	
Revision 18	05-01-2008	Revision Page viii Effective Page ix Effective Page xii Section A all pages	
Revision 19	11-11-2008	Revision Page viii Effective Page ix Effective Page x Section C all pages Section S insert 3	
Revision 20	07-01-2009	Revision Page viii Effective Page ix Effective Page x Effective Page xi Effective Page xv Section A Page A-12 Section C all pages Section J Pages J1 Section P Pages P1 & P2 Section R Page R-1 Section S Page S-1 & Insert 3 cover pg. Section U all pages	

LOG OF REVISIONS continued:

Revision 21	01-18-2010	Revision Page ix Effective Page x Effective Page xi Effective Page xii Table of Contents Page xiii Table of Contents Page xiv Table of Contents Page xv Table of Contents Page xvi Section C all pages Section S Insert 3 cover pg. (2009-2010 HOT) Section S Insert 3 (2009-2010 HOT) Section U Page U1 / U2	
Revision 22	04-15-2010	Revision Page ix Effective Page x Effective Page xi Effective Page xii Section D all pages Section G all pages Section I all pages Section P HM pg B-2 / C-1 Section P DOT Chart 13 Section U Page U1 / U2	
Revision 23	10-18-2010	Revision Page ix Effective Page x Effective Page xi Effective Page xii Section B page B-1 Section C all pages Section E page E-1 Section F page F1, F2 & Addendum Section I page I-7 Section J page J-1 Section M page M-3 Section R page R-10 Section S Insert 3 & cover page Section U all pages	

LOG OF REVISIONS continued:

Revision 24	06-01-2011	Cover Insert Cover Page Revision Page x Effective Page xi Effective Page xii Effective Page xiii Table of Contents Page xiv Table of Contents Page xv Table of Contents Page xvi Table of Contents Page xvii Section B all pages Section C all pages Section P DgHm Manual all pages after P-2 Section R page R-7 Section R pages R-20 thru R-26 Section T page T-1 Section T page T-6 Section T page T-10 Section T page T-22 Section U page U-2 & U-12	
Revision 25	11-23-2011	Revision Page x Effective Page xi Effective Page xiii Section C all pages Section G page G-3 Section S insert 3 (HOT) Section U all pages	
Revision 26	01-09-2012	Revision Page x Effective Page xi Effective Page xii Section C all pages Section P all pages	
Revision 27	05-07-2012	Revision Page x Effective Page xi Effective Page xii Effective Page xiii Table of Contents Page xiv Section A Page A-2 Section E all pages Section R page R-13and R-14 Section U page U-2	

LOG OF REVISIONS continued:

Revision 28	08-15-2012	Revision Page xi Effective Page xii Effective Page xiii Effective Page xiv Table of Contents Page xv Table of Contents Page xvi Table of Contents Page xvii Table of Contents Page xviii Section A all pages Section C all pages Section E all pages Section R all pages Section U page U-2	
Revision 29	03-01-2013	Revision Page xi Effective Page xii Effective Page xiii Effective Page xiv Section B all pages Section C all pages Section E all pages Section R-7 Section S insert 3 cover & holdover tables Section T all pages Section U page U-2	
Revision 30	06-30-2014	Revision Page xi Effective Page xii Section A pages A-2 and A-17 Section B page B-2 Section C all pages	
Revision 31	02-16-2015	Revision Page xi Effective Pages xii, xiii,xiv Section A pages A-17 Section page B-2 Section C all pages Section J pages J-1 Section U pages U-2, U3	
Revision 32	03-23-2016	Section P 'Will-Carry' HAZMAT Manual Update	
Revision 33	08-27-2016	CoverPage InsertCover Section A pages A-2, A17 Section B (B-7 to B-11 deleted)	

LOG OF REVISIONS continued:

Revision 33	08-27-2018	Revision Page xi through xix
Revision 34	11-05-2016	Exterior Cover, Interior Cover Revision Page xii Effective Page xiii, xiv, xv Section A - A6, A15, A16 Section P - P1, P2; add P3, P4 Section U - U2, U3b, U3c, U3d
Revision 35	10-19-2018	Exterior Cover, Interior Cover Revision Page xii Effective Page xiii, xiv, xv Section A - A1, A6, A9, A11, A17 Section B - B2 Section C - Operations Specifications Section D - D2 Section E - E1 Section M - M1 Section S - FAA Holdover Time Tables 2018-2019 Section U - U2, U3
Revision 36	08-31-2020	Exterior Cover, Interior Cover Revision Page xii Section I - add I8
Revision 37	11-25-2020	Exterior Cover, Interior Cover Revision Page xi, xiii, xiv, xv Section A - A2, A12 Section B - B1 Section C - All Section P - All Section S - FAA Holdover Time Tables 2020-2021 Section U - U2, U12, add U13
Revision 38	03-05-2021	Exterior Cover, Interior Cover Revision Page xii Effective Page xiii, xiv Table of Contents - xix Section A - A12, A14, A16 Section E - E2 Section P - Remove Appendix G,DOT Chart 16; add DOT Chart 17t Section R - R21 Section S - S13, S14, Remove Insert 5, FAA Holdover Time Tables 2020-2021; add FAA Holdover Time Tables 2021-2022 Section U - U2

LOG OF REVISIONS continued:

Revision 39	04-20-2022	Exterior Cover/Interior Cover Add Log of Revision pages xiia/xiib Effective Pages xiii, xiv, xv Table of Contents page xix Section A: pages A-2, A-9 Section P: DG/HM Manual (Special Permit made Defunct - Display purposes only) Section U: U-2, U-8, add U-14/U-15

LOG OF REVISIONS continued:

EFFECTIVE PAGES

This listing contains all current pages, with effective dates, of the General Operations Manual. It should be used after posting changes to insure the manual is complete and up-to-date.

PAGE	STATUS	DATE
Cover	Rev 39	04-20-22
Insert Cover	Rev 39	04-20-22
Preface	Rev 13	10-02-06
iii	Rev 5	05-03-04
iv	Orig	03-03-03
v	Rev 5	05-03-04
vi	Rev 11	09-01-05
vii	Rev 14	10-18-06
viii	Rev 20	07-01-09
ix	Rev 23	10-18-10
x	Rev 27	05-07-12
xi	Rev 33	08-27-16
xii	Rev 38	11-17-21
xiia	Rev 39	04-20-22
xiib	Rev 39	04-20-22
xiii	Rev 39	04-20-22
xiv	Rev 39	04-20-22
xv	Rev 39	04-20-22
xvi	Rev 33	08-27-16
xvii	Rev 33	08-27-16
xviii	Rev 33	08-27-16
xix	Rev 39	04-20-22
Section A		
A-1	Rev 35	10-19-18
A-2	Rev 39	04-20-22
A-3	Rev 28	08-15-12
A-4	Rev 28	08-15-12
A-5	Rev 28	08-15-12
A-6	Rev 35	10-19-18
A-7	Rev 28	08-15-12
A-8	Rev 28	08-15-12
A-9	Rev 39	04-20-22
A-10	Rev 28	08-15-12
A-11	Rev 35	10-19-18
A-12	Rev 38	11-17-21
A-13	Rev 28	08-15-12
A-14	Rev 38	11-17-21
A-15	Rev 28	08-15-12
A-16	Rev 38	11-17-21
A-17	Rev 35	10-19-18
A-18	Rev 28	08-15-12
A-19	Rev 28	08-15-12
A-20	Rev 28	08-15-12
A-21	Rev 28	08-15-12

PAGE	STATUS	DATE
Section B		
B-1	Rev 37	11-25-20
B-2	Rev 35	10-19-18
B-3	Rev 29	03-01-13
B-4	Rev 29	03-01-13
B-5	Rev 29	03-01-13
B-6	Rev 29	03-01-13
Section C		
C-1	Rev 37	11-25-20
C-2	Rev 37	11-25-20
Section D		
D-1	Orig	03-03-03
D-2	Rev 35	10-19-18
Section E		
E-1	Rev 35	10-19-18
E-2	Rev 38	11-17-21
E-3	Rev 33	08-27-16
Section F		
F-1	Rev 23	10-18-10
F-2	Rev 23	10-18-10
Addendum	Rev 23	10-18-10
Section G		
G-1	Rev 22	04-15-10
G-2	Rev 22	04-15-10
G-3	Rev 25	11-23-11
G-4`	Rev 22	04-15-10
Section H		
H-1	Orig	03-03-03
H-2	Orig	03-03-03

EFFECTIVE PAGES (cont.)

PAGE	STATUS	DATE
Section I		
I-1	Rev 22	04-15-10
I-2	Rev 22	04-15-10
I-3	Rev 22	04-15-10
I-4	Rev 22	04-15-10
I-5	Rev 22	04-15-10
I-6	Rev 22	04-15-10
I-7	Rev 23	10-18-10
I-8	Rev 36	08-31-20
Section J		
J-1	Rev 31	02-16-15
J-2	Rev 14	10-18-06
Section K		
K-1	Orig	03-03-03
K-2	Orig	03-03-03
Section L		
L-1	Orig	03-03-03
L-2	Orig	03-03-03
Section M		
M-1	Rev 35	10-19-18
M-2	Orig	03-03-03
M-3	Rev 23	10-18-10
M-4	Orig	03-03-03
Section N		
N-1	Orig	03-03-03
N-2	Orig	03-03-03
Section O		
O-1	Orig	03-03-03
O-2	Orig	03-03-03
Section P		
P-1	Rev 37	11-25-20
P-2	Rev 37	11-25-20
P-3	Rev 37	11-25-20
P-4	Rev 37	11-25-20
DG/HM Manual	Rev 39	04-20-22
Section Q		
Q-1	Orig	03-03-03
Q-2	Orig	03-03-03
Section R		
R-1	Rev 28	08-15-12
R-2	Rev 28	08-15-12
R-3	Rev 28	08-15-12
R-4	Rev 28	08-15-12
R-5	Rev 28	08-15-12
R-6	Rev 28	08-15-12
R-7	Rev 29	03-01-13
R-8	Rev 28	08-15-12
R-9	Rev 28	08-15-12
R-10	Rev 28	08-15-12
R-11	Rev 28	08-15-12
R-12	Rev 28	08-15-12
R-13	Rev 27	05-07-12
R-14	Rev 27	05-07-12
R-15	Rev 28	08-15-12
R-16	Rev 28	08-15-12
R-17	Rev 28	08-15-12
R-18	Rev 28	08-15-12
R-19	Rev 28	08-15-12
R-20	Rev 28	08-15-12
R-21	Rev 38	11-17-21
R-22	Rev 28	08-15-12
R-23	Rev 28	08-15-12
R-24	Rev 28	08-15-12
R-25	Rev 28	08-15-12
R-26	Rev 28	08-15-12
Section S		
S-1	Rev 20	07-01-09
S-2	Rev 13	10-02-06
S-3	Rev 12	10-18-05
S-4	Rev 12	10-18-05
S-5	Rev 12	10-18-05
S-6	Rev 12	10-18-05
S-7	Rev 12	10-18-05
S-8	Rev 12	10-18-05
S-9	Rev 12	10-18-05
S-10	Rev 12	10-18-05
S-11	Rev 12	10-18-05
S-12	Rev 12	10-18-05
S-13	Rev 38	11-17-21
S-14	Rev 38	11-17-21
S-15	Rev 12	10-18-05
S-16	Rev 12	10-18-05
S-17	Rev 12	10-18-05
S-18	Rev 12	10-18-05

EFFECTIVE PAGES (cont.)

PAGE	STATUS	DATE
Section S		
S-19	Rev 12	10-18-05
S-20	Rev 12	10-18-05
S-21	Rev 12	10-18-05
S-22	Rev 12	10-18-05
S-23	Rev 12	10-18-05
S-24	Rev 12	10-18-05
S-25	Rev 12	10-18-05
S-26	Rev 12	10-18-05
S-27	Rev 12	10-18-05
S-28	Rev 12	10-18-05
S-29	Rev 12	10-18-05
S-30	Rev 12	10-18-05
S-31	Rev 12	10-18-05
Insert 3	Rev 29	03-01-13
Section T		
T-1	Rev 29	03-01-13
T-2	Rev 29	03-01-13
T-3	Rev 29	03-01-13
T-4	Rev 29	03-01-13
T-5	Rev 29	03-01-13
T-6	Rev 29	03-01-13
T-7	Rev 29	03-01-13
T-8	Rev 29	03-01-13
T-9	Rev 29	03-01-13
T-10	Rev 29	03-01-13
T-11	Rev 29	03-01-13
T-12	Rev 29	03-01-13
T-13	Rev 29	03-01-13
T-14	Rev 29	03-01-13
T-15	Rev 29	03-01-13
T-16	Rev 29	03-01-13
T-17	Rev 29	03-01-13
T-18	Rev 29	03-01-13
T-19	Rev 29	03-01-13
T-20	Rev 29	03-01-13
T-21	Rev 29	03-01-13
T-22	Rev 29	03-01-13
T-23	Rev 29	03-01-13
T-24	Rev 29	03-01-13
T-25	Rev 29	03-01-13
T-26	Rev 29	03-01-13
T-27	Rev 29	03-01-13
T-28	Rev 29	03-01-13
T-29	Rev 29	03-01-13
T-30	Rev 29	03-01-13
T-31	Rev 29	03-01-13
T-32	Rev 29	03-01-13
T-33	Rev 29	03-01-13
T-34	Rev 29	03-01-13
T-35	Rev 29	03-01-13
T-36	Rev 29	03-01-13
T-37	Rev 29	03-01-13
T-38	Rev 29	03-01-13
T-39	Rev 29	03-01-13
T-40	Rev 29	03-01-13
T-41	Rev 29	03-01-13
T-42	Rev 29	03-01-13
T-43	Rev 29	03-01-13
T-44	Rev 29	03-01-13
T-45	Rev 29	03-01-13
T-46	Rev 29	03-01-13
T-47	Rev 29	03-01-13
Section U		
U-1	Rev 28	08-15-12
U-2	Rev 39	04-20-22
U-3	Rev 35	10-19-18
U-3a	Rev 25	11-23-11
U-4	Rev 25	11-23-11
U-5	Rev 25	11-23-11
U-6	Rev 25	11-23-11
U-7	Rev 25	11-23-11
U-7a	Rev 25	11-23-11
U-8	Rev 39	04-20-22
U-9	Rev 25	11-23-11
U-10	Rev 25	11-23-11
U-11	Rev 25	11-23-11
U-12	Rev 37`	11-25-20
U-13	Rev 37	11-25-20
U-14	Rev 39	04-20-22
U-15	Rev 39	04-20-22

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

SECTION A - GENERAL
[135.21 and 135.23]

This manual sets forth Martinaire's procedures and policies that are acceptable to the Administrator of the Federal Aviation Administration. This manual will be kept current with revisions as necessary. One copy of this manual will be maintained in current form at the principal operations base. A copy of this manual will be issued (including all changes and additions) to all flight crewmembers, and appropriate ground operations personnel. All recipients are required to keep their manual copy up to date with the changes and revisions furnished to them. All Martinaire flight, ground, and maintenance personnel must use this manual in the conducting of all operations. As required by FAR 135.293(a)(1), all pilots will be tested at least annually on their knowledge of this manual.

Martinaire has also furnished the North Texas Flight Standards District Office SW19 of the Federal Aviation Administration with a current and complete copy of this manual. The Director of Operations or the Chief Pilot will furnish the FAA with all changes and additions to this manual in a timely manner.

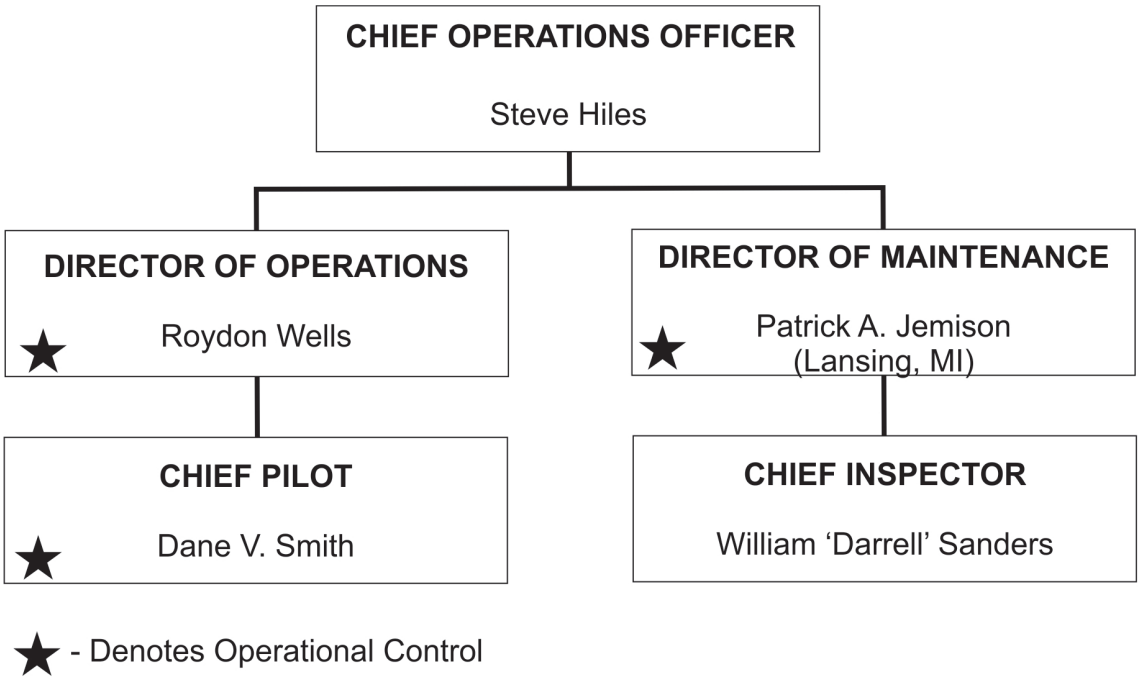
All Martinaire Pilots will keep a current and complete copy of this manual in their possession. The Pilot-in-Command will make this manual copy available to ground and flight personnel for their use when the airplane is away from home base.

Great care has been taken to ensure that this manual is not contrary to any applicable Federal Aviation Regulations, applicable foreign regulations, Martinaire's operating certificate, or Martinaire's operations specifications. However, errors do sometimes occur despite all efforts. If you find such a conflict, the regulation, certificate, or operations specification will take precedence. You are required to bring any such conflict to the attention of the Director of Operations for correction.

MANAGEMENT PERSONNEL
[135.23(A)]

Martinaire has appointed the following persons to the management positions listed:

Chief Operating Officer.....Steve Hiles
★ Director of Operations.....Roydon Wells
★ Chief Pilot.....Dane V. Smith
★ Director of Maintenance.....Patrick A. Jemison



Business Office &
Primary Base of Operations

4553 Glenn Curtiss Drive
Addison, TX 75001-3244

Tele: 972-349-5700

Satellite
Base of Operations

2618 E. Circle Drive
Lansing, MI 49608

Tele: 517-321-0224

DUTIES AND RESPONSIBILITIES

Each of these people has the authority to act for Martinaire and, in his respective sphere, exercises operational control under FAR Part 135.77. Martinaire, Inc. reserves the right to combine administrative positions as allowed by Federal Aviation Regulations and approved by the Administrator. Their specific duties and responsibilities are:

President and Chief Executive Officer

1. Reports to the Board of Directors.
2. Formulates company policy and ensures compliance.
3. Delegates duties to other key personnel as required by complying with the general provisions of this General Operations Manual.

Executive Vice President and Chief Operating Officer

1. Reports to the President and Chief Executive Officer.
2. Assists the CEO in designing and initiating company policies and procedures.
3. Responsible for day-to-day administrative, financial, marketing and planning functions.
4. Performs such other duties as may be assigned by the CEO and acts on behalf of the CEO in his absence.

Director of Operations

OVERVIEW: The Director of Operations is responsible for the overall performance, safety, reliability, and efficiency of the Flight Operations Departments to include supervision and direction over all flight operations, training, dispatch, crew scheduling, crew planning, and flight operations administrative functions. The Director of Operations has full operational control, authority, and responsibility for the Company's flight operations.

1. Reports to the Executive Vice President and Chief Operating Officer

2. Supervises the Chief Pilot and other employees as directed by the EVP/COO.

3. Ensures that all flight operations are conducted safely and in compliance with all Federal Aviation Regulations, Operations Specifications, and Company policies.

4. Has authority to act for the Certificate holder, including the signing of FAA correspondence and operations specifications.

5. Communicates with the FAA Flight Standards District Office and the National Transportation Safety Board. Files all required reports and documents.

6. Devises revisions to this manual as needed, submits the proposed revisions to the FSDO, receives confirmation from the FSDO that the revisions are acceptable, and then distributes those revisions to all manual holders.

7. Schedules aircraft availability, including scheduling the aircraft for required inspections.

8. Coordinates with the Director of Maintenance the timely correction of mechanical irregularities and discrepancies.

9. Acts as liaison between company and FAA, DOT, NTSB and other domestic and foreign governmental agencies.

10. Directs the execution of operational policies and establish operating standards.

11. Responsible for operational, administrative, and financial functions within the flight operations department.

12. Perform all other duties as assigned by the Executive VP/COO.

Chief Pilot

1. Reports to the Director of Operations.
2. Supervises all flight crew personnel.
3. Conducts or supervises all training activities of flight crew personnel.
4. Advises the Director of Operations regarding the training of flight crew personnel.
5. Assists the Director of Operations in formulating operations policies, coordinates those policies, and coordinates operations and training.
6. Ensures that all aircraft are properly equipped for applicable operations.
7. Disseminates information to all crewmembers pertaining to routes, airports, NOTAMS, NAVAIDS, company policies, and regulations.
8. Maintains proficiency as Pilot-in-Command.
9. Schedules flight crewmembers, including assigning Pilot-in-Command duties.
10. Prepares and maintains proficiency records, pilot files, flight schedules, duty time records, reports, and correspondence pertaining to flight operations activities.
11. Submits all reports regarding flight personnel to the Director of Operations.
12. Ensures that all flight crew personnel are certified and supervised according to the requirements specified in the Federal Aviation Regulations.
13. Interacts directly with pilots regarding daily operational procedures, provide flight crewmembers with required operating information, and act as the collection point for inputs from pilots and other personnel regarding the operation of the Company as it relates to the pilot group.
14. Ensures the professionalism of pilots and overall pilot standards including: performance, appearance, and conduct of pilots consistent with Company policies and professional standards.
15. Exercises operational control over Martinaire flight operations.
16. Conducts interview, hiring, and termination of pilots.
17. Performs all other duties as assigned by the Director of Operations.

Assistant Chief Pilot

1. Reports to the Chief Pilot.
2. Supervises flight crew personnel.
3. Conducts or supervises all training activities of flight crew personnel.
4. Advises the Director of Operations regarding the training of flight crew personnel.
5. Assists the Director of Operations in formulating operations policies, coordinates those policies, and coordinates operations and training.
6. Ensures that all aircraft are properly equipped for applicable operations.
7. Disseminates information to all crewmembers pertaining to routes, airports, NOTAMS, NAVAIDS, company policies, and regulations.
8. Maintains proficiency as Pilot-in-Command.
9. Schedules flight crewmembers, including assigning Pilot-in-Command duties.
10. Prepares and maintains proficiency records, pilot files, flight schedules, duty time records, reports, and correspondence pertaining to flight operations activities.
11. Submits all reports regarding flight personnel to the Director of Operations.
12. Ensures that all flight crew personnel are certified and supervised according to the requirements specified in the Federal Aviation Regulations.
13. Interacts directly with pilots regarding daily operational procedures, provide flight crewmembers with required operating information, and act as the collection point for inputs from pilots and other personnel regarding the operation of the Company as it relates to the pilot group.
14. Ensures the professionalism of pilots and overall pilot standards including: performance, appearance, and conduct of pilots consistent with Company policies and professional standards.
15. Exercises operational control over Martinaire flight operations.
16. Conducts interview, hiring, and termination of pilots.
17. Performs all other duties as assigned by the Chief Pilot.

Company Check Airman

1. Reports to the Chief Pilot.
2. Assists in the supervision of flight crew personnel.
3. Conducts or supervises training activities of flight crew personnel.
4. Advises the Chief Pilot regarding the training of flight crew personnel.
5. Ensures that all aircraft are properly equipped for applicable operations.
6. Assists in disseminating information to crewmembers pertaining to routes, airports, NOTAMS, NAVAIDS, company policies, and regulations.
7. Maintains proficiency as Pilot-in-Command.
8. Prepares and assists in maintaining proficiency records and pilot files.
9. Ensures the professionalism of pilots and overall pilot standards including: performance, appearance, and conduct of pilots consistent with Company policies and professional standards.
10. Exercises operational control over Martinaire flight and ground training operations.
11. Assists in conducting interviews and hiring.
12. Performs all other duties as assigned by the Chief Pilot or Assistant Chief Pilot.

Director of Maintenance

1. Reports to the Executive Vice President/Chief Operating Officer.

2. Is responsible for all maintenance and inspection personnel and signing of Part D & E of the Operations Specifications.

3. Ensures that company aircraft are maintained in an airworthy condition.

4. Ensures that all inspections, repairs, and component changes are accomplished in accordance with manufacturers or FAA approved procedures.

5. Ensures compliance with maintenance procedures, airworthiness directives, service bulletins, service letters, and applicable Federal Aviation Regulations and manages the MEL.

6. Ensures all maintenance technicians are trained and current on the types of aircraft for which approved.

7. Ensures that all maintenance technicians are certified and supervised according to the requirements specified in the Federal Aviation Regulations.

8. Coordinates with maintenance contracting agencies when maintenance activities are being performed on company aircraft.

9. Provides the Director of Operations with the current airworthiness status of the aircraft and the forecast down times to facilitate maintenance scheduling and insure timely deferral or correction of aircraft discrepancies.

10. Maintains a close liaison with manufacturer's representatives, parts supply houses, repair facilities and the FAA.

11. Makes available to maintenance personnel the necessary overhaul manuals, service bulletins, service letters, airworthiness directives, applicable sections of this manual, and any other required technical data.

12. Maintains all necessary work records and logbooks, including certification in the aircraft permanent maintenance records that the aircraft is approved for return to service.

13. Maintains the weight and balance records for all aircraft.

14. Completes the required SDR and MIS reports and submits them to the Director of Operations for forwarding to the FAA.

15. Exercises operational control over Martinaire flight operations.

PILOT IN COMMAND

1. GENERAL

The Pilot In Command reports to the Chief Pilot and is responsible for the safe and efficient operation and conduct of the flight. Duties may be delegated, but the PIC retains ultimate responsibility.

2. PILOT IN COMMAND RESPONSIBILITIES

A. Must have in his personal possession for each flight operation, an airman's certificate and valid medical certificate.

B. Has on file a current instrument proficiency check and route check.

C. UPDATES AIRCRAFT AERONAUTICAL CHARTS AND DATABASES ON THE DAY THEY ARE IN EFFECT.

D. Maintains and keeps with him the assigned copy of the General Operations Manual during all duty assignments.

E. Ensures aircraft airworthiness certificate is valid and required aircraft inspections are in compliance for the aircraft for which he is assigned.

F. Notifies Martinaire Dispatch of known or anticipated flight delays.

G. Notifies the Chief Pilot when dispatch may result in FAR violation.

H. Notifies the Chief Pilot whenever a medical deficiency exists affecting safety of flight.

I. Notifies the Chief Pilot whenever any unsafe condition or practice is observed.

J. Makes recommendations and suggestions that will enhance operational safety or efficiency.

3. PILOT IN COMMAND SPECIFIC DUTIES

A. Reports to airport for duty not less than 60 minutes prior to scheduled dispatch time, unless otherwise directed, in proper uniform as described in this GOM and adequately and legally rested in accordance with applicable FARs.

1. Checks departure airport, flight route, destination, and alternate airport weather. Reviews NOTAMs for departure, destination and alternate airports if applicable.

   1a. Completes and submits Martinaire Flight Risk Analysis Form to Martinaire Dispatch via email to frat@martinaire.com. (See Section U of Martinaire General Operations Manual pages U-14 and U-15 for Flight Risk Analysis Form display and instructions).

   1b. Analyze risk elements and formulate a plan to mitigate known risk elements.

2. Calls Martinaire Dispatch; reports in-position and informs Dispatch that enroute weather is sufficient for the flight and that the aircraft is in sufficient condition for the flight.

3. Flight Plans

   a. Files FAA IFR flight plans if assigned as a non-scheduled flight. Dispatch may do this, time permitting.

   b. For all scheduled flights pre-filed IFR flight plans are filed by Martinaire Dispatch with the appropriate FAA agency.

   c. Should pre-filed flight plan not be available, the PIC is responsible for filing a FAA IFR flight plan with the appropriate FAA agency.

B. Preflights assigned aircraft.

1. Checks Martinaire AFL and DDS for outstanding maintenance discrepancies, deferred discrepancies, VOR check, next maintenance due (date, hobbs, cycles and landings).

2. Ensures aircraft fueling is accomplished in accordance with Martinaire procedures.

   a. Confirms required fuel is aboard considering enroute and destination weather.

   b. Calculates revenue payload with reference to required fuel.

3. Inspects engine, fuselage and control surfaces for mechanical and structural integrity. Checks proper operation of communications and navigation equipment.

4. Ensures that the required aircraft documentation are on board such as current airworthiness certificate, aircraft registration, radio station license, AFM, approved C208 Normal and Emergency checklists.

5. Review current enroute and approach charts and ensure required personal flight equipment is on board.

6. Secures aircraft mooring equipment in POD A mooring kit.

7. Installs tail stand preparatory to loading cargo.

C. Supervises loading of aircraft and assists as required by customer contract.

1. Ensures the aircraft is loaded within approved C.G. limits and the cargo is properly secured in accordance with the AFM.

2. Ensures that aircraft loading is accomplished according to specific loading procedures as required.

3. On multi-stop routes, checks each box address to ensure that it is being offloaded at the appropriate station.

4. Completes a weight and balance computation showing the aircraft to be within proper CG limits on Martinaire Form 01.

5. Completes Martinaire Form 01A UPS Loading Procedures Form if applicable.

6. Review and approves hazardous material documentation in accordance with IATA or CFR Title 49.

7. Review and approves cargo manifest.

D. Secures aircraft for flight after completion of loading.

1. Removes and secures tail stand in POD D and checks security of cargo and pod doors.

2. **PERFORMS FINAL FRONT TO BACK CHECK – PHYSICALLY CHECKS FRONT AND SIDES OF AIRCRAFT FOR CONES AND REAR FOR TAIL STAND AND OTHER EQUIPMENT THAT MAY OBSTRUCT THE TAXI OF THE AIRCRAFT.**

DI. Supervises de-icing operation in accordance with Martinaire De-Icing Procedures as detailed in this GOM.

DII. Operates aircraft efficiently and expeditiously, commensurate with safety, weather conditions and air traffic control constraints.

DIII. Records aircraft trend data on Martinaire Aircraft Flight Log AFL after aircraft is stabilized in level cruise flight for a minimum of 5 minutes.

DIV. Codes customer ground and flight delays on Martinaire AFL.

DV. Opens cargo door and pods and installs cargo stand before unloading cargo or allowing customer truck to back up to aircraft.

DVI. Ensures that customer orange warning cones are in position PRIOR to the truck backing into the safety area.

DVII. Marshall's the customer's truck to the main door of the aircraft ensuring that no contact is made with the aircraft and that the truck back no closer than 3 feet to the cargo door.

DVIII. Completes aircraft post flight inspection.

1. ENSURE THAT NO FREIGHT IS LEFT ON BOARD AIRCRAFT.

2. Checks the main cargo area including under or behind curtains, the rear cargo area, and the pods by physically looking into each of these areas to ensure no freight left on board.

3. Checks engine oil level.

4. Looks for any damage to the aircraft and reports immediately to maintenance.

5. Checks tires and brakes for serviceability and/or leaks.

6. Check that the red flag on the fuel filter is not present and if it is, report immediately to maintenance.

7. Disconnects battery and checks engine compartment for leaks or other noted problems, and if noted, report immediately to maintenance.

M. Ensures aircraft is properly secured or tied down before leaving the ramp.

1. Ensures that all three mooring straps are in place or hangared if applicable.

2. Ensures aircraft is hangared in the event of winter weather.

3. Chocks the main wheels.

4. Ensures that all control locks are in place including vertical tail lock.

5. Installs pitot covers, engine nacelle inlet covers, and the propeller secured with prop strap.

MI. Contacts Martinaire Dispatch to close out flight within 30 minutes or less of arrival time.

MII. LEGIBLY completes IN ITS ENTIRETY Martinaire Form 01 and 01A and the aircraft flight log for the flight and uses central time for all flights.

MIII. Submits all company materials (COMAT) (e.g., aircraft flight records, weight & balance forms, fuel receipts, etc.), to Martinaire Dispatch each week via U.S. Mail.

1. Procedural Flow

a. Martinaire Dispatch receives and sorts all COMAT contents.

b. Martinaire Dispatch disseminates the paperwork to the specific department.

c. White logbook pages are sent to Aircraft Records.

i. Aircraft Records files white pages in the aircraft flight log file in numerical order.

ii.If white page has a maintenance action entry, the white page is filed in the aircraft maintenance folder and a copy is placed in the aircraft flight log file.

d. When a completed aircraft logbook is returned to the Aircraft Records Department, it too is filed with aircraft records.

e. IIf notified of a white page missing, Martinaire Dispatch will contact the pilot..t.

FLIGHT FOLLOWER "DISPATCHER"

The smooth operation of the Dispatch Department is paramount if Martinaire is to conduct business in the most efficient way possible and provide a premium service to its customers. Dispatch is the central point of information dissemination within the company. All pertinent data is either sent from other departments to Dispatch or is generated within the department for dissemination to the flight crewmembers, maintenance department, and customers. Therefore, it is vitally important that the Dispatcher be completely familiar with the operating philosophy of the Dispatch Department. The following is a listing of the most important Dispatcher duties that must be carried out consistently throughout each shift.

GENERAL

The Dispatch Department consists of designated dispatchers who report directly to the Chief Dispatcher.

CHIEF DISPATCHER

A. Reports directly to the Director of Operations and exercises operational control

B. Responsible for the overall operation of the Dispatch Department

C. Ensures that each designated shift is assigned to a dispatcher

D. Ensures that all working materials are current and available such as AF/D, AIM, Hotel Lists, Company Telephone Directory, Pilot Telephone Numbers, and any other working materials

E. Ensure that Dispatch JEPPS are current and that computerized JEPPs are also current

F. Ensures that CALM reports such as "aircraft edit report" are completed each day

G. Maintains and updates the charter tally spreadsheet

H. Ensures that all flights are scheduled correctly

I. Ensures that travel arrangements are made for any standby pilots who will be traveling out of town including hotel, rental car, etc

J. Coordinates with CALM technical staff if any problems are encountered with this program

K. Ensures that NOTAMS and Weather are checked or are being checked during each shift

L. Creates and submits Daily Operational Report to management

M. Schedules vacation requests and submits vacation and absentee reports to accounting department and submits overtime pay requests as necessary

N. Submits to the Chief Pilot or Flight Operations Administrator, the Monday morning Pilot Call In Sheet

O. Ensures that the Hazmat Material Reporting System NOPC is being properly used by all dispatch personnel.

DISPATCHER

A. Reports to the Chief Dispatcher and exercises operational control

B. Ensures that pilots call in at appropriate time and if they do not then attempts to contact them immediately and reports to the Chief Pilot or Flight Operations Administrator of any pilots who did not call in or who cannot be contacted

C. Ensures that all flights are scheduled as necessary

D. Checks Notams at the beginning of each shift and notifies flight crewmembers and customers as necessary if any problems are indicated

E. Checks weather for the operating area at the beginning of each shift and notifies crewmember and customers as necessary if any problems are indicated

F. Ensures that the computerized Martinaire Daily Flight Assignment Sheet is updated AT ALL TIMES and printed and a new updated copy put on each dispatch station

G. Ensures that the computerized Martinaire Daily Flight Assignment Sheet is emailed to the customer before PM operations and before AM operations WITHOUT FAIL

H. Immediately notifies the Director of Operations of any flight interruptions

I. Ensures that all flight times from crewmembers are properly and accurately entered into the CALM dispatch program when they are received

J. Ensures that all aircraft trend information reported by crewmembers are properly and accurately entered at www.thetrendgroup.com in a timely manner

K. Immediately updates the Company telephone list when new information is received from a pilot, vendor, customer, etc

L. Schedules aircraft swaps as dictated by Maintenance Control

M. Informs pilots of the scheduled aircraft swaps each evening as necessary

N. Schedules the aircraft swaps in CALM dispatch program when they are received from maintenance

O. Reviews changing weather conditions throughout shift and makes necessary decisions about diversions that may need to be scheduled due to weather that will clearly affect operations at scheduled departure or arrival times; IMMEDIATELY notifies the customer and the pilot of the recommendations for a smoother weather operation

P. Ensures that the Charter Quote Form is COMPLETELY filled out for each charter, and that price quoted is correct, that aircraft and pilot are available for the trip, and that it can be conducted within FAR duty and flight time requirements

Q. Ensures that the pilot is informed about all aspects of the charter including Proof Of Delivery if needed, route, fuel arrangements, hotel, etc.

R. Ensures that the flight plans are filed, hotel reservations made, etc. for each charter

S. ENSURES that World Fuel or AvFuel is contacted and arrangements made for the most economical fuel price and fuel is obtained FOR EACH stop on the charter and that pilot is notified of such arrangements

T. Ensures that the aircraft is ready and pilot is available and current before scheduling any charter

U. Notifies customer of any delays that may be encountered, or are encountered, enroute that may delay the charter or scheduled operation

V. Ensures that Dispatch Status Board is updated immediately when new information is received

W. Makes recommendations or suggestions for increased department efficiency

X. Updates the computer ized passdown log immediately when new information is received

Y. Ensures that during shift change that the dispatcher coming on duty is completely briefed as to the operation and what will need to be accomplished.

Z. Fills out the Hazardous Materials Reporting System NOPC forms as Pilot crewmembers call into Dispatch the required Hazmat aboard their aircraft. The Dispatcher taking the information must then place the completed NOPC form in the provided Hazmat NOPC binder available in the Dispatch Office. This form will then be kept here for 90 days

OPERATIONAL CONTROL

1. Operational Control is defined in FAR 1 as "the exercise of authority over initiating, conducting, and terminating a flight". Operational Control is exercised through both active and passive means. Passive control consists of developing and publishing policies and procedures for operational control personnel and flight crews to follow in the performance of their duties and assuring adequate information and facilities are available to conduct the planned operation. Active control consists of making those decisions and performing those actions necessary to operate a specific flight such as crew scheduling, accepting charter flights from the public, reviewing weather and NOTAMs, and flight planning.

   Martinaire is responsible for ensuring that both flight crew and operational control employees comply with published policies and procedures.

2. Operational Control systems vary with the type of operation authorized. In accordance with company policy, the major responsibility for operational control is with the Director of Operations. The Director of Operations may delegate the active control of flight to the pilot-in-command but always retains full responsibility.

3. Operational Control at Martinaire is in this general order of authority:

   A. President/CEO
   B. Vice President/COO
   C. Director of Operations
   D. Chief Pilot
   E. Assistant Chief Pilot
   F. Director Of Maintenance
   G. Flight Follower

   H. Pilot In Command *

   * (PIC operational control is limited to conducting and terminating a flight)
   [only the persons listed in A through F can initiate a flight]

4. Martinaire's operational control system is described or referenced in the required manual by FAR 135.21. Describes how flights for certificate holder are initiated, conducted, terminated.

5. Martinaire retains all responsibility for the operational control of aircraft operations, including actions or in-actions of direct employees and agents of the company.

6. Martinaire's holder's operational control responsibility is not transferable to any other person or entity.

7. Martinaire's operational control responsibility supersedes any agreement, contract, understanding or arrangement, either written or oral, expressed or implied, between any persons or entities.

8. Martinaire does not engage in franchising or sharing it's authority for the conduct of operations under Martinaire operation specifications, to or with any person or entity.

OPERATIONAL CONTROL (continued)

9. Martinaire does not use any DBA, in anyway that represents an entity that does not hold an air carrier or operator certificate and operations specifications as having such a certificate and operations specifications.

10. Martinaire does not enter into any wet lease with any person not authorized by the FAA to engage in common carriage under parts 121 or 135, where that person provides an aircraft and at least one crewmember.

11. Martinaire and any aircraft owner / lessor do not agree that certificate holder is required to use the aircraft owner's / lessor's pilot in part 135 operations.

12. No "non-Martinaire" aircraft owner / lessor is obligated to furnish pilots to Martinaire to operate the aircraft.

13. No "non-Martinaire" aircraft owner / lessor has the power to veto who the certificate holder will use to pilot the aircraft in part 135 operations, so as to limit the certificate holder to using only the owner / lessor's pilots. Only Martinaire pilots can fly Martinaire aircraft.

14. Martinaire does not transfer, surrender, abrogate, or share operational control responsibility to or with any other party.

15. Martinaire does not engage in any arrangement with any aircraft owner, lessor, person, or entity, which allows the use of an aircraft for operations without a complete, effective and sustainable transfer of operational control to certificate holder for all part 135 flight operations.

16. Martinaire holder does not conduct operations under part 135, unless the crewmembers are direct employees or agents for certificate holder during all aspects of part 135 operations, including pre-flight and post-flight duties.

17. Martinaire is accountable for the actions and in-actions of all crewmembers during all part 135 operations.

18. Martinaire aircrews are current, trained, qualified, appropriately rated, and have a current medical to conduct flights under part 135, and approved by the Martinaire (135.63).

19. Martinaire aircrews are qualified to accept specific flight assignments, considering flight, and rest requirements (135.265).

20. Each of Martinaire's pilots is specifically listed by name and airman certificate number on a list of pilots at certificate holder's principle base of operations.

OPERATIONAL CONTROL (continued)

21. Martinaire does not use any aircraft in flight operations, unless the aircraft is owned by and remains, without interruption in certificate holder's legal and actual possession (directly or through the certificate holder's employees and agents).

22. Martinaire does not use any aircraft in flight operations, unless the aircraft is leased by the certificate holder and remains in certificate holder's exclusive possession or custody during all of its part 135 flights.

23. For each aircraft Martinaire operates, the aircraft owner or lessee may operate the aircraft under part 91, under the control and responsibility (including potential liability for unsafe operation) of the owner as long as maintenance is current to certificate holder's FAA approved maintenance program.

24. Aircraft on Martinaire's certificate, operated under part 91 by the aircraft owner, continue to adhere to certificate holder's maintenance program at all times, or must undergo a part 135 conformity validation check before subsequent part 135 flight operations.

25. Martinaire has exclusive legal and actual possession (directly or through the certificate holder's employees and agents) of at least one aircraft for at least one kind of operation authorized in the Martinaire operation specifications, as specified in 14 CFR Section 135.25.

26. Martinaire's exclusive use aircraft are not listed on any other Part 119 certificate holder's operations specifications during the term of the exclusive use lease.

27. Martinaire does not allow or create the circumstances to enable any other entity to conduct a flight for compensation or hire under parts 119, 121, or 135 as if the entity were the certificate holder.

28. Martinaire does not operate any aircraft under part 135, under the name or fictitious name of any other person or entity, unless authorized by the FAA in paragraph A001 of the Martinaire operations specifications.

OPERATIONAL CONTROL (continued)

29. Martinaire does not use any fictitious name to obscure the certificate holder's responsibility and accountability to exercise operational control, and responsibility for the safety of each part 135 flight operations.

30. In accordance with 119.53(b), the Martinaire does not wet lease from or enter into a wet lease arrangement with any person not authorized by the FAA to engage in common carriage operations under parts 121 or 135.

31. Any agreement or arrangement between the Martinaire and an aircraft owner fully explains how the certificate holder oversees and ensures that only airworthy aircraft are used in the certificate holder's part 135 operations.

32. Certificate holder's operational control system includes a system of ensuring the certificate holder has complete, effective, and sustainable operational control over each aircraft operated, and that no surrender or loss of operational control exists.

33. Martinaire does not operate any aircraft in agreements between itself and aircraft owners or lessees, that shifts liability and accountability for safety of part 135 operations from Martinaire to the aircraft owner or other parties.

34. Prior to any part 135 flight, at least one person, or mgmt designee, (a direct employee) listed in paragraph A006 (other than pilot), must determine whether each assigned crewmember is qualified and eligible to serve as a crewmember in the aircraft and type of operation assigned.

35. Prior to any part 135 flight, at least one person, or mgmt designee, (a direct employee) listed in paragraph A006 (other than pilot), must determine whether the aircraft assigned is listed in operations specifications paragraph D085.

36. Prior to any part 135 flight, at least one person, or mgmt designee (other than pilot), (a direct employee) listed in paragraph A006, must determine the assigned aircraft is airworthy under Martinaire's approved inspection, maintenance, or airworthiness program.

37. Prior to any 135 flight or series of flights, at least the PIC assigned must determine, whether the flight can be initiated, conducted, or terminated safety and in accordance with the Martinaire operations specifications, manuals, and regulations.

38. Operational determinations that are made for Martinaire part 135 flights, made by PIC's assigned to that flight, are made in accordance with the Martinaire written policies, procedures and standards.

OPERATIONAL CONTROL (continued)

39. Delegated personnel who make operational control decisions for the certificate holder meet the requirements of FAR 119.69(**d**), and their names, titles, duties, responsibilities, and authorities are specified in the certificate holder's required manuals, Op Spec A006, or described in A008 .

40. Certificate holders issued A039 & A040, persons listed in the Op Specs must determine & have sufficient knowledge of whether a flight or series of part 135 flights can be initiated, conducted, or terminated safely in accordance with the limitations, authorizations, procedures approved is subparagraph (a) above & the appropriate regulations. (Martinaire does not have Op Specs A039 & A040, therefore A008 d.6(c)(ii) does not apply).

41. The Martinaire GOM is issued to every PIC. It is used as a ready reference and explains which flight operations, and segments of flight operations are conducted under part 135 and which are conducted under part 91. For part 135 operations, that the certificate holder is responsible and accountable for safe operation of all part 135 flight operations.

42. The Martinaire GOM clearly states and management ensures that each pilot is informed and understands that failure to adhere to the certificate holder's directions and instructions, may be contrary to parts 119 and/or 135, and therefore may be subject to legal enforcement action by the FAA.

This page left blank intentionally

SECTION B - WEIGHT AND BALANCE CONTROL
[135.23(b)]

ESTABLISHING EMPTY WEIGHT BEFORE USE IN REVENUE SERVICE

FAR 135.185 requires all Martinaire multiengine aircraft be weighed every thirty-six (36) calendar months. This is tracked by the maintenance department as a "time due" item.
The maintenance department arranges for the aircraft to be weighed and ensures the revised weight & balance calculations are placed the POH or AFM.

The aircraft weight will be recorded in the aircraft assigned Pilot Operating Handbook (POH) and on the Fleet Aircraft Weight Sheet provided for reference to the flight crew. If the Fleet Aircraft Weight Sheet is not available, the POH is sufficient as a source for determining the aircraft weight.

WEIGHT AND BALANCE PROCEDURES

Before each revenue flight, the PIC will calculate the gross takeoff weight, gross landing weight (if the maximum allowable gross landing weight is less than the maximum allowable gross takeoff weight for this aircraft), and the actual center of gravity for the loaded weight. The PIC will determine that these calculated values fall within the manufacturer's allowable weight and balance limits for the aircraft.

Weight and balance calculations will be computed from the aircraft weight and balance records using actual weight for the crew and actual weights for baggage and cargo. Only those loading tables listed by the manufacturer or approved by the FAA will be used to determine safe loading conditions.

Actual weight may be determined by scale weighing each passenger including carry on baggage. The actual weight may also be determined by asking each passenger their weight. In the event the PIC determines an obvious discrepancy in the weight given it will become necessary to weigh that passenger.

Cargo weight will be actual weight. Cargo that is accompanied by shipping papers with the weight shown may be used at the discretion of the PIC. If the weight of the freight is in question, the pilot must then weight the freight using the calibrated scale. Each calibrated scale is located in the aircraft mooring kit.

A Martinaire Form 01 will be completed prior to each flight performed under FAR Part 135.

Load Manifest.

When a revenue flight is conducted under FAR 135, the PIC will record the results of these aircraft loading computations on the Martinaire Form 01. The PIC will carry a copy of this form in the aircraft until reaching the final destination of the flight. The PIC will also forward this copy to flight operations at the end of each week. Martinaire will keep a copy of this form on file at the corporate office for a minimum of 30 days after the completion of the flight.

For multiengine aircraft the load manifest will be completed in duplicate and both copies are to be carried onboard the aircraft.

The load manifest must be prepared by the flight crew of Martinaire aircraft prior to departure and shall include at least the following items:

1. The number of passengers, if applicable.
2. The total weight of the loaded aircraft.
3. The maximum allowable takeoff weight for that flight.
4. The center of gravity limits.
5. The center of gravity of the loaded aircraft.
6. The registration number of the aircraft.
7. The origin and destination.
8. Identification of crewmembers and their crew position assignments.

To simplify determination of take off gross weight and center of gravity and expedite preparation of load manifests, the following technique shall be used:

1. The current aircraft empty weight, moment, and date of weighing is listed in the weight and balance section of the FAA Approved Airplane Flight Manual.

2. Martinaire Form 01 will be completed using information contained in the weight and balance section of the Airplane Flight Manual. Maximum weights for each zone can be different if using partition nets versus tie down method. These weights are found in the Airplane Flight Manual.

3. Weights at each station are entered on the left half of the MRA Form 01 by trip leg number.

4. For the C-208B, aircraft moments for each station are computed by multiplying the weight times the arm. The weights and moments for each leg are then totaled. The total moment is then divided by the total weight to arrive at the actual Center of Gravity location. This is entered in the appropriate column. The Pilot In Command will verify that the C.G. and gross weight are within the limits prescribed in the AFM and record the forward and aft limits for the takeoff weight in the appropriate column on Form 01.

C-208B Loading Procedure:

The tail stand must be installed prior to loading. The aircraft empty weight and fuel load can be written on the MRA Form 01. The pilot shall subtract the aircraft empty weight, fuel weight, and crew weight from the maximum takeoff weight and inform the customer how much freight can be carried. The pilot must have a copy of the load manifest from the customer and be present at the cargo door or inside the aircraft for loading.

The pilot will make sure that aircraft zone loads are not exceeded by adding up the weights of the packages as they are placed into each loading zone. This can be done using automatic totalizing scales. Without totalizing scales the pilot must add up the weight of the boxes manually as they are placed in each zone. If the pilot can determine the exact weight of the freight in one zone by subtracting the weight from the zone loaded immediately prior to it, individual box weights do not need to be added up. For example, if the customer brings 1275 pounds of freight to the aircraft and the pilot and/or loading crew fills up zone #1 with the max. zone weight of 415 lbs., it is safe to put the rest of the freight (860 lbs) into zone #2 without having to count each box or reweigh it since the load max. zone weight for zone #2 is 860 lbs.

When the maximum weight limit for a particular zone is reached it is written in the appropriate block of the Form 01 and loading for that zone must stop. If a partition net is required, it is installed and the next zone is loaded. No more than 2 zones can be loaded without installing a partition net.

Once all the zones are loaded and the partition nets are put in place, the pilot will secure the mesh curtain and close the main cargo door. Pods A, B, C and D can be loaded while the main cargo bay is being loaded as long as the pilot knows how much weight is being placed in each pod. Weight limits for each cargo pod are marked on the inside of the corresponding pod.

Once loading is complete, the pilot will remove the tail stand and stow it.

Having kept track of how much freight went into each aircraft zone or pod on the MRA Form 01, the pilot can complete the weight and balance calculations. The actual center of gravity (C.G.) must fall between the maximum forward and maximum aft C.G. in order to be considered safe and legal (within the C.G. envelope.)

When the PIC is satisfied that all computations are correct and the aircraft if properly loaded for existing conditions, he/she will initial the space provided on the MRA Form 01 and depart for his next destination.

Use numbered example, key code and fwd CG chart on pages B-4 through B-6 as guidance to complete the C-208B Form 01.

MARTINAIRE

WEIGHT AND BALANCE - MRA FORM 01

GENERAL INFO

ROUTE: 1 _____ N#: 2 _____ PIC DUTY FROM: 3 _____ TO: 4 _____ DATE: 5 _____

C-208B ONLY

WEIGHT AND BALANCE

LEG / CITY	1	2	3	4	5	6	ARM	1	2	3	4	5	6
	6												
EMPTY WT.	7						8	9					
CREW	10						135.5	11					
FUEL (2224)	12						206.4	13					
ZONE 1 (415)	14						172.0	15					
ZONE 2 (860)	16						217.8	17					
ZONE 3 (495)	18						264.4	19					
ZONE 4 (340)	20						294.5	21					
ZONE 5 (315)	22						319.5	23					
ZONE 6 (245)	24						344.0	25					
POD A (230)	26						132.4	27					
POD B (310)	28						182.1	29					
POD C (270)	30						233.4	31					
POD D (280)	32						287.6	33					
TOTALS	34							35					
C.G.	36						MAX. FWD	37					
MAX T.O. WT.	38						MAX. AFT	39					
CAPT. INITIALS	40						C.G. FROM	179.6	C.G.TO	204.35	MAX RAMP WT		8785

Pilot Notes:

This form must be sent to the chief pilot weekly

Cessna 208B Weight and Balance Worksheet (Form 01) Key:

1. Route Number (enter the route number you are flying)
2. Aircraft Registration Number (enter the tail # you are flying)
3. Starting Time of Duty Day (enter the time you came on duty)
4. Ending Time of Duty Day (enter the time you went off duty)
5. Date (enter the date of the flight)
6. Departure Airport Code (enter the airport code of the airport you are departing)
7. Empty Weight of the Aircraft (enter the empty weight of the aircraft from the POH)
8. Empty Arm of the Aircraft (enter the empty arm of the aircraft from the POH)
9. Total Moment of the Empty Aircraft (enter the empty moment of the aircraft from the POH)
10. Total Weight of the Crew Member(s) (enter the crew weight)
11. Total Moment of the Crew Member(s) (enter the crew moment calculated by multiplying crew weight by arm)
12. Total Weight of Fuel (enter the amount of fuel on board read from the fuel gages)
13. Total Moment of the fuel (enter the fuel moment calculated by multiplying fuel weight by arm)
14. Zone 1 Weight (enter the weight of the freight in zone 1)
15. Zone 1 Moment (enter the zone 1 moment calculated by multiplying the zone 1 weight by arm)
16. Zone 2 Weight (enter the weight of the freight in zone 2)
17. Zone 2 Moment (enter the zone 2 moment calculated by multiplying the zone 2 weight by arm)
18. Zone 3 Weight (enter the weight of the freight in zone 3)
19. Zone 3 Moment (enter the zone 3 moment calculated by multiplying the zone 3 weight by arm)
20. Zone 4 Weight (enter the weight of the freight in zone 4)
21. Zone 4 Moment (enter the zone 4 moment calculated by multiplying the zone 4 weight by arm)
22. Zone 5 Weight (enter the weight of the freight in zone 5)
23. Zone 5 Moment (enter the zone 5 moment calculated by multiplying the zone 5 weight by arm)
24. Zone 6 Weight (enter the weight of the freight in zone 6)
25. Zone 6 Moment (enter the zone 5 moment calculated by multiplying the zone 5 weight by arm)
26. Pod A Weight (enter the weight of the freight in pod A)
27. Pod A Moment (enter the pod A moment calculated by multiplying the pod A weight by arm)
28. Pod B Weight (enter the weight of the freight in pod B)
29. Pod B Moment (enter the pod B moment calculated by multiplying the pod B weight by arm)
30. Pod C Weight (enter the weight of the freight in pod C)
31. Pod C Moment (enter the pod C moment calculated by multiplying the pod C weight by arm)
32. Pod D Weight (enter the weight of the freight in pod D)
33. Pod D Moment (enter the pod D moment calculated by multiplying the pod D weight by arm)
34. Total Weight (add up A/C empty weight, crew weight, fuel weight and all pod and zone weights)
35. Total Moment (add up A/C empty moment, crew moment, fuel moment and all pod and zone moments)
36. Aircraft Center of Gravity (obtained by dividing total weight by total moment)
37. Maximum Forward Center of Gravity for aircraft takeoff weight (obtained from forward CG chart or POH)
38. Maximum Takeoff Weight (enter the maximum takeoff weight for the aircraft with regard to lift kit installed or not and icing conditions)
39. Maximum Aft Center of Gravity of 204.35 (does not change)
40. Captains Initials (the PIC's initials)
41. Pilot Notes (used to write down clearances, ATIS, calculations etc.)

VOLUME CAPACITY

Station	Cubes	½-di-Bulk
Zone 1	52.9	12
Zone 2	109.0	24
Zone 3	63.0	14
Zone 4	43.5	10
Zone 5	40.1	9
Zone 6	31.5	7
Sub-total	340	75
Pod A	23.4	5
Pod B	31.5	7
Pod C	27.8	6
Pod D	28.8	6
Sub-total	111.5	25
Total	451.5	100

FORWARD CG LIMITS FOR CE-208B

GROSS WEIGHT	FWD LMT	GROSS WEIGHT	FWD LMT	GROSS WEIGHT	FWD LMT	GROSS WEIGHT	FWD LMT	GROSS WEIGHT	FWD LMT	GROSS WEIGHT	FWD LMT
5500	179.6	6050	182.6	6590	185.6	7130	188.6	7670	191.6	8210	195.0	8750	199.2
5510	179.7	6060	182.7	6600	185.7	7140	188.6	7680	191.6	8220	195.1	8760	199.2
5520	179.7	6070	182.7	6610	185.7	7150	188.7	7690	191.7	8230	195.1	8770	199.2
5530	179.8	6080	182.8	6620	185.8	7160	188.7	7700	191.7	8240	195.2	8780	199.3
5540	179.8	6090	182.8	6630	185.8	7170	188.8	7710	191.8	8250	195.3	8800	199.3
5550	179.9	6100	182.9	6640	185.9	7180	188.9	7720	191.8	8260	195.4	8810	199.4
5560	179.9	6110	183.0	6650	185.9	7190	188.9	7730	191.9	8270	195.5	8820	199.4
5570	180.0	6120	183.0	6660	186.0	7200	189.0	7740	191.9	8280	195.5	8830	199.4
5580	180.0	6130	183.1	6670	186.0	7210	189.0	7750	192.0	8290	195.6	8840	199.5
5590	180.1	6140	183.1	6680	186.1	7220	189.1	7760	192.0	8300	195.7	8850	199.5
5600	180.2	6150	183.2	6690	186.2	7230	189.1	7770	192.1	8310	195.8	8860	199.5
5610	180.2	6160	183.2	6700	186.2	7240	189.2	7780	192.2	8320	195.8	8870	199.6
5620	180.3	6170	183.3	6710	186.3	7250	189.2	7790	192.2	8330	195.9	8880	199.6
5630	180.3	6180	183.3	6720	186.3	7260	189.3	7800	192.3	8340	196.0	8890	199.6
5640	180.4	6190	183.4	6730	186.4	7270	189.3	7810	192.3	8350	196.1	8900	199.7
5650	180.4	6200	183.5	6740	186.4	7280	189.4	7820	192.4	8360	196.1	8910	199.7
5660	180.5	6210	183.5	6750	186.5	7290	189.5	7830	192.4	8370	196.2	8920	199.7
5670	180.5	6220	183.6	6760	186.5	7300	189.5	7840	192.5	8380	196.3	8930	199.8
5680	180.6	6230	183.6	6770	186.6	7310	189.6	7850	192.5	8390	196.4	8940	199.8
5690	180.6	6240	183.7	6780	186.7	7320	189.6	7860	192.6	8400	196.5	8950	199.8
5700	180.7	6250	183.7	6790	186.7	7330	189.7	7870	192.7	8410	196.5	8960	199.9
5710	180.8	6260	183.8	6800	186.8	7340	189.7	7880	192.7	8420	196.6	8970	199.9
5720	180.8	6270	183.8	6810	186.8	7350	189.8	7890	192.8	8430	196.7	8980	200.0
5730	180.9	6280	183.9	6820	186.9	7360	189.8	7900	192.8	8440	196.8	8990	200.0
5740	180.9	6290	184.0	6830	186.9	7370	189.9	7910	192.9	8450	196.8	8990	200.0
5750	181.0	6300	184.0	6840	187.0	7380	190.0	7920	192.9	8460	196.9	9000	200.0
5760	181.0	6310	184.1	6850	187.0	7390	190.0	7930	193.0	8470	197.0	9010	200.1
5770	181.1	6320	184.1	6860	187.1	7400	190.1	7940	193.0	8480	197.1	9020	200.1
5780	181.1	6330	184.2	6870	187.1	7410	190.1	7950	193.1	8490	197.1	9030	200.1
5790	181.2	6340	184.2	6880	187.2	7420	190.2	7960	193.1	8500	197.2	9040	200.2
5800	181.3	6350	184.3	6890	187.3	7430	190.2	7970	193.2	8510	197.3	9050	200.2
5810	181.3	6360	184.3	6900	187.3	7440	190.3	7980	193.3	8520	197.4	9060	200.2
5820	181.4	6370	184.4	6910	187.4	7450	190.3	7990	193.3	8530	197.5		
5830	181.4	6380	184.5	6920	187.5	7460	190.4	8000	193.4	8540	197.5		
5840	181.5	6390	184.5	6930	187.5	7470	190.5	8010	193.4	8550	197.6		
5850	181.5	6400	184.6	6940	187.5	7480	190.5	8020	193.5	8560	197.7		
5860	181.6	6410	184.6	6950	187.6	7490	190.6	8030	193.6	8570	197.8		
5870	181.6	6420	184.7	6960	187.6	7500	190.6	8040	193.7	8580	197.8		
5880	181.7	6430	184.7	6970	187.7	7510	190.7	8050	193.8	8590	197.9		
5890	181.7	6440	184.8	6980	187.8	7520	190.8	8060	193.8	8600	198.0		
5900	181.8	6450	184.8	6990	187.8	7530	190.8	8070	193.9	8610	198.1		
5910	181.9	6460	184.9	7000	187.9	7540	190.8	8080	194.0	8620	198.1		
5920	181.9	6470	184.9	7010	187.9	7550	190.9	8090	194.1	8630	198.2		
5930	182.0	6480	185.0	7020	188.0	7560	190.9	8100	194.1	8640	198.3		
5940	182.0	6490	185.1	7030	188.0	7570	191.0	8110	194.2	8650	198.4		
5950	182.1	6500	185.1	7040	188.1	7580	191.1	8120	194.3	8660	198.5		
5960	182.1	6510	185.2	7050	188.1	7590	191.1	8130	194.4	8670	198.5		
5970	182.2	6520	185.2	7060	188.2	7600	191.2	8140	194.4	8680	198.6		
5980	182.2	6530	185.3	7070	188.2	7610	191.2	8150	194.5	8690	198.7		
5990	182.3	6540	185.3	7080	188.3	7620	191.3	8160	194.6	8700	198.8		
6000	182.4	6550	185.4	7090	188.4	7630	191.3	8170	194.7	8710	198.8		
6010	182.4	6560	185.4	7100	188.4	7640	191.4	8180	194.8	8720	198.9		
6020	182.5	6570	185.5	7110	188.5	7650	191.4	8190	194.8	8730	199.0		
6030	182.5	6580	185.5	7120	188.5	7660	191.5	8200	194.9	8740	199.1		
6040	182.6									8750	199.2		

SECTION C - OPERATIONS SPECIFICATIONS
[135.23(c)]

The automated operations specifications generated and issued by the FAA are identified by individual paragraph number.

In order to ease the revision control procedure, the Director of Operations will maintain this index as page 1 in the operations specifications section.

Ops Specs sections A, B, and C are included in this GOM for reference by the pilots.

Maintenace Ops Specs D and E are held and maintained by the Chief Inspector.

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

Part A

A001 . Issuance and Applicability

HQ Control: 05/09/2003
HQ Revision: 02c

a. These operations specifications are issued to Martinaire Aviation L.L.C., whose principal base of operation is located at:

Primary Business Address:	Mailing Address:
4553 Glenn Curtiss Dr	4553 Glenn Curtiss Dr
Addison, Texas 75001	Addison, Texas 75001

The holder of these operations specifications is the holder of Air Carrier Certificate Number MT9A828W and shall hereafter be referred to as the certificate holder. The certificate holder is authorized to conduct:

On Demand Cargo Only	operations in	Common	carriage pursuant to Title 14 Code of Federal Regulations (CFR) Section	119.21(a)(5) - On-Demand	and provided, at all times, the certificate holder has appropriate written economic authority issued by the Department of Transportation.

The certificate holder shall conduct these kinds of operations in accordance with the specific authorizations, limitations, and procedures in these operations specifications and all appropriate Parts of the CFR.

b. These operations specifications are effective as of the "Date Approval is effective" listed in each paragraph and shall remain in effect as long as the certificate holder continues to meet the requirements of Part 119 as specified for certification.

c. The certificate holder is authorized to conduct the operations described in subparagraph a under the following other business names:

Martinaire

d. The certificate holder is authorized to conduct flights under 14 CFR Part 91 for crewmember training, maintenance tests, ferrying, re-positioning, and the carriage of company officials using the applicable authorizations in these operations specifications, without obtaining a Letter of Authorization, provided the flights are not conducted for compensation or hire and no charge of any kind is made for the conduct of the flights.

1. The Certificate Holder applies for the Operations in this paragraph.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A002 . Definitions and Abbreviations **HQ Control: 04/25/2018**
HQ Revision: 11e

Unless otherwise defined in these operations specifications, all words, phrases, definitions, and abbreviations have identical meanings to those used in Title 14 Code of Federal Regulations (CFR) and Title 49 United States Code as cited in Public Law 103-272, as amended. Additionally, the definitions listed below are applicable to operations conducted in accordance with these operations specifications.

Term or Terms	Definition
Agent(s)	The significance of the words "agent" and "agents" as used in these operations specifications is that the certificate holder is the principal and that the certificate holder is accountable and liable for the acts or omissions of each of its agent or agents.
Air Ambulance Aircraft	An aircraft used in air ambulance operations. The aircraft must be equipped with at least medical oxygen, suction, and a stretcher, isolette, or other approved patient restraint/containment device. The aircraft need not be used exclusively as an air ambulance aircraft and the equipment need not be permanently installed.
Air Ambulance Operations	(a) Air transportation of a person with a health condition that requires medical personnel as determined by a health care provider; or (b) Holding out to the public as willing to provide air transportation to a person with a health condition that requires medical personnel as determined by a health care provider including, but not limited to, advertisement, solicitation, association with a hospital or medical care provider and (c) Uses an air ambulance aircraft, either fixed wing or helicopter.
Airways Navigation Facilities	Airways navigation facilities are those ICAO Standard Navigation Aids (VOR, VOR/DME, and/or NDB) which are used to establish the en route airway structure within the sovereign airspace of ICAO member states. These facilities are also used to establish the degree of navigation accuracy required for air traffic control and Class I navigation within that airspace.
Approved Unit Load Device (ULD) Cargo	Cargo loaded into a ULD, as defined by National Aerospace Standard (NAS) 3610, SAE Aerospace Standard (AS) 36100, Technical Standard Order (TSO) - C90, or other approval standards, that is approved for carriage within the airplane as specified in the Airplane Flight Manual / Weight and Balance Manual approved by the type certificate or supplemental type certificate
Authority	A power that a person is vested with.
Auto Flight Guidance	Aircraft systems, such as an autopilot, auto throttles, displays, and

System (AFGS)	controls, that are interconnected in such a manner so as to allow the crew to automatically control the aircraft's lateral and vertical flightpath and speed. A flight management system is sometimes associated with an AFGS.
Automatic Dependent Surveillance (ADS)	A function for use by air traffic services in which the ADS equipment in the aircraft automatically transmits data derived from on-board navigation systems via a datalink. As a minimum, the data include aircraft identification and three-dimensional position. ADS is sometimes referred to as ADS-A or ADS-Contract (e.g., a communications contract between the aircraft communications/surveillance system and an air traffic facility or service provider only).
Automatic Dependent Surveillance-Broadcast (ADS-B)	ADS-B is a function on an aircraft or surface vehicle operating within the surface movement area that periodically broadcasts via datalink its state vector (horizontal and vertical position, horizontal and vertical velocity) and other information. ADS-B is Automatic in that it requires no external stimulus to elicit a transmission. ADS-B is Dependent because it relies on on-board navigation sources. ADS-B Surveillance information is provided, via data link, to any users (either aircraft or ground-based) within range of the Broadcast signal.
Available Landing Distance (ALD)	ALD is that portion of a runway available for landing and roll-out for aircraft cleared for land and hold short operations (LAHSO). This distance is measured from the landing threshold to the hold-short point.
Bulk Cargo	Cargo usually transported as individual pieces and loaded into a compartment approved for bulk cargo by the Airplane Flight Manual / Weight and Balance Manual that is approved by the type certificate or supplemental type certificate. These items are generally loaded planeside and loaded directly into the bulk compartment.
Cargo	Any property carried on an aircraft other than mail, stores, and accompanied or mishandled baggage.
Category I Instrument Approach	A Category I instrument approach is any authorized precision or nonprecision instrument approach which is conducted with a minimum height for IFR flight not less than 200 feet (60 meters) above the touchdown zone and a minimum visibility/RVV not less than 1/2 statute mile or RVR 1800 (for helicopters, 1/4 statute mile or RVR 1600).
Certificate Holder	In these operations specifications the term "certificate holder" shall mean the holder of the certificate described in Part A paragraph A001 and any of its officers, employees, or agents used in the conduct of operations under these operations specifications.
Class I Navigation	Class I navigation is any en route flight operation or portion of an operation that is conducted entirely within the designated Operational Service Volumes (or ICAO equivalents) of ICAO standard airway navigation facilities (VOR, VOR/DME, NDB). Class I navigation also

	includes en route flight operations over routes designated with an "MEA GAP" (or ICAO equivalent). En route flight operations conducted within these areas are defined as "Class I navigation" operations irrespective of the navigation means used. Class I navigation includes operations within these areas using pilotage or any other means of navigation which does not rely on the use of VOR, VOR/DME, or NDB.
Class II Navigation	Class II navigation is any en route flight operation which is not defined as Class I navigation. Class II navigation is any en route flight operation or portion of an en route operation (irrespective of the means of navigation) which takes place outside (beyond) the designated Operational Service Volume (or ICAO equivalents) of ICAO standard airway navigation facilities (VOR, VOR/DME, NDB). However, Class II navigation does not include en route flight operations over routes designated with an "MEA GAP" (or ICAO equivalent).
Cockpit Display of Traffic Information (CDTI)	A CDTI is a generic display that provides a flightcrew with surveillance information about other aircraft including their position. Traffic information for a CDTI may be obtained from one or multiple sources (including ADS-B, TCAS, and traffic information services) to provide improved awareness of proximate aircraft and as an aid to visual acquisition as part of the normal see and avoid operations both in the air and on the ground.
Decision Altitude (Height)	DA(H) is a specified minimum altitude in an instrument approach procedure by which a missed approach must be initiated if the required visual reference to continue the approach has not been established. The 'altitude' value is typically measured by a barometric altimeter; the 'height' value (H) is typically a radio altitude equivalent height above the touchdown zone (HAT) used only for advisory reference and does not necessarily reflect actual height above underlying terrain. [This definition is consistent with both current U.S. operator usage and ICAO international agreements.]
Dual-Certificated-Noise Compliance	For purposes of noise compliance rules, dual-certificated airplanes are those that are certificated to operate in either a Stage 2 or Stage 3 configuration. The only airplanes dual certificated by the FAA were certain Boeing 747's, -300 series or earlier. For noise compliance purposes, these airplanes are considered Stage 2 unless the operator gets a supplemental type certificate to make the airplane Stage 3 only, or unless the operator voluntarily limits the operation to Stage 3 only.
Duty	A task or function a person must do.
Fault Detection and Exclusion (FDE)	FDE technology allows onboard GPS equipment to automatically detect a satellite failure that effects navigation and to exclude that satellite from the navigation solution.
Flight Management Systems (FMS)	An integrated system used by flightcrews for flight planning, navigation, performance management, aircraft guidance, and flight progress

	monitoring.
Free Flight	A safe and efficient flight operating capability under instrument flight rules in which the operators have the freedom to select a path and speed in real time. Air traffic restrictions are imposed only to ensure separation, to preclude exceeding airport capacity, to prevent unauthorized flight through special use airspace, and to ensure safety of flight. Restrictions are limited in extent and duration to correct the identified problem. Any activity that removes restrictions represents a move toward Free Flight.
Global Position System (GPS) Landing System (GLS)	GLS is a differential GPS-based landing system providing both vertical and lateral position fixing capability. The term GLS may also be applied to any GNSS-based differentially corrected landing system.
Helicopter Emergency Medical Service	Helicopter emergency medical service (HEMS) is: (a) Air transportation by helicopter of a person with a health condition that requires medical personnel as determined by a health care provider; or (b) Holding out to the public as willing to provide air transportation by helicopter to a person with a health condition that requires medical personnel as determined by a health care provider including, but not limited to, advertisement, solicitation, association with a hospital or medical care provider. (c) Helicopter emergency medical evacuation service (HEMES).
ILS-PRM	Simultaneous close parallel ILS approaches are enabled through the implementation of special precision runway monitoring (PRM) equipment operated by ATC at certain airfields for specific runways, titled in 14 CFR part 97 as "ILS PRM." ILS PRM approaches are conducted between 4,299 and 3,000 feet parallel runway spacing. Runways 3,400 feet or greater apart utilize two parallel ILS courses, aligned with the runway centerlines (RCLs). For runways spaced less than 3,400 feet, one ILS is offset 2.5° to 3.0°.
Imported Airplane-Noise Compliance	For purposes of the noise compliance rules, an imported airplane is a Stage 2 airplane of 75,000 pounds or more that was purchased by a U.S. person from a non-U.S. owner on or after November 5, 1990. [Under the non addition rule (see 14 CFR § 91.855), an imported airplane may not be operated to or from any airport in the contiguous United States. Such airplanes may be owned and registered by U.S. persons but are limited to operation outside the contiguous United States.]
JAA JAR-OPS-1	Joint Aviation Authorities (JAA) Joint Aviation Requirements (JAR) operational agreements (OPS). The European JAA adopted common operational guidance for all Member States in order to harmonize the rules within those States. The JAR-OPS-1, is part 1 of the operational agreement and comprises the operational requirements applicable to commercial air transportation fixed wing aircraft.
Localizer-Type	See definition of SOIA.

Directional Aid (LDA) PRM	
Lease	A lease is where an aircraft owner transfers possession and use of a specific aircraft to a lessee for a fixed period. In a lease, as opposed to other types of custody/use agreements, the lessee has the right to possess and use the aircraft even if the aircraft owner needs the aircraft returned, assuming the lessee has made timely payments and is properly maintaining the aircraft. In accordance with Section 119.53(b), the certificate holder may not wet lease from or enter into any wet leasing arrangement with any person not authorized by the FAA to engage in common carriage operations under 14 CFR Parts 121 or 135 (as appropriate), whereby that other person provides an aircraft and at least one crewmember to the certificate holder.
Life Vest, Non-Quick-Donning	A non-quick-donning life vest is one which must be removed from its container, placed over the wearer's head, and/or requires additional steps beyond inflation to make it ready to use for its intended purpose.
Life Vest, Quick-Donning	A quick-donning life vest is fastened around a person in a manner which requires the wearer only to pull on a single tab and lift the life vest over his/her head. At this point the life vest needs only to be inflated to be ready to use for its intended purpose.
Local Flying Area	An area designated by the operator in which air ambulance services will be conducted. Each local flying area should be defined in a manner acceptable to the operator, the local Flight Standards District Office, and the Principal Operations Inspector, taking into account the operating environment, the geographic terrain features, and the capabilities of the aircraft.
Major Contract Training	Any flight training, flight testing, or flight checking leading to and maintaining certification and qualification of air carrier flightcrew members in accordance with the requirements (maneuvers and procedures) explicitly stated in 14 CFR Parts 61, 121, or 135; or in SFAR 58 Advanced Qualification Program (AQP), as applicable.
Medical Crewmember	A person with medical training who is assigned to provide medical care and other crewmember duties related to the aviation operation during flight.
Minimum Descent Altitude (Height)	MDA(H) is the lowest altitude in an instrument approach procedure to which a descent is authorized on final approach or during circle-to-land maneuvering. The 'altitude' value is typically measured by a barometric altimeter; the 'height' value (H) is typically a radio altitude equivalent height above the touchdown zone (HAT) or height above airport (HAA) published elevation. The (H) is used only for advisory reference and does not necessarily reflect actual height above underlying terrain. [This definition is consistent with both current U.S. operator usage and ICAO international agreements.]

Operational Service Volume	The Operational Service Volume is that volume of airspace surrounding a NAVAID which is available for operational use and within which a signal of usable strength exists and where that signal is not operationally limited by co-channel interference. Operational Service Volume includes all of the following: (1) The officially designated Standard Service Volume excluding any portion of the Standard Service Volume which has been restricted. (2) The Expanded Service Volume. (3) Within the United States, any published instrument flight procedure (victor or jet airway, SID, STAR, SIAP, or instrument departure). (4) Outside the United States, any designated signal coverage or published instrument flight procedure equivalent to U.S. standards.
Outsourced Training	Any training, testing, or checking activity which an air carrier certificate holder provides by way of a contract arrangement with another party.
Parabolic Flight Operations	Parabolic flight operations are aerobatic maneuvers in which the aircraft is intentionally pitched in excess of 30 degrees above and 30 degrees below the horizon in a repeated fashion for the specific purpose of exposing the participants to reduced or zero gravity conditions.
Planned Redispatch or ReRelease EnRoute	The term "planned redispatch or rerelease en route" means any flag operation (or any supplemental operation that includes a departure or arrival point outside the 48 contiguous United States and the District of Columbia) that is planned before takeoff to be redispatched or rereleased, in accordance with 14 CFR 121.631(f), at a predetermined point along the route of flight to an airport other than that specified in the original dispatch or flight release.
Polar Area (North)	The north polar area of operations is that area that lies north of latitude N 78º 00'.
Qualified Local Observer	A person who provides weather, landing area, and other information as required by the operator, and has been trained by the operator under a training program approved by the Principal Operations Inspector.
Raw Terrain	Raw terrain is devoid of any person, structure, vehicle or vessel.
Receiver Autonomous Integrity Monitoring (RAIM)	RAIM is a function that considers the availability of satisfactory signal integrity broadcasted from the particular GPS satellites used during a given flight. Onboard GPS navigators accomplish this automatically as the aircraft proceeds along its route. When insufficient signal integrity is detected an alarm is provided to the flightcrew. Using the predictive RAIM software flightcrews and dispatchers know in advance whether or not suitable GPS navigation will be available throughout the flight. This predictive information may also be determined during flight planning by contacting an FAA Flight Service Station.
Reliable Fix	A "reliable fix" means station passage of a VOR, VORTAC, or NDB. A

	reliable fix also includes a VOR/DME fix, an NDB/DME fix, a VOR intersection, an NDB intersection, and a VOR/NDB intersection provided course guidance is available from one of the facilities and the fix lies within the designated operational service volumes of both facilities which define the fix.
Required Navigation Performance (RNP)	A statement of navigation performance necessary for operations within a defined airspace.
Required Navigation Performance (RNP) Time Limit	Applies to aircraft equipped with INS or IRU systems where those systems provide the means of navigation to navigate to the degree of accuracy required by ATC. The FAA-approved time in hours--after the system is placed in navigation mode or is updated en route--that the specific INS or IRU make/model can meet a specific RNP type on a 95% probability basis. It is used to establish the area of operations or routes on which the aircraft/navigation system is qualified to operate.
Required Navigation Performance (RNP) Type	A value typically expressed as a distance in nautical miles from the intended position within which an aircraft would be for at least 95 percent of the total flying time. For example, RNP-4 represents a lateral and longitudinal navigation accuracy of 4 nm on a 95 percent basis. Note: Applications of RNP to terminal area and other operations may also include a vertical component.
Responsibility	Something a person is accountable for.
RNAV (GPS) PRM	Area navigation (RNAV) (GPS) PRM approach that may be substituted for an ILS PRM or LDA PRM approach and is procedurally equivalent.
Runway	In these operations specifications the term "runway" in the case of land airports, water airports and heliports, and helipads shall mean that portion of the surface intended for the takeoff and landing of land airplanes, seaplanes, or rotorcraft, as appropriate.
Simultaneous Offset Instrument Approach (SOIA)	This operation comprises one ILS and one LDA with glide slope. The ILS is aligned with its runway, but the LDA serving the second runway is offset (between 2.5° and 3°) from a parallel track. This offset permits simultaneous instrument approach operations to parallel runways spaced less than 3,000 feet apart, but no less than 750 feet. Because of the offset, this operation is also known as an SOIA.
Special Cargo	Cargo that requires special handling and securing/restraining procedures within the limitations specified in the Airplane Flight Manual (AFM) / Weight and Balance Manual (WBM) approved by the type certificate / supplemental type certificate. Special cargo may be enclosed in an approved bulk compartment if the WBM has limitations supporting procedures for securing and restraining the special cargo.

Sustainable Transfer	A sustainable transfer is a transfer of operational control, without any impediment, by a contract, agreement, lease, or other written or verbal arrangement between the owner, lessor, or other entity, and any other entity, that restricts any person or entity from transferring operational control to the certificate holder. Examples of such impediments are lease, mortgage, insurance, management agreements, and other agreements which limit the use of the aircraft to a particular party or purpose other than the certificate holder and its authorized kinds of operation.
VFR Station-Referenced Class I Navigation	VFR station-referenced Class I navigation is any operation conducted within the operational service volumes of ICAO standard navigation aids under visual flight rules (VFR) which uses nonvisual navigation aids (stations), such as VOR, VOR/DME, or NDB as the primary navigation reference. VFR station-referenced Class I navigation includes Class I navigation conducted on-airways and off-airway routings predicated on airways navigation facilities. These operations also include Class I navigation using an area navigation system which is certificated for IFR flights over the routes being flown.
Wide Area Augmentation System (WAAS)	WAAS has been developed to improve the accuracy, integrity, availability, and reliability of GPS signals. WAAS utilizes a fixed localized ground station to calculate GPS integrity and correction data, then broadcasts this information through the GPS satellites to GPS/WAAS users along with ranging signals. It is a safety critical system consisting of a ground network of reference and integrity monitor data processing sites which assess current GPS performance, as well as a space segment that broadcasts that assessment to GNSS users to support IFR navigation**.**

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A003 . Aircraft Authorization

HQ Control: 03/10/2011
HQ Revision: 02h

The certificate holder is authorized to conduct operations under the provisions of Title 14 CFR Part 135 using aircraft with the approved configuration and operations described in the following table:

M/M/S	Type Section 119	Operation Configuration	Class/Category Operation	En Route	Condition of Flight
CE-208-B	119.21(a)(5) - On-Demand	All Cargo	SEL	IFR/VFR	Day/Night

1. The Certificate Holder applies for the Operations in this paragraph.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A004 . Summary of Special Authorizations and Limitations **HQ Control: 08/03/2001**
HQ Revision: 000

a. The certificate holder, in accordance with the reference paragraphs, is authorized to:

	Reference Paragraphs
Conduct special en route IFR operations in Class G airspace.	A014
Conduct certain CFR Part 135 operations in accordance with flight and rest time limitations under 14 CFR Sections 135.261 through 135.273.	A033
Conduct a pretakeoff contamination check during ground icing conditions for Part 135 operators.	A041
Accept, handle, and carry materials regulated as Hazardous Materials (HazMat).	A055
Use an approved flightcrew member certificate verification plan in accordance with 14 CFR Part 135, § 135.95(b).	A063
Use only actual passenger and baggage weights (no combinations of average and actual weights) for all its aircraft	A096
Issue an International Civil Aviation Organization (ICAO) air operator certificate (AOC) through the Operations Safety System (OPSS).	A999
Conduct IFR en route operations.	B032
Conduct Class I navigation using an area navigation system.	B034
Conduct terminal instrument operations using specific procedures and landing minima for airplanes.	C051
Conduct operations using basic instrument approach procedures for airplanes.	C052
Conduct IFR approach procedures using special IFR landing minimums for airplanes.	C054
Derive alternate airport weather minimums from the standard table for airplanes.	C055
Use IFR takeoff minimums, 14 CFR Part 135 airplane operations - all airports.	C057
Conduct nonscheduled passenger and/or all-cargo, special terminal area IFR airplane operations in Class G airspace and at airports without an operating control tower.	C064
Conduct airplane IFR circle-to-land approach maneuvers.	C075
Use an approved aircraft inspection program (AAIP).	D073
Use an FAA-approved Minimum Equipment List (MEL).	D095
Use aircraft with nine or less passenger seats with the additional maintenance requirements of 14 CFR Section 135.421 applicable for aircraft engine, propeller, and propeller control (governor).	D101
Use aircraft with nine or less passenger seats with the additional maintenance requirements of 14 CFR Section 135.421 applicable for emergency equipment.	D104

b. The certificate holder is *not authorized* and *shall not* :

	Reference Paragraphs

Conduct operations under certain exemptions and/or deviations.	A005
Use an approved carry-on baggage program.	A011
Conduct extended overwater turbojet operations without required emergency equipment.	A013
Use an autopilot in lieu of a second-in-command.	A015
Use an approved security program in helicopter operations.	A017
Conduct scheduled passenger helicopter operations.	A018
Use automotive gasoline as aircraft fuel.	A019
Conduct Part 135 airplane operations without instrument-rated pilots.	A020
Conduct helicopter air ambulance operations in accordance with 14 CFR Part 135.	A021
Use an approved exit row seat program.	A022
Determine ground icing conditions for the purpose of flight [using an approved deicing/anti-icing procedure IAW CFR Section 135.227(b)(3)].	A023
Conduct airplane air ambulance operations under 14 CFR Part 135.	A024
Use the electronic signatures, electronic recordkeeping systems, or electronic manual system listed in A025.	A025
Conduct Land and Hold Short Operations (LAHSO) at designated airports and specified runway configurations as identified by Air Traffic Services in Notice 7110.118, Appendix 1.	A027
Conduct aircraft wet lease arrangements.	A028
Use an aircraft interchange agreement under 14 CFR Section 119.49.	A029
Make arrangements with training centers and other organizations for certificate holder training in accordance with 14 CFR Section 135.324.	A031
Adopt flight crewmember flight time limitations rules to establish flight attendant duty & flight time limitations & rest restrictions.	A032
Conduct operations using an approved Advanced Qualification Program in accordance with 14 CFR Part 121, Subpart Y, subsection 121.901 - 121.925.	A034
Conduct commuter and on-demand operations as a basic Part 135 operator IAW the deviation provisions of Section 135.21(a), and 135.341(a).	A037
Conduct on-demand operations as a basic 14 CFR Part 135 operator IAW the deviation provisions of Sections 135.21(a), 119.69(b), and 135.341(a)	A038
Conduct single pilot-in-command operations as a Part 135 operator IAW the deviation provisions of Section 135.21(a), 119.69(b), and 135.341(a).	A039
Conduct operations as a single pilot operator.	A040
Conduct Part 135 aircraft operations without a deicing/anti-icing procedure.	A042
Conduct Single Engine IFR (SEIFR) Passenger-Carrying Operations Under CFR Part 135.	A046
Conduct helicopter night vision goggle operations.	A050
Conduct enroute ANVG operations and any additional authorized ANVG operations in accordance with 14 CFR Part 135 and the limitations and provisions of Operations Specification A051.	A051
Conduct data link communications.	A056

Conduct "eligible on-demand operations" as defined in and in accordance with 14 CFR Section 135.4.	A057
Use an Electronic Flight Bag (EFB) in the aircraft as part of an authorized EFB Program.	A061
Use multiengine airplanes or single-engine turbine-powered airplanes under an SIC Professional Development Program (PDP).	A062
Use any combination of actual, standard average, or survey-derived average weights in its small cabin aircraft.	A097
Use any combination of actual, standard average, or survey-derived average weights for its medium cabin aircraft.	A098
Use any combination of actual, standard average, or survey-derived average weights for its large cabin aircraft.	A099
Use standardized and supporting instructor/check pilot curricula under contract or agreement with 14 CFR Part 142 training centers authorized to offer these curricula in accordance with 14 CFR Part 135, § 135.324.	A131
Conduct Part 135 rotorcraft operations without the radio altimeter equipment required by 14 CFR Part 135, §135.160(a), under a deviation as provided in §135.160(b) and in accordance with the limitations and provisions of LODA A160.	A160
Conduct the Airline Transport Pilot (ATP) Certification Training Program (CTP), required by 14 CFR Part 61, §61.156 for all ATP applicants, subject to the conditions and limitations in OpSpec A304.	A304
Conduct flight operations within the territory and airspace of Iraq in accordance with a grant of exemption from SFAR 77.	A320
Conduct airplane operations using a Liquid Water Equivalent System (LWES).	A323
Allow persons eligible under 14 CFR Section 121.547(a)(3) access to the flightdeck using the CASS program and/or the FDAR program IAW the limitations and provisions of A348.	A348
Conduct In-Trail Procedures (ITP) using Automatic Dependent Surveillance-Broadcast IN (ADS-B IN).	A354
Use ADS-B IN equipment and procedure(s) as specified in paragraph A355.	A355
Suspend its liability insurance due to seasonal operations.	A501
Use the air carrier merger and/or acquisition plan.	A502
Conduct the Airline Transport Pilot (ATP) Certification Training Program (CTP), required by 14 CFR Part 61, §61.156 for all ATP applicants, subject to the conditions and limitations in OpSpec A504.	A504
Conduct operations into the Democratic Peoples Republic of Korea (DPRK).	A519
Conduct civil flight operations in the Baghdad Flight Information Region (FIR) (ORBB) at altitudes below Flight Level (FL) 320 under a contract or subcontract, grant, or cooperative agreement with the sponsoring U.S. Government Department, Agency, or Instrumentality.	A530
Conduct flight operations in accordance with SFAR No. 112, 14 CFR Part 91, § 91.1603, in the Tripoli (HLLL) FIR under a contract or subcontract, grant, or cooperative agreement with the sponsoring U.S. Government Entity.	A532
Conduct flight operations in accordance with SFAR No. 107, 14 CFR Part 91, §	

91.1613 in the territory and airspace of Somalia at altitudes below FL260 under a contract or subcontract, grant, or cooperative agreement with the sponsoring U.S. Government Entity.	A533
Conduct flight operations in accordance with SFAR No. 114, 14 CFR Part 91, § 91.1609, in the Damascus (OSTT) FIR under a contract or subcontract, grant, or cooperative agreement with the sponsoring U.S. Government Entity.	A535
Conduct flight operations in accordance with SFAR 115, 14 CFR Part 91, § 91.1611, in the specified areas of the Sanaa (OYSC) FIR, under a contract or subcontract, grant, or cooperative agreement with the sponsoring U.S. Government Entity.	A536
Conduct operations using approved driftdown or fuel dumping procedures.	B029
Conduct IFR en route RNAV operations in the State of Alaska using TSO C145a/C146a GPS/WAAS RNAV systems as the only means of IFR navigation IAW SFAR 97.	B030
Conduct Class I navigation in the U.S. Class A airspace using an area or long-range navigation system.	B035
Conduct Oceanic and Remote Continental Navigation Using Multiple Long-Range Navigation Systems (M-LRNS).	B036
Conduct operations in Central East Pacific (CEP) airspace.	B037
Conduct operations in North Pacific (NOPAC) airspace.	B038
Conduct operations in North Atlantic High Level Airspace (NAT HLA).	B039
Conduct operations in areas of magnetic unreliability.	B040
Conduct extended overwater operations using a single long-range communication system (S-LRCS).	B045
Conduct operations in reduced vertical separation minimum (RVSM) airspace.	B046
Conduct air tour operations below an altitude of 1,500 feet AGL in the State of Hawaii.	B048
Conduct operations in the Grand Canyon National Park Special Flight Rules Area (GCNP-SFRA).	B049
Conduct Oceanic and Remote Airspace Navigation Using a Single Long-Range Navigation System	B054
Conduct north polar operations.	B055
Conduct commercial air tour operations over certain national park(s) and tribal lands within or abutting those national park(s).	B057
Conduct extended operations (ETOPS) with two-engine airplanes.	B342
Conduct extended operations (ETOPS) in passenger-carrying airplanes with more than two-engines.	B344
Operate into/out of or overfly sensitive international area(s) as identified in B450 in accordance with the authorizations, conditions, and limitations of B050.	B450
Conduct the specified EFVS operations under 14 CFR Part 91, § 91.176, in accordance with the limitations and provisions in C048.	C048
Use a destination airport analysis program.	C049
Conduct foreign terminal instrument procedures with special restrictions for airplanes.	C058
Conduct airplane SA CAT I instrument approach and landing operations.	C059

Conduct CAT II, or CAT II and CAT III instrument approach and landing operations in accordance with operations specification C060.	C060
Use flight control guidance systems for airplane automatic landing operations other than Categories II and III.	C061
Use manually flown flight control guidance systems certified for airplane landing operations.	C062
Conduct IFR area navigation (RNAV 1) and/or RNP 1 instrument departure procedures (DPs): RNAV 1 and/or RNP 1 Standard Terminal Arrivals Routes (STARs) published in accordance with 14 CFR Part 97; and/or tailored arrivals (TA).	C063
Use powerplant reversing systems for rearward taxi in specific airplane operations.	C065
Operate airplanes with special airport authorizations, provisions, and limitations.	C067
Conduct noise abatement departure profile operations with its subsonic turbojet-powered airplanes over 75,000 pounds gross takeoff weight.	C068
Conduct scheduled passenger and cargo operations at authorized airports.	C070
Use autopilot minimum use altitudes/heights in accordance with 14 CFR Part 135, § 135.93 and the limitations and provisions of operations specification C071.	C071
Conduct engine-out departure procedures with approved 10-minute takeoff thrust time limits.	C072
Use minimum descent altitude (MDA) as a decision altitude (DA)/decision height (DH) with vertical navigation (VNAV) on a nonprecision approach (NPA).	C073
Conduct airplane contact approaches using IFR Category I landing minimums.	C076
Conduct certain Part 135 turbojet operations in the terminal area using visual flight rules.	C077
Conduct 14 CFR Part 135 IFR airplane operations using lower than standard takeoff minima.	C079
Conduct scheduled passenger, special terminal area IFR airplane operations in Class G airspace and/or at airports without an operating control tower.	C080
Conduct the special Instrument Approach Procedure (IAP), departure procedure, Standard Terminal Arrival (STAR) and RNAV Visual Flight Procedure (RVFP) operations specified in OpSpec C081.	C081
Conduct RNAV operations substituting for 14 CFR Part 97 instrument approaches.	C085
Conduct "RNP-like" foreign RNAV terminal instrument procedures with Required Navigation Performance (RNP) lines of minima.	C358
Conduct RNP AR approaches in accordance with 14 CFR Part 97 and operations specification C384.	C384
Conduct continuous airworthiness maintenance programs.	D072
Use a reliability program for the entire aircraft.	D074
Use a reliability program for airframe, powerplant, systems, or selected items.	D075
Use short-term escalation.	D076
Use leased maintenance program authorization: U.S.-registered aircraft.	D080
Use specific aircraft for which prorated times have been established.	D082

Use short-term escalation authorization for borrowed parts that are subject to overhaul requirements.	D083
Conduct ferry flights under special flight permits with continuing authorization.	D084
Use an Extended Operations (ETOPS) aircraft maintenance program.	D086
Use a maintenance program for leased foreign-registered aircraft.	D087
Use maintenance time limitations for operators with a partial reliability program.	D088
Use maintenance time limitations for operators without a reliability program.	D089
Use coordinating agencies for suppliers evaluation (CASE).	D090
Use listed airplanes for operations in designated RVSM airspace in accordance with B046 and D092.	D092
Use an approved maintenance program for helicopter night vision goggle operations.	D093
Use NVIS and NVGs on aircraft to conduct ANVGO per maintenance documents, under Part 135.	D094
Use aircraft with nine or less passenger seats with the additional maintenance requirements of 14 CFR Section 135.421 applicable for rotorcraft operations.	D102
Use a single-engine aircraft maintained in accordance with §135.411 and §135.421 in passenger-carrying IFR operations.	D103
Suspend its liability insurance for specific aircraft in long-term storage or maintenance.	D106
Use an integrated aircraft health management (IAHM) program for maintenance credit for the aircraft with an approved IAHM system.	D302
Use weight and balance control procedures.	E096
Conduct terminal flight operations under instrument flight rules - helicopter.	H101
Conduct operations using basic instrument approach procedures for helicopters.	H102
Conduct category I IFR landings other than airborne radar approaches - helicopter.	H103
Conduct helicopter offshore instrument operations using Offshore Standard Approach Procedure (OSAP), Airborne Radar Approach (ARA), and Helicopter En Route Descent Area (HEDA) Operations and/or in accordance with operations specification H104.	H104
Use alternate airport IFR weather minimums - helicopter.	H105
Conduct helicopter operations using standard takeoff minimums under Part 135.	H106
Use special restrictions for foreign terminal instrument procedures - helicopter.	H107
Conduct Helicopter Category II operations.	H108
Conduct Helicopter Category III operations.	H109
Use flight control guidance systems for rotorcraft automatic landing operations.	H110
Use manually flown flight control guidance systems certified for rotorcraft landing operations.	H111
Conduct helicopter approach operations using an area navigation system.	H112
Conduct nonscheduled passenger and all-cargo (scheduled and nonscheduled) special terminal area IFR rotorcraft operations in Class G airspace.	H113
Use special airport authorizations, limitations, and provisions - Helicopter.	H114

Conduct helicopter operations using lower than standard takeoff minimums under Part 135.	H116
Conduct helicopter Category I, ILS, MLS, or GLS approach procedures with specific IFR landing minimums.	H117
Conduct helicopter circle-to-land maneuvers using IFR Category I landing minimums.	H118
Conduct helicopter contact approaches using IFR Category I landing minimums.	H119
Conduct operations in authorized airports for scheduled operations - helicopter.	H120
Conduct scheduled passenger terminal area IFR rotorcraft operations in Class G airspace.	H121
Conduct special instrument approach procedure, departure procedure and standard terminal arrival (STAR) rotorcraft operations specified in operations specification H122.	H122
Conduct Class I Navigation using area or long-range navigation systems with WAAS for rotorcraft RNP 0.3 en route and terminal operations.	H123

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A006 . Management Personnel **HQ Control: 01/28/2019**
HQ Revision: 040

a. The certificate holder is authorized to use the named personnel in the 14 CFR Part 135 management positions listed in Table 1 below. The Director of Operations and Chief Pilot listed in this operations specification must be direct employees of the certificate holder. The Director of Maintenance may or may not be a direct employee as indicated with their 14 CFR Part 119 Position Title.

Table 1- Authorized Management Positions and Personnel

Part 119 Position Title	Name	Company Equivalent Position Title
Dir. of Maintenance, Part 135	Jemison, Patrick	Director of Maintenance
Dir. of Operations, Part 135	Rusinowitz, Alan S.	Director of Operations
Chief Pilot, Part 135	Smith, Dane V.	Chief Pilot

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A007 . Other Designated Persons **HQ Control: 12/19/2006**
HQ Revision: 020

a. The following person is designated as the certificate holder's Agent for Service:

Hiles, Steven
4553 Glenn Curtiss Dr
Addison, Texas 75001
United States

b. The following personnel are designated to officially apply for and receive operations specifications for the certificate holder as indicated below.

Table 1 – Personnel Designated to Apply for and Receive Operations Specifications

Title	Name	Parts Authorized
Director of Maintenance	Jemison, Patrick	D,E
Director of Operations	Wells, Roydon J.	A,B,C,D,E
Chief Pilot	Smith, Dane V.	A,B,C

c. The following personnel or company email boxes are designated to receive Safety Alert for Operators (SAFO) and/or Information for Operators (INFO) messages for the certificate holder as indicated below. A receipt of the information by an air carrier or person is not required.

Table 2 – Personnel Designated to Receive SAFOs and/or INFOs

Name	Email Address	Telephone No.	Type of Information to Receive
Wells, Roydon	rwells@martinaire.com	(469) 386-1050	Both OPS/AW
Jemison, Pat	pjemison@martinaire.com	(972) 349-5733	AW
Smith, Dane V.	dsmith@martinaire.com	(214) 244-0588	OPS

1. The Certificate Holder applies for the Operations in this paragraph.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A008 . Operational Control **HQ Control: 01/28/2019**
HQ Revision: 040

a. The system described or referenced below in this subparagraph must be used by the certificate holder that conducts operations under 14 CFR Part 135 to provide operational control for its flight operations. The essential elements of operational control described in subparagraph d below must be included or described in that system.

Operational Control and Flight Locating shall be exercised in accordance with Martinaire Aviation LLC,
company General Operations Manual (GOM), Section A, A-13 through A-17.

b. Certificate Holder Responsibilities.

(1) The certificate holder retains all responsibility for the operational control of aircraft operations, and thus the safety of each flight conducted under this certificate and operations specification, including the actions or inactions of all direct employees and agents of the certificate holder.

(2) This responsibility is not transferable to any other person or entity.

(3) The certificate holder's responsibility for operational control supersedes any agreement, contract, understanding, or arrangement, either oral or written, expressed or implied, between any persons or entities.

c. The certificate holder may not engage in any of the following practices:

(1) Franchise or share the certificate holder's authority for the conduct of operations under its certificate and operations specifications to or with another person or entity.

(2) Use a "Doing Business As" (DBA) name in any way that represents an entity that does not hold an Air Carrier or Operating Certificate and operations specifications as having such a certificate and operations specifications.

(3) Engage in a Wet Lease Contrary to 14 CFR Part 119, § 119.53. In accordance with § 119.53(b), the certificate holder may not wet lease from or enter into any wet leasing arrangement with any person not authorized by the FAA to engage in common carriage operations under 14 CFR Part 121 or Part 135 (as applicable), whereby that other person provides an aircraft and at least one crewmember to the certificate holder. A lease, or other business arrangement with a lease, is considered a wet lease if any of the following conditions exists:

(a) The certificate holder and the aircraft owner or lessor agree that the certificate holder is required to use the aircraft owner's or lessor's pilot in Part 135 operations;

(b) The aircraft owner or lessor is obligated to furnish pilots to the certificate holder to

operate the aircraft; or

(c) The aircraft owner or lessor has the power to veto who the certificate holder will use to pilot the aircraft in Part 135 operations, so as to limit the certificate holder to using only the owner's or lessor's pilots.

(4) Transfer, surrender, abrogate, or share operational control responsibility with any party.

(5) Engage in any arrangement with an aircraft owner, lessor or any other person or entity, such as an aircraft management entity, which allows the use of an aircraft for operations under these operations specifications without a complete, effective, and sustainable transfer of operational control to the certificate holder for all Part 135 operations conducted under these operations specifications.

d. Elements of Operational Control. The following items are essential elements of operational control and are required to be components of the operational control system, used by the certificate holder, and as described or referenced in subparagraph a above:

(1) Crewmember Requirements. The certificate holder may not conduct any operation under Part 135, unless each of the certificate holder's crewmembers is:

(a) The certificate holder's direct employee or agent during every aspect of the Part 135 operations, including those aspects related to any preflight and postflight duties. The certificate holder is accountable for the actions and inactions of these persons during all of its aircraft operations.

(b) Currently trained and/or tested, qualified, and holds the appropriate airman and medical certificates to conduct flights for the certificate holder under Part 135, and is otherwise qualified to accept the specific flight assignment, considering flight and rest requirements, airspace qualification and the type of operation intended in the assignment. Each pilot must be specifically listed by name and airman certificate number on a list of pilots maintained by the certificate holder at its main base of operations or listed in operations specification A039 or A040, if applicable. This information must be available for inspection by the Administrator as specified in Part 135, § 135.63.

(2) Aircraft Requirements.

(a) The certificate holder may not conduct any operation under Part 135 unless each aircraft used in its Part 135 operations is:

(i) Owned by the certificate holder and remains, without interruption in the certificate holder's legal and actual possession (directly or through the certificate holder's employees and agents) during all of its Part 135 flights; or

(ii) Leased by the certificate holder or otherwise in the legal custody of the certificate holder and remains in the certificate holder's exclusive possession or custody during all of its Part 135 flights.

(b) For each aircraft the certificate holder uses under these operations specifications, the aircraft owner or other lessee of the aircraft may operate the aircraft under 14 CFR Part 91, under the control and responsibility (including potential liability for an unsafe operation) of the owner or other lessee, as long as the following condition is met:

(i) The certificate holder ensures that the maintenance of the aircraft continues to adhere to the certificate holder's maintenance program at all times; or

(ii) When the aircraft is returned to the certificate holder but before the aircraft is operated under Part 135 again by the certificate holder, that aircraft undergoes an appropriate airworthiness conformity validation check.

(3) Exclusive Aircraft Use Requirements for Part 135 Operations. At least one aircraft that meets the requirements for at least one kind of operation authorized in the certificate holder's operations specifications must remain in the certificate holder's exclusive legal and actual possession (directly or through the certificate holder's employees and agents) as specified in § 135.25. This aircraft cannot be listed on any other Part 119 certificate holder's operations specification during the term of the exclusive use lease.

(4) Use of Other Business Name(s) (DBA).

(a) The certificate holder may not allow or create the circumstances that would enable any other entity to conduct a flight for compensation or hire under Part 119, 121 or 135 as if that entity were the certificate holder.

(b) The certificate holder must not operate an aircraft under Part 135 under the legal name or fictitious name of any other person or entity, unless authorized in operations specification A001 of these operations specifications. Such authorization does not authorize any person or entity, other than the certificate holder, to conduct operations under the certificate holder's certificate and operations specifications.

(c) The certificate holder may not allow the use of a fictitious name to obscure the certificate holder's responsibility and accountability to exercise operational control over its flight operations.

(5) Aircraft Operation Agreements and Other Arrangements.

(a) In accordance with § 119.53(b), the certificate holder may not wet lease from or enter into any wet leasing arrangement with any person not authorized by the FAA to engage in common carriage operation under Part 121 or 135, whereby that other person provides an aircraft and at least one crewmember to the certificate holder. This requirement does not prohibit the separate use of a crewmember by the certificate holder when that crewmember is also employed by the aircraft's owner or lessor.

(b) Any agreement or arrangement between the certificate holder and an aircraft owner must fully explain how the certificate holder oversees and ensures that only airworthy aircraft are used in its Part 135 operations.

(c) The certificate holder's operational control system must include a system of ensuring that it has complete, effective, and sustainable operational control over each aircraft operated under these operations specifications, and that no surrender or loss of operational control exists.

(d) The certificate holder may not operate any aircraft in Part 135 operations, which is subject to an agreement between the certificate holder and the aircraft owner or any lessee of the aircraft, if that agreement shifts liability and accountability for the safety of the certificate holder's Part 135 flight operations from the certificate holder to the aircraft owner or other parties.

(6) Management Personnel and Persons Authorized to Exercise Operational Control.

(a) Prior to conducting a Part 135 flight or series of flights, at least one management person who is a direct employee listed in operations specification A006, Management Personnel, or a management person designee who is a direct employee of the certificate holder, other than a pilot assigned to the specific flight or series of flights, must determine and have sufficient knowledge of the following:

(i) Whether each assigned crewmember is qualified and eligible to serve as a required crewmember in the aircraft and type of operation to which the crewmember is assigned (see subparagraph d(1)(b) above); and

(ii) Whether the aircraft assigned for use is listed in operations specification D085 and is airworthy under the certificate holder's FAA-approved maintenance, inspection, or airworthiness program, as appropriate.

(b) Prior to conducting a Part 135 flight or series of flights, at least the pilot assigned in accordance with subparagraph d(6)(a)(i) above must determine and have sufficient knowledge of the following:

(i) Whether a Part 135 flight or series of flights can be initiated, conducted, or terminated safely and in accordance with the authorizations, limitations, and procedures approved in the certificate holder’s operations specifications, general operations manual (GOM), or subparagraph a above and the appropriate regulations.

(ii) Notwithstanding the requirements of subparagraph d(6)(a) above, this determination and knowledge described in subparagraph d(6)(b)(i) above may be made for the certificate holder by pilots and/or flightcrew members assigned to a flight or series of flights, in accordance with the policies, procedures, and standards prescribed by the certificate holder.

(A) Such non-management persons must meet the requirements of § 119.69(d), and their names, titles, and duties, responsibilities, and authorities must be specified in the GOM, or described in subparagraph a above; or

(B) For those certificate holders issued operations specification A039 or A040, the persons listed in those operations specifications must determine and have sufficient knowledge of whether a Part 135 flight or series of flights can be initiated, conducted, or terminated safely in accordance with the authorizations, limitations, and procedures approved in subparagraph a above and in accordance with the appropriate regulations.

(7) Operational Control Information Requirements.

(a) Prior to the certificate holder conducting any flight operation under Part 135, the certificate holder must provide information to the designated PIC that indicates which flight or series of flights will be conducted under Part 135, that indicates which Part 91 flights will be conducted by the certificate holder, and that the certificate holder is accountable and responsible for the safe operations of these flights or series of flights. For those issued operations specification A039 or A040 the pilots listed in those operations specifications are accountable and responsible for the safe operations of these flights or series of flights.

(b) The system of operational control for Part 135 operations must ensure that each pilot is knowledgeable that the failure of a pilot to adhere to the certificate holder's directions and instructions, or compliance with directions or instructions from an aircraft owner (other than the certificate holder), or any other outside private person or private entity, that are contrary to the certificate holder's directions or instructions, while operating aircraft under these operations specifications, may be contrary to Parts 119 and/or 135, and therefore may be subject to legal enforcement action by the FAA.

(c) These requirements do not apply to the following:

(i) ATC instructions, clearances and NOTAMs received from FAA or cognizant foreign ATC authorities,

(ii) Aeronautical safety of flight information received by the pilot, and

(iii) Operation under the emergency authority of the PIC in accordance with Part 91, § 91.3(b), and /or Part 135, § 135.19(b).

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A009 . Airport Aeronautical Data

HQ Control: 12/05/1997
HQ Revision: 01b

a. The system described or referenced in this paragraph is used by the certificate holder to obtain, maintain, and distribute current aeronautical data for the airports it uses.

(1) PERTINENT AIRPORT DATA IS DISSEMINATED TO FLIGHT CREWMEMBERS BY COMPANY FURNISHED JEPPESEN MANUALS OR N.O.S. CHARTS COVERING THE AREAS OF OPERATIONS AUTHORIZED BY THE OPERATIONS SPECIFICATIONS. ADDITIONALLY, CURRENT COPIES OF THE AERONAUTICAL INFORMATION MANUAL, VFR SECTIONALS, OR WAC CHARTS, AND AIRWAYS FACILITIES INFORMATION ARE MAINTAINED IN THE FLIGHT OPERATIONS AREA.

---

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A010 . Aviation Weather Information **HQ Control: 03/02/2016**
HQ Revision: 04a

a. The certificate holder conducting 14 CFR Part 135 operations is authorized to use weather reporting facilities operated by the U.S. National Weather Service or a source approved by the U.S. National Weather Service.

b. The Administrator approves the certificate holder to use the following sources of aviation weather information.

The National Weather Services for those United States and its territories located outside of the 48 contiguous States

U.S. and North Atlantic Treaty Organization (NATO) military observing and forecasting sources

Members of the World Meteorological Organization (WMO)

Active meteorological offices operated by a foreign state that subscribe to the standards and practices of the International Civil Aviation Organization (ICAO) conventions

A meteorological station, or automated observation weather product, authorized by an ICAO member State.

For reports of adverse weather phenomena: Pilot Weather Reports (PIREP) provided by aircraft of the same, or similar, type and size

For reports of adverse weather phenomena: Aircraft Reports (AIREP) provided by aircraft of the same or similar type and size

c. The certificate holder is approved to use an Enhanced Weather Information System (EWINS) to obtain and disseminate aviation weather information for the control of flight operations.

Table 1 - EWINS

Name of Weather Source	Name of Manual Containing EWINS	Date of Initial Approval of EWINS	Date of Latest Revision of EWINS

d. In accordance with §135.213(b) the certificate holder is authorized a deviation to §135.213 (a) in accordance with A005 of these operations specifications and Table 2 of this operations specification.

Table 2 – Deviation in Accordance with § 135.213(b)

Location of Operation	Location of Weather Observation	Date of National Weather Service Concurrence	Conditions and Limitations	Revision Date of Conditions and Limitations

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A014 . Special En Route IFR Operations in Class G Airspace **HQ Control: 08/09/2002**
HQ Revision: 04a

The certificate holder is authorized to conduct en route IFR operations in Class G airspace provided the following provisions are met:

a. All such IFR operations are conducted within the areas of Class G airspace specifically authorized for IFR flight in operations specification paragraph B050 of these operations specifications.

b. All such operations are conducted in accordance with the limitations and provisions of operations specification paragraph B032 of these operations specifications.

c. The facilities and services necessary to safely conduct IFR operations in Class G airspace are available and operational during the period of operation in Class G airspace.

d. All Title 14 CFR Part 135 turbojet operations in Class G airspace are conducted under instrument flight rules.

e. TERMINAL AREA IFR OPERATIONS OUTSIDE OF CONTROLLED AIRSPACE. The certificate holder is authorized to conduct terminal area IFR operations outside controlled airspace provided the following provisions are met:

(1) The necessary facilities and services are available to safely conduct IFR operations to the airport outside controlled airspace and are operating during the period of the operation at that airport.

(2) The IFR terminal area operations are authorized in paragraph C064 of these operation specifications and the operation is conducted in accordance with the limitations and provisions therein.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A033 . Title 14 CFR Section 135.265 Flight and Rest Time Requirements for Certain Part 135 Operations

HQ Control: 03/06/1998
HQ Revision: 000

The certificate holder is authorized to conduct certain Title 14 Code of Federal Regulations (CFR) Part 135 operations using flight and rest time limitations under 14 CFR Section 135.265, in lieu of any other sections of CFR Sections 135.261 through 135.273, as described below:

Martinaire Aviation L.L.C. will teach their flight crews the flight and duty time requirements listed in FAR 135.265 during new hire Indoc and recurrent training.The flight crews are responsible for making sure they are legally rested prior to accepting an assignment.

Martinaire flight followers and management pilots will assist the flight crews in ensuring compliance with FAR 135.265 by monitoring the flight crew's, flight and duty times per day, week, month and year using CALM.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A041 . Authorization for 14 CFR Part 135 Airplane Operators to Conduct a Pretakeoff Contamination Check

HQ Control: 02/10/1998
HQ Revision: 00b

a. The certificate holder is authorized to conduct a pretakeoff contamination check or use an approved alternate procedure as described below.

(1) At any time the conditions are such that frost, ice, or snow may reasonably be expected to adhere to the aircraft, the certificate holder will check the aircraft prior to takeoff or use an approved alternate procedure. The check/procedure shall ensure that the wings, control surfaces, propellers, engine inlets, and other critical surfaces are free of frost, ice, or snow.

(2) Procedures for the conduct of this check or its alternate are described or referenced in this paragraph.

Martinaire Aviation, LLC, GOM, Section S-5

(3) In addition to the above, the pilots shall demonstrate knowledge to operate in ground icing conditions during the initial and recurrent flight checks.

---

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A055 . Carriage of Hazardous Materials (HazMat) **HQ Control: 05/27/2009**
HQ Revision: 01a

a. The certificate holder is authorized by the Federal Aviation Administration to accept, handle, and carry materials regulated as Hazardous Materials (HazMat) including hazardous COMAT (company hazmat material), in accordance with 49 CFR parts 171 through 180 and 14 CFR part 121, subpart Z and Appendix O or part 135 subpart K, as applicable.

b. The certificate holder that conducts operations outside of the United States certifies that it complies with the HazMat training standards established by the International Civil Aviation Organization (ICAO) and International Air Transport Association (IATA) for the safe transport of dangerous goods by air.

c. The certificate holder must notify its repair stations regulated by 49 CFR parts 171 through 180 of its Will Carry status.

d. The certificate holder that is issued HazMat exemptions or permits should list those in Table 1 below (*if there are no additional exemptions or permits, enter N/A in the cells*):

Table 1 – HazMat Exemptions or Permits Issued by Other Agencies

Exemption/Permit Number	Date of Expiration	Agency Issuing, Remarks and/or References
N/A	N/A	N/A

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A063 . Flightcrew Member Certificate Verification Plan **HQ Control: 12/24/2018**
HQ Revision: 000

a. In accordance with 14 CFR Part 135, § 135.95(b), the certificate holder is authorized to provide temporary verification documents to flightcrew members who have lost, reported stolen, destroyed or are otherwise missing their airman certificate or medical certificate in accordance with the certificate verification plan approved by this operations specification.

b. Applicable Certificates and Method of Issuance. The certificate holder is authorized to provide temporary verification documents using the methods specified in Table 1 below.

Table 1-Applicable Certificates and Method of Issuance

Type of Certificate	Method of Issuance	Remarks/Limitations
Pilot	Paper	
Medical	Paper	

c. Description of Policies and Procedures. The certificate verification plan policies and procedures are described in the following certificate holder manual(s):

Martinaire Air Carrier Verfication Plan

d. Other Limitations and Provisions.

(1) Temporary verification documents must contain all the information available on the original certificate.

(2) Temporary verification documents are valid for no more than 72 hours and must include the date and time of issuance and the date and time of expiration.

(3) The certificate holder may not extend the expiration date and time of the temporary verification documents. The certificate holder may not issue a subsequent temporary verification document to a flightcrew member for the same instance of a lost, stolen, destroyed or otherwise missing airman or medical certificate.

(4) Temporary verification documents are only valid for flights conducted within the United States.

(5) Temporary verification documents are only valid when the flightcrew member is engaged in a flight operation for the certificate holder, including ferry flights and repositioning flights.

(6) Pilot flightcrew members must possess a valid photo identification in accordance with 14 CFR Part 61, § 61.3(a)(2).

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

A096 . Actual Weight Program For All Aircraft **HQ Control: 06/11/2020**
HQ Revision: 020

a. The certificate holder is authorized to use only actual weights when determining the aircraft weight and balance for all aircraft. This includes:

(1) Actual weights of all passengers and bags (including carry-on, checked, plane-side loaded, and heavy bag weights) and cargo, or

(2) Solicited ("asked") passenger weight plus 10 pounds and the actual weight of bags and cargo.

b. In accordance with the certificate holder's issued operations specification A011, the certificate holder is authorized to use an approved Carry-On Baggage Program..

c. The following aircraft must use actual weights:

(1) All single-engine aircraft, with the exception of single engine turbine-powered HAA operations

(2) All reciprocating engine-powered aircraft, and

(3) All aircraft certificated with less than five (5) passenger seats, with the exception of single engine turbine-powered HAA operations.

d. The certificate holder is authorized to use the following weights for flightcrew members, crewmembers, authorized persons and their baggage, listed in Table 1 below.

Table 1 – Authorized Weights for Flightcrew Members, Crewmembers, Authorized Persons, and their Baggage

Authorized Weights	Expiration Date
Actual Wt./Solicited +10 lbs /Bags Actual Wt.	

e. For cargo-only operated aircraft, flightcrew member weights and flightcrew member bag weights, may be included in the basic operating weight of the aircraft.

f. The following loading schedules and instructions listed in Table 2 below must be used for routine operations.

Table 2 – Loading Schedules and Instructions for Routine Operations

Aircraft M/M/S	Type Loading Schedule	Loading Schedules Instructions	Weight and Balance Control Procedures
CE-208-B	Actual	As per GOM Section B	As per GOM Section B

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

Digitally signed by Thomas R Good, Principal Operations Inspector (SW19)
[1] SUPPORT INFO: Operator requested to update and continue using actual weights.
[2] EFFECTIVE DATE: 9/22/2020, [3] AMENDMENT #: 7
DATE: 2020.11.02 09:53:25 -06:00

3. I hereby accept and receive the Operations Specifications in this paragraph.

Digitally signed by Dane V Smith, Chief Pilot
DATE: 2020.09.22 08:24:53 -05:00

A449 . Antidrug and Alcohol Misuse Prevention Program **HQ Control: 07/17/2009**
HQ Revision: 00a

a. The certificate holder who operates under Title 14 Code of Federal Regulations (CFR) Part 135 certifies that it will comply with the requirements of 14 CFR Part 120 and 49 CFR Part 40 for its Antidrug and Alcohol Misuse Prevention Program.

b. Antidrug and Alcohol Misuse Prevention Program records are maintained and available for inspection by the FAA's Drug Abatement Compliance and Enforcement Inspectors at the location listed in Table 1 below:

Table 1

	Location of Antidrug and Alcohol Misuse Prevention Program Records:	**Telephone Number:**
Address:	4553 Glenn Curtiss Drive	(972) 349-5700
Address:		
City:	Addison	
State:	TX	
Zip Code:	75001	

c. Limitations and Provisions.

(1) Antidrug and Alcohol Misuse Prevention Program inspections and enforcement activity will be conducted exclusively by the Drug Abatement Division. All questions regarding this program should be directed to the Drug Abatement Division.

(2) The certificate holder must implement its Antidrug and Alcohol Misuse Prevention Programs fully in accordance with 14 CFR Part 120 and 49 CFR Part 40.

(3) The certificate holder is responsible for ensuring that its contractors who perform safety-sensitive work for the certificate holder are subject to Antidrug and Alcohol Misuse Prevention Programs.

(4) The certificate holder is responsible for updating this operations specification when any changes occur in the following:

(a) Location or phone number where the Antidrug and Alcohol Misuse Prevention Records are kept (as listed in Table 1 above).

(b) If the certificate holder's number of safety-sensitive employees goes to 50 and above, or falls below 50 safety-sensitive employees.

(5) The certificate holder with 50 or more employees performing a safety-sensitive function on January 1 of the calendar year must submit an annual report to the Drug Abatement Division of the FAA. The certificate holder with fewer than 50 employees performing a safety-sensitive function on January 1 of any calendar year must submit an annual report upon request of the Administrator, as specified in the regulations.

The certificate holder has fewer than 50 safety-sensitive employees.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

AIR OPERATOR CERTIFICATE		
	State of the Operator United States of America	
	Issuing Authority Federal Aviation Administration	
AOC #: MT9A828W	Martinaire Aviation L.L.C.	Operational Points of Contact: Roydon J. Wells Contact details, at which operational management can be contacted without undue delay, are listed in Martinaire Aviation, LLC General Operations Manual, Section A, Page 2.
Expiration Date : N/A	Dba: Martinaire	
	Operator Address: 4553 Glenn Curtiss Dr Addison, Texas 75001 Telephone: (972) 349-5700 Fax: (972) 349-5750 E-mail: rwells@martinaire.com	
This certificate certifies that Martinaire Aviation L.L.C. is authorized to perform commercial air operations, as defined in the attached operations specifications, in accordance with the Operations Manual and the .		
Date of Issue:	Name: Title:	

CERTIFICATION STATEMENT

I hereby certify that the attached is a true copy of the Martinaire Aviation L.L.C. AOC issued at SW19 - North Texas FSDO (NTX) on by the FAA.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

Table of Contents

Part B

B031 . Areas of En Route Operation **HQ Control: 02/09/2001**
HQ Revision: 01e

The certificate holder is authorized to conduct the en route operations specified in this paragraph only within the areas of en route operation listed in paragraph B050 of these operations specifications. The certificate holder shall comply with any limitations and/or procedures specified for each area listed and the provisions of the paragraphs referenced for each area. The certificate holder shall not conduct any other en route operation within any other area under these operations specifications.

a. The certificate holder is authorized to conduct en route operations in accordance with the provisions of these operations specifications.

b. The certificate holder is authorized to conduct Class I navigation. When conducting IFR Class I navigation, the certificate holder is authorized to conduct these operations in accordance with the following additional provisions:

(1) Operate IFR flights over routing predicated on ATC radar vectoring services, within controlled airspace.

(2) Operate IFR flights (including flights to alternate or diversionary airports) within controlled airspace over off-airway routings which are predicated on airways navigation facilities, provided the following conditions are met:

(a) These off-airway routings lie within the operational service volume of the facilities used and such off-airway operation is authorized by the appropriate ATC facility.

(b) The operation is conducted in accordance with the route width and MEA criteria prescribed for or applied to the certificate holder by the appropriate ICAO contracting state.

(c) The required airborne and ground-based navigation facilities are available and operational and enable navigation performance to meet the degree of accuracy required for air traffic control over the route of flight specified in the ATC clearance.

(3) Operate IFR flights including flights to alternate or diversionary airports in Class G Airspace in accordance with the provisions of paragraphs A014, C064, C080, H113, and/or H121, as applicable, of these operations specifications, if issued.

c. Deviations from routings specified in this paragraph are authorized when necessary due to inflight emergencies or to avoid potentially hazardous meteorological conditions.

d. For operations within Class A Airspace, the certificate holder is authorized to conduct Class I navigation under positive radar control with the area navigation or long-range navigation systems specified in paragraph B035 of these operations specifications, if that paragraph is issued.

e. The certificate holder is authorized to conduct Class I navigation, including en route IFR operations outside positive radar control, with the area navigation systems specified in paragraph B034 of these operations specifications, if that paragraph is issued.

f. The certificate holder is authorized to conduct Class II navigation in accordance with paragraphs B032 and B036 of these operations specifications, if those paragraphs are issued.

g. The certificate holder is authorized to use approved GPS navigation equipment as a supplement to ICAO standard navigation equipment while conducting Class I navigation.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

B032 . En Route Limitations and Provisions **HQ Control: 03/24/2009**
HQ Revision: 020

a. The certificate holder shall comply with the following IFR en route limitations and provisions when conducting any en route operation under these operations specifications. Unless otherwise authorized by these operations specifications, the certificate holder shall not conduct IFR operations outside controlled airspace.

b. When conducting Class I navigation:

(1) An aircraft's position shall be "reliably fixed" as necessary to navigate to the degree of accuracy required for ATC.

(2) With the exception of b(3) and b(5) below, the airways used and the off-airway routing predicated on airways navigation facilities shall lie within the operational service volume of the facilities defining the airways or off-airway routing.

(3) Operations over routes with a minimum en route altitude (MEA) gap (or International Civil Aviation Organization (ICAO) equivalent) are an exception to the operational service volume requirement.

(4) With the exception of b(5) below, the facilities which define an airway, or an off-airway routing predicated on airways navigation facilities, shall be used as the primary navigation reference.

(5) An area navigation system may be used if the aircraft’s position can be "reliably fixed" at least once each hour using airway navigation facilities to the degree of accuracy required for ATC. This system must be certificated for use in IFR flight for the conduct of Class I navigation over the routes being flown and authorized in accordance with paragraph B034.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

B034 . IFR Class I Terminal and En Route Navigation Using Area Navigation Systems **HQ Control: 12/04/2010**
HQ Revision: 040

a. The certificate holder is authorized to conduct IFR Class I terminal and en route navigation (including operations outside positive radar control) using aircraft and RNAV systems approved by this paragraph in those areas of operations where this paragraph is referenced in B050 of these operations specifications.

b. Approved Operations. If specified in Table 1 below, the certificate holder is authorized to conduct Precision RNAV (P-RNAV) and/or Basic RNAV (B-RNAV)/RNAV 5 operations in terminal and/or en route areas where this paragraph is referenced in paragraph B050 of these operations specifications.

(1) The route design determines whether the operation is terminal or en route navigation.

(2) For B-RNAV/RNAV 5 terminal and en route operations, the navigation performance is ±5 nautical miles (NM) for 95 percent of the flight time.

(3) For P-RNAV terminal and en route operations, the navigation performance is ±1 NM for 95 percent of the flight time.

(4) If the RNAV equipment is certified for P-RNAV, it may be authorized for both P-RNAV and B-RNAV/RNAV 5 terminal and en route operations.

c. Authorized En Route Navigation. Except as provided in these operations specifications, the certificate holder shall not conduct any other IFR Class I en route navigation using RNAV systems.

d. Authorized Aircraft Navigation Systems. The certificate holder is authorized to conduct IFR Class I terminal and en route navigation using the following aircraft and RNAV systems for the operations indicated in Table 1 below. If no specific navigation performance (for B-RNAV/RNAV 5 and/or P-RNAV) is authorized, enter N/A in column 4.

Table 1 – Aircraft, Navigation Systems, and Navigation Performance

Aircraft M/M/S	Area Navigation Systems Manufacturer	Model	Navigation Performance	Limitations and Conditions
CE-208-B	King	KLN-89B	B-RNAV/RNAV 5 (+/-5NM)	N/A
CE-208-B	Garmin	GNS 530W	B-RNAV/RNAV 5 (+/-5NM)	N/A
CE-208-B	Garmin	GNS 430W	B-RNAV/RNAV 5 (+/-5NM)	N/A
CE-208-B	Avidyne	IFD 540	B-RNAV/RNAV 5 (+/-5NM), and P-RNAV (+/-1NM)	N/A
CE-208-B	Avidyne	IFD 440	B-RNAV/RNAV 5 (+/-5NM), and P-RNAV (+/-1NM)	N/A

e. Special En Route Limitations and Provisions. The certificate holder shall conduct all operations authorized by this paragraph in accordance with the following en route limitations and provisions:

(1) Except when navigation is performed under the supervision of a properly qualified check airman, the flightcrew must be qualified in accordance with the certificate holder's approved training program for the system being used or have satisfactorily completed a flight check using the system. The flightcrew shall have satisfactorily completed the ground school portion of that training program before performing under the supervision of a check airman.

(2) The navigation system shall be fully operational or operating in accordance with the certificate holder's approved MEL, when the system is used for any navigation.

(3) Prior to conducting operations in airspace that require a specific navigation performance, if authorized and listed in Table 1 above, the certificate-holder must ensure that the aircraft navigation system will provide the navigation performance for the planned flight time in that airspace.

(4) The RNAV systems used must permit the flight to navigate to the degree of accuracy or operational performance level required for ATC; be approved for the particular area of operation as specified in paragraph B050 of these operations specifications; and be certificated for IFR flight.

(5) IFR Class I navigation using a single RNAV system shall not be conducted unless Class I navigation with a single system is authorized by this paragraph and all of the following conditions are met:

(a) The redundant airborne equipment required to conduct IFR Class I navigation using airways navigation facilities is installed and operational.

(b) The capability exists at any point along the planned route of flight to safely return to and use airways navigation facilities for navigation if the single RNAV system fails.

(c) Any flight operated over off-airway routing is operated under ATC radar control.

(6) IFR Class I navigation, using a single RNAV system, shall not be conducted without at least one pilot using the facilities which define the airway or off-airway routing as the primary navigation reference unless the following conditions are met:

(a) The aircraft's present position and its relationship to NAVAID, airways, and any other Instrument Flight Procedure (IFP) specified in the currently effective ATC clearance are continuously displayed on each pilot's flight instruments.

(b) An indication is immediately provided on the forward instrument panel, within the normal field of view of each pilot, when the navigation performance of the RNAV system is insufficient to navigate to the degree of accuracy required for ATC.

(7) An approved RNAV system fix may be substituted for a required en route ground facility when that facility is temporarily out of service, provided the approved navigation system has sufficient accuracy to navigate the aircraft to the degree of accuracy or navigation performance required for ATC over that portion of the flight.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

B050 . Authorized Areas of En Route Operations, Limitations, and Provisions **HQ Control: 09/12/1997**
HQ Revision: 020

a. The certificate holder is authorized to conduct en route operations in the areas of en route operation specified in this paragraph. The certificate holder shall conduct all en route operations in accordance with the provisions of the paragraphs referenced for each area of en route operation. The certificate holder shall not conduct any en route operation under these operations specifications unless those operations are conducted within the areas of en route operation authorized by this paragraph.

Authorized Areas of En Route Operation	Reference Paragraphs	Note Reference #
Canada - Excluding Canadian MNPS airspace	B031	
USA - The 48 contiguous United States and the District of Columbia - Excluding: United States	B031, B032	

b. The certificate holder shall conduct all en route operations in accordance with the following limitations, provisions, and special requirements referenced numerically for each area of en route operation listed in subparagraph a. above.

Note Reference #	Limitations Provisions and Special Requirements
N/A	N/A

1. The Certificate Holder applies for the Operations in this paragraph.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

Table of Contents

Part C

C051 . Terminal Instrument Procedures **HQ Control: 09/12/2012**
HQ Revision: 02b

a. The certificate holder is authorized to conduct terminal instrument operations using the procedures and minima specified in these operations specifications, provided one of the following conditions is met:

(1) The terminal instrument procedure used is prescribed by these operations specifications.

(2) The terminal instrument procedure used is prescribed by Title 14 Code of Federal Regulations (CFR) Part 97, Standard Instrument Approach Procedures.

(3) At U.S. military airports, the terminal instrument procedure used is prescribed by the U.S. military agency operating the airport.

(4) If authorized foreign airports, the terminal instrument procedure used at the foreign airport is prescribed or approved by the government of an ICAO contracting state. The terminal instrument procedure must be constructed using criteria based on FAA Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS); or ICAO Document 8168-OPS; Procedures for Air Navigation Services-Aircraft Operations (PANS-OPS), Volume II; or Military Instrument Procedures Standardization (MIPS); or other special criteria approved by the headquarters Flight Technologies and Procedures Division (AFS-400). The visibility, RVR, or Converted Meteorological Visibility (CMV) is based on TERPS, EU-OPS 1, Aerodrome Operating Minimums or ICAO Doc 9365, Manual of All Weather Operations, Third Edition.

b. If applicable, Special Limitations, and Provisions for Instrument Approaches at Foreign Airports.

(1) Terminal instrument procedures may be developed and used by the certificate holder for any foreign airport, provided the certificate holder makes a determination that each procedure developed is equivalent to U.S. TERPS, ICAO PANS-OPS, MIPS criteria, or other special criteria approved by the headquarters Flight Technologies and Procedures Division (AFS-400). The visibility, RVR, or CMV is based on TERPS, EU-OPS 1 or ICAO Document 9365. The certificate holder shall submit to the FAA a copy of the terminal instrument procedure with supporting documentation.

(2) At foreign airports, the certificate holder shall not conduct terminal instrument procedures determined by the FAA to be “not authorized for United States air carrier use.” In these cases, the certificate holder may develop and use a terminal instrument procedure provided the certificate holder makes a determination that each procedure developed is equivalent to U.S. TERPS, ICAO PANS-OPS, MIPS criteria, or other special criteria approved by the headquarters Flight Technologies and Procedures Division (AFS-400). The visibility, RVR, or CMV is based on TERPS, EU-OPS 1 or ICAO Document 9365. The certificate holder shall submit to the FAA a copy of the terminal instrument procedure with supporting documentation.

(3) When the minima are specified only in meters, the certificate holder shall use the metric operational equivalents as specified in the RVR Conversion Table (Table 1) or the Meteorological Visibility Conversion Table (Table 2) for both takeoff and landing. Values not shown may be interpolated.

Table 1

RVR Conversion	
Feet	**Meters**
300 ft	75 m
400 ft	125m
500 ft	150 m
600 ft	175 m
700 ft	200 m
1000 ft	300 m
1200 ft	350 m
1400 ft	450 m
1600 ft	500 m
1800 ft	550 m
2000 ft	600 m
2100 ft	650 m
2400 ft	750 m
3000 ft	1000 m
4000 ft	1200 m
4500 ft	1400 m
5000 ft	1500 m
6000 ft	1800 m

Table 2

Meteorological Visibility Conversion	
Statute Miles	**Meters**
1/4 sm	400 m
3/8 sm	600 m
1/2 sm	800 m
5/8 sm	1000 m
3/4 sm	1200 m
7/8 sm	1400 m
1 sm	1600 m
1 1/8 sm	1800 m
1 1/4 sm	2000 m
1 1/2 sm	2400 m
1 3/4 sm	2800 m
2 sm	3200 m
2 1/4 sm	3600 m
2 1/2 sm	4000 m
2 3/4 sm	4400 m
3 sm	4800 m

(4) When operating at foreign airports where the published landing minima are specified in RVR, the RVR may not be available, therefore the meteorological visibility is reported. When the minima are reported in meteorological visibility, the certificate holder shall convert meteorological visibility to RVR by multiplying the reported visibility by the appropriate factor, shown in Table 3. The conversion of reported meteorological visibility to RVR is used only for Category I landing minima, and shall not be used for takeoff minima, CAT II or III minima, or when a reported RVR is available.

Table 3

[RVR = (reported meteorological visibility) X (factor)]

AVAILABLE LIGHTING	DAY	NIGHT
High Intensity approach and runway lighting	1.5	2.0
Any type of lighting installation other than above	1.0	1.5
No lighting	1.0	N/A

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

C052 . Straight-in Non-Precision, APV, and Category I Precision Approach and Landing Minima – All Airports

HQ Control: 11/06/2018
HQ Revision: 07c

a. The certificate holder is authorized to conduct operations using the types of IAPs listed in Table 1 below, and shall not conduct operations using any other types.

Table 1 – Authorized Instrument Approach Procedures

Nonprecision Approach Procedures Without Vertical Guidance	Approaches With Vertical Guidance (APV)	Precision Approach Procedures (ILS & GLS)
LOC		ILS
LOC BC		ILS/DME
NDB		
VOR		
VOR/DME		
ASR/SRA/SRE		
RNAV (GPS)	RNAV (GPS)	

Note: Approval for RNAV (GPS) approaches may be extended to include approval for "RNAV (GNSS)" and/or "RNP" titled approaches in foreign States. Certificate holder should consult applicable foreign Aeronautical Information Publications (AIP) and ensure navigation equipment equivalency. This approval does not extend to RNP approaches with authorization required (RNP AR).

b. Conditions and Limitations.

(1) Unless otherwise authorized by these operations specifications, the certificate holder shall not use any IFR IAP at any U.S. civil, military, or joint-use airport unless:

(a) It is promulgated under 14 CFR Part 97, or

(b) The procedure has been constructed using FAA Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS), or other special criteria approved by the headquarters Flight Technologies and Procedures Division (AFS-400), or

(c) The procedure has been prescribed by the U.S. military agency operating the U.S. military airport.

(2) Runway Visual Range: TDZ RVR reports, when available for a particular runway, are controlling for all approaches to and landings on that runway.

(a) The mid RVR and rollout RVR reports (if available) provide advisory information to pilots.

(b) Visibility values below ½ statute mile are not authorized and shall not be used.

(c) The mid RVR report may be substituted for the TDZ RVR report if the TDZ RVR

report is not available.

(3) The certificate holder may not use DA(H) in lieu of MDA(H) unless paragraph C073 is authorized.

(4) Unless otherwise authorized by these operations specifications, the certificate holder may not conduct any RNP authorization required (RNP AR) operations.

(5) Approach Procedures Using GPS or GPS Wide Area Augmentation System (WAAS). The certificate holder is authorized to conduct GPS and/or GPS WAAS instrument approach operations using the approved GPS and/or GPS WAAS equipment listed in paragraph B034 if "…. or GPS", GPS, or RNAV (GPS) or RNAV (GNSS) is listed in Table 1 above. This authorization to conduct approaches using GPS and/or GPS WAAS is subject to the following limitations and conditions:

(a) The airborne GPS and/or GPS WAAS navigation equipment to be used must be approved for IFR operations, certified for the intended operation (LPV, LNAV/VNAV, LP or LNAV) and must contain current navigation data.

(b) Both the GPS constellation and the required airborne equipment must be providing the levels of availability, accuracy, continuity of function, and integrity required for the operation.

c. Reduced Precision CAT I Landing Minima.

(1) Reduced Landing Minima – 200 feet DH and 1800 RVR. The certificate holder is authorized precision CAT I landing minima as low as 1800 RVR to approved runways without TDZ lights and/or runway centerline (RCL) lights, including runways with installed but inoperative TDZ lights and/or RCL lights, in accordance with the following requirements:

(a) The authorized airplane(s) must be equipped with an approved FD, AP, or HUD approved for at least CAT I operations that provides guidance to DA. The flightcrew must be required to engage the FD, AP, or HUD as applicable and use it to DA or initiation of missed approach unless adequate visual references with the runway environment are established that allow the safe continuation to a landing. Single pilot operations are prohibited from using the FD to reduced CAT I landing minima without the accompanying use of an AP or HUD.

(b) Should the FD, AP, or HUD malfunction or be disengaged during the approach, the flightcrew must execute a missed approach unless the approach can be continued with the use of an operational FD, AP, or HUD, or visual reference to the runway environment has been established.

(c) The flightcrew must demonstrate proficiency in ILS, GLS, and /or RNAV (GPS) with LPV DA/HAT less than 250 feet approaches to minimums using the FD, AP, or HUD as applicable.

(d) The Part 97 SIAP must have an 1800 RVR minimum.

d. Limitations and Provisions for IAPs at Foreign Airports.

(1) Unless otherwise authorized by these operations specifications, the certificate holder shall

not use any IFR IAP at any foreign airport unless:

(a) The procedure has been constructed using criteria based on FAA Order 8260.3, or other special criteria approved by the headquarters Flight Technologies and Procedures Division (AFS-400), or the procedure has been constructed using criteria prescribed by the ICAO Doc 8168, Procedures for Air Navigation Services, and,

(b) The visibility, RVR, or Converted Meteorological Visibility (CMV) is based on FAA Order 8260.3, or the applicable European Union (EU) or European Aviation Safety Agency (EASA) regulation or ICAO Doc 9365, Manual of All Weather Operations, Third Edition, and,

(c) The DH/MDA shall not be below 200 feet HATh unless authorized by these operations specifications.

(2) The certificate holder may not conduct operations using RNP-AR or "RNP-Like" foreign procedures unless the certificate holder is authorized nonstandard paragraph C384 or paragraph C358, respectively, and the procedures are authorized from within the applicable paragraph.

(3) Foreign approach lighting systems compliant with the ICAO Annex 14 Standards and Recommended Practices (SARPS) or equivalent to U.S. standards are authorized for non-precision, APV, and precision instrument approaches. Sequenced flashing lights are not required when determining the equivalence of a foreign approach lighting system to U.S. standards.

(4) For straight-in landing minima at foreign airports where an MDA(H) or DA(H) is not provided, the lowest authorized MDA(H) or DA(H) shall be obtained as follows:

(a) When an Obstruction Clearance Limit (OCL) is specified, the authorized MDA(H) or DA(H) is the sum of the OCL and the airport elevation. The MDA(H) may be rounded to the next higher 10-foot increment.

(b) When an Obstacle Clearance Altitude (OCA)/Obstacle Clearance Height (OCH) is specified, the authorized MDA(H) or DA(H) is equal to the OCA/OCH as adjusted by any operational requirement to increase the altitude/height. For non-precision approaches, the authorized MDA(H) may be expressed in intervals of 10 feet.

(5) When conducting an IAP outside the United States, the certificate holder shall not operate an aircraft below the prescribed MDA(H) or continue an approach below the DA(H), unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and at least one of the following visual references is clearly visible to the pilot:

(a) Runway, runway markings, or runway lights.

(b) Approach light system (in accordance with 14 CFR § 91.175(c)(3)(i)).

(c) Threshold, threshold markings, or threshold lights.

(d) Touchdown zone (TDZ), TDZ markings, or TDZ lights.

(e) Visual glidepath indicator (such as VASI, PAPI).

(f) Runway end identifier lights.

(6) Approaches to runways with published minima as low as 1800 RVR (550m) without installed RCL and/or TDZ lighting or with inoperative RCL and/or TDZ lighting are authorized as long as the requirements of subparagraph c (1)(a-c) of this operations specification are met.

---

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

C054 . Special Limitations and Provisions for Instrument Approach Procedures and Instrument Flight Rules Landing Minimums

HQ Control: 11/28/2017

HQ Revision: 03a

a. High-Minimum PIC Provisions. A PIC who has not met the requirements of 14 CFR Part 135, § 135.225(e), must use the high-minimum pilot RVR landing minimum equivalents as determined from Table 1 below.

Table 1 – High-Minimum PIC RVR Landing Minimum Equivalents

RVR Landing Minimum as Published	RVR Landing Minimum Equivalent required for High-Minimum Pilots
RVR 1800	RVR 4500
RVR 2000	RVR 4500
RVR 2400	RVR 5000
RVR 3000	RVR 5000
RVR 4000	RVR 6000
RVR 5000	RVR 6000

b. Limitations on the Use of Landing Minimums for Turbojet Airplanes.

(1) A PIC of a turbojet airplane must not conduct an IAP when visibility conditions are reported to be less than ¾ statute mile (sm) or RVR 4000 until that pilot has been specifically qualified to use the Lower Landing Minimums (LLM).

(2) If the destination visibility conditions are forecast to be less than ¾ sm or RVR 4000, the following conditions must be met:

(a) The destination runway length must be determined prior to takeoff to be at least 115 percent of the runway field length required by the provisions of § 135.385(b); and

(b) Precision instrument (all weather) runway markings or runway centerline (RCL) lights must be operational on that runway unless authorized to conduct Enhanced Flight Vision System (EFVS) operations and use EFVS operational minimums.

(3) If unforecast adverse weather or failures occur, the PIC must not begin the final approach segment of an instrument approach unless the runway length needed for landing is determined prior to approach. The runway surface composition and length, reported runway and weather conditions, AFM limitations, operational procedures, and airplane equipment status must be considered.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

C055 . Alternate Airport IFR Weather Minimums **HQ Control: 12/04/2018**
HQ Revision: 050

a. The certificate holder is authorized to derive alternate airport weather minimums from Table 1 below, according to the limitations and provisions of this operations specification.

Table 1 - Alternate Airport IFR Weather Minimums

Approach Facility Configuration	Ceiling	Visibility
For airports with at least one operational navigational facility providing a straight-in nonprecision approach procedure, or CAT I precision approach, or, when applicable, a circling maneuver from an IAP.	Add 400 ft to MDA(H) or DA(H), as applicable.	Add 1 statute mile (sm) or 1600 m to the landing minimum.
For airports with at least two operational navigational facilities, each providing a straight-in approach procedure to different suitable runways.	Add 200 ft to higher DA(H) or MDA(H) of the two approaches used.	Add ½ sm or 800 m to the higher authorized landing minimum of the two approaches used.

b. Special Limitations and Provisions.

(1) The certificate holder must not use an alternate airport weather minimum other than any applicable minimum derived from Table 1. The certificate holder must not use any GPS-based IAP unless the certificate holder is authorized to conduct GPS-based IAP and meets the requirements in subparagraph b(8).

(2) In determining alternate airport weather minimums, the certificate holder must not use any published IAP which specifies that alternate airport weather minimums are not authorized.

(3) When determining the suitability of a runway, wind (including gust) must be forecast to be within operating limits (including reduced visibility limits) and should be within the manufacturer's maximum demonstrated crosswind.

(4) All conditional forecast elements below the lowest applicable operating minimums must be taken into account. Additives are applied only to the height value (H) rounded up to the next 100 ft value (if not a multiple of 100) to determine the required ceiling.

(5) When dispatching under the provisions of the minimum equipment list (MEL), those MEL limitations affecting instrument approach minimums must be considered in determining alternate minimums.

(6) For operations outside the United States, because of variations in the international metric weather forecasting standards, 700 m may be used in lieu of 800 m.

(7) Credit for alternate minimums based on CAT II or CAT III capability is authorized if the certificate holder is approved for engine inoperative CAT III operations under operations specification C060, Category II and Category III Instrument Approach and Landing Operations.

(8) Use of GPS-Based IAP Minimums at an Alternate Airport. The certificate holder may use GPS-based IAP with the airplane make, model, and series (M/M/S) listed in Table 2. If no authorizations appear in Table 2, GPS-based IAP minimums are not authorized at an alternate airport. Examples of GPS-based IAP include GPS, RNAV (GPS), and RNAV (RNP).

Table 2 - GPS-Based IAP Authorizations

Airplane M/M/S	Conditions and Limitations	Remarks
CE-208-B	Subparagraph b8(e)(i)	None
CE-208-B	Subparagraph b8(e)(iii)	None
CE-208-B	Subparagraph b8(e)(iv)	None

(a) Before the certificate holder is authorized to plan for the lines of minimums specified below, the certificate holder must be approved to conduct GPS-based IAP under operations specification C052, Straight-in Non-Precision, APV, and Category I Precision Approach and Landing Minima - All Airports, and if applicable, RNAV (RNP) IAP if issued operations specification C384, Required Navigation Performance (RNP) Procedures with Authorization Required (AR).

(b) The certificate holder with either a Technical Standard Order (TSO)-C129( ) or a TSO-C196( ) navigation system must perform a preflight receiver autonomous integrity monitoring (RAIM) prediction for the airport where the GPS-based IAP will be flown. The certificate holder must also ensure that the conventional approach (at destination) can be flown without reliance on GPS. The certificate holder must check NOTAMs as part of the preflight planning activities.

(c) The certificate holder with either a TSO-C145( ) or a TSO-C146( ) navigation system must review appropriate Aeronautical Information Services (AIS) and NOTAMs for wide area augmentation system (WAAS) service outages.

(d) The certificate holder may use suitable RNAV systems for flight planning at an alternate airport, provided planned availability of the substitute means of navigation is confirmed (e.g., NOTAMs and RAIM prediction for use of GPS and NOTAM/AIS checks for use of WAAS). The certificate holder may plan for a conventional approach at the destination and may plan to use a substitute means of navigation based on GPS at the alternate airport, not including substitution for the navigation aid providing lateral guidance on the final approach segment, unless otherwise authorized. For example, the certificate holder may use GPS to substitute for an out-of-service VOR that supports an ILS missed approach procedure at an alternate airport (unless the procedure is NOTAM'd “not authorized”).

(e) The certificate holder may use GPS-based IAP with the airplane M/M/S listed in Table 2 according to the conditions and limitations in subparagraphs b(8)(e)(i) through (iv), as indicated in the “Conditions and Limitations” column for each airplane M/M/S.

(i) The certificate holder must have a navigation system, either a TSO-C129( ) or a TSO-C196( ), that includes fault detection and exclusion (FDE) capability to utilize GPS-based IAP

at either the destination or an alternate (not both). At the alternate, if not equipped with barometric vertical navigation (baro-VNAV) the certificate holder must only plan to lateral navigation (LNAV) (or circling) minimum descent altitude (height) (MDA(H)).

(ii) The certificate holder must have a navigation system, either a TSO-C129( ) or a TSO-C196( ), that includes FDE capability and is equipped with baro-VNAV to utilize GPS-based IAP at either the destination or an alternate (not both). At the alternate, the certificate holder may plan to LNAV (or circling) MDA(H) or LNAV/VNAV decision altitude (height) (DA(H)) if using baro-VNAV. The certificate holder authorized under operations specification C384, utilizing an RNAV (RNP) IAP at the alternate, must plan to no lower than an RNP 0.30 DA(H).

(iii) The certificate holder must have a navigation system, either a TSO-C145( ) or a TSO-C146( ), and may utilize GPS-based IAP at both the destination and an alternate. At the alternate, if not equipped with and using baro-VNAV, the certificate holder must only plan to LNAV (or circling) MDA(H).

(iv) The certificate holder must have a navigation system, either a TSO-C145( ) or a TSO-C146( ), equipped with baro-VNAV, to utilize GPS-based IAP at both the destination and an alternate. At the alternate, the certificate holder may plan for LNAV (or circling) MDA(H) or LNAV/VNAV DA(H) if using baro-VNAV. The certificate holder authorized under operations specification C384, utilizing an RNAV (RNP) IAP at the alternate, must plan to no lower than an RNP 0.30 DA(H).

(9) The certificate holder may not file for GPS-based IAP at a designated Extended Operations (ETOPS) alternate airport unless authorized by the Air Transportation Division (AFS-200).

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

C057 . IFR Takeoff Minimums, 14 CFR Part 135 Airplane Operations - All Airports

HQ Control: 01/13/2000
HQ Revision: 02a

Standard takeoff minimums are defined as 1 statute mile visibility or RVR 5000 for airplanes having 2 engines or less and 1/2 statute mile visibility or RVR 2400 for airplanes having more than 2 engines. RVR reports, when available for a particular runway, shall be used for all takeoff operations on that runway. All takeoff operations, based on RVR, must use RVR reports from the locations along the runway specified in this paragraph.

a. When a takeoff minimum is not published, the certificate holder may use the applicable standard takeoff minimum and any lower than standard takeoff minimums authorized by these operations specifications. When standard takeoff minimums or greater are used, the Touchdown Zone RVR report, if available, is controlling.

b. When a published takeoff minimum is greater than the applicable standard takeoff minimum and an alternate procedure (such as a minimum climb gradient compatible with airplane capabilities) is not prescribed, the certificate holder shall not use a takeoff minimum lower than the published minimum. The Touchdown Zone RVR report, if available, is controlling.

NOTE: Single-Engine IFR Part 135 passenger-carrying operations are not authorized lower than standard takeoff minimums at any airport.

c.When takeoff minimums are equal to or less than the applicable standard takeoff minimum, the certificate holder is authorized to use a takeoff minimum equal to the lowest authorized straight-in Category I IFR landing minimum applicable to the certificate holder for that particular airport. The Touchdown Zone RVR report, if available, is controlling.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

C064 . Terminal Area IFR Operations in Class G Airspace and at Airports Without an Operating Control Tower-- Nonscheduled Passenger and All-Cargo Operations

HQ Control: 12/17/2003

HQ Revision: 03a

The certificate holder is authorized to conduct nonscheduled passenger and all-cargo (scheduled and nonscheduled) terminal area IFR operations in Class G airspace or at airports without an operating control tower specified in accordance with the limitations and provisions of this paragraph. The certificate holder shall not conduct any other terminal area IFR operations under this operations specification.

a. The certificate holder is authorized to conduct these operations, provided that the certificate holder determines that:

(1) The airport is served by an authorized instrument approach procedure.

(2) The airport has an approved source of weather or in accordance with the provisions for conducting the flight under the eligible on-demand authorization.

(3) The airport has a suitable means for the pilot-in-command to acquire timely air traffic advisories and the status of airport services and facilities.

(4) The facilities and services necessary to safely conduct IFR operations are available and operational at the time of the particular operation.

b. The certificate holder is authorized to designate and use an alternate or diversionary airport which will involve terminal area IFR operations in Class G airspace or at airports without an operating control tower provided that at the time of any operation to that alternate or diversionary airport, the certificate holder determines that the provisions specified in subparagraphs a(1) through (4) are met.

c. Except as provided in operations specifications paragraph C077, all 14 CFR Part 135 turbojet and all Part 121 operations in the terminal area are conducted under instrument flight rules.

The certfficate holder is authorized to conduct operations using the Special Terminal Instrument
Procedures specified for thefollowing airports, provided the operations is conducted in accordance with
the limitations and provisions of the following Special Terminal Instrument Procedures:

AIRPORT (IDENT)

ADDISON (ADS)
EXECUTIVE (RBD)
ALTUS (AXS)
EURIKA (EKA)

This certfficate holder is authorized to conduct non-scheduled passenger and scheduled and

non-scheduled
all cargo terminal area IFR operations outside controlled airspace during periods when an approved
weather source is not available at the airport listed in deviation of l4 CFR 135.213 (b) provided that the
certificate holder determines that the provisions specified in subparagraphs A (1), (3), and (4) are met.
The following requirements must also be metfor the airports listed:
(1) ARRIVAL: No pilot may begin an instrument approach procedure to an airport listed above during
periods when an approved weather source is not available at the airports listed:
(a) The reported visibility or RVR at the weather source airport is l/2 mile (2400 RVR) or greater than the
authorized landing visibility for the desired approach at the destination airport.
(b) The reported ceiling at the weather source airport is 100 feet higher than the authorized HAT or HAA
for the desired approach at the destination airport.
(c) The approach is conducted in accordance with the published procedure.
(2) DEPARTURE: The pilot in command shall determine the ceiling and visibility by personal observation
in accordance with the certificate's holder's procedures, in order to comply with the published take off and
departure limitations.
(a) The certificate holder is authorized to conduct non-scheduled passenger and scheduled and nonscheduled
all cargo terminial area IFR operations outside controlled airspace provided that the certificate
holder determines that:
(l) The airport is served by an instrument approach procedure.
(2) The airport has an approved source of weather.
(3) The airport has a suitable means for the pilot in command to acquire air traffic advisories and the
status of the airport services and facilities.
(4) The facilities and services necessary to safely conduct IFR operations are available and operational at
the time of the particular operation.
(b) The certificate holder is authorized to designate and use and alternate or divisionary airport which will
involve terminal area IFR operations outside controlled airspace provided at the time of any operations to
the alternate or divisionary airport, the certificate holder determines that the provisions specified in
subparagraphs a. (l) through (4) are met.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

C075 . Category I IFR Landing Minimums - Circle-to-Land Approach Maneuver

HQ Control: 04/27/2001
HQ Revision: 020

The certificate holder is authorized Category (CAT) I IFR landing minimums for circle-to-land approach maneuvers in accordance with the limitations and provisions of this operations specification.

a. The lowest authorized IFR landing minimum for instrument approaches, which require a circle-to-land maneuver to the runway of intended landing, shall be determined for a particular aircraft by using the speed category appropriate to the highest speed used during the circle-to-land maneuver.

b. Aircraft operating under IFR during all circle-to-land maneuvers are required to remain clear of clouds. If visual reference to the airport is lost while conducting a circle-to-land maneuver the missed approach procedure specified for the applicable instrument approach must be followed, unless an alternate missed approach procedure is specified by ATC.

c. All Certificate Holders- Training and Checking Provided . If the certificate holder provides training and checking the following subparagraphs c(1) through c(3) apply.

(1) The certificate holder shall use the highest of the following landing minimums for an instrument approach that requires a circle-to-land maneuver to align the aircraft with the runway of intended landing when a straight-in landing from an instrument approach is not possible or is not desirable:

(a) The circling landing minimum specified by the applicable instrument approach procedure, or

(b) A landing minimum specified in the following table.

Speed Category	HAA	Visibility in Statute Miles
Less than 91 kts	350’	1
91 to 120 kts	450’	1
121 to 140 kts	450’	1½
141 to 165 kts	550’	2
Above 165 kts	1000’	3

(2) The certificate holder shall conduct authorized circle-to-land maneuvers using only pilots who:

(a) Are not required by a pilot certificate restriction to conduct circling approaches in VMC conditions only; and,

(b) Have successfully completed an approved training program (if required) and a proficiency check for the circle-to-land maneuver. The training program must specifically include the circle-to-land maneuver. Satisfactory completion of an Advanced Qualification Program (AQP)

validation of the circle-to-land maneuver satisfies this requirement.

(3) The certificate holder is authorized to use the following aircraft to conduct circle-to-land maneuvers when training and checking are provided (if none are authorized, enter N/A):

Table 1

Aircraft Make/Model/Series
CE-208-B

d. If Foreign Airports are Authorized . The following special limitations and provisions for instrument approach procedures apply at foreign airports.

(1) Foreign approach lighting systems equivalent to U.S. standards are authorized for precision, precision-like (other than ILS, MLS, or GLS), and nonprecision instrument approaches. Sequenced flashing lights are not required when determining the equivalence of a foreign approach lighting system to U.S. standards.

(2) For straight-in landing minimums at foreign airports where an MDA(H) or DA(H) is not specified, the lowest authorized MDA(H) or DA(H) shall be obtained as follows:

(a) When an obstruction clearance limit (OCL) is specified, the authorized MDA(H) or DA(H) is the sum of the OCL and the touchdown zone elevation (TDZE). If the TDZE for a particular runway is not available, threshold elevation shall be used. If threshold elevation is not available, airport elevation shall be used. For approaches other than ILS, MLS, or GLS, the MDA (H) may be rounded to the next higher 10-foot increment.

(b) When an obstacle clearance altitude (OCA)/obstacle clearance height (OCH) is specified, the authorized MDA(H) or DA(H) is equal to the OCA/OCH. For approaches other than ILS, MLS, or GLS, the authorized MDA(H) may be expressed in intervals of 10 feet.

(c) The HAT or HAA used for precision approaches shall not be below those specified in subparagraph a of this operations specification.

(3) When only an OCL or an OCA/OCH is specified, visibility and/or RVR minimums appropriate to the authorized HAA/HAT values determined in accordance with subparagraph b(2) above will be established in accordance with criteria prescribed by U.S. TERPS or Joint Aviation Authorities, Joint Aviation Requirements, operational agreements, Part 1 (JAR-OPS-1).

(4) When conducting an instrument approach procedure outside the United States, the certificate holder shall not operate an aircraft below the prescribed MDA(H) or continue an approach below the DA(H), unless the aircraft is in a position from which a normal approach to the runway of intended landing can be made and at least one of the following visual references is clearly visible to the pilot:

(a) Runway, runway markings, or runway lights.

(b) Approach light system (in accordance with 14 CFR section 91.175(c)(3)(i)).

(c) Threshold, threshold markings, or threshold lights.

(d) Touchdown zone, touchdown zone markings, or touchdown zone lights.

(e) Visual glidepath indicator (such as VASI or PAPI).

(f) Runway-end identifier lights.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

D073 . Approved Aircraft Inspection Program (AAIP)

HQ Control: 09/09/2015
HQ Revision: 010

a. The certificate holder is authorized under 14 CFR Part 135, § 135.419 to use the Approved Aircraft Inspection Program (AAIP) in Table 1 below, provided:

1. Each aircraft listed in Table 1 below, is inspected in accordance with that program.

2. The AAIP program is for any make and model of aircraft for which the certificate holder has the exclusive use of at least one aircraft (as defined in § 135.25(b)).

3. The program includes instructions and procedures for the conduct of aircraft inspections (which must include necessary tests and checks), setting forth in detail the parts and areas of the airframe, engines, propellers, rotors, and appliances, including emergency equipment, that must be inspected,

4. The program includes a schedule for the performance of the aircraft inspections expressed in terms of time in service, calendar time, number of system operations, or any combination of these.

5. The program includes instructions and procedures for recording discrepancies found during inspections and correction or deferral of discrepancies, including form and disposition of records.

6. The certificate holder includes the approved aircraft inspection program in its manual required by § 135.21.

Table 1 - Aircraft on Approved Aircraft Inspection Program

Aircraft Registration Number	Aircraft Serial Number	Aircraft M/M/S	Approved Aircraft Inspection Program Document Name	FAA Program Approval Date
N802AA	208B0873	CE-208-B	Martinaire AAIP, Rev 14	5/14/2012

Aircraft Registration Number	Aircraft Serial Number	Aircraft M/M/S	Approved Aircraft Inspection Program Document Name	FAA Program Approval Date
N1037N	208B0334	CE-208-B	Martinaire AAIP, Rev 14,	05/14/2012
N1041L	208B0337	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N1116N	208B0417	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N1119V	208B0383	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N1120W	208B0388	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N12155	208B0562	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N162SA	208B0548	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N208N	208B0279	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N208TF	208B0592	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N4591B	208B0137	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N4602B	208B0140	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N4625B	208B0159	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N4655B	208B0160	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N4662B	208B0161	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N4687B	208B0167	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N78SA	208B0476	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9331B	208B0055	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9469B	208B0079	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9471B	208B0081	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9505B	208B0085	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9594B	208B0131	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9760B	208B0102	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9761B	208B0107	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012

Aircraft Registration Number	Aircraft Serial Number	Aircraft M/M/S	Approved Aircraft Inspection Program Document Name	FAA Program Approval Date
N9762B	208B0109	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9956B	208B0119	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N9546B	208B0126	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012
N1031P	208B0404	CE-208-B	Martinaire AAIP, Rev 14	05/14/2012

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

D085 . Aircraft Listing

HQ Control: 02/06/1998
HQ Revision: 02a

a. The certificate holder is authorized to conduct operations under 14 CFR Part 135 using the aircraft identified on this operations specification.

Registration No.	Serial No.	Aircraft M/M/S
N1031P	208B0404	CE-208-B
N1037N	208B0334	CE-208-B
N1041L	208B0337	CE-208-B
N1116N	208B0417	CE-208-B
N1119V	208B0383	CE-208-B
N1120W	208B0388	CE-208-B
N12155	208B0562	CE-208-B
N162SA	208B0548	CE-208-B
N208N	208B0279	CE-208-B
N208TF	208B0592	CE-208-B
N4591B	208B0137	CE-208-B
N4625B	208B0159	CE-208-B
N4655B	208B0160	CE-208-B
N4687B	208B0167	CE-208-B
N78SA	208B0476	CE-208-B
N802AA	208B0873	CE-208-B
N9331B	208B0055	CE-208-B
N9469B	208B0079	CE-208-B
N9471B	208B0081	CE-208-B
N9505B	208B0085	CE-208-B
N9546B	208B0126	CE-208-B
N9594B	208B0131	CE-208-B
N9760B	208B0102	CE-208-B
N9761B	208B0107	CE-208-B
N9762B	208B0109	CE-208-B
N9956B	208B0119	CE-208-B

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

D095 . Minimum Equipment List (MEL) Authorization **HQ Control: 06/14/2013**
HQ Revision: 02c

a. The certificate holder is authorized to use an FAA-approved MEL provided the conditions and limitations of this paragraph are met. The certificate holder shall not use an MEL for any aircraft that is not specifically authorized by this paragraph.

b. Authorized Aircraft. The certificate holder is authorized to use an FAA-approved MEL for the aircraft listed below:

Aircraft M/M/S	Limitations and Conditions
CE-208-B	

c. Maximum Times Between Deferral and Repair. Except as provided in subparagraph e of this operations specification, the certificate holder shall have instrument and equipment items repaired within the time intervals specified for the repair categories listed below:

(1) Repair Category A. Items in this category shall be repaired within the time interval specified in the "Remarks or Exceptions" column of the certificate holder's FAA-approved MEL. For time intervals specified in "calendar days" or "flight days", the day the malfunction was recorded in the aircraft maintenance record/logbook is excluded. For all other time intervals (e.g., flights, flight legs, cycles, hours, etc.), repair tracking begins at the point when the malfunction is deferred in accordance with the certificate holder's FAA-approved MEL.

(2) Repair Category B. Items in this category shall be repaired within three (3) consecutive calendar days (72 hours) excluding the calendar day the malfunction was recorded in the aircraft maintenance log and/or record.

(3) Repair Category C. Items in this category shall be repaired within ten (10) consecutive calendar days (240 hours) excluding the calendar day the malfunction was recorded in the aircraft maintenance log and/or record.

(4) Repair Category D. Items in this category shall be repaired within one hundred twenty (120) consecutive calendar days (2,880 hours) excluding the day the malfunction was recorded in the aircraft maintenance log and/or record.

d. MEL Management Program. The certificate holder shall develop and maintain a comprehensive program for managing the repair of instrument and equipment items listed in the FAA-approved MEL. The certificate holder shall include in a document or manual a description of the MEL management program. The MEL management program must include at least the following provisions:

(1) A method which provides for tracking the date and, when appropriate, the time an item was deferred and subsequently repaired. The method must include a supervisory review of:

(a) The number of deferred items per aircraft; and

(b) Each deferred item to determine the reason for any delay in repair, length of delay,

and the estimated date the item will be repaired.

(2) A plan for bringing together parts, maintenance personnel, and aircraft at a specific time and place for repair.

(3) A review of items deferred because of the unavailability of parts to ensure that a valid back order exists with a firm delivery date.

(4) A description of specific duties and responsibilities, by job title, of the personnel who manage the MEL management program.

(5) Procedures for controlling an extension to specified repair intervals as permitted by subparagraph e of this operations specification**,** to include the limit of the extension and the procedures to be used for authorizing an extension.

e. Continuing Authorization-Single Extension. The certificate holder is authorized to use a continuing authorization-single extension to approve a single, one-time extension to the repair interval for repair category B and C items, as specified in the FAA-approved MEL, provided the responsible Flight Standards District Office (FSDO) is notified within 24 hours of the extension approval.

(1) If an additional extension is required after the continuing authorization-single extension privilege has been exercised, it must be approved by the principal inspectors (PIs) prior to the expiration of the current extension time period.

(2) The certificate holder is not authorized to approve a single, one-time extension to the repair interval for repair category A and D items, as specified in the FAA-approved MEL.

(3) The FSDO may deny the use of the continuing authorization-single extension privilege if abuse is evident.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

D101 . Additional Maintenance Requirements - Aircraft Engine, Propeller, and Propeller Control (Governor)

HQ Control: 09/09/2015
HQ Revision: 010

a. The certificate holder is authorized to use the aircraft types identified in the table below in Table 1 in its 14 CFR Part 135 nine seats or less operation, provided these aircraft meet the additional maintenance requirements of Part 135, § 135.421.

b. Aircraft Engine. Each installed engine, to include turbo superchargers, appurtenances and accessories necessary for its functioning shall be maintained in accordance with the maintenance document listed in Table 1 below. The engine shall be overhauled on or before the time in service interval shown in the table.

c. Propeller and Propeller Control (governor). Each installed propeller and propeller control (governor) shall be maintained in accordance with the maintenance document listed in Table 1 below. The propeller and propeller control (governor) shall be overhauled on or before the time in service interval shown in Table 1.

d. Limitations and Conditions. Limitations and Conditions are for the specific engine, propeller and governor authorization listed.

Table 1 - Aircraft Engine, Propeller, and Propeller Control (Governor)

Airplane Type	Engine			Propeller			Governor			Limitations and Conditions
MMS	Make & Model	Maintenance Document	Time in Service Interval	Make & Model	Maintenance Document	Time in Service Interval	Make & Model	Maintenance Document	Time in Service Interval	
CE-208-B	Pratt & Whitney PT6A-114; PT6A-114A	Pratt & Whitney maintenance manual 3043512, SB 1703 & SB 1002	TBO: 3600 Hrs/ 12 Years HSI-1800 Hrs.	Hartzell HCB3TN-3B ---------- ------- Hartzell	Hartzell maintenance manual 118F & SL 61U ----------	TBO: 3000 hrs / 60 months ---------- ---------	Woodward 8210-002	Woodward maintenance manual WG60015, SB 33580E, & P&W SB 1703	TBO of engine / 6 yrs	

Table 1 - Aircraft Engine, Propeller, and Propeller Control (Governor)

Airplane Type	Engine			Propeller			Governor			Limitations and Conditions
MMS	Make & Model	Maintenance Document	Time in Service Interval	Make & Model	Maintenance Document	Time in Service Interval	Make & Model	Maintenance Document	Time in Service Interval	
	This is for rental and/or leased engines only.			HCB3MN-3 --- McCauley 3GFR34C703	Hartzell maintenance manual 118F & SL 61U --- McCauley maintenance manual 810301 & SB 137Q --- and/or Cessna Service Manual D2078	TBO: 3850 hrs/ 66 months --- TBO: 4000 hrs / 72 months				
CE-208-B	Pratt & Whitney PT6A-114; PT6A-114A	"Pratt & Whitney Canada maintenance manual 304351, SB1002 & Letter dated 8 July 2003 Fleet Extension. And Martinaire Extended Overhaul Program & Manual as revised. ECTM must be accomplished by The Trend Group." ___ P&W letter dated 10/25/2010 one time extension. Must be maintained per above program.	TBO: 8000 hrs/ 15 Years S/N's- PCE-PC0499, PCE- PC1006, PCE-PC1396, PCE-PC1944, PCE-PC2053, PCE-PC2077,PCE-PC2087, PCE-PC1930, PCE-17211, PCE-17326, PCE-	Hartzell HCB3TN-3B --- Hartzell HCB3MN-3 --- McCauley	Hartzell maintenance manual 118F & SL 61U --- Hartzell maintenance manual 118F & SL 61U	TBO: 3000 hrs / 60 months --- TBO: 3850 hrs/ 66 months ---	Woodward 8210-002	Woodward maintenance manual WG60015, SB 33580E, & P&W SB 1703	TBO of engine / 15 yrs	

Table 1 - Aircraft Engine, Propeller, and Propeller Control (Governor)

Airplane Type	Engine			Propeller			Governor			Limitations and
MMS	Make & Model	Maintenance Document	Time in Service Interval	Make & Model	Maintenance Document	Time in Service Interval	Make & Model	Maintenance Document	Time in Service Interval	Conditions
			17334, PCE-19224, PCE-19418, PCE-PC0451, PCE-PC0675, PCE-PC0836, PCE-PC1097, PCE-PC17320, PCE19379, PCE-PC2079, PCE-PC19282, PCE-PC2090, PCE-PC1811, PCE-PC0956, PCE-PC1225, PCE-PC1405, PCE-PC1353, PCE-19364, PCE-PC1173 HSI On condition. _____	3GFR34C703	---------- McCauley maintenance manual 810301 & SB 137Q and/or Cessna Service Manual D2078	------ TBO: 4000 hrs / 72 months				

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

D104 . Additional Maintenance Requirements - Emergency Equipment

HQ Control: 05/10/2004
HQ Revision: 00a

The certificate holder is authorized to use the following emergency equipment in its 14 CFR Part 135 nine seats or less operations, provided the applicable aircraft have met the additional maintenance requirements of Section 135.421:

a. Emergency equipment. Each item of installed emergency equipment shall be maintained in accordance with the manufacturer's maintenance documents and/or the limitations and provisions listed in the following table.

(1) In addition to the maintenance document listed in this table, the following specifications must be followed for the applicable listed emergency equipment items:

(a) Oxygen (O2) bottles and liquid fire extinguishers. Inspections, hydrostatic tests, and life limits of pressure vessels manufactured under a DOT specification are accomplished as set forth in 49 CFR Part 180.209, as amended.

(b) Fire extinguishers. Inspections, hydrostatic tests, and life limits of portable fire extinguishers are accomplished as set forth in 46 CFR Sections 71.25 and 162.028, as amended.

(c) Military-manufactured. Pressure vessels manufactured under a MIL-SPEC are maintained in accordance with the applicable military specifications.

(d) Foreign-manufactured. Foreign-manufactured pressure cylinders are maintained in accordance with the applicable foreign manufacturer's specifications.

(e) Other. Pressure cylinders not manufactured under DOT, foreign, or U.S. MIL-SPECS are maintained in accordance with the applicable aircraft manufacturer's specifications.

Emergency Equipment

Emergency Equipment Items	Maintenance Document	Limitations and Provisions
Halon Portable Fire Extinguisher: Halon 1211	Service Manual 35905/ 35906Inspect/ service IAW Placard Instructions-NFPA 10	Monthly per 4-3.2 6 Year recharge check 12 Year Hydrostatic check
O2 Bottle: DOT-E-8162	Cessna MM CD2078	Hydrostatic test: 5 year Bottle life limit: 15 yrs.
O2 Bottle: DOT-SP-8162	Cessna MM CD2078	Hydrostatic test: 5 year Bottle life limit: 15 yrs.
O2 Bottle: DOT-3AA	Cessna MM CD2078	Hydrostatic test: 5 year Bottle life limit: 15 yrs.

1. Issued by the Federal Aviation Administration.
2. These Operations Specifications are approved by direction of the Administrator.

3. I hereby accept and receive the Operations Specifications in this paragraph.

SECTION D - ACCIDENT NOTIFICATION REQUIREMENTS
[135.23(d)]

1. From the time any person boards the aircraft with the intention to fly until all such persons have disembarked, the occurrence of any of the following require Martinaire to notify the National Transportation Safety Board:

   A. An aircraft accident, as defined in NTSB Part 830.

   B. A flight control system malfunction or failure.

   C. The inability of any required flight crewmember to perform his normal flight duties as a result of injury or illness.

   D. Failure of any structural component of a turbine engine, excluding compressor and turbine blades and vanes.

   E. In-flight fire.

   F. Aircraft collide in flight.

   G. Damage to property (other than an aircraft) if the cost of repair is estimated to exceed $25,000. If the property is considered a total loss, then notification is required if the lessor of the estimated repair cost or its fair market value exceeds $25,000.

   H. An aircraft is overdue (45 minutes late or beyond its programmed fuel endurance time, whichever is less) and is believed to have been involved in an accident.

2. Martinaire personnel will notify the NTSB in the most expeditious means available as follows:

   A. The Pilot-in-Command (PIC) shall notify Company Dispatch.

   B. Company Dispatch shall immediately notify the Director of Operations.

   C. If Company Dispatch cannot notify the Director of Operations then the Chief Pilot or the Flight Operations Administrator shall be notified.

   D. If Company Dispatch cannot notify the Chief Pilot or the Flight Operations Administrator then Company Dispatch shall notify the NTSB.

   E. If the Director of Operations has good reason to believe the PIC cannot contact him, and that one of the occurrences requiring notification has happened, he will immediately notify the NTSB. This notification may be through the FAA (ATC or FSDO), if possible; or may be direct to the NTSB, if necessary.

EMERGENCY NOTIFICATION

Any Martinaire employee who, under emergency authority, deviates from any Federal Aviation Regulation while on duty will immediately write a complete report of the aircraft operation involved. The employee will include a description of the deviation taken and the reasons for it.

**This information will be sent to the FAA at the following address no later than ten business days after the day of the deviation. The Director of Operations shall submit this report.

North Texas Flight Standards District Office
8700 Freeport Parkway
Suite 225
Irving, Texas 75063

The Pilot in Command will submit the report to the Director of Operations within 24 hours of any deviation, incident, accident or unusual circumstance.

EMERGENCY FLIGHT LOCATING PROCEDURES

When an aircraft is overdue by more than 30 minutes, Martinaire Dispatch will call the following people or agencies, in the order shown below:

1. The fixed base operators who normally service the aircraft on the route in question;

2. The Air Route Traffic Control Center which controls the airspace in which the aircraft would normally be operating.

3. If the aircraft cannot be located, the Dispatcher on duty will contact the following individuals for further instructions:

    A. Chief Pilot

    B. Director of Operations

The telephone numbers of the above are on file at Martinaire Dispatch in Addison, Texas.

SECTION E - AIRWORTHINESS INFORMATION
[135.23(e)]

As part of the preflight duties, the assigned Pilot-in-Command (PIC) will:

1. Note the date and the aircraft Hobbs time and compare them with the inspection due dates and times listed on the Aircraft Flight Log (AFL).

2. Determine whether the flight or series of flights can be completed without any required inspection coming due before the aircraft returns to home base. The applicable inspections are listed below along with when they must have been previously accomplished.

   A. 200 hour Inspection within the preceding 200 hours of operation on Cessna 208 aircraft +/- allotted grace period per manufacturer

   B. Transponder, encoder, pitot/static system, and altimeter inspections and calibrations within the preceding 24 calendar months.

   C. ELT battery replaced on or before the date listed by the manufacturer or after one hour of cumulative use, whichever comes first.

3. If the scheduled flight(s) cannot be completed without one of the aforementioned inspections becoming overdue, the PIC will immediately contact Martinaire Dispatch for instructions. Under no conditions will a PIC commence a flight if any required inspection time has been exceeded.

4. Determine that for deferred and corrected mechanical irregularities the aircraft has been certified approved for return to service. The Pilot will ensure that an identifying signature, certificate type and either a license number or repair station number accompanies the return to service. This certification will appear on the Martinaire Aircraft Deferred Discrepancy Sheet in each aircraft.

5. If a Pilot is unable to reach Martinaire Dispatch or maintenance personnel to report a mechanical defect, he/she will write the discrepancy in the AFL and place a fuchsia colored "aircraft grounded" placard on the chart clip of the left seat control wheel of the aircraft. The placard may only be removed once Dispatch or maintenance has been notified and the item has either been repaired or deferred.

AIRPLANE FLIGHT MANUAL REVISIONS

Airplane Flight Manual revisions will be kept current at Martinaire's base of operations at Addison, Texas. The Director of Maintenance is responsible for inserting additional, or replacing out-dated AFM paragraphs and/or sections as presented by the aircraft manufacturer's Service Bulletins. The Director of Maintenance is furthermore responsible for the distribution of AFM revisions to designated individuals or entities for the purpose of keeping each airplane's Manual current.

The Director of Maintenance will forward a copy of any revisions to the Chief Pilot who will then post these on the Martinaire Pilot's website at www.martinaire.com. The Pilot in Command will be required to familiarize himself with the revision and review its contents. The Pil ot in Command is also responsible for ensuring that the actual revision has been done in the aircraft that he is currently flying. If the PIC finds that the revision is not current he must immediately contact Martinaire maintenance.

14 CFR § 43.3 (k)

Persons authorized to perform maintenance, preventive maintenance, rebuilding, and alterations.

(k) Updates of databases in installed avionics meeting the conditions of this paragraph are not considered maintenance and may be performed by pilots provided:

(1) The database upload is:

(i) Initiated from the flight deck;

(ii) Performed without disassembling the avionics unit; and

(iii) Performed without the use of tools and/or special equipment.

(2) The pilot must comply with the certificate holder's procedures or the manufacturer's instructions.

(3) The holder of operating certificates must make available written procedures consistent with manufacturer's instructions to the pilot that describe how to:

(i) Perform the database update; and

(ii) Determine the status of the data upload.

Navigational Database Procedures

Navigation databases will be updated as the new revision is released. The currency of the database will be tracked on Martinaire's computerized tracking program and reviewed by Maintenance Control. Upon receipt of the new database Maintenance Control will:

1. Review the aircraft status (due list) for the fleet to ensure that all databases are within currency.
2. When a revision is due, identify the maintenance organization or pilot responsible for updating the database on each individual aircraft.
3. Contact the maintenance facility or pilot to inform them of the new revision.
4. Ensure delivery of the new database to the maintenance facility or pilot.
5. Review the flightlog entries for the revision.
6. Inform the Records Department that the update has been accomplished.
7. Inform the Records Department of the expiration date of the new revision.

Maintenance Records Department will:

1. Enter into the maintenance record for each aircraft, (after accomplishment of the database update has been verified), the date the new revision was accomplished.
2. Enter into the maintenance record entry the date of expiration of the new database.

[1] An entry for the database update will be entered into the aircraft flightlog and must be signed by an authorized certificated mechanic or repairman or Martinaire pilot, except that a certificated repairman may sign the entry only if his job description qualifies him for such work. The entry must meet the requirements of CFR 43.9 and the expiration date of the new database card must be entered as the next due date.

Out of Date Navigational Databases

The current Expiration date of the database can be ascertained by reading the information on the side of the card for the expiration date. If it is discovered that a navigational database is out of revision, the pilot or maintenance personnel that finds the discrepancy will defer the database in accordance with the procedures found in Section F "*Reporting and Recording of Mechanical Irregularities*" of this manual and contact Maintenance Control to report the discrepancy. If after hours, contact Martinaire Dispatch. The pilot in command will adhere to the Operational (O) Procedures in the MEL for out of currency databases.

[2] To facilitate validating database currency, the FAA has developed procedures for publishing the amendment date that instrument approach procedures were last revised. The amendment date follows the amendment number, e.g., Amdt 4 14 Jan10. Currency of graphic departure procedures and STARs may be ascertained by the numerical designation in the procedure title. If an amended chart is published for the procedure, or the procedure amendment date shown on the chart is on or after the expiration date of the database, the operator must not use the database to conduct the operation.

[1] Title 14 CFR 135.443 "*Airworthiness Release or Aircraft Maintenance Log Entry*" (b) (3).

[2] Aeronautical Information Manual (AIM) 1-2-3 "*Use of Suitable Aeronautical Area Navigation (RNAV) Systems on Conventional Procedures and Routs*" a. 2. Note 4.

SECTION F - REPORTING AND RECORDING OF MECHANICAL IRREGULARITIES
[135.23(f), and 135.65(d)]

Whenever a pilot finds a defective piece of equipment, they will:

1. Check the Aircraft Flight Log Discrepancy Section in the aircraft to see if the item has been previously reported and properly deferred. If the item has not been previously written up, the Pilot-in-Command (PIC) will record the pertinent information on the company Aircraft Discrepancy Section of the AFL. The Aircraft Discrepancy Section of the AFL will remain in the aircraft until the affected part is repaired or replaced and an entry to that effect is made in the aircraft permanent maintenance records. The Pilot In Command will immediately notify Martinaire maintenance of the reported problem with exact and specific information about the problem. When reporting an item to maintenance state the noticed problems. Do not say the "VOR receiver isn't working", but state as an example that the "TO/FROM flag is stuck in the TO position."

2. Check the approved minimum equipment list to determine if the defective equipment may be deferred and the conditions that must be met.

3. If the defective equipment is not deferrable, the (PIC) will not allow the aircraft to take off until the Director of Maintenance (or his designee) is contacted and the mechanical irregularity is corrected in accordance with this manual.

All mechanical irregularities discovered during the course of a flight will be brought to the attention of the Director of Maintenance after the flight, whether or not the Director of Maintenance was notified previously.

THIS PAGE INTENTIONALLY LEFT BLANK

October 18, 2010

ADDENDUM to Martinaire GIM Rev 23/ 10-18-2010

This is to be added to section “F” of the Martinaire GOM following page F-2.

Service difficulty reports (135.415)

(a) This certificate holder shall report the occurrence or detection of each failure, malfunction, or defect to aircraft concerning –

(1) Fires during flight and whether the related fire-warning system functioned properly;

(2) Fires during flight not protected by related fire-warning system;

(3) False fire-warning during flight;

(4) An exhaust system that causes damage during flight to the engine, adjacent structure, equipment, or components;

(5) An aircraft component that causes accumulation or circulation of smoke, vapor, or toxic or noxious fumes in the crew compartment or passenger cabin during flight;

(6) Engine shutdown during flight because of flameout;

(7) Engine shutdown during flight when external damage to the engine or aircraft structure occurs;

(8) Engine shutdown during flight due to foreign object ingestion or icing;

(9) Shutdown of more than one engine during flight;

(10) A propeller feathering system or ability of the system to control overspeed during flight;

(11) A fuel or fuel-dumping system that affects fuel flow or causes hazardous leakage during flight;

(12) An unwanted landing gear extension or retraction or opening or closing of landing gear doors during flight;

(13) Brake system components that result in loss of brake actuating force when the aircraft is in motion on the ground;

(14) Aircraft structure that requires major repair;

(15) Cracks, permanent deformation, or corrosion of aircraft structures, if more that the maximum acceptable to the manufacturer or the FAA; and

(16) Aircraft components or systems that result in taking emergency actions during flight (except action to shut-down an engine).

(b) For the purpose of this section, *during flight* means the period from the moment the aircraft leaves the surface of the earth on takeoff until it touches down on landing.

[c] In addition to the reports required by paragraph (a) of this section, this certificate holder shall report any other failure, malfunction, or defect in an aircraft that occurs or is detected at any time if, in its opinion, the failure, malfunction, or defect has endangered or may endanger the safe operation of the aircraft.

(d) This certificate holder shall submit each report required by this section, covering each 24-hour period beginning at 0900 local time each day and ending at 0900 local time on the next day, to the FAA offices in Oklahoma City, Oklahoma. Each report of occurrences during a 24-hour period shall be submitted to the collection point with the next 96 hours. However, a report due on Saturday or Sunday may be submitted on the following Monday, and a report due on a holiday may be submitted on the next workday.

(e) This certificate holder shall transmit the reports required by this section on a form and in a manner prescribed by the Administrator, and shall include as much of the following as is available:

(1) The type and identification number of the aircraft.

(2) The name of the operator.

(3) The date.

(4) The nature of the failure, malfunction, or defect.

(5) Identification of the part and system involved, including available information pertaining to type designation of the major component and time since last overhaul, if known.

(6) Apparent cause of the failure, malfunction, or defect (e.g., wear, crack, design deficiency, or personnel error).

(7) Other pertinent information necessary for more complete identification, determination of, seriousness, or corrective action.

(f) No person may withhold a report required by this section even though all information required by this action is not available.

(g) When this certificate holder gets additional information, including information from the manufacturer or other agency, concerning a report required by this section, it shall expeditiously submit it as a supplement to the first report and reference the date and place of submission of the report.

(h) All mechanical irregularities as described in paragraph (a) will be brought to the attention of the Director of Maintenance after the flight. The Director of Maintenance will gather the information needed to be filed per paragraph (a)(d)(f) and (g).

Mechanical interruption summary report. (135.417)

This certificate holder shall mail or deliver, before the end of the 10th day of the following month, a summary report of the following occurrences in multiengine aircraft for the preceding month to the certificate-holding district office:

(a) Each interruption to a flight, unscheduled change of aircraft en route, or unscheduled stop or diversion from a route, caused by known or suspected mechanical difficulties or malfunctions that are not required to be reported under 135.415.

(b) The number of propeller featherings in flight, listed by type of propeller and engine and aircraft on which it was installed. Propeller feathering for training, demonstration, or flight check purposes need not be reported.

All mechanical interruption as described in paragraph (a) and (b) will be brought to the attention of the Director of Maintenance after the flight.

The above info will be fax and/or e-mailed to all Martinaire pilot to be insisted into their assigned GOM.

Alan Rusinowitz

Martinaire Aviation, L.L.C. CCO/EVP

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION G
PREVIOUSLY DEFERRED AND CORRECTED MECHANICAL IRREGULARITIES
[135.23(g)]

As part of his preflight duties, the assigned Pilot-in-Command (PIC) will review the previous Aircraft Discrepancy Section of the Aircraft Flight Log (AFL), in the aircraft to determine whether any write-ups have been either deferred in accordance with the approved minimum equipment list, or corrected. Deferred MEL items can be found in the Deferred Discrepancy Sheet DDS in each aircraft. If the PIC finds a mechanical irregularity that has not been either corrected or properly deferred, the PIC will not takeoff, but will contact the Director of Maintenance or his designee for instructions.

FLIGHT WITH INOPERATIVE EQUIPMENT

DEFINITION

A. Any discrepancy (mechanical irregularity or defect) recorded against an aircraft, must be reported to the Dispatch Center who will immediately notify the Director of Maintenance and/or his designee. At that time a determination must be made as to the effect of the situation on the airworthiness of the aircraft and whether continued operation is allowed.

B. The primary question involving a discrepancy is to consider what effect the "operability" of a particular instrument, indicator, item of installed equipment, component, system, etc. is involved. In addition, the combined effect on systems operation must be determined when more than one irregularity is involved.

C. A defect is a discrepancy which documents a situation that does not involve a determination of operability. For example, a carpet or seat cushion is worn or dirty, a trim panel is loose or missing, a windshield wiper will not park, etc.

D. The question as to whether a mechanical irregularity results in an operative or inoperative condition will be based on the following definitions:

OPERATIVE	Means a system or component malfunction which does not prohibit the system or component from accomplishing its intended purpose and consistently functions normally within its approved limit(s) and tolerance(s).
INOPERATIVE	Means a system or component malfunctions to the extent that it does not accomplish its intended purpose or is not consistently functioning normally within its approved operation limit(s) or tolerance(s). Note: Inoperative items which are components of a system which has been determined to be inoperative are usually considered components directly associated with and having no other function than to support that system. (Warning/Caution systems associated with the inoperative system must be operative unless relief is specifically authorized per the MEL).

DEFERRED DISCREPANCY TRACKING AND EXTENSION PROCEDURES

A. The Maintenance Department will maintain a Maintenance Control Number Master Log. Each discrepancy (mechanical irregularity or defect) against any aircraft will be entered in the data base. The system automatically generates a maintenance control number when a discrepancy is entered. If a computer failure occurs, a manual log system will be used.

B. The following information must be entered for each maintenance entry:

1. Maintenance Control Number
2. Repair Category from the MEL (if applicable)
3. Aircraft Registration Number
4. Aircraft Hobbs Time (Air Time)
5. Maintenance Control (MC) plus approval initials
6. Item Number from MEL (if applicable)
7. Date discrepancy entered
8. Date discrepancy corrected

9. Person entering discrepancy
10. Person entering that discrepancy is cleared
11. Discrepancy
12. Remarks

C. Each day a printout of all discrepancies will be provided to and reviewed by the Director of Maintenance, Director of Operations, and Chief Pilot. This review and subsequent action provides a comprehensive program for tracking, correction, and/or extension of deferred items (if applicable).

D. An aircraft with a reported discrepancy shall be considered "grounded" until the discrepancy has been corrected or deferral has been properly conducted in accordance with company procedures.

E. During a review of the deferred item list, the Director of Maintenance, or his delegated representative, will arrange for the purchase and shipment of all required parts and the provision of maintenance personnel to perform any required maintenance action. When a deferred discrepancy is corrected, the corrective action will be entered on the Deferred Discrepancy Sheet (DDS). Notification of any corrective action or deferral must be transmitted to the Maintenance Controller and the Maintenance Controller shall transmit this to the Dispatch Center. When this information is received, the appropriate entry in the database will be completed by the Maintenance Controller to reflect the current status.

F. Should a determination be made that a mechanical irregularity involves an inoperative condition, further flight is not allowed except in accordance with the Minimum Equipment List (MEL). If the inoperative item is included in the MEL , a maintenance control number could be issued. If the inoperative item is not listed on the MEL, the discrepancy must be repaired.

G. The maintenance control number will issued by Maintenance Control. If the MEL includes a repair category, that category A, B, C, or D, will be added as a suffix to the number, i.e., 011596A or 011596B. All Category A MEL items will be tracked using aircraft Total Time and all Category B, C, and D items are tracked using dates

H. If it is determined that any item cannot be repaired within the time interval required by the MEL the Director of Maintenance will prepare a Deferral Extension Notification Form (AAI-003). This form will be completed and forwarded to the FAA Certificate Holding District Office (CHDO) within 24 hours before the required interval has passed. This form will include the aircraft registration number, maintenance control number, date, discrepancy, and the length of extension requested. The reason for the time extension will be given in detail. If the extension is needed due to parts, the purchase order and if needed, the back order number

will be provided. The expected arrival date will be provided, if available from the vendor. The form will be signed by the Director of Maintenance or his delegated representative. Only MEL Category B and/or C items may be extended.
MEL category A and/or D items CANNOT be extended.
If your assigned aircraft has an open MEL category A or D item that is nearing the time limit, notify Dispatch immediately.

SECTION H - OBTAINING MAINTENANCE AWAY FROM HOME BASE
[135.23(h)]

If the aircraft requires preventative maintenance, maintenance, or servicing while away from the home base, the Pilot-in-Command (PIC) will contact the Director of Maintenance or his designee for instructions.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION I - USE OF MINIMUM EQUIPMENT LIST
[135.23(i)]

1. General

A. Federal Aviation Regulations require certain systems and equipment to be operative for aircraft operations. These FAR's also provide for deviations from these requirements via the Minimum Equipment List (MEL). The policy and procedures in this section will be adhered to by Martinaire.

B. All components/systems on an aircraft fall into three categories in regard to airworthiness requirements.

1) Units obviously required for the aircraft to be airworthy (such as tires, primary control systems, wings, and units required for original certification) are generally not included in the MEL.

2) Units that do not affect the airworthiness of the aircraft (including such items as entertainment systems, cabin trim, curtains, pillows, additional systems for weather detection, flight phones, etc.) are generally not included in the MEL.

3) Units which do not clearly fall into either of the above categories or for which some deviation from the normal complement of equipment has been approved.

C. The MEL contains units and systems in category 3 above for which operation of the aircraft with some deviation from airworthiness standards or operating rules has been approved. These are components and systems that the operator or manufacturer has proven that the aircraft may safely operate without, under specific conditions.

D. The MEL does not include every piece of equipment or system in the aircraft. When no specific mention of a unit or system is made in the MEL, it is necessary that the equipment be in place and operative unless it falls into category 2 above. It is the Pilot-in-Command's (PIC) responsibility to determine if an item falls into category 2 above. When the item falls into category 2, the PIC must also determine that the inoperative item does not affect the airworthiness of the aircraft.

E. Should any doubt exist as to interpretation of MEL items, or the proper category of an item, assistance shall be obtained from the Director of Maintenance, or the Director of Operations.

F. The PIC of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft. It is the PIC's responsibility to assure that the inoperative equipment is allowed for in the MEL. However, this authority does not allow the PIC to operate an aircraft with an inoperative item requiring maintenance that has not been approved for return to service.

G. MEL authorized inoperative items such as radio black boxes, control heads, etc. may be temporarily removed for repair with a logbook entry. Any necessary weight and balance entries must also be made.

H. Before a qualified crewmember operates the aircraft with an inoperative item he shall:

1) Determine that the inoperative item is an MEL authorized inoperative item as stated in the Martinaire MEL for that type of aircraft.

2) Determine that the inoperative item will not affect safety of flight.

3) Determine that any required alternate equipment is operative.

4) Review the aircraft maintenance record to assure that the proper write ups and sign offs have been accomplished.

5) Notify the Director of Maintenance at the earliest opportunity of any inoperative item. This notification will allow him to program and initiate procedures to assure timely corrective action is accomplished.

2. **Approving Aircraft for Return to Service with Inoperative Items Requiring Maintenance**

A. Aircraft may be approved for Return to Service as allowed by the MEL if the Director of Maintenance or his designee and the PIC agree that operation in the conditions prevailing at the time does not compromise safe operation of the aircraft, and the Director of Maintenance has confirmed that required maintenance action is taken to assure compliance with MEL procedures and prevention of secondary hazards. If an item is marked with an (M), the maintenance procedure must be followed. Items marked with an (M) are the only procedures that require approval for Return to Service.

B. The MEL is designed to provide coverage for individual failure in non- related systems. In the event of multiple discrepancies, even though each in itself may be permitted, coordination, communication and agreement shall be accomplished by the PIC and the Director of Maintenance. Consideration of the interrelationship of the discrepancies and good judgment must be exercised by personnel authorized to approve the aircraft for Return to Service.

C. When the indicating portion of an aircraft system or component is malfunctioning, it may be necessary to perform appropriate troubleshooting procedures to determine that the fault exists in the indicating system and not in the aircraft system or component, in order to properly apply the requirements of this section.

D. Prior to any maintenance being accomplished by any non-company personnel or organization the Director of Maintenance will determine whether that personnel or organization is suitable and qualified.

E. Before an aircraft is approved for Return to Service the procedures will be accomplished as follows:

1) Before an aircraft is approved for Return to Service under an (M) provision of the MEL an authorized person will:

a. Determine whether or not maintenance action is required in addition to that mandated in the MEL, and ensure prevention of secondary hazards.

b. Comply with the appropriate procedures in the MEL for the inoperative item.

c. Whenever complying with the recording requirements, the procedures outlined in Part 3 of this section will be adhered to.

2) Before an aircraft is approved for Return to Service under an (M) provision of the MEL from an airport where company maintenance personnel are not based and/or are not on duty and after authorizing a suitable and qualified maintenance person to accomplish the maintenance procedures the PIC will:

a. Ascertain that the authorized maintenance person is familiar with and understands the provisions and procedures of the approved MEL and this manual.

b. Ascertain that the aircraft maintenance record is completed as outlined in Part 3 of this section by the authorized maintenance person.

3. **Proper Write Ups and Sign Offs in the Aircraft Discrepancy Section of the Aircraft Flight Log (AFL) and Deferred Discrepancy Sheet (DDS)**

A. The portion of the Aircraft Flight Log (AFL) Discrepancy Section and the Deferred Discrepancy Sheet (DDS), containing the discrepancy records must be on board the aircraft during operation so the PIC may be aware of any inoperative instruments or equipment and be able to write up airworthiness discrepancies as they are discovered.

B. Each person who discovers a discrepancy that affects the airworthiness of the aircraft shall write it up in the aircraft discrepancy record as follows:

1) Description of the discrepancy.

2) Signature of person discovering discrepancy.

C. Each authorized person who maintains, performs preventative maintenance, rebuilds or alters an aircraft, aircraft engine, propeller, appliance, or component part to comply with a provision of the MEL shall make an entry in the Aircraft Flight Log (AFL) Discrepancy Section and Deferred Discrepancy Sheet (DDS) of the following information:

1) A description of work performed, which shall include the statement "Aircraft operations continued per MEL ATA # - Item #".
(Example: "Aircraft operations continued per MEL Item 23-1").

2) The date of completion of work performed.

3) The signature, certificate number, and kind of certificate held by the person approving the work. The signature constitutes the approval for Return to Service only for the work performed.

D. Each authorized person who approves an aircraft to continue operations with an MEL authorized inoperative item that does not have an (M) procedure shall make and entry into the AFL Discrepancy Section and Deferred Discrepancy Sheet (DDS), containing the following information:

1) The statement "Aircraft operations continued per MEL ATA # - Item #".
(Example: "Aircraft operations continued per MEL Item 23-1").

2) Date action taken.

3) The signature, certificate number, and kind of certificate held by the person approving the aircraft to continue operations.

E. The following persons are authorized to approve an aircraft to continue operations with inoperative items in accordance with the MEL:

1) The Pilot in Command.

2) The mechanic assigned to perform maintenance on the aircraft who has been delegated authority to approve an aircraft for Return to Service.

3) The Director of Maintenance.

4. **Corrective Action to MEL Inoperative Items**

A. The Director of Maintenance or his designee shall review the status of each item that has been approved to continue operations under the terms of the MEL, and shall schedule repair as required by the repair interval designator (A, B, C or D) as specified in the MEL. Except as provided in B below, repairs MUST be accomplished as specified by the repair interval designator.

B. The Director of Maintenance or his designee is authorized to approve an extension to the repair interval provided he accomplishes the following actions:

1) In the case that required parts are not immediately available:

a. He shall obtain a firm delivery date of the part from the supplier.

b. He shall have the supplier note the delivery date on the order invoice.

c. He shall attach a copy of the invoice to the aircraft discrepancy record page containing the entry in question.

d. Upon receipt of the subject part the Director of Maintenance shall be notified and repair scheduled.

2) In the case of other factors beyond the control of the Company:

a. A statement containing all pertinent information shall be prepared and affixed to the record of the inoperative item.

. He shall coordinate with the Director of Operations to schedule repair on the expected repair date.

Note: "Schedule Repair" means making adequate arrangements for bringing the aircraft, parts, and maintenance personnel together at a given time and place. For repairs to be performed at Company facilities, the Director of Maintenance shall coordinate with the Director of Operations and arrange to take the aircraft out of service to effect the repair. In case of the necessity to use the services of an outside maintenance facility, this also involves making a firm schedule with the facility to effect the repairs.

3) He shall notify the FAA Principal Maintenance Inspector of each time extension he authorizes within 2 working days of such extensions.

C. After repairs have been made, the person approving the aircraft for Return to Service shall enter the date, time, description of corrective action, and his signature in the "corrective action" column of the page of the aircraft discrepancy record containing the original discrepancy entry. He shall also ensure that an appropriate entry is made in the permanent aircraft maintenance record as required by FAR.

(M) Maintenance and (O) Operational Procedures

These procedures as specified in the MEL for certain items will be complied with before approving an aircraft for continued operations with an MEL authorized inoperative item.

"(M)" symbol indicates a requirement for a specific maintenance procedure which must be accomplished prior to operation with the listed item inoperative. Normally these procedures are accomplished by maintenance personnel; however, other personnel may be qualified and authorized to perform certain functions. Procedures requiring specialized knowledge or skill, or requiring the use of tools or test equipment should be accomplished by maintenance personnel. The satisfactory accomplishment of all maintenance procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as part of the operator's manual or MEL.

"(O)" symbol indicates a requirement for a specific operations procedure which must be accomplished in planning for and/or operating with the listed item inoperative. Normally these procedures are accomplished by the flight crew; however, other personnel may be qualified and authorized to perform certain functions. The satisfactory accomplishment of all procedures, regardless of who performs them, is the responsibility of the operator. Appropriate procedures are required to be published as a part of the operator's manual or MEL.

TRACKING AND RECORDING OF DEFECTS

A. The persons specified in Paragraph (B) will make the determination that a reported discrepancy meets the definition of a "defect". This will be accomplished after consultation with the person who observed, and/or reported the discrepancy, and the company flight followers. There must be no question of airworthiness involved for the reported discrepancy to meet the definition of a defect. The item may in no way be involved in the Minimum Equipment List (MEL) process. When the determination is made that the item is a defect, a Maintenance Control (MC) number will be issued. The maintenance control number will be formatted as stated above with the exception that the letters "MC" plus the initials of the person authorizing the issuance of the number added as a suffix, rather than a repair category letter.

B. Persons authorized to issue an MC number for or his designee are;
   1. Director of Maintenance
   2. Chief Inspector
   3. Maintenance Controller.

C. The Martinaire Aviation L.L.C. Director of Maintenance will provide training to the Martinaire Aviation L.L.C. FAA Certified Repair Station employees noted in Paragraph (B), in the methods and procedures which Martinaire Aviation L.L.C. considers necessary before these persons may authorize the issuance of an MC number. The minimum requirements for training will be as follows:

   1. Review of the Martinaire Aviation L.L.C. General Operations Manual (GOM) and its contents.
   2. Must possess a Mechanic Certificate with Airframe and Powerplant Ratings.
   3. Must be familiar with the make and model aircraft used by Martinaire Aviation L.L.C. in its FAR 135 operations.
   4. Must be familiar with the Martinaire Aviation L.L.C. Aircraft Flight Logbook and the procedure for its use.
   5. Must be familiar with the Martinaire Aviation L.L.C. Flight Following System and the methods used to defer discrepancies and defects.
   6. These authorized persons must be listed in the Martinaire Aviation L.L.C. Inspection Procedures Manual (IPM) Authority Roster with a code for the function as assigned by the Martinaire Aviation L.L.C. Chief Inspector.
   7. Training records will be provided and maintained by the Martinaire Aviation L.L.C. Chief Inspector which indicates the persons received training from the Martinaire Aviation L.L.C. Director of Maintenance.
   8. Must be familiar with the evaluation of all other items which may be deferred on the aircraft which could affect the MC deferred process.

D. The MC number must be issued and tracked as stated in Deferred Discrepancy Tracking and Extension Procedures, Paragraphs (A, B, E, and F), except as noted above. The corrective action must be completed within ten (10) working days unless an extension is exercised in accordance with the procedures of the MEL process as specified in Deferred Discrepancy Tracking and Extension Procedures, Paragraph (H).

MINIMUM EQUIPMENT LIST MANAGEMENT

The **Director of Maintenance** (DOM) oversees the creation, implementation, revision, and review of the MEL program. The Director of Maintenance has the authority to assign designees to oversee implementation and revision within the company, but the sole responsibility of program oversight rests with the DOM.

The **Chief Inspector** acts as the interim representative between Martinaire Aviation, L.L.C., and the Federal Aviation Administration where the MEL program is concerned. The Chief Inspector, acting as a designee of the DOM, maintains the currency of the MEL and has the ability to revise the program when necessary. The Chief Inspector oversees the methods and maintenance used for deferred discrepancies and defects and ensures that all pertinent, maintenance records are maintained.

The **Maintenance Controller** acts as a logistics officer in coordinating maintenance personnel, parts, and aircraft for repair of MEL controlled items. The Maintenance Controller is the main point-of-contact between Martinaire Dispatch and/or the Pilot-in-Command of Martinaire aircraft concerning MEL maintenance items. He has the ability and authority to issue Maintenance Control Numbers (if required) for MEL deferrable items. The Maintenance Controller keeps track of maintenance timelines and limits for maintenance on deferred items.

Martinaire Dispatch is the central, communication hub between pilots of Martinaire and Martinaire Maintenance. They are able to contact maintenance at-all-hours concerning an MEL affected aircraft. Dispatch also has the authority to issue Maintenance Control Numbers and to contact maintenance on their issuance.

The **Pilot-In-Command** is directly responsible for and is the final authority as to the operation of his/her aircraft. It is the PIC's responsibility to assure that inoperative equipment is allowed for in the MEL. If inoperative equipment is not allowed for in the MEL, it is the PIC's responsibility to contact Martinaire Maintenance and/or Martinaire Dispatch immediately.

SECTION J - FUELING PROCEDURES
[135.23(j)]

All refueling will be made from aviation fuel sources using adequate filtering. There will be no "hot" refueling i.e., refueling an aircraft with any engine running.

The Pilot-in-Command (PIC) will:

1. Determine the amount and type of fuel that will be required for the scheduled flight and place the order for it. The octane rating of the fuel dispensed will be the minimum octane required by the engine and airframe manufacturer; or, if that is not available, the next higher octane rating.

   Cessna 208B: Jet A, A-1, B, JP-1, 4, 5, 8

2. The PIC will then fill out a Martinaire Fuel Requisition Form with the amount and type of fuel filled in the appropriate blanks and then turn this into the fuel supplier. The PIC will give the top "white" copy to the fueler and retain the blue copy in his records.

3. Ensure refueling is not attempted in the vicinity of a thunderstorm.

4. Ensure that refueling does not take place inside a hangar.

5. Disembark all passengers and ensure they will not approach within 50 feet of the aircraft until refueling has been completed.

6. Verify that all aircraft electrical switches are placed in the off position prior to fueling and remain so for the duration of the fueling procedure, unless otherwise required for the refueling operation.

7. Verify that an adequate and operable fire extinguisher is available in the immediate vicinity.

8. Ensure that no person smokes, and that there is no lighted flame or spark within 50 feet of the aircraft.

9. After the refueling operation is completed, and prior to flight:

   A. Take fuel samples from the tank and sump drains and verify these fuel samples are free from moisture and other contamination.

   B. Verify the fuel and oil caps and associated access doors are secured.

EMERGENCY PROCEDURES

If the aircraft, fuel truck or inadvertently spilled fuel catch fire, the PIC will immediately NOTIFY THE FIRE DEPARTMENT AT ONCE!! DO NO DELAY CALLING FOR ANY REASON!! DO NOT TRY TO FIGHT THE FIRE YOURSELF!! When the situation permits, notify Martinaire Dispatch at 866-557-1861.

It is the responsibility of all personnel to protect all company equipment and property, and others who might be endangered by the fire to the extent that personal safety if not jeopardized.

LIGHTNING STORMS

Aircraft refueling WILL CEASE during any lightning activity.

VAPOR TRAVEL

There is a basic rule that aircraft should not be fueled or defueled inside hangars. From this rule there has grown a generally accepted impression that if fuel servicing is accomplished out of doors, all explosive gases and vapors will be either automatically carried away, or be so diluted or leaned by the air that they will not burn. THIS IS NOT TRUE!

The concentration of fuel vapor in the area surrounding the aircraft varies with the wind velocity and the rate of fueling. These vapors are heavier than air and they tend to settle and spread. It should be remembered that when fuel is pumped into the aircraft tanks it displaces an equal volume of vapor which is discharged into the atmosphere. Most importantly, concentrations are dangerously increased with fuel spills. SPILLS ARE THE GREATEST HAZARD!

ALWAYS

Fuel only in the open air.

Wait until all the engines are fully stopped.

Make sure of the grade and quantity of fuel required.

Make grounding and bonding connections before opening any fuel tanks.

Stop fueling if ANY hazard becomes apparent.

Place ground power units upwind.

Report accidents, spills, and mistakes immediately to Martinaire Dispatch.

SECTION K - PASSENGER BRIEFING
[135.23(k)]

Passenger Briefing: The Pilot-in-Command (PIC) shall conduct the briefing prior to engine start up and taxi, using the company devised briefing checklist. A copy of the FAA Approved passenger briefing card for the make and model of aircraft operated shall be available for each passenger. The following items shall be briefed:

1. Smoking.
2. Use of seat belts.
3. Placement of seat backs in an upright position before takeoff and landing.
4. Location and means for opening the passenger entry door and emergency exits.
5. Location of survival equipment.
6. Ditching procedures and use of required flotation equipment, if the flight involves extended over water operation.
7. Normal and emergency use of oxygen, if flight is above 12,000 feet MSL.
8. Location and operation of fire extinguishers.

Non-essential (those allowed by FARs for accompanying freight, etc.) passenger carrying is only allowed in KFC-250 three axis auto pilot equipped aircraft.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION L - FLIGHT LOCATING PROCEDURES
[135.23(l)]

Martinaire has established the following procedures to be followed in the event an FAA flight plan cannot be filed for a particular flight:

1. The Pilot-in-Command (PIC) will telephone the Martinaire corporate offices (collect, if long distance) and relay the flight plan information as if it were being filed with the FAA along with the time when the PIC will again telephone the corporate offices after completion of the flight.

2. The employee taking the call will record the information on the CALM Dispatch Program, together with the calculated search commence time (one hour after the contact time given by the PIC, or the time calculated for fuel exhaustion, whichever is sooner).

3. The Dispatcher on Duty will check the flight locating board beginning one-half hour before the flight due time and every 30 minutes thereafter to learn if the pilot has closed his company flight plan.

4. If a flight goes beyond the search commence time without reestablishing contact, the Director of Operations will immediately contact the nearest Flight Service Station, give them particulars of the flight, request a search be commenced, and ask them to notify the NTSB.

Flights may be conducted under VFR Flight Rules provided that the Pilot in Command is able to establish VFR Flight Following with the appropriate ATC facility along his planned route of flight. THIS IS MANDATORY.

Whether IFR or VFR, 135 or 91, all Martinaire flights will use ATC Flight Following and Traffic Advisory Services. If the controller states that workload does not permit this service THEN you must request an IFR clearance.

ALL flights and their route must be relayed to Martinaire Dispatch including ferry and maintenance flights.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION M - EMERGENCY PROCEDURES
[135.23(m)]

Whenever the Pilot-in-Command (PIC) is the sole company employee on board the flight, the PIC is assigned all emergency evacuation duties.

Whenever a Second-in-Command (SIC) is assigned to the flight, the emergency evacuation duties are assigned as follows:

Pilot-in-Command

1. Opening of the main cabin door, if possible.
2. Assisting passengers to disembark.
3. Leading passengers to safety.
4. Notifying proper authorities and requesting aid.

Second-in-Command

1. Opening of the emergency exit, if possible.
2. Ensuring all viable passengers have disembarked.
3. Accounting for all passengers.
4. Administering First Aid.

If either pilot is incapacitated, the other pilot will assume all emergency duties.

Individual aircraft "Emergency Procedures" are adopted in this manual but are not specifically included here because each aircraft has an AFM in which complete emergency procedures are published for each particular company aircraft. It is the responsibility of the Pilot in Command to see that the aircraft he is flying has a complete AFM.

In the event of an emergency the Pilot in Command may deviate from any rule to the extent necessary to meet the emergency. Any operational deviation or emergency action taken by pilots will be reported in writing to the Chief Pilot and Director of Operations within 24 hours. If requested by the Administrator, the Director of Operations will transmit a copy to the Administrator's Representative within the prescribed time limit of ten days after the occurrence with a copy to the SW-19 North Texas Flight Standards District Office or the FSDO responsible for the location involved in the incident.

In the event of an inflight emergency regarding the operation of the aircraft, its systems, or powerplants, the Pilot in Command will perform the emergency procedures memory items as published in the emergency checklist and/or AFM. Completion of the emergency flight procedure may be accomplished by using the emergency checklist as a reference to ensure all items have been performed. In an emergency or accident the Pilot in Command will brief and/or assist the passenger, if any, in the appropriate procedures if the situation and time allow.

STORM/SEVERE WEATHER WARNING

It is the responsibility of ALL Martinaire personnel to see that all aircraft operated by Martinaire are either hangered or tied down using the appropriate mooring straps whenever a storm warning has been received or whenever adverse weather conditions are noticed. Any pilot that allows the aircraft he is assigned to fly to remain unsecured, if outside a hangar, is subject to dismissal from the company. All aircraft if outside and unattended must be tied down using all three mooring straps available in POD A mooring kit. If not tie downs or hangar are available contact Company Dispatch for further instructions.

FIRE

Upon the first recognition of a fire (aircraft, hangar, building, etc.) by an employee, it is his responsibility to first inform all other employees, customers, or any other person that might be endangered by the fire and to see to their safety. It is then his responsibility to see that the FIRE DEPARTMENT IS CALLED IMMEDIATELY!

It is the responsibility of all personnel to protect company equipment and property, and others who might be endangered by the fire TO THE EXTENT THAT PERSONAL SAFETY IS NOT JEOPRADIZED.

BOMB THREAT PROCEDURES

If a bomb threat is received while in flight, the Pilot in Command will land at the nearest suitable airport. After landing the aircraft will be shut down, away from all aircraft, buildings, and personnel or at a place as directed by ATC ground control if applicable. All occupants will leave the area as quickly as possible. The Pilot in Command is responsible for the safety of all personnel on the aircraft and for the notification of the Fire Department and Martinaire Dispatch.

DITCHING PROCEDURES

Should conditions exist that would make it necessary to ditch, make every effort to ditch near a surface vessel. A low pass over the vessel if practical will raise the vessel's attention. Time permitting, an FAA facility should be able to obtain the position of the nearest commercial or Coast Guard vessel.

A successful aircraft ditching is dependent on three primary factors. In order of importance they are:

1. Sea conditions and wind direction.
2. Type of aircraft.
3. Skill and technique of pilot.

The Pilot in Command will, at a minimum, perform the following actions before, during, and after and emergency water landing.

1. Radio – TRANSMIT MAYDAY on 121.5 MHz, giving location and intentions and SQUAWK 7700 on transponder.
2. Heavy objects in cabin – SECURE
3. Seats, seat belts, shoulder harnesses – SECURE
4. Wing Flaps – as required
5. Power – as required
6. Approach – INTO THE WIND
7. Face – CUSHION at touchdown with folded coat or similar object.
8. Touchdown – NO FLARE – maintain descent attitude
9. Airplane – EVACUATE
10. Life Vests and Raft (if equipped) – INFLATE outside of aircraft!

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION N - EN ROUTE QUALIFICATION PROCEDURES
[135.23(n)]

Pilot-in-command: Line checks: Routes and airports
[135.299(c)]

Any pilot who has not flown over a route and into an airport within the preceding 90 days, will, before beginning a flight over that route and/or into that airport:

1. Study the route on low altitude VFR or IFR charts as appropriate, noting MEA's, MOCA's, routing, ATC frequency allocations, changes to NAVAIDS, and any other pertinent information.

2. Study the current Airport Facility Directory, noting runway lengths and orientations, available instrument approaches, weather observation capability, tower hours of operation, and any other pertinent information. Martinaire Dispatch has current AFD and other publications available to the pilot if they are not available at the stations. If requested by the pilot, Martinaire Dispatch will aid the pilot in review of these documents, time permitting.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION O - APPROVED AIRCRAFT INSPECTION PROGRAM
[135.23(o)]

Martinaire is authorized to use those aircraft as listed in paragraph D 073 of the company FAA approved Operations Specifications in accordance with Martinaire's Approved Aircraft Inspection Program. The complete copy of the Martinaire FAA Operations Specifications are on file at the corporate office in Addison, Texas.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION P - HAZARDOUS MATERIALS PROCEDURES

GENERAL

A. The following terms are considered synonymous: *dangerous goods, hazardous materials, restricted articles, hazardous substances, HAZMAT and dangerous materials.*

B. No employee or crew of Martinaire will perform any assigned duties or responsibilities involving the acceptance, handling, storage, and/or transportation of Dangerous Goods/Hazardous Materials (DG/HM) cargo and DG/HM COMAT unless the individual has satisfactorily completed the approved company initial or recurrent hazardous material recognition training program within the preceding 12 calendar months.

SHIPPING PAPERS FOR HAZARDOUS MATERIALS ABOARD AIRCRAFT & INFORMATION TO THE PILOT-IN-COMMAND 49 CFR 175.33 - NOPC AVAILABILITY

Martinaire crewmembers are required by Federal Regulation to notify Martinaire Dispatch of the contents of any HAZMAT being carried aboard Martinaire aircraft. This will be accomplished by calling in each HAZMAT listed on the Notification of Pilot in Command (NOPC) and communicating to Martinaire Dispatch via telephone, the following information:

- **DATE**
- **FLIGHT NUMBER**
- **AIRCRAFT TAIL NUMBER**
- **PILOT IN COMMAND EMPLOYEE NUMBER**
- **UPS TRACKING NUMBER**
- **SPECIAL PERMIT NUMBER (if accompanying HAZMAT shipment)**
- **EMERGENCY CONTACT NUMBER (not required for dry ice)**
- **UN ID#**
- **HAZARD CLASS**
- **PACKING GROUP (if applicable)**
- **QUANTITY/WEIGHT**
- **LOCATION ON BOARD THE AIRCRAFT**
- **PASSENGER AIRCRAFT or CARGO AIRCRAFT ONLY**

This must be accomplished for each and every HAZMAT shipment submitted to the Pilot in Command and Martinaire Dispatch must confirm receipt of the information prior to flight departure.

Martinaire Dispatch will record the NOPC information and have this information readily available and accessible for an authorized official of a Federal, State, or local government agency (which includes emergency responders) at reasonable times and locations for the

duration of the flight that HAZMAT is being transported.

A placard containing the telephone number for Martinaire Dispatch will be located on the inside of the pilot door, co-pilot door, and on the lower door section of the cargo door. In the event of an emergency involving hazardous material being transported by Martinaire aircraft and/or when requested by ATC or other appropriate governmental agency, the Pilot in Command will be required to give the requesting agency, the telephone number for Martinaire Dispatch.

The NOPC information shall be retained by Martinaire Dispatch for 90 days after the date of HAZMAT transport at Martinaire's place of business in a dedicated binder located in the Martinaire Dispatch office.

SIMPLY:

The customer (UPS), presents a HAZMAT to the Pilot-in-Command (PIC). The PIC records the pertinent HAZMAT information on the NOPC form and calls Martinaire Dispatch and presents the same NOPC information from the shipping papers to the Dispatcher. The Dispatcher accurately records the information and retains it in a binder in the Dispatch Office.

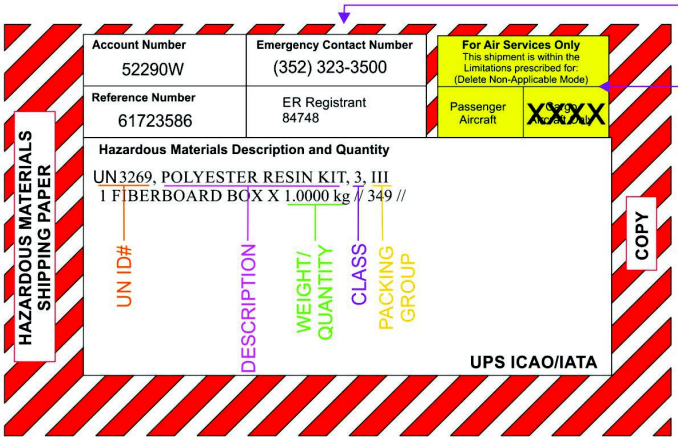
An example of the proper way of filling out the NOPC form follows. (**See pages P3-P4)**

A copy of the existing Martinaire NOPC form is available in Section U.

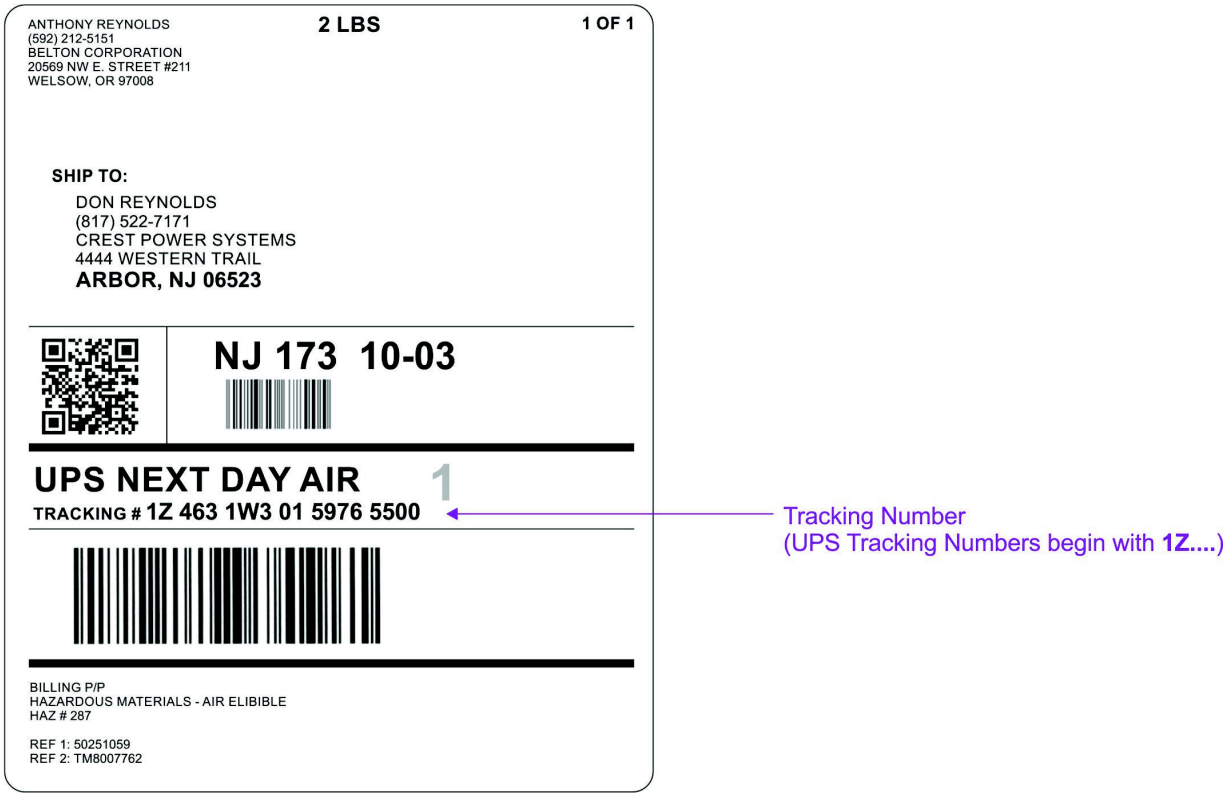
NOPC EXAMPLE

Martinaire Form MRA-HAZ02, otherwise known as the ***Dangerous Goods/HAZMAT Notification of Pilot in Command*** form, shall utilize the following example on the proper way of 'filling out' the NOPC form. This form exercise appears on page P-4.

HAZMAT STICKER EXAMPLE



SHIPPING LABEL EXAMPLE



The Martinaire form MRA-HAZ02, utilizes the example data supplied on page P-3.

Dangerous Goods / HAZMAT Notification of Pilot in Command **NOPC**

Martinaire	Date	Flight No.	Dest. Apt.	A/C Tail #	PIC EMPL #
	mm/dd/yyyy	MRA 123	XYZ	N1234Z	7777

Proper Shipping Name (*do not abbreviate*):
POLYESTER RESIN KIT

UN ID#: 3269

Hazard Class: 3 **Subsidiary Risk:**
(e.g. Oxygen is a 2.2 & 5.1. (5.1 is subsidiary))

Packing Group: III
(I, II, or III if applicable)

Quantity / Weight: 1.0000
(enter quantity)

qt. liters gallons g oz lbs **(kg)**
(check applicable unit)

Emergency Contact # From Shipping Papers:
[***not required for dry ice or consumer commodity shipments. 49 CFR 172.604 (d)(2)***]

352-323-3500

☑ Passenger Aircraft ☐ Cargo Aircraft
(check / mark applicable box)

Location On-Board Aircraft

CARGO ZONE						CARGO POD				
1	2	3	4	(5)	6	■	A	B	C	D

(mark applicable location)

SP / CA Required:
☐ YES ☑ NO
(check applicable box)

Special Permit #:

UPS Tracking #:
1Z 463 1W3 01 5976 5500

Date:

Proper Shipping Name (*do not abbreviate*):

UN ID#:

Hazard Class: **Subsidiary Risk:**
(e.g. Oxygen is a 2.2 & 5.1. (5.1 is subsidiary))

Packing Group:
(I, II, or III if applicable)

Quantity / Weight:
(enter quantity)

qt. liters gallons g oz lbs kg
(check applicable unit)

Emergency Contact # From Shipping Papers:
[***not required for dry ice or consumer commodity shipments. 49 CFR 172.604 (d)(2)***]

☐ Passenger Aircraft ☐ Cargo Aircraft
(check / mark applicable box)

Location On-Board Aircraft

CARGO ZONE						CARGO POD				
1	2	3	4	5	6	■	A	B	C	D

(mark applicable location)

SP / CA Required:
☐ YES ☐ NO
(check applicable box)

Special Permit #:

UPS Tracking #:

Printed Name:

RAM TI & LOCATION (if applicable):
(no more than 50 TI allowed on MRA aircraft)

For information regarding this form, contact Martinaire Flight Operations at 972-349-5700.

Damaged or Leaking Packages are not Permitted on Martinaire Aircraft.

NOPC page 1 of 1
(enter number of NOPC forms used. 5 DG/HM packages require 3 NOPC forms)

Total # of DG/HM packages on board: 1
(if you have 5 DG/HM packages, enter '5' on each page)

Captain's or Dispatchers printed name:
Alphonso E. Corbin

Auditor's Signature:

Martinaire Form MRA-HAZ02 Rev6. 08-28-20

MARTINAIRE AVIATION LLC

WILL-CARRY

HAZARDOUS MATERIALS

OPERATIONS MANUAL and

TRAINING PROGRAM

SEPTEMBER 16, 2020

Martinaire Aviation LLC : 4553 Glenn Curtiss Drive, Addison, TX 75001

Record of Changes

WILL-CARRY HAZARDOUS MATERIALS
OPERATIONS MANUAL & TRAINING PROGRAM

Change Number to Original	Date	Description
Original	03/03/2003	Hazardous Materials Recognition Procedures
10	08/01/2005	FAA Hazmat Manual; Hazmat Incident Reporting Form
13	10/02/2006	DG-HM Cover Page
14	10/18/2006	Signature Page
17	03/17/2008	All pages (except DOT Chart 12)
20	07/01/2009	Pages P1 and P2
22	04/15/2010	Hazmat pg. B2/C1; DOT Chart 13
24	06/01/2011	DG-HM All pages after P2
26	01/09/2012	All pages
31	02/16/2016	Martinaire Aviation LLC 'Will-Carry Hazardous Materials Operations Manual and Training Program Update
36	09/16/2020	All pages

WILL-CARRY HAZARDOUS MATERIALS OPERATIONS MANUAL & TRAINING PROGRAM

MARTINAIRE AVIATION, L.L.C.
(Certificate Holder Name)

MT9A828W
(Certificate Number)

4553 Glenn Curtiss Drive

Addison	**Texas**	**75001-3244**
(City)	(State)	(Zip Code)

(Signature Block)
Corporate Officer

AUG 28 2020
Date

(Signature Block)
Responsible HAZMAT Officer

AUG 28 2020
Date

Statement of Intent:

This Hazardous Materials (HM) Operations Manual and Training Program shall be followed by all employees, agents, and contract employees of the above named certificate holder. This manual/program will be continually reviewed to ensure compliance with 14 CFR and 49 CFR.

Will Transport Commercial Hazardous Materials? ☒ YES ☐ NO

Will Transport Own HM Company Material (COMAT)? ☒ YES ☐ NO

Manual Acceptance and Training Program
Approval Recommendation Hazardous
FAA Hazardous Materials Safety Program

Date

Manual Accepted & Training
Program Approved
FSDO Principal Operations Inspector

Date

HAZARDOUS MATERIALS OPERATIONS MANUAL AND TRAINING PROGRAM

Table of Contents

PART TWO: HAZARDOUS MATERIALS TRAINING PROGRAM

APPENDICES

WILL-CARRY HAZARDOUS MATERIALS
OPERATIONS MANUAL & TRAINING PROGRAM

CORPORATE OVERVIEW

Martinaire Aviation, L.L.C., is a 14 CFR Part 135, non-scheduled, on-demand, air cargo unit that operates throughout the contiguous United States. As part of Martinaire's Operations Specifications (OpSpec), Martinaire Aviation has the authorization to transport dangerous goods and/or COMAT containing dangerous goods aboard its aircraft.

[*See OpSpec A055 'Accept, handle, and carry materials regulated as Hazardous Materials (Hazmat)', in Section C of the Martinaire Aviation LLC General Operations Manual*]

In accordance with 49 CFR, Martinaire Aviation, L.L.C., accepts all classes of Hazardous Materials and Dangerous Goods for air transport with noted exceptions. **[*See Figure 1*]**. HM/DG classes and class divisions not accepted are noted on the figure.

In addition and in reference to 49 CFR 175, Martinaire Aviation is restricted to carrying more than 25kg (55 lbs) net weight of hazardous material...and no more than 75 kg (165 lbs) net weight of Division 2.2 (non-flammable compressed gas), in an inaccessible cargo compartment. No limitation applies to the number of packages of Class 9 materials.

Martinaire Aviation, L.L.C., being a supplemental carrier for United Parcel Service (UPS), is also capable of carrying HM/DG as indicated by Special Permit DOT-SP 11110, granted to UPS. **[*See Appendix G of this section*]**

Hazard Classes Permitted/Restricted in Air Dangerous Good (ADG) Service
Domestic U.S. Small Package ADG Service

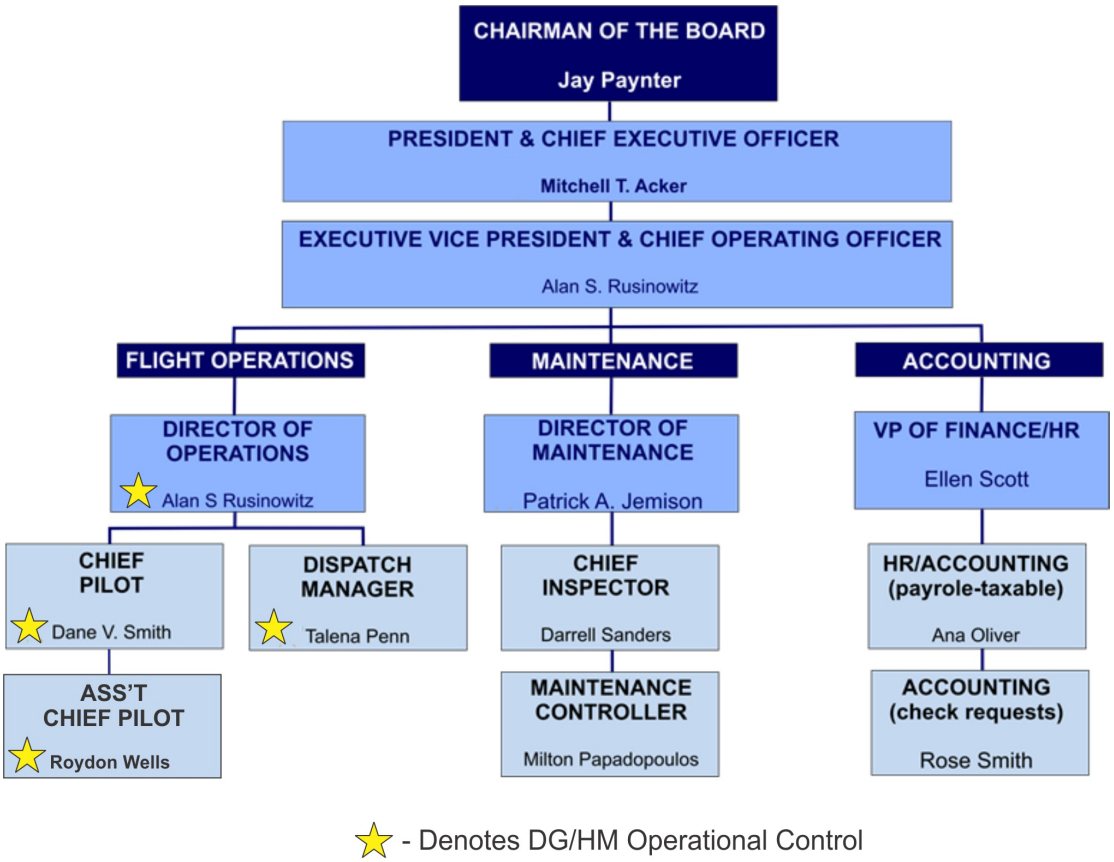
CLASS	ACCEPTED	NOT ACCEPTED
1	DIVISION 1.4 (Explosives) C, D, E, S	DIVISION 1.1, 1.2, 1.3, 1.4 (except C, D, E, S), 1.5, 1.6
2	DIVISION 2.1 (flammable gas) 2.2 (non-flammable gas)	DIVISION 2.3 (Toxic Gas)
3	FLAMMABLE LIQUIDS	
4	DIVISION 4.1 (Flammable Solid) DIVISION 4.3 (Dangerous When Wet)	DIVISION 4.2 (Spontaneously Combustible)
5	DIVISION 5.1 (Oxidizers)	DIVISION 5.2 (Organic Peroxides)
6	DIVISION 6.1 (Toxic Materials)[1] 6.2 (Infectious Substance Category A)(UN3373 Biological Substance, Category B)	
7	RADIOACTIVE[2] Category I (White) provided they are being shipped for medical, research, or diagnostic purposes.	Category II (Yellow) Category III (Yellow)
8	CORROSIVES	
9	MISCELLANEOUS	
		Hazardous Waste
		Salvage Containers

1.Materials in division 4.3 and 6.1 Packing Groups I and II are required to be in packaging excepted from the labeling (except Cargo Aircraft Only label), placarding, and segregation requirements of Subchapter C of 49 CFR.

2. Including Radioactive Excepted Material Packages.

Figure 1

The following flow chart indicates the corporate structure of Martinaire Aviation, L.L.C., with corporate officers in charge of HM/DG oversight indicated by a ‘star’.



Director of Operations

The Director of Operations (DO), is responsible for the overall performance, safety, and reliability of the Hazardous Materials program. The DO delegates oversight, management, training and update/revision authority of the Hazardous Materials program to the Chief Pilot and Assistant Chief Pilot. The DO directs the execution of operational policies and is responsible for operational, administrative, and financial functions within the flight department of the company.

Chief Pilot

The Chief Pilot is charged with maintaining the Hazardous Materials Program, HM/DG Training Program and pilot training regimen, the General Operations Manual updates and revisions, and any and all policy, regulation, and safety updates and revisions as they pertain to the transport of Hazardous Materials and Dangerous Goods.

The Chief Pilot oversees field implementation of HM/DG protocols with company pilots throughout the Martinaire network including acceptance, handling, processing and rejection of hazardous materials.

The Chief Pilot monitors regulatory changes, FAA notices, safety alerts and Advisory Circulars (AC's) on the FAA.gov website as they pertain to the carriage of dangerous goods and makes regulatory changes and/or revisions to the General Operations Manual and HM/DG program as necessary.

In the event of an incident involving HM/DG on Martinaire aircraft, the Chief Pilot shall act as liason between the Pilot-in-Command, the North Texas Flight Standards District Office SW19, the Pipeline and Hazardous Materials Safety Administration (PHMSA), and any and all safety agencies participating in the incident. The Chief Pilot will be responsible for the generation and distribution of the Hazardous Materials Incident Report to the various agencies. **[*See Appendix D of this Section*].**

A copy of the Hazardous Materials Incident Report is retained in the Martinaire General Operations Manual and on the company website at www.martinaire.com.

Assistant Chief Pilot

The Assistant Chief Pilot shall assume all duties and functions of the Chief Pilot as related to the HM/DG program and training should the Chief Pilot be unavailable.

Dispatch Manager/Dispatch

The Dispatch Manager and Dispatch, in general, shall serve as the 'nerve center' for operational control of Martinaire aircraft, their pilots and crews. They also act as liaison between United Parcel Service and Martinaire Aviation. In the event of an incident involving hazardous materials, Dispatch possesses all contact information for emergency responders, the FAA, PHMSA, UPS, and Martinaire corporate officers. All required officers and responders shall be notified at the earliest moment and respond to the incident at hand.

Primary contact numbers utilized by Martinaire Aviation, L.L.C., appear below:

UPS Hazardous Material Hotline	800-554-9964
FSDO SW19	214-277-8500
National Response Center	800-424-8802
U.S. Dept. Of Transportation	202-366-4433

GENERAL

Not withstanding the contents of this manual, Martinaire Aviation is responsible for compliance with all provisions of the Hazardous Material Regulations (HMR), Title 49, Code of Federal Regulations (49 CFR) and the Federal Aviation Regulations, Title 14 CFR.

A current copy of this manual shall be made available to ground and maintenance personnel and crewmembers when performing any Hazardous Materials (HM) duties (14 CFR 135.21). A current copy of the HM regulations found in 49 CFR Parts 107-185 (or a current copy of the International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air or the International Air Transport Association(IATA) Dangerous Goods Regulations shall be available at each station.

This Hazardous Materials Operations and Training Program shall be followed by each crewmember and person performing or directly supervising any of the following job functions involving any item for transport on Martinaire aircraft: acceptance, rejection, handling, storage incidental to transport, packaging of company material, or loading. No employee, agent, or contract employee may prepare HM for shipment, including Company Material (COMAT), unless trained in this function.

The terms ‘Dangerous Goods’ and ‘Hazardous Materials’ are synonymous and may be used interchangeably. Dangerous Goods and hazardous materials are sometimes referred to as regulated materials, restricted articles, and dangerous materials. Definitions of common terms applicable to HM are found in 49 CFR 171.8, Definitions and Abbreviations.

Martinaire Aviation shall not use or allow any crewmember or person to perform or directly supervise any job function in the Training Reference Table of Part Two of this section, unless that person has satisfactorily completed our FAA-approved initial or recurrent hazardous materials program within the past 24 months. Exceptions for new hires; persons performing a new job function, and persons who work for more than one certificate holder are specified in 14 CFR 135.505(b) and ©.

Each repair station performing work for or on Martinaire’s behalf, shall be notified in writing of our policies pertaining to hazardous materials (14 CFR 135.505(e)). This notification requirement only applies to repair stations that are regulated by 49 CFR Parts 171-180. **[*See Appendix E of this Section*]**

It shall be the responsibility of the Chief Pilot; and the Assistant Chief Pilot in the Chief Pilot’s absence; to maintain currency of this manual, revise and distribute revision changes in a timely manner to all affected, Martinaire employees. Revisions to the HM program shall be identified through review of an annual ‘Summary of Changes for 49 CFR HAZMAT’ published by IATA; ‘Special Orders’ directed specifically to Martinaire from the FAA; and any emergency orders, safety alerts, and procedural changes regarding the transport of HM/DG appearing via the FAA.gov website.

Any tentative revision of this section shall be submitted to Martinaire's Principal Operations Inspector for review and approval. Each revision will have a revision number, date, and page numbers being revised. It will be the responsibility of the Chief Pilot and/or Assistant Chief Pilot to maintain manual currency and record any revisions on the Log of Revisions and designate 'Effective Pages' presented in the front of Martinaire Aviation's, General Operations Manual. All program revisions will have to meet FAA approval and acceptance prior to being implemented.

Once a revision has been approved by the FAA, the documents shall be sent to all employees and crewmembers of Martinaire along with a Revision Notice containing instructions on what pages to remove, void, and/or insert into the General Operation Manuals in their respective possession. **[*See Forms, Section U, page U-2 of the Martinaire General Operations Manual*].**

PART ONE

HAZARDOUS MATERIALS OPERATIONS MANUAL

I. ACCEPTANCE PROCEDURES

Martinaire Aviation, L.L.C., is a supplemental carrier for United Parcel Service (UPS) and is responsible for air cargo carriage only. Martinaire Aviation does not participate in or provide passenger services. UPS offering Hazardous Materials (HM) for air transportation aboard Martinaire aircraft, are responsible for properly identifying, describing, classifying, packaging, marking, and labeling the materials as required by 49 CFR or ICAO. Through their FAA approved, UPSCO Hazardous Materials Program, UPS is also responsible for properly completing the communications and packaging requirements prior to offering the shipment for transport aboard Martinaire aircraft.

Employees, agents, and contract employees of Martinaire may rely on the certification and information provided by UPS to determine if the HM shipment is authorized for air transport. Said employees responsible for the acceptance of cargo shall be provided a 'trigger' list of indicators of undeclared HM to assist them in their review.
[*See Appendix A of this Section*]

UPS will offer domestic shipments to Martinaire Aviation throughout their U.S. Air Transport Network at all stations where Martinaire has been contracted to serve. The shipments may be offered in compliance with 49 CFR or ICAO requirements. UPS chooses which regulations apply in their entirety. Shipments following ICAO must also comply with 49 CFR 171.22.

If the shipment is offered in accordance with ICAO, Martinaire employees, agents, or contract employees must ensure that UPS has complied with all applicable U.S. variations to the ICAO Dangerous Goods Table.

A checklist, **[*See Appendix F, Acceptance Checklist, of this Section*]**, will be used and will include all reasonable steps to ensure:

- any package containing HM which is damaged, leaking, or out-gassing shall be refused without further processing;
- the material is properly described on the shipping papers;
- the required certification is on the shipping papers;
- the authorized package is marked and labeled as required;
- the shipment is authorized to be transported by aircraft in the condition offered; and
- emergency response information accompanies the shipment.

A. Shipping Documents & Certification

1. **If Offered Under Title 49 CFR:** The proper shipping name for each HM is found in 49 CFR 172.101, 'Reference - UN & NA Lookup Table' The basic description must include the UN identification number(Column 4); the proper shipping name (supplemented with the technical name(s), if required (Column 2); the hazard class or division (Column 3), along with any subsidiary hazard class or division (Column 6); and the packing group in roman numerals (Column 5).

   Example: **UN2744, Cyclobutyl Chloroformate, 6.1, (8, 3), PG II.** (See 49 CFR 172.202 (a)(6)(b)

   Listed next is the total quantity of the material by weight or volume and type of packaging. The emergency response telephone number and additional entry requirements follow the basic description and quantity, when required. The shipper's certification number must appear on the shipping document and be signed by a representative of the shipper.

2. **If Offered Under ICAO: The basic dangerous goods description is the same as 49 CFR.**

   Example: **UN1717, Acetyl Chloride, 3 (8), II** or **UN1717, Acetyl Chloride, Class 3 (Class 8), PG II.** Refer to ICAO 5:4.1.4.2

   In addition to the basic, dangerous goods description, the following information must be included on the dangerous goods document: the net quantity of HM in each package covered by the description of each item of HM bearing a different shipping name; the UN number or packing group; the number and type of packaging and any packing instructions. The emergency response telephone number and additional entry requirements follow the basic description and quantity.

3. **If Offered Under 49 CFR or ICAO:** Two (2) copies of the shipping papers must be provided with the shipment. One copy must accompany each shipment and one copy must be retained for one (1) year after the shipment is accepted. Shipping papers must be made available to an authorized official upon request. For a hazardous waste, each shipping paper copy must be retained for three (3) years after the material is accepted. Each shipping paper must include the date of acceptance.

B. <u>Marking</u>

The proper shipping name and identification number appearing on the shipping paper shall also be marked on the outside of the package, outside container, or overpack. The name

and address of either the consignee or consignor must also be marked on each package. Packages containing liquid hazardous materials must be legibly marked/labeled on two opposite vertical sides of the package with the orientation arrows pointing in the correct upright direction, unless otherwise excepted. Any additional marking requirements specified in 49 CFR required for the package or material being shipped must be met (e.g., specification package marking, overpack marking, limited quantity, etc.). (See 49 CFR Part 172, Subpart D)

C. Labeling

Prior to offering HM for shipment, the package must be properly labeled. Labels are a printed hazard warning. Labels will identify primary and subsidiary hazards specific to the material. They also identify handling instructions.

The labeling requirements are found in 49 CFR Part 172, Subpart E. Acceptance personnel shall verify that the outside of the package is labeled with the appropriate label(s) from Column 6 of the Hazardous Materials Table (HMT). Additional handling labels may be required. The "Cargo Aircraft Only" label will be affixed to packages containing a quantity of HM that may be shipped only on cargo aircraft or are forbidden for transport on passenger aircraft but are permitted for transport on cargo only aircraft per Columns 9A and 9B of the HMT in Part 172.

The hazard classes are:

Class 1- Explosives (See 49 CFR 173 .50)
Class 2- Flammable Gas (See 49 CFR 173.115)
Class 3- Flammable Liquids (See 49 CFR 173.120)
Class 4- Flammable Solids (See 49 CFR 173.124)
Class 5- Oxidizers and Organic Peroxides (See 49 CFR 173.127 and 173.128)
Class 6-Toxic and lnfectious Substances (See 49 CFR 173.132 and 173.134)
Class 7- Radioactive Materials (See 49 CFR 173.403)
Class 8- Corrosive Materials (See 49 CFR 173.136)
Class 9- Miscellaneous (See 49 CFR 173 .140)

Markings and labels identifying handling instructions are:

"Cargo Aircraft Only" label (49 CFR 172.402)

"Magnetized Material" label (ICAO Dangerous Goods List for magnetized materials. Also see 49 CFR 173.2l(d))

Unless excepted, orientation markings/labels are required on packages containing liquids (See 49 CFR 172.312).

These markings and labels are depicted on the Hazardous Materials Marking, Labeling &

Placarding Guide. **[*See Appendix B of this Section*]**

D. Placards

Not Applicable. Martinaire Aviation, L.L.C., does not accept and/or make use of Unit Loading Devices (ULD's) or freight containers aboard its aircraft.

E. Rejection of Non-Compliant Hazardous Materials

Non-compliant HM shipments shall be rejected; segregated from all other cargo shipments to prevent accidental introduction into the transportation system; and returned to UPS at the acceptance station upon discovery during the loading operation.

Non-compliant HM shipments shall be identified by the following and returned to UPS without further processing:

- Any HM package damaged, leaking, or out-gassing.
- Any HM package being transported in a prior HM packaging vehicle that displays any remnants of labeling, marking, placarding or printing of a previous hazardous material shipment.
- Any HM package not documented, certified, marked and labeled in accordance with 49 CFR or ICAO.
- Any HM package with conflicting information, documentation, certifications, markings and labels.

Since Martinaire Aviation, L.L.C., is a supplemental carrier for UPS and UPS guarantees that any HM provided to Martinaire for carriage meets all DG/HM requirements under their program, any HM package deemed non-compliant shall be rejected and returned to UPS upon discovery.

All HM packages, both compliant and non-compliant, are separated and kept isolated from all other cargo during loading at the acceptance station for the purpose of processing and inspecting the HM package; preparing the Notice to Pilot-In-Command; and transmitting the HM information to Martinaire Dispatch via telephone as outlined in this manual.

Upon discovery, a non-compliant, HM package shall be returned to the acting, UPS Ramp Manager or UPS Loading Supervisor for disposition, correction, or return to the Shipper of Origin. No records of rejected DG/HM shipments are maintained by Martinaire.

II. COMPANY MATERIALS (COMAT)

COMAT is an industry term developed and used by certificate holders indicating COmpany MATerials and is generally used to describe a wide array of company materials including replacement items for installed equipment and consumable materials.
[*See Appendix C - Hazardous Materials Aboard Aircraft, of this Section*]

A. Shipping / Transporting of COMAT

Martinaire Aviation, L.L.C., does not ship hazardous materials COMAT aboard its aircraft apart from the exceptions noted.

If a contractor (e.g., aircraft maintenance vendor) performs any delivery or removal of HM/DG for Martinaire, materials are moved by ground transport only and the following conditions apply:

- The contractor must be trained as required by the U.S.DOT and in accordance with local legislation.
- The contractor must use appropriate classifications, packaging, and containment vessels approved by their company. (e.g., chemical drums, gas cylinder tanks)
- The contractor must mark containment vessels with appropriate placards, markings, and labeling as illustrated by the current DOT Hazardous Materials Chart for easy identification by Martinaire personnel.

B. HM COMAT Exceptions (49 CFR 175.8)

- When Martinaire Aviation, L.L.C., transports its own replacement items aboard its own aircraft in accordance with the applicable airworthiness requirements and operating regulations, packaging specifically designed for the items of replacement may be used provided they have an equivalent level of protection required by 49 CFR Part 175.

- When Martinaire Aviation, L.L.C., transports its own replacement items aboard its own aircraft, aircraft batteries are not subject to the quantity limitations such as those provided in 49 CFR 172.101 or 175.75 (c). **[*See 49 CFR 175.8(a)(3)(ii)*]**

- When Martinaire Aviation, L.L.C., transports its own replacement items aboard its own aircraft, a tire assembly is excepted provided the tire is not inflated to a gauge pressure exceeding the maximum rated pressure for that tire, and the tire (including valve assemblies) is protected from damage during transport. A tire or tire assembly which is unserviceable or damaged is forbidden from air transport; however, a damaged tire is not subject to the

requirements of 49 CFR Part 175 if it contains no material meeting the definition of a hazardous material (e.g. Division 2.2). **[*See 49 CFR 175.8(b)(4)*]**

C. Storage / Disposal of COMAT (Non-Transport)

Within Martinaire Aviation, L.L.C.'s facilities, all hazardous material aircraft components and consumables must be readily identifiable. Said materials are moved, stored, separated, labeled, and handled in accordance with Occupational Safety and Health Administration (OSHA) Guidelines and all other regulatory requirements communicated to Martinaire; applied, and enacted according to the FAA, Addison Airport Administration (TX), Lansing Airport Administration (MI), and Hazardous Material annual audits.

Martinaire Aviation, L.L.C. does not ship DG/HM aboard its aircraft. All DG/HM COMAT is delivered and removed by contractors/vendors via ground transport throughout the Martinaire network. Any package rejected from transport shall be placed in an isolated holding area and the vendor notified for package retrieval.

III. LOADING / STOWAGE / HANDLING PROCEDURES

Martinaire Aviation, L.L.C., is a supplemental carrier for UPS and is responsible for air cargo carriage only. In addition, Martinaire Aviation does not ship hazardous materials of company nature or load, store, or handle hazardous materials for private, air charters. All loading, handling, and processing procedures of hazardous materials performed by Martinaire employees are for those packages that have been deemed acceptable by the UPSCO Hazardous Materials program.

No employee, agent, or contract employee of Martinaire, unless trained in this function, may load or transport aboard Martinaire aircraft any HM unless the shipment has met acceptance and packaging requirements and the Notification of Pilot-In-Command has been completed and the information dictated to Martinaire Dispatch via telephone. **[*See 49 CFR 175.30 & 175.33*]**

Martinaire employees, agents, or contract employees shall inspect each and every HM package for damage, leakage, or out-gassing and refuse such packages with aforesaid damage without further processing. Rejected packages will be isolated and returned to UPSCO or their ramp manager immediately.

Packages that pass visual inspection will be scrutinized further to ensure shipping paper information and the identification of the hazardous material are correct. Packages containing misinformation or incorrect or incomplete information shall be refused without

further processing.

Packages that meet 49 CFR Part 175 qualifications shall have their shipping paper information copied to the Notification of Pilot-In-Command form and that information dictated to Martinaire Dispatch via telephone. The Pilot-In-Command will be the sole entity to identify, place, and load any HM package on board Martinaire aircraft. The PIC will ensure HM packages are loaded and secured from movement as required by the hazardous materials regulations (HMR). The PIC will also ensure packages with orientation arrows or 'This Side Up' are properly oriented and secured prior to departure. Information as to the placement and location on board the aircraft shall be duly noted on the Notification of Pilot-In-Command form. Under no circumstance will HM packages be carried in the cockpit of Martinaire aircraft. Such packages may only be carried in the main cargo hold and/or in the lower cargo pods of Martinaire aircraft. HM packages shall only be loaded by the Pilot-In-Command only when all pertinent NOPC package information has been recorded by Martinaire Dispatch via telephone. Under no circumstances may the Pilot-In-Command commence with the flight until Martinaire Dispatch has received and confirmed the HM information.

B. <u>Stowage Compatibility of Cargo</u>

(a) For stowage on an aircraft, in a cargo facility, or in any other area at an airport designated for the stowage of hazardous materials, packages containing hazardous materials which might react dangerously with one another may not be placed next to each other or in a position that would allow a dangerous interaction in the event of leakage.

(b)

(1) At a minimum, the segregation instructions prescribed in the following Segregation Table must be followed to maintain acceptable segregation between packages containing hazardous materials with different hazards. The Segregation Table instructions apply whether or not the class or division is the primary or subsidiary risk.

(2) Packages and overpacks containing articles of Identification Numbers UN3090 and UN3480 prepared in accordance with § 173.185(b)(3) and (c)(4)(vi) must not be stowed on an aircraft next to, in contact with, or in a position that would allow interaction with packages or overpacks containing hazardous materials that bear a Class 1 (other than Division 1.4S), Division 2.1, Class 3, Division 4.1, or Division 5.1 hazard label. To maintain acceptable segregation between packages and overpacks, the segregation requirements shown in the Segregation Table must be followed. The segregation requirements apply based on all hazard labels applied to the package or overpack, irrespective of whether the hazard is the primary or subsidiary hazard.

Hazard Label	Class or Division										
	1	2.1	2.2, 2.3	3	4.1	4.2	4.3	5.1	5.2	8	9 see (b)(2)
1	Note 1	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2	Note 2
2.1	Note 2										x
2.2, 2.3	Note 2										
3	Note 2							x (Note 3)			x
4.1	Note 2										x
4.2	Note 2							x			
4.3	Note 2									x	
5.1	Note 2			x (Note 3)		x					x
5.2	Note 2										
8	Note 2						x				
9 see (b)(2)	Note 2	x		x	x			x			

(c) Instructions for using the Segregation Table are as follows:

(1) Hazard labels, classes or divisions not shown in the table are not subject to segregation requirements.

(2) Dots at the intersection of a row and column indicate that no restrictions apply.

(3) The letter “X” at the intersection of a row and column indicates that packages containing these classes of hazardous materials may not be stowed next to or in contact with each other, or in a position which would allow interaction in the event of leakage of the contents.

(4) Note 1. “Note 1” at the intersection of a row and column means the following:

(i) Only Division 1.4, Compatibility Group S, explosives are permitted to be transported aboard a passenger aircraft. Only certain Division 1.3, Compatibility Groups C and G, and Division 1.4, Compatibility Groups B, C, D, E, G and S, explosives may be transported aboard a cargo aircraft.

(ii) Division 1.4 explosives in Compatibility Group S may be stowed with Division 1.3 and 1.4 explosives incompatibility groups as permitted aboard aircraft under paragraph (c)(4)(i) above.

(iii) Except for Division 1.4B explosives and as otherwise provided in this Note, explosives of different compatibility groups may be stowed together whether or not they belong to the same division. Division 1.4B explosives must not be stowed together with any other explosive permitted aboard aircraft except Division 1.4S, unless segregated as prescribed in paragraph (c)(4)(iv) of this section (“Note 1”).
(iv) Division 1.4B and Division 1.3 explosives may not be stowed together. Division 1.4B explosives must be loaded into separate unit load devices and, when stowed aboard the aircraft, the unit load devices must be separated by other cargo with a minimum separation of 2 m (6.5 feet). When not loaded in unit load devices, Division 1.4B and Division 1.3 explosives must be loaded into different, non-adjacent loading positions and separated by other cargo with a minimum separation of 2 m (6.5 feet).

(5) Note 2. “Note 2” at the intersection of a row and column means that other than explosives of Division 1.4, Compatibility Group S, explosives may not be stowed together with that class.

(6) Packages containing hazardous materials with multiple hazards in the class or divisions, which require segregation in accordance with the Segregation Table, need not be segregated from other packages bearing the same UN number.

(7) A package labeled “BLASTING AGENT” may not be stowed next to or in a position that will allow contact with a package of special fireworks or railway torpedoes.

(8) Note 3. “Note 3” at the intersection of a row and column means that UN 3528, Engines, internal combustion, flammable liquid powered; Engines, fuel cell, flammable liquid powered; Machinery internal combustion, flammable liquid powered; and Machinery, fuel cell, flammable liquid powered need not be segregated from packages containing dangerous goods in Division 5.1.

Poisons: Packages bearing the poison/toxic or infectious substance label may not be stowed in a ground facility or transported in the same compartment of an aircraft with material known to be foodstuffs, feed, or any other edible material intended for consumption by humans or animals unless loaded in the cargo pods beneath and separate from the main cargo hold of Martinaire aircraft.

Radioactive Materials (RAM): Martinaire Aviation, L.L.C., shall carry radioactive materials designated *Category I - White* on board Martinaire aircraft provided they are indicative of medical, research, or diagnostic purposes. *Category II - Yellow* and *Category III - Yellow* radioactive materials are not accepted.

RAM packages may not exceed the transport index and criticality safety index limits for both passenger-carrying aircraft and cargo aircraft as specified in 49 CFR Part 175.700(b)(l) & (2). The minimum separation distance allowed for RAM packages or group of packages in passenger-carrying aircraft and/or cargo aircraft will be maintained as specified in the tables shown in 49 CFR Parts 175.701, 175.702 and 175.706.

Carbon Dioxide, solid / (Dry Ice): When dry ice is offered for transportation by aircraft, the dry ice must be carried in packages designed and constructed to permit release of the carbon dioxide gas to prevent a buildup of pressure that could rupture the packaging. Packaging requirements must conform to the general packaging requirements of 49 CFR 178 Subpart B.

(1) The net mass of the dry ice must be marked on the outside of the package.

(2) Martinaire aircraft are limited to 200 kg (440 lbs) of dry ice in its entirety used to refrigerate other hazardous materials.

(3) Dry ice is excepted from the shipping paper requirements of 49 CFR Part 172, Subpart C provided alternative written documentation is supplied containing the following information:

- Proper shipping name (Dry Ice or Carbon Dioxide, solid)
- UN # 1845
- Class 9
- The number of packages
- Net quantity of dry ice in each package

(4) Dry ice, in quantities not exceeding 2.5 kg (5.5 lbs) per package and used as a refrigerant for the contents of the package is excepted from all requirements of 49 CFR Part 173, Subpart E if the requirements of this entry are complied with and the package is marked ‘Carbon Dioxide, solid’ or ‘Dry Ice’; the name of the contents being cooled are marked; and the net weight of the dry ice is displayed as being 2.5 kg (5.5 lbs) or less.

(5) Dry ice, when used to refrigerate materials being shipped for diagnostic or treatment purposes (e.g., frozen medical specimens), is excepted from the shipping paper and certification requirements of 49 CFR Part 173, Subpart E if the requirements of this entry are met and the package is marked ‘Carbon Dioxide, solid’ or ‘Dry Ice’ and is marked with an indication that the material being refrigerated is being transported for diagnostic or treatment purposes.

C: Pre-Board Inspection

General Inspection: As the originating aircraft operator, UPSCO has the responsibility for performing an initial acceptance audit and maintaining the required file of shipping papers. Each dangerous goods package presented to Martinaire will be examined by UPS for verification that it has been accepted for transportation.

No employee, agent, or contract employee of Martinaire Aviation, L.L.C., shall load any package containing HM aboard any Martinaire aircraft unless immediately before doing so, that person has inspected the package for damage, leakage, out-gassing, or other obvious indications that its integrity has been compromised. Any HM package found to be unacceptable due to compromised integrity shall be refused for transport and returned to UPS without further processing.

HM material packages deemed acceptable, shall be removed from aircraft loading procedures and set aside for further processing of the Notification of the Pilot-In-Command form (NOPC) by the Martinaire Pilot-In-Command. Once acceptance processing is complete, the Pilot-In-Command may load the package or packages on board the aircraft noting their stationing or position and recording the location on the NOPC form. The Pilot-In-Command will then call Martinaire Dispatch via telephone and dictate NOPC information to the dispatcher for system recording and logging. Only when this information has been duly recorded by Martinaire Dispatch may the flight commence. The Pilot-In-Command shall retain the NOPC form for the duration of the flight until such time that HM material packages on board have been off-loaded at the destination airport.

Martinaire Aviation, L.L.C., does not use or accept Unit Load Devices (ULD's). Any ULD containing hazardous material and/or non-hazardous material shall be refused.

General cargo offered to Martinaire may have hazards that are not apparent and not indicated as to having HM present in the packaging. Employees, agents, and contract employees of Martinaire Aviation, L.L.C., are presented with a list of Hidden Shipment Indicators and trained to be wary of such packages during loading procedures. If such a package is discovered that the Pilot-In-Command deems hazardous, it shall be rejected and brought to the attention of UPS for further examination; forwarded by other means if found to be suitable; or forwarded by Martinaire aircraft if, under further scrutiny, both parties agree that it is suitable.
[*See Appendix A of this Section*]

This process is repeated at each and every station within the UPS network for which Martinaire is contracted for air transport services.

Radioactive Materials (RAM)

Radioactive Contamination - Martinaire Aviation, L.L.C. shall take care to avoid possible inhalation, ingestion, or contact by any person with Class 7 RAM that may have been released from their packagings. It is the responsibility of the Pilot-In-Command to vacate the aircraft and notify Martinaire Dispatch immediately of an incident regarding Class 7 radioactive materials providing as much detailed information on the incident deemed applicable at the time. The Pilot-In-Command will submit a HM Incident Report as soon as practical but no later than 12 hours after the occurrence **[*See Appendix D of this Section*].**

Martinaire Dispatch will, in turn, notify the U.S. Department of Energy and/or appropriate State or local radiological authorities for assistance and the National Response Center (800-424-8802). Martinaire Dispatch will also notify UPSCO at the earliest practical moment following the incident.

An aircraft in which Class 7 (radioactive) material has been released must be taken out of service and may not be returned to service or routinely occupied until the aircraft is checked for radioactive substances and it

is determined that any radioactive substances present do not meet the definition of radioactive material, as defined in § 173.403 of this subchapter, and it is determined in accordance with § 173.443 of this subchapter that the dose rate at every accessible surface must not exceed 0.005 mSv per hour (0.5 mrem per hour) and there is no significant removable surface contamination.

Each aircraft used routinely for transporting Class 7 materials shall be periodically checked for radioactive contamination, and an aircraft must be taken out of service if contamination exceeds the level specified in the preceding paragraph. The frequency of these checks shall be related to the likelihood of contamination and the extent to which Class 7 materials are transported.

Martinaire Aviation, L.L.C., does not accept or carry Class 7 Radioactive II - Yellow or Radioactive III - Yellow aboard its aircraft. Radioactive I - White is not subject to loading restrictions and are considered ‘Unrestricted’ for aircraft loading purposes.

Quantity and Loading Table

Applicability	Forbidden	Quantity Limitation: 25 kg net weight of hazardous material plus 75 kg net weight of Division 2.2 (non-flammable compressed gas) per cargo compartment	No limit
Passenger-carrying aircraft	Cargo Aircraft Only labeled packages	Inaccessible	Accessible
Cargo-only aircraft - Packages authorized aboard a passenger carrying aircraft	Not applicable	Inaccessible (Note 1)	Accessible (Note 2)
Cargo-only aircraft- Packages not authorized aboard a passenger-carrying aircraft and displaying a Cargo Aircraft Only label	Inaccessible (Note 1)	Not applicable	Accessible (Note 2)

Note 1: The following materials are not subject to this loading restriction -

a. Class 3, PG III (unless the substance is also labeled CORROSIVE).

b. Division 6.1 (unless the substance is also labeled for any hazard class or division except FLAMMABLE LIQUID)

c. Class 7 (unless the hazardous material meets the definition of another hazard class).

d. Class 9, Limited Quantity or Excepted Quantity material.

e. Articles of Identification Numbers UN0012, UN0014, or UN0055 also meeting the requirements of § 173.63(b).

f. Articles of Identification Numbers UN3528 or UN3529.

Note 2: Aboard cargo-only aircraft, packages required to be loaded in a position that is considered to be accessible include those loaded in a Class C cargo compartment.

Orientation and Securing of HM Packages - A package containing hazardous materials marked “THIS SIDE UP” or “THIS END UP”, or with arrows to indicate the proper orientation of the package, must be stored and loaded aboard an aircraft in accordance with such markings. A package without orientation markings containing liquid hazardous materials must be stored and loaded with top closure facing upward. (49 CFR 175.88)

HM Location and Quantity Limitations Aboard Aircraft - No HM package may be carried in the cockpit or flight deck of Martinaire aircraft. HM may be carried in the upper cargo hold and/or in the lower, cargo, belly pods of the aircraft.

Cargo-Only Aircraft (CAO) Packages - Each CAO package must be loaded in such a manner that a crew member or other authorized person can see, handle, and when size and weight permit, separate such packages from other cargo during flight. See 49 CFR 175.75(e) for exceptions to this requirement.

D. Emergency Response Information

A HM shipment shall not be accepted without emergency response information immediately available. Emergency response information means information that can be used in the mitigation of an incident involving HM. This information may come in the form of a North American Emergency Response Guidebook (ERG), Material Safety Data Sheet (SDS), the ICAO "Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods". (ICAO Redbook), or equivalent information as provided by the shipper. Emergency response information must be immediately available where the HM is received, stored, or handled during transportation. Emergency response information must also be immediately available onboard the aircraft while HM is being transported.

An emergency response telephone number shall be provided on the shipping document offered with HM packages. The ERG can be ordered, or downloaded at:
https://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg.
Martinaire provides each pilot with a printed copy of the ERG. In addition, a copy of the ERG is located in each aircraft.

Emergency response information does not apply to HM which is excepted from the shipping paper requirement of 49 CFR 172 Subpart G.

IV. PILOT-IN-COMMAND NOTIFICATION (NOPC)

UPS offering Hazardous Materials (HM) for air transportation aboard Martinaire aircraft, are responsible for properly identifying, describing, classifying, packaging, marking, and labeling the materials as required by 49 CFR or ICAO. Through their FAA approved, UPSCO Hazardous Materials Program, UPS is also responsible for properly completing the communications and packaging requirements prior to offering the shipment for transport aboard Martinaire aircraft.

The Pilot-In-Command (PIC) must be given accurate and legibly written information by UPS as early as practicable before departure regarding the HM:

- Proper Shipping Name
- UN Identification Number
- Packing Group
- Quantity/Weight
- Emergency Contact Number (if required)
- Passenger or Cargo Aircraft Only Designation
- Tracking Number
- Special Permit Number (if required)
- RAM TI

It is the responsibility of the Pilot-In-Command to transfer this information to and complete the Martinaire NOPC form(s) along with each HM load position aboard the aircraft prior to departure. The PIC shall, under no circumstances, conduct the flight with HM aboard unless all NOPC information has been called into Martinaire Dispatch via telephone and Martinaire Dispatch has confirmed receipt.

NOPC information provided by the PIC, is retained by Martinaire Dispatch in their Hazardous Materials Logbook in the dispatch center for a period of 90 days. The NOPC information retains the airport of departure and the intended airport of arrival as indicated by the assigned flight number (e.g. MRA 666 (KDFW-KABI)).

The NOPC information is available, upon request, to an authorized official of a Federal, State, or local government agency (which includes emergency responders) at reasonable times and locations, the documents or information required to be retained by this paragraph. In the event of a reportable incident, as defined in § 171.15 of this subchapter, Martinaire will make immediately available to an authorized official of a Federal, State, or local government agency (which includes emergency responders), the documents or information required.

The PIC shall maintain the completed NOPC form(s) in the aircraft cockpit for the duration of the flight from the airport of departure to the airport of intended arrival. After unloading of the HM by UPS personnel at the airport of intended arrival, the PIC may retain the NOPC form and send the collected forms to Martinaire weekly in COMAT paperwork.

V. SPECIAL FLIGHTS/SPECIAL PERMITS

Specific requirements for the transport of flammable liquid fuel when other means of transportation are impracticable, on small passenger-carrying aircraft operating within the

State of Alaska or into a remote area, in other than scheduled passenger operations, and on a cargo aircraft, is authorized only when the provisions of 49 CFR 175. 310 are met. Operations covered by 175.310 require additional conditions and limitations to be accepted by our FAA POI with coordination from the Office of Security and Hazardous Materials Safety (49 CFR 175.310(e)).

Flights made under the provisions of a DOT Special Permit (Exemption) or approval must comply with the conditions specified in the Special Permit or approval.
Any approved Special Permit or approval shall be retained as an Appendix to this manual.

VI. HM EXCEPTIONS FOR CREW MEMBERS

Certain materials that are normally regulated as HM are excepted from the HMR. A summary of commonly utilized exceptions of this regulation are provided in this section. All available exceptions are listed in 49 CFR 175.10 to include matches/lighters, implanted medical devices and radiopharmaceuticals, alcoholic beverages, butane powered curling irons, fuel cells, small thermometers, small arms ammunition, dry ice, self inflating life jacket, compressed gas for medical limbs, and electrically powered heat producing articles. A current copy of Title 49 CFR Part 175 or a printout of the applicable sections from the internet will be maintained for reference.

https://ecfr.io/Title-49/Part-175

A. HM Carried by Crew Members

Personal use items carried by a crew member are allowed under the following conditions:

1. Non-radioactive medicinal or toiletry articles (including aerosols) may be carried in carry-on baggage. Release devices on aerosols must be protected by a cap or other suitable means to prevent inadvertent release.
2. The aggregate quantity of all HM items carried by a crew member may not exceed 70 oz. (2 kg) by mass or 68 fl. Oz. (2 L) by volume. Each individual container cannot exceed 18 oz. (0.5 kg) by mass or 17 fl. oz. (500 ml) by volume.

B. Batteries - All Types

"Dry cell" batteries, such as alkaline, nickel cadmium, and carbon zinc are not listed as hazardous materials or dangerous goods in the U.S. and international regulations. However, the batteries must be packed in a manner that prevents the generation of a dangerous quantity of heat and short circuits and packaged in strong outer packaging.

Except as provided in 49 CFR 173.21, portable electronic devices (e.g. watches, cameras, cellular phones, etc.) containing dry cells or dry batteries (including lithium cells or batteries) and spare dry cells or batteries for these devices, when carried by crew members for personal use. Portable electronic devices and spare lithium batteries may be carried in carry-on baggage. Each installed or spare lithium battery must be of a type proven to meet the requirements of each test in the UN Manual of Tests an Criteria, part III, sub-section 38.3 and each spare lithium battery must be individually protected so as to prevent short circuits (e.g., by placement in original retail packaging, by otherwise insulating terminals by taping over exposed terminal, or placing each battery in a separate plastic bag or protective pouch).

Except as provided in 49 CFR 173.21, battery-powered portable electronic smoking devices (e.g., e-cigarettes, e-cigs, e-cigars, e-pipes, e-hookahs, personal vaporizers, electronic nicotine delivery systems) when carried by crew members for personal use must be carried on one's person or in carry-on baggage only. Measures must be taken to prevent unintentional activation of the heating element while on board the aircraft. Spare lithium batteries also must be carried on one's person or in carry-on baggage only and must be individually protected so as to prevent short circuits (by placement in original retail packaging or by otherwise insulating terminals, e.g., by taping over exposed terminals or placing each battery in a separate plastic bag or protective pouch). Each lithium battery must be of a type which meets the requirements of each test in the UN Manual of Tests and Criteria, Part III, Subsection 38.3. Recharging of the devices and/or the batteries on board the aircraft is not permitted.

In addition, each installed or spare lithium battery must not exceed the following:

- For a lithium metal battery, a lithium content of not more than 2 grams per battery; or

- For a lithium ion battery, the Watt-hour rating must not exceed 100 Wh. With the approval of Martinaire, portable electronic devices may contain lithium ion batteries exceeding 100 Wh, but not exceeding 160 Wh and no more than two, individually protected lithium ion batteries each exceeding 100 Wh, but not exceeding 160 Wh, may be carried by the crew member as spare batteries in carry-on baggage.

- For a non-spillable battery, the battery and equipment must conform to 49 CFR 173.159(d). Each battery must not exceed a voltage greater than 12 volts

and a watt-hour rating of not more than 100 Wh. No more than two individually protected spare batteries may be carried. Such equipment and spare batteries must be carried in checked or carry-on baggage.

Martinaire Aviation, L.L.C., allows crew members to carry portable electronic devices (e.g., cellular phones, laptop computers, etc.) in carry-on baggage for personal use. Devices utilizing lithium ion batteries with a Watt-hour rating exceeding 100 Wh, but not exceeding 160 Wh are allowed. Such batteries must be packaged in outer packaging (e.g., plastic bag, bubble-wrap, etc.) or contained in a device to prevent short-circuiting of battery terminals with other batteries, metal objects or conductive surfaces. The batteries must also be isolated and protected within carry-on baggage to prevent damage from puncture and dropage. Said devices must remain in carry-on baggage and under no circumstances, be used by any flight crew member during flight operations. Use of said devices by a crew member during flight operations is strictly prohibited.

To determine if the battery meets Wh criteria, the watt-hour rating may be determined by multiplying the battery's nominal voltage (V) and capacity in ampere-hours (Ah): **Ah** x **V** = **Wh.** Voltage and current capacity are located on the battery label, original packaging, and/or stamp on the battery housing.

C. Portable Oxygen Concentrators (POC)

Portable Oxygen Concentrators can be carried aboard Cargo Aircraft Only in accordance with 49 CFR 172.101.

VII. REPAIR STATION NOTIFICATION

As required by 14 CFR 135.505(e), Martinaire Aviation,L.L.C., notifies repair stations of HM policies in writing. This is done in the form of a letter which includes the text shown below:

Martinaire Aviation LLC is hereby notifying you of our policies and operation specifications concerning the transport of Hazardous Materials as required by 14 CFR 135.505(e).

1. Martinaire Aviation is a 14 CFR Part 135 carrier with a 'will-carry' status.

2. Martinaire has a Dangerous Goods program approved by the FAA.

3. Martinaire will only transport Dangerous Goods and non-regulated shipments or materials that have been scrutinized and loaded by personnel qualified under the appropriate, function-specific training in the Martinaire Dangerous Goods Program.

4. No person, including employees, vendors, contractors, or contract employees, working

on behalf of a Repair Station may perform any transportation function on behalf of Martinaire other than preparing shipments for transportation under the conditions set forth in this notification. This restriction specifically includes (a) Acceptance; (b) Rejection; (c) Handling; (d) Storage incidental to transport; (e) Loading; and (f) Transportation of Hazardous Materials.

5. Authorized Repair Stations employees may package Martinaire Company Materials (COMAT) only under the following conditions:

- No Dangerous Goods/Hazardous Materials classified under 49 CFR Part 172, intended for use by Martinaire, whether regulated or non-regulated, may be transported on Martinaire aircraft.

- This does not apply to items deemed 'Ship's Equipment'.

6. Martinaire-owned materials being offered for transportation as common carriage shipments to Martinaire or any other commercial carrier are not subject to Martinaire Policy restrictions.

I hereby acknowledge receipt of this notification in accordance with 14 CFR 145.206(a).

Repair stations acknowledge receipt of the notification by returning a signed copy of the notification letter. Notifications are filed in the Martinaire Maintenance Chief Inspector's Office at Martinaire's Principal Place of Business. **[*See Appendix E of this Section*]**

VIII. NOTIFICATION OF HM INCIDENTS, DISCREPANCIES & REQUIRED REPORTS

All hazardous materials incidents and discrepancies will be reported immediately to the Director of Operations and/or the Chief Pilot of Martinaire Aviation LLC. The Director of Operations and/or the Chief Pilot will be responsible for incident and discrepancy management and reporting to include reporting to the FAA Hazardous Materials Program Office.

A. Incident Reporting - An incident, as defined by 49 CFR 171.15 and 49 CFR 171.16, is any unintentional release of a hazardous material in transportation or in storage incident to transportation. Any hazardous material incident within the air system must be reported to the UPS ADG Compliance function.

Immediate Notification: Martinaire is required to notify the NRC at 800-424-8802 or 202-267-2675 [and regional, 24-hour operations centers at 202-267-3333 (Washington Headquarters); 404-305-5180 (Eastern Region); 817-222-5006 (Central Region); and 206-231-2000 (Western Region)] as soon as practical

but no later than 12 hours after an occurrence if as a direct result of a hazardous material any of the following events occur:

- A person is killed
- A person receives an injury requiring admittance to a hospital
- The general public is evacuated for one hour or more
- A major transportation artery or facility is closed or shut down for one hour or more; or
- The operational flight pattern or routine of an aircraft is altered
- Fire, breakage, spillage or suspected radioactive contamination occurs involving a radioactive material
- Fire, breakage, spillage or suspected contamination occurs involving an infectious substance other than a regulated medical waste
- A release of a marine pollutant occurs in a quantity exceeding 450 L (119 gal) for a liquid or 400 kg (882 lbs) for a solid
- A situation exists of such a nature (e.g., a continuing danger to life exists at the scene of the incident) that, in the judgment of the person in possession of the hazardous material, it should be reported to the NRC
- During transportation by aircraft, a fire, violent rupture, explosion or dangerous evolution of heat (i.e., an amount of heat sufficient to be dangerous to packaging or personal safety to include charring of packaging, melting of packaging, scorching of packaging or other evidence) occurs as a direct result of a battery or battery-powered device

This reporting is to be performed by the Martinaire Dispatch Office. Any Martinaire operation experiencing one of these serious incidents involving an air service package must notify Martinaire Dispatch immediately. The Director of Operations and/or Chief Pilot will be notified immediately thereafter.

Written Report Notification: The aforementioned, immediate telephone incident notification also requires submission of a written report on DOT Form 5800.1 within 30 days of incident discovery to the Pipeline and Hazardous Materials Safety Administration. **[*See VIII B - Filing an Incident Report*].** This report shall be filed for incidents previously disclosed including:

- An unintentional release of a hazardous material or the discharge of

any quantity of hazardous waste.

- A specification cargo tank with a capacity of 1,000 gallons or greater containing any hazardous material that suffers structural damage.

- An undeclared hazardous material being discovered, or

- A fire, violent rupture, explosion or dangerous evolution of heat occurs as a direct result of a battery or battery-powered device.

Other incidents must also be reported through the ADG Compliance function. However, immediate telephone notification may not be required, and written incident reports may suffice. Written reports for any unintentional release of a hazardous material are designated as DOT Form 5800.1.

The DOT Form 5800.1 is to be prepared by the Pilot-In-Command at the location discovering the incident and distributed as soon as possible to Martinaire Dispatch. **[*See Appendix D of this Section*]**

The initial reporting of an HM incident, and prior to completion and submission of DOT Form 5800.1, the Pilot-In-Command (or reporter) shall relay the initial information to Martinaire Dispatch and include:

a) Name of PIC or reporter;
b) Name and address of PIC or reporter;
c) Contact number where PIC or reporter can be contacted;
d) Date, time, and location of incident;
e) The extent of injury, if any;
f) Class or Division, Proper Shipping Name, and Quantity of HM involved, if such information is available; and,
g) Type of Incident and Nature of HM involvement and whether a continuing danger to life exists at location.

This initial reporting information is also required when reporting incidents via telephone.

B. <u>Filing an Incident Report</u>

In accordance with 49 CFR 171.16, a written copy of the Hazardous Materials Incident Report will be sent to the Information Systems Manager, PHH-60, Pipeline and Hazardous Materials Safety Administration, Department of Transportation, East Building, 1200 New Jersey Ave., SE., Washington, DC 20590-0001, or an electronic Hazardous Material Incident Report to the Information System Manager, PHH-60, Pipeline and Hazardous Materials Safety Administration, Department of Transportation, Washington, DC 20590-0001 at https://www.phmsa.dot.gov/hazmat-

program-management-data-and-statistics/data-operations/incident-reporting

An electronic copy of the Incident Report will also be submitted to the FAA at 9-AWA-AXH-Air5800-1Reports@faa.gov.

Furthermore, a copy of the Incident Report will be submitted to Martinaire Dispatch and be made available at Martinaire Aviation's Principal Place of Business within 24 hours for any authorized representative or special agent of the Department of Transportation.

C. Parties Requiring Notification

Martinaire reports undeclared dangerous goods or other discrepancies as defined in 49 CFR 175.31. Notification will be performed by Martinaire Dispatch.

Martinaire Dispatch will notify the FAA Office by email following the FAA HAZMAT Notification procedure on discrepancies of hazardous material shipments that have been accepted for air transportation. To electronically report discrepancies involving cargo, email reports to: 9-AWA-AXH-175-31CargoNotifications@faa.gov.

The table below show the correct parties who must be notified, depending on the type of incident.

TYPE OF INCIDENT	PARTY TO BE NOTIFIED, AND METHOD
Undeclared dangerous goods or other discrepancy as defined under 49 CFR 175.31.	The FAA by email following the FAA Hazmat Notification procedure and DOT/PHMSA by DOT Form 5800.1, within 30 days.
Any unintentional release of dangerous goods (including undeclared shipments).	The FAA by email following the FAA Hazmat Notification procedure and DOT/PHMSA by DOT Form 5800.1, within 30 days.
A release to the environment of a hazardous substance in a quantity that meets or exceeds the RQ.	The NRC by telephone (800-424-8802 or 202-267-2675) as soon as practicable, but no later than 12 hours after occurrence.
Damage to or leakage from a package containing an Infectious Substance (Division 6.2).	The NRC by telephone (800-424-8802 or 202-267-2675) as soon as practicable, but no later than 12 hours after occurrence.
During transportation by aircraft, a fire, violent rupture, explosion or dangerous evolution of heat (which may cause charring of packaging, melting of packaging, scorching of packaging, or other evidence) occurs as a direct result of a battery or battery-powered device.	The NRC by telephone (800-424-8802 or 202-267-2675) as soon as practicable, but no later than 12 hours after occurrence. The FAA by email following the FAA Hazmat Notification procedure and DOT/PHMSA by DOT Form 5800.1, within 30 days.

C. Reporting of Dangerous Goods Occurrences

Dangerous goods occurrences are defined as any occasion in which Martinaire discovers DG/HM have been improperly loaded, segregated / separated or DG/HM has been carried without being included on the NOPC.

EMERGENCY RESPONSE CONTACT LISTS

Carrier Response Contacts

CONTACT	PHONE NUMBER
Martinaire Dispatch Center	(972) 349-5700 Ext. 11
UPS HAZMAT Support Center	(800) 554-9964

National Incident Response Contacts

CONTACT	PHONE NUMBER
Center for Disease Control	(800) 232-4636
National Response Center	(800) 424-8802
Department of Energy (DOE)	(202) 586-5000
Nuclear Regulatory Commission	(301) 816-5100

In addition to the contacts listed above, current local listing of emergency contacts at each station where operations are conducted will be maintained. At a minimum, the list will contain the following contact information:

Local Incident Response Contacts

CONTACT	PHONE NUMBER
Local FAA Security & HAZMAT Field Office	(817) 222-5720
FAA Regional Operations Center (24 hours)	(817) 222-5006
FAA Flight Standards District Office	(972) 582-1800
Airport Police (Airport Dependent)	call 911 or Martinaire Dispatch
Fire Department (Airport Dependent)	call 911 or Martinaire Dispatch
Ambulance / Hospital (Airport Dependent)	call 911 or Martinaire Dispatch
State Department of Emergency Services	call 911 or Martinaire Dispatch
HAZMAT Disposal	call 911 or Martinaire Dispatch
State Radiation Control	call 911 or Martinaire Dispatch

NOTES:

1. *The current Emergency Response Guidebook is a valuable resource for the handling of HAZMAT incidents.*
   https://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg

2. *The Emergency Response Telephone number provided on the Dangerous Goods Declaration (shipping papers) should be utilized as a resource in a HAZMAT incident.*

PART TWO

HAZARDOUS MATERIALS TRAINING PROGRAM

I. REQUIREMENTS

Martinaire Aviation, L.L.C., shall not use any person or crew member to perform or directly supervise any assigned duties for acceptance, rejection, handling, storage, and/or transportation of Dangerous Goods/Hazardous Materials (DG/HM) cargo, baggage, and DG/HM COMAT unless the individual has satisfactorily completed Martinaire's, FAA-approved, initial or recurrent hazardous materials training program within the preceding 12 calendar months.

A record of the satisfactory completion of the initial and recurrent DG/HM training for each individual shall be maintained at Martinaire's principal place-of-business within the preceding three (3) years. These records will be maintained for Martinaire crew members, dispatchers, contractors, subcontractors, and any other Martinaire employee who performs or directly supervises a DG/HM function for as long as that individual performs DG/HM duties and for 90 days thereafter. Records may be maintained electronically and/or in 'hard copy' form and will be made available upon request by the FAA Administrator or agent thereof.

It will be the function and responsibility of Martinaire's Chief Pilot and/or Assistant Chief Pilot to:

- Administer, implement. maintain, and revise the FAA-approved DG/HM training manual and program.

- Conduct and administer initial and recurrent DG/HM training and testing of 'New Hire' employees and existing employees of Martinaire working in the capacity of Pilots-In-Command and/or Dispatchers in flight operations. All incorrect testing answers shall be reviewed with the test subject until proficiency is achieved.

- Maintain employee records on DG/HM initial and recurrent training at Martinaire Aviation, L.L.C.'s principal place-of-business.

All DG/HM Training Records will include the following

1. The individual's name;
2. The most recent training completion date;
3. A description, copy, or reference to training materials used to meet the training requirement;
4. The name and address of the organization providing the training; and

5. A copy of the certification issued when the individual was trained and satisfactorily tested.

II. TRAINING REFERENCE TABLE

At a minimum, training in the subject matter relating to DG/HM transport will be provided to the various categories of personnel as indicated below:

MODULE	AREA OF TRAINING	CATEGORY OF PERSONNEL				
		1	2	3	4	5
1	General Awareness/Familiarization	✓	✓	✓	✓	✓
2	Hidden Dangerous Goods	✓	✓	✓	✓	✓
3	Company Materials (COMAT)	✓	✓	✓	✓	✓
4	Documentation	✓	✓		✓	
5	Acceptance & Handling	✓	✓		✓	
6	Marking & Labeling	✓	✓	✓	✓	✓
7	Classification	✓	✓	✓	✓	✓
8	Identification	✓	✓		✓	
9	Packing	✓	✓			
10	Notification of Pilot-In-Command	✓	✓		✓	✓
11	Safety & Reporting	✓	✓	✓	✓	✓
12	Dangerous Goods Exceptions	✓	✓	✓	✓	✓
13	Testing	✓	✓	✓	✓	✓
SEE NOTE	*Recommended Training Time - Initial*	8 hrs	6 hrs	1 hr	2 hrs	1 hr
SEE NOTE	*Recommended Training Time - Recurrent*	2 hrs	2 hrs	1 hr	2 hrs	1 hr

Category 1 - Personnel engaged in the acceptance of DG/HM shipments
Category 2 - Maintenance, stores, and other personnel engaged in ground handling, storage, and loading/unloading of DG/HM.
Category 3 - Personnel engaged in passenger and baggage check-in procedures (*Skycaps, ticket counter agents, etc.*)
Category 4 - Flight Crew Members
Category 5 - Flight attendants and dispatchers

Note: The extent of training varies for each person depending on the job function they perform. The material shall be covered in such scope and depth as to provide all persons with sufficient knowledge of applicable HM regulations and procedures **to safely accomplish their specific duties.**

Initial DG/HM Training for Martinaire flight crew member applicants shall commence during the first week of an assigned 'Ground School' class. The Chief Pilot and/or Assistant Chief Pilot for Martinaire sets the tentative dates of all ground school classes on an 'as needed' basis. For Dispatcher applicants, initial DG/HM training may commence at any time the Martinaire Dispatch office deems it necessary.

Recurrent DG/HM Training for all Martinaire employees who perform duties associated with DG/HM and who are currently qualified shall commence at any time from 30 days before an employee's base month to 30 days after an employee's base month. This provides ample time for the Chief Pilot or Assistant Chief Pilot to schedule training periods amidst other management responsibilities. An employee's base month is the month that the said employee successfully completed and passed their initial DG/HM training.

II. TRAINING CURRICULUM

The modules listed below will be covered during the initial and recurrent training of this:·air carrier's personnel. This training will be considered to comply with all requirements for the acceptance, handling, and transportation ofDG/HM as specified in 49 CFR and/or the ICAO Technical Instructions. Training will be presented,,, via multimedia projector using Power Point, Section P of the Martinaire GOM, the current DOT Chart; a current 49 CFR book and an up to date copy of the Air Shipper Air International Regulations·book and a current copy of the ICAO Technical Instructions for the safe transport of dangerous goods by air manual.

All materials and regulations used in our training curriculum shall be current and valid at the time of the training. Part 135 hazardous material training requirements can be found in 14 CFR Part 135, Subpart K, and may be electronically accessed online at: https://ecfr.io/Title-14/sp14.3.135.k The training program will satisfy the requirements in the Training ReferenceTable and 49 CFR Parts 171 through 180.

A sample test will be reviewed with the Chief Pilot or Assistant Chief Pilot where the student can interact and ask questions.

Tests are issued individually to each student at individual computers using commercial testing Software that randomizes the questions and the order of the answers, so that no two tests are identical. The minimum passing grade is 80% and all test questions answered incorrectly will be reviewed with the student. The test will then be printed and retained in the pilot's training folder along with a ground training certificate until the next recurrent training takes place
(usually every 11-13 months).

All training records are maintained in accordance with the requirements of FAR 135.507 at Martinaire Company Headquarters in Addison, TX.

Module 1 - General Awareness/Familiarization

Applicable Regulatory Materials
Overview of 49 CFR Parts 100-185
Use of ICAO Technical Instructions - 49 CFR 171.22
Use of IATA Dangerous Goods Regulations
Definitions Used in Air Transportation of Hazardous Materials - 49 CFR 171.8
General Transportation Requirements - 49 CFR 171.2
Carriage By Aircraft - 49 CFR Part 175
Training Requirements and Recordkeeping - 49 CFR 172 Subpart H
Enforcement

Module 2 - Hidden Dangerous Goods

Hidden Shipment Indicators -Appendix A
Suspicious Cargo and Baggage Awareness

Module 3 - Company Materials (COMAT)

Identify and Recognize DG COMAT
- Hazardous Materials Onboard Aircraft - Appendix D
- Replacement Components
- Consumable Materials

Specific DG COMAT Exceptions -49 CFR 175.8 and 175.9

Facility Storage, Safe Movement and Handling Requirements for DG COMAT - 49CFR 175.75 and 175.78
- Specific Hazards and Precautionary Measures
- Proper Disposal Procedures for DG COMAT
- Environmental Precautions
- Transportation Precautions .

Module 4 - Documentation

Shipper's Certification Requirements for Hazardous Materials -49 CFR 172.204
Shipping Paper Requirements -49 CFR 172.200 and 172.201
Description of Hazardous Materials Required on Shipping Papers - 49 CFR 172.202 and 172.203 ··
Shipping Papers for Hazardous Materials Aboard Aircraft-49 CFR 175.33
Special Permits - Appendix G

Module 5 - **Acceptance** & **Handling**

Passenger and Cargo Information Signage Requirements -49 CPR 175.25 and 175.26
Acceptance Procedures and Requirements for DG/HM -49 CFR 171.2(e), 175.3, and 175.30
Unit Load Device and Package Inspection -49 CFR 175.88
Quantity Limitations Aboard Aircraft -49 CFR 175.75

Stowage Compatibility-49 CFR 175.78
Orientation of Packages -49 CFR 175.78 and 175.88
Securing Packages -49 CFR 175.88
Location of Packages -49 CFR 175.75
Damaged Shipments of Hazardous Materials -49 CFR 175.90

Module 6 - Marking & Labeling

Markings Required on Packages Containing Hazardous Materials -49 CFR 172 Subpart D
Labels Required on Packages Containing Hazardous Materials -49 CFR 172 Subpart E
Keeping and Replacement of Hazardous Materials Labels

Module 7 - **Classification**

Hazardous Materials Classification-49 CFR 172.101, 173.2, and 173.2(a)
Unacceptable Hazardous Materials -49 CFR 172.101, 173.21, and 175.3

Modules 8 - Identification

Purpose and Use of the Hazardous Materials Tables -49 CFR 172.101
Proper Shipping Names -49 CFR 172.101 and 172.202
Hazard Class (Definitions) -49 CFR 172.101 and 173.50 - 173.144
UN/ID Numbers -49 CFR 172.101 and 172.202
Packing Group -49 CFR 172.101 and 172.202

Module 9 - Packing

Shippers Responsibilities -49 CFR 171.2(e) and 173.22
General Packing Requirements -49 CFR 173.24, 173.24a, and 173.27
Packing Instructions and Assignments - 49 CFR 172.101 and Part 173
Excepted Quantities -49 CFR 173 .4a
Limited Quantity Exceptions-49 CFR 173.27(f)(2); 173.150-173.156

Module 10 - Notification to Pilot-In-Command

Notification to Pilot-In-Command - 49 CFR 175.33
Emergency Response Information - 49 CFR 172 Subpart G

Module 11 - Safety & Reporting

Emergency Response Information - 49 CFR 172.600
Hazardous Materials Discrepancy/Incident Reporting-49 CFR 171.15, 171.16, 175.31

Module 12 - Dangerous Goods Exceptions

Exceptions - 49 CFR 175.8, 175. 9 and 175.10

Module 13 - Testing - 49 CFR 172. 702(d), 49 CFR 172. 704(d),14 CFR 135 Subpart K

III. SUBSIDIARY RECORDS

Martinaire Aviation, L.L.C., is a supplemental carrier for United Parcel Service (UPS) and is responsible for air cargo carriage only. Martinaire Aviation does not participate in or provide passenger services. UPS offering Hazardous Materials (HM) for air transportation aboard Martinaire aircraft, are responsible for properly identifying, describing, classifying, packaging, marking, and labeling the materials as required by 49 CFR or ICAO. Through their FAA approved, UPSCO Hazardous Materials Program, UPS is also responsible for properly completing the communications and packaging requirements prior to offering the shipment for transport aboard Martinaire aircraft.

In the event that UPSCO records are requested by the FAA Administrator or agent thereof, concerning UPSCO DG/HM personnel who assist Martinaire in any capacity involving duties associated with the transportation of DG/HM, Martinaire will:

- Contact UPS (Station Dependent) and request an UPSCO employee's DG/HM Record-of-Training referencing their name and/or employee number.

- UPSCO will forward a copy of the employee's record either electronically or by mail to Martinaire's Principal Place-of-Business in Addison, Texas.

- Martinaire will notify the FAA Administrator or agent thereof, of their receipt and forward applicable copies, either electronically or by mail, to the Administrator or agent thereof, at the address of their choosing.

HIDDEN SHIPMENT INDICATORS

Cargo and baggage that are offered to an air carrier under a general description might have hazards that are not apparent. The Hazardous Materials Table in **49 CFR Part 172** is not complete and shippers may not be aware of this. Some of these consignments have caused incidents that could have seriously endangered the safety of the aircraft and/or air carrier personnel.

Air carrier personnel should be alert to these possible hazards. Item found containing a hazardous material need to be shipped in accordance with the 49 CFR/ICAO Technical Instructions.

AIRCRAFT SPARE PARTS / AIRCRAFT EQUIPMENT — may contain explosives (flares or other pyrotechnics), chemical oxygen generators, unserviceable tyre assemblies, cylinders of compressed gas (oxygen, carbon dioxide, nitrogen or fire extinguishers), paint, adhesives, aerosols, life-saving appliances, first aid kits, fuel in equipment, wet or lithium batteries, matches, etc.

AUTOMOBILES, AUTOMOBILE PARTS / SUPPLIES — (car, motor, motorcycle) may contain ferro-magnetic material which may not meet the definition for magnetized material but which may be subject to special stowage requirements due to the possibility of affecting aircraft instruments. May also contain engines, including fuel cell engines, carburettors or fuel tanks which contain or have contained fuel, wet or lithium batteries, compressed gases in tyre inflation devices, fire extinguishers, shocks/struts with nitrogen, air bag inflators/air bag modules, flammable adhesives, paints, sealants and solvents, etc.

BATTERY-POWERED DEVICES / EQUIPMENT — may contain wet or lithium batteries.

BREATHING APPARATUS — may indicate cylinders of compressed air or oxygen, chemical oxygen generators or refrigerated liquefied oxygen.

CAMPING EQUIPMENT — may contain flammable gases (butane, propane, etc.), flammable liquids (kerosene, gasoline, etc.), flammable solids (hexamine, matches, etc.) or other dangerous goods.

CHEMICALS — may contain items meeting any of the criteria for dangerous goods, particularly flammable liquids, flammable solids, oxidizers, organic peroxides, toxic or corrosive substances.

COMAT (COMPANY MATERIALS) — such as aircraft parts, may contain dangerous goods as an integral part, e.g. chemical oxygen generators in a passenger service unit (PSU), various compressed gases such as oxygen, carbon dioxide and nitrogen, gas lighters, aerosols, fire extinguishers, flammable liquids such as fuels, paints and adhesives, and corrosive material such as batteries. Other items such as flares, first aid kits, life-saving appliances, matches, magnetized material, etc.

CONSOLIDATED CONSIGNMENTS (GROUPAGES) — may contain any of the defined classes of dangerous goods.

CRYOGENIC (LIQUID) — indicates refrigerated liquefied gases such as argon, helium, neon and nitrogen.

CYLINDERS — may indicate compressed or liquefied gas.

DENTAL APPARATUS — may contain flammable resins or solvents, compressed or liquefied gas, mercury and radioactive material.

DIAGNOSTIC SPECIMENS — may contain infectious substances.

DIVING EQUIPMENT — may contain cylinders (such as scuba tanks, vest bottles, etc.) of compressed gas (air, oxygen, etc), high intensity diving lamps which can generate extremely high heat when operated in air. In order to be carried safely, the bulb or battery must be disconnected.

DRILLING AND MINING EQUIPMENT — may contain explosive(s) and/or other dangerous goods.

DRY SHIPPER (VAPOUR SHIPPER) — may contain free liquid nitrogen. Dry shippers are subject to these Regulations when they permit the release of any free liquid nitrogen irrespective of the orientation of the packaging.

ELECTRICAL EQUIPMENT / ELECTRONIC EQUIPMENT — may contain magnetized materials or mercury in switch gear and electron tubes, wet batteries, lithium batteries or fuel cells or fuel cell cartridges that contain or have contained fuel.

ELECTRICALLY POWERED APPARATUS — (wheel chairs, lawn mowers, golf carts, etc.) may contain wet batteries, lithium batteries or fuel cells or fuel cell cartridges that contain or have contained fuel.

EXPEDITIONARY EQUIPMENT — may contain explosives (flares), flammable liquids (gasoline), flammable gas (propane, camping gas) or other dangerous goods.

FILM CREW OR MEDIA EQUIPMENT — may contain explosive pyrotechnic devices, generators incorporating internal combustion engines, wet batteries, lithium batteries, fuel, heat producing items, etc.

FROZEN EMBRYOS — may contain refrigerated liquefied gas or Carbon dioxide, solid (dry ice).

FROZEN FRUIT, VEGETABLES, ETC. — may be packed in Carbon dioxide, solid (dry ice).

FUELS — may contain flammable liquids, flammable solids or flammable gases.

FUEL CONTROL UNITS — may contain flammable liquids.

HOT AIR BALLOON — may contain cylinders with flammable gas, fire extinguishers, engines internal combustion, batteries, etc.

HOUSEHOLD GOODS — may contain items meeting any of the criteria for dangerous goods including flammable liquids such as solvent based paint, adhesives, polishes, aerosols, bleach, corrosive oven or drain cleaners, ammunition, matches, etc.

INSTRUMENTS — may conceal barometers, manometers, mercury switches, rectifier tubes, thermometers, etc. containing mercury.

LABORATORY / TESTING EQUIPMENT — may contain items meeting any of the criteria for dangerous goods, particularly flammable liquids, flammable solids, oxidizers, organic peroxides, toxic or corrosive substances, lithium batteries, cylinders of compressed gas, etc.

MACHINERY PARTS — may contain adhesives, paints, sealants, solvents, wet and lithium batteries, mercury, cylinders of compressed or liquefied gas, etc.

MAGNETS AND OTHER ITEMS OF SIMILAR MATERIAL — may individually or cumulatively meet the definition of magnetized material.

MEDICAL SUPPLIES / EQUIPMENT — may contain items meeting any of the criteria for dangerous goods, particularly flammable liquids, flammable solids, oxidizers, organic peroxides, toxic, corrosive substances or lithium batteries.

METAL CONSTRUCTION MATERIAL, METAL FENCING, METAL PIPING — may contain ferro-magnetic material, which may be subject to special stowage requirements due to the possibility of affecting aircraft instruments.

PARTS OF AUTOMOBILE (CAR, MOTOR, MOTORCYCLE) — may contain wet batteries, etc.

PASSENGERS BAGGAGE — may contain items meeting any of the criteria for dangerous goods. Examples include fireworks, flammable household liquids, corrosive oven or drain cleaners, flammable gas or liquid lighter refills or camping stove cylinders, matches, ammunition, bleach, aerosols, etc.

PHARMACEUTICALS — may contain items meeting any of the criteria for dangerous goods, particularly radioactive material, flammable liquids, flammable solids, oxidizers, organic peroxides, toxic or corrosive substances.

PHOTOGRAPHIC SUPPLIES / EQUIPMENT — may contain items meeting any of the criteria for dangerous goods, particularly heat producing devices, flammable liquids, flammable solids, oxidizers, organic peroxides, toxic or corrosive substances or lithium batteries.

RACING CAR OR MOTORCYCLE TEAM EQUIPMENT — may contain engines, including fuel cell engines, carburettors or fuel tanks which contain fuel or residual fuel, flammable aerosols, cylinders of compressed gases, nitromethane, other fuel additives, wet batteries, lithium batteries, etc.

REFRIGERATORS — may contain liquefied gases or an ammonia solution. REPAIR KITS — may contain organic peroxides and flammable adhesives, solvent based paints, resins, etc.

SAMPLES FOR TESTING — may contain items meeting any of the criteria for dangerous goods, particularly infectious substances, flammable liquids, flammable solids, oxidizers, organic peroxides, toxic or corrosive substances.

SEMEN — may be packed with Carbon dioxide, solid (dry ice) or refrigerated liquefied gas.

SHIPS' SPARES — may contain explosives (flares), cylinders of compressed gas (life rafts), paint, lithium batteries (emergency locator transmitters), etc.

SHOW, MOTION PICTURE, STAGE AND SPECIAL EFFECTS EQUIPMENT — may contain flammable substances, explosives or other dangerous goods.

SPORTING GOODS / SPORTS TEAM EQUIPMENT — may contain cylinders of compressed or liquefied gas (air, carbon dioxide, etc.), lithium batteries, propane torches, first aid kits, flammable adhesives, aerosols, etc.

SWIMMING POOL CHEMICALS — may contain oxidizing or corrosive substances.

SWITCHES IN ELECTRICAL EQUIPMENT OR INSTRUMENTS — may contain mercury.

TOOL BOXES — may contain explosives (power rivets), compressed gases or aerosols, flammable gases (butane cylinders or torches), flammable adhesives or paints, corrosive liquids, lithium batteries, etc.

TORCHES — micro torches and utility lighters may contain flammable gas and be equipped with an electronic starter. Larger torches may consist of a torch head (often with a self-igniting switch) attached to a container or cylinder of flammable gas.

UNACCOMPANIED PASSENGERS BAGGAGE / PERSONAL EFFECTS — may contain items meeting any of the criteria for dangerous goods, such as fireworks, flammable household liquids, corrosive oven or drain cleaners, flammable gas or liquid lighter refills or camping stove cylinders, matches, bleach, aerosols, etc.

VACCINES — may be packed in Carbon dioxide, solid (dry ice).

Note: Articles and substances which do not fall within the definitions of dangerous goods as shown in these Regulations and which in the event of leakage may cause a serious clean-up problem or corrosion to aluminum on a long term basis must be checked by the shipper to at least ensure that the packaging is adequate to prevent leakage during transportation. These may include brine, powdered or liquid dyes, pickled foodstuffs, etc.

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

DOT CHART 17

Hazardous Materials Markings, Labeling and Placarding Guide

Refer to 49 CFR, Part 172:

Marking - Subpart D

Labeling - Subpart E

Placarding - Subpart F

NOTE: This document is for general guidance only and should not be used to determine compliance with 49 CFR, Parts 100-185.

HAZARDOUS MATERIALS MARKINGS

Package Orientation (Red/Black)

§172.312(a)

Keep Away from Heat

§172.317

Overpack Mark

§173.25(a)(4)

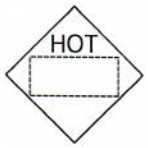
Fumigant Marking

§172.302(g) and §173.9

Material Poisonous by Inhalation

§172.313(a)

Elevated Temperature Material



§172.325

UN ID Number Mark

§§172.332 and §172.336

Biological Substances, Category B

§173.199 (a)(5)

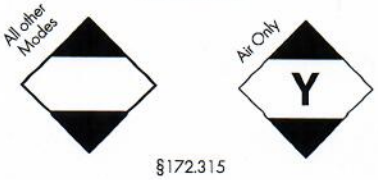
Lithium Battery Handling Mark

§173.185

Marine Pollutant

§172.322

Limited Quantity



§172.315

Biohazard Mark

§172.323

Petroleum Sour Crude Oil

§172.327

Excepted Quantity

§173.4a(g)

Hazardous Materials Warning Labels

Actual label size: at least 100 mm (3.9 inches) on all sides

CLASS 1 Explosives: Divisions 1.1, 1.2, 1.3, 1.4, 1.5, 1.6

Subsidiary Risk Label

§172.411

CLASS 2 Gases: Divisions 2.1, 2.2, 2.3

§172.405(b), §172.415, §172.416, §172.417

CLASS 3 Flammable Liquid

§172.419

CLASS 4 Flammable Solid, Spontaneously Combustible, and Dangerous When Wet: Divisions 4.1, 4.2, 4.3

§172.420, §172.422, §172.423

CLASS 5 Oxidizer, Organic Peroxide: Divisions 5.1 and 5.2

§172.426, §172.427

* Replace with compatibility group letter.

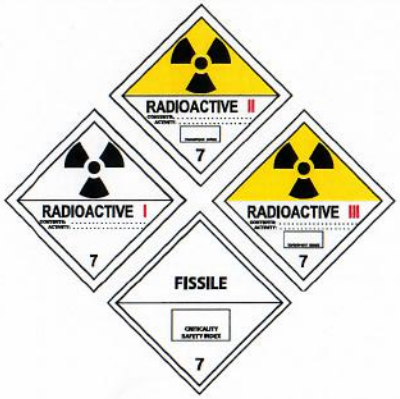
** Replace with division number and compatibility group letter.

CLASS 6 Poison (Toxic), Poison Inhalation Hazard, Infectious Substance: Divisions 6.1 and 6.2

§172.323, §172.405(c), §172.429, §172.430, §172.432

For Regulated Medical Waste (RMW), an Infectious Substance label is not required on an outer packaging if the OSHA Biohazard marking is used as prescribed in 29 CFR 1910.1030(g) (see § 173.134(c)). A bulk package of RMW must display a BIOHAZARD marking (see § 172.323(a)).

CLASS 7 Radioactive

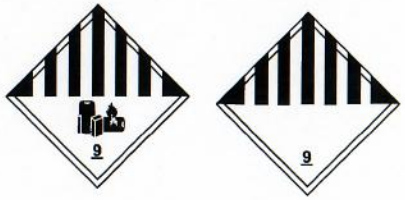


§172.436, §172.438, §172.440, §172.441

CLASS 8 Corrosive

§172.442

CLASS 9 Miscellaneous Hazardous Material



§§172.446, §172.447

Cargo Aircraft Only

§172.448

Empty Label

EMPTY

§172.450

Hazardous Materials Warning Placards

Actual placard size: at least 250 mm (9.84 inches) on all sides

CLASS 1 Explosives

§172.522
§172.523
§172.524
§172.525

* For Divisions 1.1, 1.2, or 1.3, enter division number and compatibility group letter, when required; placard any quantity. For Divisions 1.4, 1.5, and 1.6, enter compatibility group letter, when required; placard 454 kg (1,001 lbs) or more.

CLASS 2 Gases

§172.528
§172.530
§172.532
§172.540

For NON-FLAMMABLE GAS, OXYGEN (compressed gas or refrigerated liquid), and FLAMMABLE GAS, placard 454 kg (1,001 lbs) or more gross weight. For POISON GAS (Division 2.3), placard any quantity.

CLASS 3 Flammable Liquid and Combustible Liquid

§172.542
§172.544

For FLAMMABLE placard 454 kg (1,001 lbs) or more. GASOLINE may be used in place of FLAMMABLE placard displayed on a cargo tank or portable tank transporting gasoline by highway. Placard combustible liquid transported in bulk. See §172.504(f)(2) for use of FLAMMABLE placard in place of COMBUSTIBLE. FUEL OIL may be used in place of COMBUSTIBLE on a cargo or portable tank transporting fuel oil not classed as a flammable liquid by highway.

CLASS 4 Flammable Solid, Spontaneously Combustible, and Dangerous When Wet

§172.546, §172.547, §172.548

For FLAMMABLE SOLID and SPONTANEOUSLY COMBUSTIBLE, placard 454 kg (1,001 lbs) or more. For DANGEROUSE WHEN WET (Division 4.3), placard any quantity.

CLASS 5 Oxidizer & Organic Peroxide

§172.550, §172.552

For OXIDIZER (Division 5.1) and ORGANIC PEROXIDE (Division 5.2 - other than TYPE B, temperature controlled), placard 454 kg (1,001 lbs) or more. For ORGANIC PEROXIDE (Division 5.2), Type B, temperature controlled, placard any quantity.

CLASS 6 Poison (Toxic) and Poison Inhalation Hazard

§172.504(f)(10), §172.554, §172.555

For POISON (PGI or PGII, other than inhalation hazard) and POISON (PGIII), placard 454 kg (1,001 lbs) or more. For POISON-INHALATION HAZARD (Division 6.1), inhalation hazard only, placard any quantity.

CLASS 7 Radioactive

§172.556

Placard all shipments that contain a package labeled as Radioactive Yellow-III; all shipments of unpackaged LSA-I material or SCO-I; all shipments required by §§173.427, 173.441, and 173.457 of this subchapter to be operated under exclusive use; and all closed vehicles used in accordance with §173.443(d).*

CLASS 8 Corrosive

§172.558

For CORROSIVE, placard 454 kg (1,001 lbs) or more.

CLASS 9 Miscellaneous

§172.560

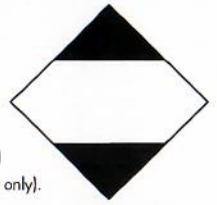
Not required for domestic transportation. A bulk packaging containing a Class 9 material must be marked with the appropriate ID number displayed on a Class 9 placard, an orange panel, or a white square-on-point display.

Dangerous

§172.521

A freight container, unit load device, transport vehicle, or rail car which contains non-bulk packages with two or more categories of hazardous materials that require different placards specified in Table 2 §172.504(e) may be placarded with DANGEROUS placards instead of the specific placards required for each of the materials in Table 2. However, when 1,000 kg (2,205 lbs) or more of one category of material is loaded at one loading facility, the placard specified in Table 2 must be applied.

Limited Quantity Marking



§172.315(a)(2)
(Vessel transport only).

Safety begins with communication!

General Guidelines on Use of Warning Labels and Placards

LABELS

See 49 CFR, Part 172, Subpart E, for complete labeling regulations.

- The Hazardous Materials Table [§172.101, Col. 6] identifies the proper label(s) for the hazardous material listed.
- Any person who offers a hazardous material for transportation MUST label the package, if required [§172.400(a)].
- Labels may be affixed to packages when not required by regulations, provided each label represents a hazard of the material contained in the package [§172.401].
- For labeling mixed or consolidated packages, see §172.404.
- The appropriate hazard class or division number must be displayed in the lower corner of a primary and subsidiary hazard label [§172.402(b)].
- For classes 1,2,3,4,5,6, and 8, text indicating a hazard (e.g., "CORROSIVE") is NOT required on a primary or subsidiary label. The label must otherwise conform to Subpart E of Part 172 [§172.405].
- Labels must be printed on or affixed to the surface of the package near the proper shipping name marking [§172.406(a)].
- When primary and subsidiary labels are required, they must be displayed next to each other [§172.406(c)].
- For a package containing a Division 6.1, PG III material, the POISON label specified in §172.430 may be modified to display the text PG III instead of POISON or TOXIC. Also see §172.313(d) [§172.405(c)].
- The ORGANIC PEROXIDE label (§172.427) indicates that organic peroxides are highly flammable. The color of the border must be black and the color of the flame may be black or white (see § 172.407(d)(2)(iii)).

PLACARDS

See 49 CFR, Part 172, Subpart F, for complete placarding regulations.

- Each person who offers for transportation or transports any hazardous material subject to the Hazardous Materials Regulations must comply with all applicable requirements of Subpart F [§172.500].
- Placards may be displayed for a hazardous material, even when not required, if the placarding otherwise conforms to the requirements of Subpart F of Part 172 [§172.502(c)].
- For other than Class 7 or the DANGEROUS placard, text indicating a hazard (e.g., "FLAMMABLE") is not required. Text may be omitted from the OXYGEN placard only if the specific ID number is displayed on the placard [§172.519(b)(3)].
- For a placard corresponding to the primary or subsidiary hazard class of a material, the hazard class or division number must be displayed in the lower corner of the placard [§172.519(b)(4)].
- Except as otherwise provided, any bulk packaging, freight container, unit load device, transport vehicle or rail car containing any quantity of material listed in Table 1 must be placarded [§172.504].
- When the aggregate gross weight of all hazardous materials in non-bulk packages covered in Table 2 is less than 454 kg (1,001 lbs.), no placard is required on a transport vehicle or freight container when transported by highway or rail [§172.504(c)].
- Notes: See §172.504(f)(10) for placarding Division 6.1, PG III materials.
- Placarded loads require registration with USDOT. See §107.601 for registration regulations.

PLACARDING TABLES

[§172.504(e)]

TABLE 1

Category of material (Hazard Class or division number and additional description, as appropriate)	Placard name
1.1	EXPLOSIVES 1.1
1.2	EXPLOSIVES 1.2
1.3	EXPLOSIVES 1.3
2.3	POISON GAS
4.3	DANGEROUS WHEN WET
5.2 (Organic peroxide, Type B, liquid or solid, temperature controlled)	ORGANIC PEROXIDE
6.1 (Materials poisonous by inhalation (see §171.8))	POISON INHALATION HAZARD
7 (Radioactive Yellow III label only)	RADIOACTIVE[1]

[1] RADIOACTIVE placards are also required for: all shipments of unpackaged LSA-I material or SCO-I; all shipments required by §§173.427, 173.441, and 173.457 of this subchapter to be operated under exclusive use; and all closed vehicles used in accordance with §173.443(d).

TABLE 2

Category of material (Hazard Class or division number and additional description, as appropriate)	Placard name
1.4	EXPLOSIVES 1.4
1.5	EXPLOSIVES 1.5
1.6	EXPLOSIVES 1.6
2.1	FLAMMABLE GAS
2.2	NON-FLAMMABLE GAS
3	FLAMMABLE
Combustible Liquid	COMBUSTIBLE
4.1	FLAMMABLE SOLID
4.2	SPONTANEOUSLY COMBUSTIBLE
5.1	OXIDIZER
5.2 (Other than organic peroxide, Type B, liquid or solid, temperature controlled)	ORGANIC PEROXIDE
6.1 (Other than materials poisonous by inhalation)	POISON
6.2	(None)
8	CORROSIVE
9	Class 9 (See §172.504(f)(9))

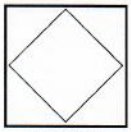
IDENTIFICATION NUMBER DISPLAYS

§172.332, 172.332(c)(4)

*Appropriate placard must be used with orange panel or white square-on-point configuration.

** For a COMBUSTIBLE placard used to display an identification number, the entire background below the white background for the identification number must be white during transportation by rail and may be white during transportation by highway.

IDENTIFICATION NUMBER MARKINGS ON ORANGE PANELS, WHITE SQUARES-ON-POINT, OR APPROPRIATE PLACARDS MUST BE DISPLAYED ON: (1) Tank Cars, Cargo Tanks, Portable Tanks, and other Bulk Packagings; (2) Transport vehicles or freight containers containing 4,000 kg (8,820 lbs.) in non-bulk packages of only a single hazardous material having the same proper shipping name and identification number loaded at one facility and transport vehicle contains no other material, hazardous or otherwise; and (3) transport vehicles or freight containers containing 1,000 kg (2,205 lbs.) of non-bulk packages of materials poisonous by inhalation in Hazard Zone A or B. See §§172.301(a)(3), 172.313(c), 172.326, 172.328,172.330, and 172.331.



Square white background required for placard for highway- route-controlled quantity radioactive material and for rail shipment of certain explosives and poisons, and for flammable gas in a DOT 113 tank car (§172.507 and §172.510).

§172.527

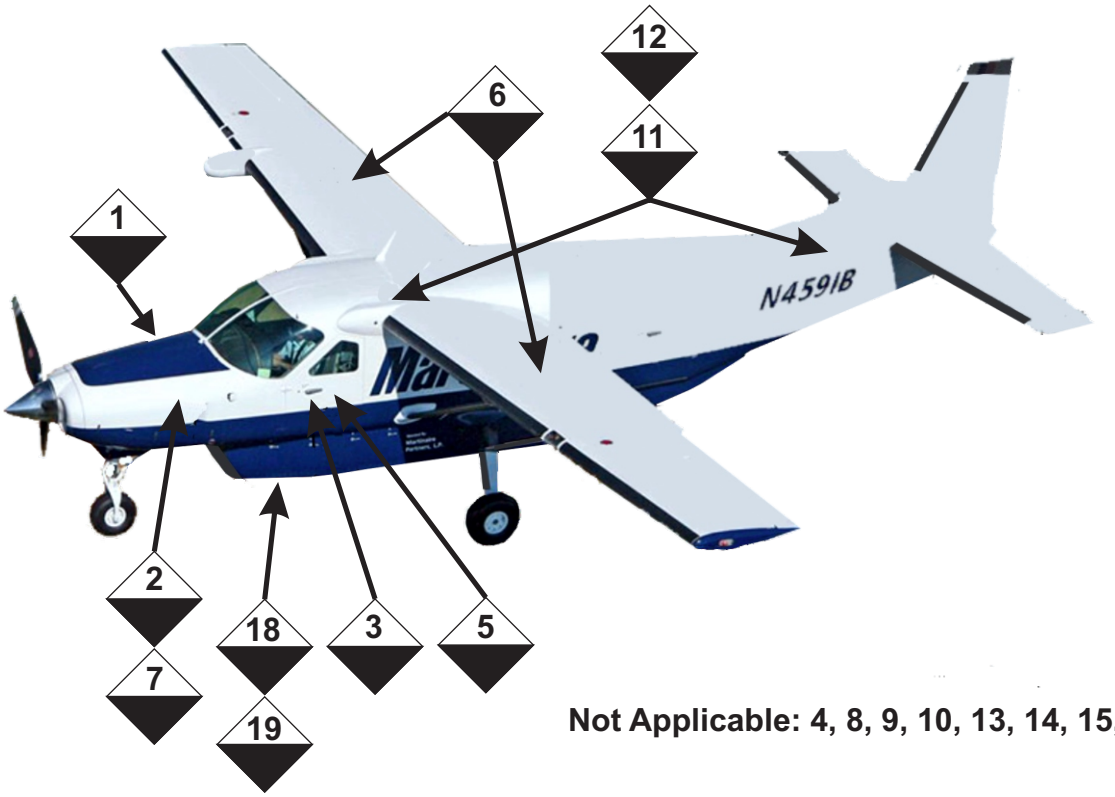
For additional information contact the Hazardous Materials Info Center
1-800-HMR-4922 (1-800-467-4922)
E-mail: infocntr@dot.gov http://phmsa.dot.gov
This Chart is available on line at the following link:
https://www.phmsa.dot.gov/training/hazmat/publications

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

CHART 17 Now Available
AS *FREE* MOBILE APP
Download on the App Store
GET IT ON Google play

PHH50-0190-1121

Hazardous Materials Aboard Aircraft



Not Applicable: 4, 8, 9, 10, 13, 14, 15, 16, 17

1. **Batteries, Aircraft**
2. **Engine Oil** (as hazardous waste)
3. **Escape Slides/Life Rafts**
4. **Fire Bottles** (APU, engines, lower cargo compartment, and lavatory waste containers)
5. **Fire Extinguishers** (attendant stations, closets, galleys, etc.)
6. **Fuel**
7. **Hydraulic Fluid, Reservoirs** (as hazardous waste)
8. **Uranium** (depleted, counter-balance weights)
9. **Ordnance Devices** (off-wing escape)
10. **Oxygen Bottles, Portable, Gaseous**
11. **Oxygen Bottles, Crew System, Gaseous**
12. **Oxygen Bottles, Passenger System, Gaseous** (Standard)
13. **Oxygen Generators** (optional: each PSU standard: each attendant station and lavatory)
14. **Rain Repellant**
15. **Refrigerant** (located in each galley)
16. **Smoke Hoods**
17. **Tritium Radioactive Signs** (aisle and emergency exit doors)
18. **Spare Oil**
19. **Ice-X Boot Treatment**
20.

Hazardous Materials Incident Report: DOT Form F 5800.1 (01-2004)

Includes Guide for Preparing Hazardous Materials Incidents Reports

For an electronic copy of the form and guide, please visit:

https://www.phmsa.dot.gov/hazmat-program-management-data-and-statistics/data-operations/incident-reporting

A downloadable copy of DOT Form F 5800.1 is available to Martinaire personnel on the company website within the Employee Portal, sub-menu Forms.

This form can be reported online at
https://portal.phmsa.dot.gov
once an individual registers with the site.

The completed form may be mailed to the Information Systems Manager at:
Information Systems Manager, PHH-60
Pipeline and Hazardous Materials Safety Administration
Department of Transportation, East Building
1200 New Jersey Ave., SE
Washington, DC 20590-0001

A copy of the completed form may be submitted to the FAA by emailing
9-AWA-AXH-Air5800-1Reports@faa.gov

For assistance in completing form F 5800.1, or any questions regarding reporting requirements, please call the Hazardous Materials Information Center at
800-467-4922.

U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

Hazardous Materials Incident Report

Form Approval OMB No. 2137-0039

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 2137-0039. The filling out of this information is mandatory and will take 96 minutes to complete.

INSTRUCTIONS: Submit this report to the Information Systems Manager, U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, DHM-63, Washington, D.C. 20590-0001. If space provided for any item is inadequate, use a seperate sheet of paper, identifying the entry number being completed. Copies of this form and instructions can be obtained from the Office of Hazardous Materials Website at http://hazmat.dot.gov. If you have any questions, you can contact the Hazardous Materials Information Center at 1-800-HMR-4922 (1-800-467-4922) or online at http://hazmat.dot.gov.

PART I - REPORT TYPE

1. This is to report:
- ☐ **A)** A hazardous material incident
- ☐ **B)** An undeclared shipment with no release
- ☐ **C)** A specification cargo tank 1,000 gallons or greater containing any hazardous materials that (1) received structural damage to the lading retention system or damage that requires repair to a system intended to protect the lading retention system and (2) did not have a release.

2. Indicate whether this is: ☐ An initial report ☐ A supplemental (follow-up) report ☐ Additional Pages

PART II - GENERAL INCIDENT INFORMATION

3. Date of Incident: _____ **4.** Time of Incident (use 24-hour time): _____

5. Enter National Response Center Report Number (if applicable): _____

6. If you submitted a report to another Federal DOT agency, enter the agency and report number: _____

7. Location of Incident: City: _____ County: _____ State: _____ ZIP Code (if known): _____

Street Address/Mile Marker/Yardname/Airport/Body of Water/River Mile _____

8. Mode of Transportation ☐ Air ☐ Highway ☐ Rail ☐ Water

9. Transportation Phase ☐ In Transit ☐ Loading ☐ Unloading ☐ In Transit Storage

10. Carrier/Reporter
Name _____
Street _____
City _____ State _____ ZIP Code _____
Federal DOT ID Number _____ Hazmat Registration Number _____

11. Shipper/Offeror
Name _____
Street _____
City _____ State _____ ZIP Code _____
Waybill/Shipping Paper _____ Hazmat Registration Number _____

12. Origin (if different from shipper address)
Street _____
City _____ State _____ ZIP Code _____

13. Destination
Street _____
City _____ State _____ ZIP Code _____

14. Proper Shipping Name of Hazardous Material: _____

15. Technical/Trade Name: _____

16. Hazardous Class/Division: _____

17. Identification Number: _____ (E.g. UN2764, NA 2020)

18. Packing Group: _____ (if applicable)

19. Quantity Released: _____ (Include Measurement Units)

20. Was the material shipped as a hazardous waste? ☐ Yes ☐ No If yes, provide the EPA Manifest Number: _____

21. Is this a Toxic by Inhalation (TIH) material? ☐ Yes ☐ No If yes, provide the Hazard Zone: _____

22. Was the material shipped under an Exemption, Approval, or Competent Authority Certificate? ☐ Yes ☐ No

If yes, provide the Exemption, Approval, or CA number: _____

23. Was this an undeclared hazardous materials shipment? ☐ Yes ☐ No

PART III - PACKAGING INFORMATION

24. Check Packaging Type (check only one - if more than one, list type of packaging, copy Part III, and complete for each type:

☐ Non-bulk ☐ IBC ☐ Cargo tank Motor Vehicle (CTMV) ☐ Tank Car

☐ Cylinder ☐ RAM ☐ Portable Tank ☐ Other _____

25. See instructions and enter the appropriate failure codes found at the end of the instructions. Be sure to enter the codes from the list that corresponds to the particular packaging type checked above. Enter the number of codes as appropriate to describe the incident. Enter the most important failure point in line 1. If there are more than two failure points, provide in this format in part VI.

1. What Failed: ____ ____ ____ How Failed: ____ ____ ____ Causes of Failure: ____ ____ ____

2. What Failed: ____ ____ ____ How Failed: ____ ____ ____ Causes of Failure: ____ ____ ____

26a. Provide the packaging identification markings, if available.

Identification Markings: _____

(Examples: 1A1/Y1.4/150/92/USA/RB/93/RL, UN31H1/Y0493/USA/M9339/10800/1200, DOT - 105A - 100W (RAIL), DOT 406 (HIGHWAY), DOT 51, DOT 3-A)

26b. For Non-bulk, IBC, or non-specification packaging, if identification markings are incomplete or unavailable, see instructions and complete the following:

Single Package or Outer Packaging:

Packaging Type: _____

Material of Construction: _____

Head Type (Drums only): ☐ Removable ☐ Non - Removable

Single Package or Inner Packaging (if any):

Packaging Type: _____

Material of Construction: _____

27. Describe the package capacity and the quantity:

Single Package or Outer Packaging:

Package Capacity: _____

Amount in Package: _____

Number in Shipment: _____

Number Failed: _____

Single Package or Inner Packaging (if any):

Package Capacity: _____

Amount in Package: _____

Number in Shipment: _____

Number Failed: _____

28. Provide packaging construction and test information, as appropriate:

Manufacturer: _____ Manufacture Date: _____

Serial Number: _____ Last Test Date: _____

Material of Construction: _____ (if Tank Car, CTMV, Portable Tank, or Cylinder)

Design Pressure: _____ (if Tank Car, CTMV, Portable Tank)

Shell Thickness: _____ (if Tank Car, CTMV, Portable Tank)

Head Thickness: _____ (if Tank Car, CTMV)

Service Pressure: _____ (if Cylinder)

If valve or device failed:

Type: _____ Manufacturer: _____ (if present and legible) Model: _____ (if present and legible)

29. If the packaging is for Radioactive Materials, complete the following:

Packaging Category: ☐ Type A ☐ Type B ☐ Type C ☐ Excepted ☐ Industrial

Packaging Certification: ☐ Self Certified ☐ U.S. Certification Certification Number _____

Nuclide(s) Present: _____ Transport Index: _____

Activity: _____ Critical Safety Index: _____

PART IV - CONSEQUENCES

30. Result of Incident (check all that apply): ☐ Spillage ☐ Fire ☐ Explosion ☐ Material Entered Waterway/Storm Sewer ☐ Vapor (Gas) Dispersion ☐ Environmental Damage ☐ No Release

31. Emergency Response : The following entities responded to the incident: (Check all that apply)

☐ Fire/EMS Report # _____ ☐ Police Report # _____ ☐ In-house cleanup ☐ Other Cleanup

32. Damages: Was the total damage cost more than $500? ☐ Yes ☐ No

If yes, enter the following information: If no, go to question 33.

Material Loss: $ _____ Carrier Damage: $ _____ Property Damage: $ _____ Response Cost: $ _____ Remediation/Cleanup Cost: $ _____

(See damage definitions in the instructions)

33a. Did the hazardous material cause or contribute to a human fatality? ☐ Yes ☐ No

If yes, enter the number of fatalities resulting from the hazardous material:

Fatalities: Employees _____ Responders _____ General Public _____

33b. Were there human fatalities that did not result from the hazardous material? ☐ Yes ☐ No If yes, how many? _____

34. Did the hazardous material cause or contribute to personal injury? ☐ Yes ☐ No

If yes, enter the number of injuries resulting from the hazardous material:

Hospitalized (Admitted Only): Employees _____ Responders _____ General Public _____

Non-Hospitalized: Employees _____ Responders _____ General Public _____

(e.g.: On site first aid or Emergency Room observation and release)

35. Did the hazardous material cause or contribute to an evacuation? ☐ Yes ☐ No

If yes, provide the following information:

Total number of general public evacuated _____ Total number of employees evacuated _____ Total Evacuated _____

Duration of the evacuation _____ (hours)

36. Was a major transportation artery or facility closed? ☐ Yes ☐ No If yes, how many? _____ (hours)

37. Was the material involved in a crash or derailment? ☐ Yes ☐ No

If yes, provide the following information: Estimated speed (mph): _____ Weather conditions: _____

Vehicle overturn? ☐ Yes ☐ No

Vehicle left roadway/track? ☐ Yes ☐ No

PART V - AIR INCIDENT INFORMATION (please refer to § 175.31 to report a discrepancy for air shipments)

38. Was the shipment on a passenger aircraft? ☐ Yes ☐ No

If yes, was it tendered as cargo, or as passenger baggage?

☐ Cargo ☐ Passenger baggage

39. Where did the incident occur (if unknown, check the appropriate box for the location where the incident was discovered)?

☐ Air carrier cargo facility ☐ Sort center ☐ Baggage area

☐ By surface to/from airport ☐ During flight ☐ During loading/unloading of aircraft

40. What phase(s) had the shipment already undergone prior to the incident? (Check all that apply)

☐ Shipment had not been transported ☐ Transported by air (first flight) ☐ Transport by air (subsequent flights)

☐ Initial transport by highway to cargo facility ☐ Transfer at sort center/cargo facility

PART VI - DESCRIPTION OF EVENTS & PACKAGE FAILURE

Describe the sequence of events that led to the incident and the actions taken at the time it was discovered. Describe the package failure, including the size and location of holes, cracks, etc. Photographs and diagrams should be submitted if needed for clarification. Estimate the duration of the release, if possible. Describe what was done to mitigate the effects of the release. Continue on additional sheets if necessary.

PART VII - RECOMMENDATIONS/ACTIONS TAKEN TO PREVENT RECURRENCE

Where you are able to do so, suggest or describe changes (such as additional training, use of better packaging, or improved operating procedures) to help prevent recurrence. Provide recommendations for improvement to hazardous materials transportation beyond the control of your individual company. Continue on additional sheets if necessary.

PART VIII- CONTACT INFORMATION

Contact's Name (Type or Print): _____ Telephone Number: ( )

Contact's Title: _____ Fax Number: ( )

Business Name and Address: _____ Hazmat Registration Number (if not already provided):

_____ _____

E-mail Address: _____ Date: _____

Preparer is: ☐ Carrier ☐ Shipper ☐ Facility ☐ Other _____

D005

SUBMIT

Notification of Hazardous Material Policies and Operation Specifications

Date: 06/18/2020

To: Whom It May Concern

From: Martinaire Aviation, L.L.C.

Martinaire Aviation LLC is hereby notifying you of our policies and operation specifications concerning the transport of Hazardous Materials as required by 14 CFR 135.505(e).

1. Martinaire Aviation is a 14 CFR Part 135 carrier with a 'will-carry' status.

2. Martinaire has a Dangerous Goods program approved by the FAA.

3. Martinaire will only transport Dangerous Goods and non-regulated shipments or materials that have been scrutinized and loaded by personnel qualified under the appropriate, function-specific training in the Martinaire Dangerous Goods Program.

4. No person, including employees, vendors, contractors, or contract employees, working on behalf of a Repair Station may perform any transportation function on behalf of Martinaire other than preparing shipments for transportation under the conditions set forth in this notification. This restriction specifically includes (a) Acceptance; (b) Rejection; © Handling; (d) Storage incidental to transport; (e) Loading; and (f) Transportation of Hazardous Materials.

5. Authorized Repair Stations employees may package Martinaire Company Materials (COMAT) only under the following conditions:

- No Dangerous Goods/Hazardous Materials classified under 49 CFR Part 172, intended for use by Martinaire, whether regulated or non-regulated, may be transported on Martinaire aircraft.

- This does not apply to items deemed 'Ship's Equipment'.

6. Martinaire-owned materials being offered for transportation as common carriage shipments to Martinaire or any other commercial carrier are not subject to Martinaire Policy restrictions.

I hereby acknowledge receipt of this notification in accordance with 14 CFR 145.206(a).

_____

_____

_____

ACCEPTANCE CHECKLISTS Non-Radioactive/Radioactive/Dry Ice

Appendix F applies if the operator elects to accept and transport Hazardous Materials using the International Air Transport Association's 'Technical Instructions' in addition to 49 CFR Hazardous Materials Regulations.

2020
DANGEROUS GOODS CHECKLIST FOR A NON-RADIOACTIVE SHIPMENT

The recommended checklist appearing on the following pages is intended to verify shipments at origin. Copies of the checklist can be obtained from:

Website: http://www.iata.org/whatwedo/cargo/dgr/Pages/download.aspx

Never accept or refuse a shipment before all items have been checked.

Is the following information correct for each entry?

SHIPPER'S DECLARATION FOR DANGEROUS GOODS (DGD)

	YES	NO*	N/A
1. Two copies in English and in the IATA format including the air certification statement. This question may be indicated as not applicable "N/A" only when the Shipper's Declaration data is submitted electronically [8.0.2.1, 8.1.1, 8.1.2, 8.1.6.12]	☐	☐	☐
2. Full name and address of Shipper and Consignee [8.1.6.1, 8.1.6.2]	☐	☐	
3. If the Air Waybill number is not shown, enter it. [8.1.6.3]	☐		
4. The number of pages shown. This question may be indicated as not applicable "N/A" only when the Shipper's Declaration data is submitted electronically [8.1.6.4]	☐	☐	☐
5. The non-applicable Aircraft Type deleted or not shown [8.1.6.5]	☐	☐	
6. If full name of Airport or City of Departure or Destination is not shown, enter it. [8.1.6.6 and 8.1.6.7]	☐		
7. The word "Radioactive" deleted or not shown [8.1.6.8]	☐	☐	
Identification			
8. UN or ID number(s), preceded by prefix [8.1.6.9.1, Step 1]	☐	☐	
9. Proper Shipping Name and the technical name in brackets for entries with ★ [8.1.6.9.1, Step 2]	☐	☐	
10. Class or Division and for Class 1, the Compatibility Group, [8.1.6.9.1, Step 3]	☐	☐	
11. Subsidiary hazard, in brackets, immediately following Class or Division [8.1.6.9.1, Step 4]	☐	☐	☐
12. Packing Group [8.1.6.9.1, Step 5]	☐	☐	☐
Quantity and Type of Packing			
13. Number and Type of Packages [8.1.6.9.2, Step 6]	☐	☐	
14. Quantity and unit of measure (net, or gross followed by "G", as applicable) within per package limit [8.1.6.9.2, Step 6]	☐	☐	
15. For Class 1, the net quantity supplemented with the net explosive mass followed by unit of measurement [8.1.6.9.2, Step 6]	☐	☐	☐
16. When different dangerous goods are packed in one outer packaging, the following rules are complied with:			
16.1 – Compatible according to Table 9.3.A.	☐	☐	☐
16.2 – Conditions met for UN packages containing Division 6.2 [5.0.2.11(c)]	☐	☐	☐
16.3 – Wording "All packed in one (type of packaging)" [8.1.6.9.2, Step 6(f)]	☐	☐	☐
16.4 – Calculation of "Q" value which must not exceed 1 [5.0.2.11 (g) & (h); 2.7.5.6; 8.1.6.9.2, Step 6(g)]	☐	☐	☐
17. Overpack			
17.1 – Compatible according to Table 9.3.A	☐	☐	☐
17.2 – Wording "Overpack Used" [8.1.6.9.2, Step 7]	☐	☐	☐
17.3 – If more than one overpack is used, identification marks shown and total quantity of dangerous goods [8.1.6.9.2, Step 7]	☐	☐	☐
Packing Instructions			
18. Packing Instruction Number [8.1.6.9.3, Step 8]	☐	☐	
19. For lithium batteries in compliance with Section IB, "IB" follows the packing instruction [8.1.6.9.3, Step 8]	☐	☐	☐
Authorizations			
20. Check all verifiable special provisions. The Special Provision Number A1, A2, A4, A5, A51, A81, A88, A99, A130, A190, A191, A201, A202, A211, A212, A331 if used [8.1.6.9.4, Step 9]	☐	☐	☐
21. Indication that governmental authorization is attached, including a copy in English and additional approvals for other items under [8.1.6.9.4, Step 9]	☐	☐	☐
Additional Handling Information			
22. Additional handling information shown for self-reactive and related substances of Division 4.1 and organic peroxides of Division 5.2, or samples thereof, PBE, infectious and controlled substances, fireworks (UN0336 & UN0337) and viscous flammable liquids [8.1.6.11]	☐	☐	☐
23. **Name of Signatory and Date** indicated and **Signature** of Shipper [8.1.6.13, 8.1.6.14 and 8.1.6.15]	☐	☐	
24. **Amendment** or alteration signed by Shipper [8.1.2.6]	☐	☐	☐

61st EDITION, 1 JANUARY 2020

	YES	NO*	N/A
AIR WAYBILL–HANDLING INFORMATION			
25. The statement: "Dangerous goods as per attached Shipper's Declaration" or "Dangerous Goods as per attached DGD" [8.2.1(a)]	☐	☐	
26. "Cargo Aircraft Only" or "CAO", if applicable [8.2.1(b)]	☐	☐	☐
27. Where non-dangerous goods are included, the number of pieces of dangerous goods shown [8.2.2]	☐	☐	☐
PACKAGE(S) AND OVERPACKS			
28. Packaging free from damage and leakage [9.1.3 (i)]	☐	☐	
29. Packaging conforms with packing instruction	☐	☐	☐
30. Same number and type of packagings and overpacks delivered as shown on DGD [9.1.3]	☐	☐	
Marks			
31. UN Specification Packaging, marked according to 6.0.4 and 6.0.5:			
31.1 – Symbol and Specification Code [6.0.4.2.1 (a), (b)]	☐	☐	☐
31.2 – X, Y or Z meets or exceeds Packing Group/Packing Instruction requirements [6.0.4.2.1 (c)]	☐	☐	☐
31.3 – Gross Weight within limits (Solids, Inner Packagings or IBCs [SP A179, 6.0.4.2.1 (d)]	☐	☐	☐
31.4 – Plastic drums, jerricans and IBCs within permitted period of use [5.0.2.15]	☐	☐	☐
31.5 – Infectious substance package mark [6.5.3.1]	☐	☐	☐
32. UN or ID number(s), preceded by prefix [7.1.4.1(a)]	☐	☐	
33. The Proper Shipping Name(s) including technical name where required [7.1.4.1(a)]	☐	☐	
34. The full name and address of Shipper and Consignee [7.1.4.1(b)]	☐	☐	
35. For consignments of more than one package of all classes (except ID 8000 and Class 7) the net quantity, or gross weight followed by "G", as applicable, unless contents are identical, marked on the packages [7.1.4.1(c)]	☐	☐	☐
36. Carbon Dioxide, Solid (Dry Ice), the net weight marked on the packages [7.1.4.1(d)]	☐	☐	☐
37. The Name and Telephone Number of a responsible person for Division 6.2 Infectious Substances shipment [7.1.4.1(e)]	☐	☐	☐
38. The Special Marking requirements shown for Packing Instruction 202 [7.1.4.1(f)]	☐	☐	☐
39. Limited Quantities mark [7.1.4.2]	☐	☐	☐
40. Environmentally Hazardous Substance mark [7.1.5.3]	☐	☐	☐
41. Lithium Battery mark [7.1.5.5]	☐	☐	☐
Labelling			
42. The label(s) identifying the Primary hazard as per 4.2, Column D properly affixed [7.2.3.1; 7.2.6]	☐	☐	
43. The label(s) identifying the Subsidiary hazard, as per 4.2, Column D properly affixed [7.2.3.1; 7.2.6.2.3]	☐	☐	☐
44. "Cargo Aircraft Only" label [7.2.4.2; 7.2.6.3]	☐	☐	☐
45. "Orientation" labels on two opposite sides, if applicable [7.2.4.4]	☐	☐	☐
46. "Cryogenic Liquid" label, if applicable as per 4.2, Column D [7.2.4.3]	☐	☐	☐
47. "Keep Away From Heat" label, if applicable as per 4.2, Column D [7.2.4.5]	☐	☐	☐
48. Any irrelevant marks and labels removed or obliterated [7.1.1; 7.2.1]	☐	☐	
For Overpacks			
49. Packaging use marks and hazard and handling labels, as required must be clearly visible or reproduced on the outside of the overpack [7.1.7.1, 7.1.7.2, 7.2.7]	☐	☐	☐
50. The word "Overpack" marked if marks and labels are not visible on packages within the overpack [7.1.7.1]	☐	☐	☐
51. If more than one overpack is used, identification marks shown and total quantity of dangerous goods [7.1.7.3]	☐	☐	☐
GENERAL			
52. State and Operator variations complied with [2.6]	☐	☐	☐
53. Cargo Aircraft Only shipments, a cargo aircraft operates on all sectors	☐	☐	☐

Comments: _____

_____

Checked by: _____

Place: _____ Signature: _____

Date: _____ Time: _____

*** IF ANY BOX IS CHECKED "NO", DO NOT ACCEPT THE SHIPMENT AND GIVE A DUPLICATE COPY OF THIS COMPLETED FORM TO THE SHIPPER.**

61st EDITION, 1 JANUARY 2020

2020
DANGEROUS GOODS CHECKLIST FOR A RADIOACTIVE SHIPMENT

The recommended checklist appearing on the following pages is intended to verify shipments at origin. Copies of the checklist can be obtained from:

Website: http://www.iata.org/whatwedo/cargo/dgr/Pages/download.aspx

Never accept or refuse a shipment before all items have been checked.

Is the following information correct for each entry?

SHIPPER'S DECLARATION FOR DANGEROUS GOODS (DGD)

	YES	NO*	N/A
1. Two copies in English and in the IATA format including the air certification statement. This question may be indicated as not applicable "N/A" only when the Shipper's Declaration data is submitted electronically [10.8.1.2, 10.8.1.4; 8.1.1; 10.8.3.12.2]	☐	☐	☐
2. Full name and address of Shipper and Consignee [10.8.3.1, 10.8.3.2]	☐	☐	
3. If the Air Waybill number is not shown, enter it. [10.8.3.3]	☐		
4. The number of pages shown. This question may be indicated as not applicable "N/A" only when the Shipper's Declaration data is submitted electronically [10.8.3.4]	☐	☐	☐
5. The non-applicable Aircraft Type deleted or not shown [10.8.3.5]	☐	☐	
6. If full name of Airport or City of Departure or Destination is not shown, enter it. [10.8.3.6 and 10.8.3.7]	☐		
7. The word "Non-Radioactive" deleted or not shown [10.8.3.8]	☐	☐	
Identification			
8. UN number, preceded by prefix "UN" [10.8.3.9.1, Step 1]	☐	☐	
9. Proper Shipping Name and where Special Provision A78 applies, the supplementary information in brackets [10.8.3.9.1, Step 2]	☐	☐	
10. Class 7 [10.8.3.9.1, Step 3]	☐	☐	
11. Subsidiary hazard, in brackets, immediately following Class [10.8.3.9.1, Step 4] and Packing Group if required for Subsidiary hazard [10.8.3.9.1, Step 5]	☐	☐	☐
Quantity and Type of Packing			
12. Name or Symbol of Radionuclide(s) [10.8.3.9.2, Step 6 (a)]	☐	☐	
13. A description of the physical and chemical form if in other form [10.8.3.9.2, Step 6 (b)]	☐	☐	☐
14. "Special Form" (not required for UN 3332 or UN 3333) or low dispersible material [10.8.3.9.2, Step 6 (b)]	☐	☐	☐
15. The number and type of packages and the activity in becquerel or multiples thereof in each package. For Fissile Material the total weight in grams or kilograms of fissile material may be shown in place of activity [10.8.3.9.2, Step 7]	☐	☐	
16. For different individual radionuclides, the activity of each radionuclide and the words "All packed in one (type of package)" [10.8.3.9.2, Step 7]	☐	☐	☐
17. Activity within limits for Type A packages [Table 10.3.A], Type B, or Type C (see attached competent authority certificate)	☐	☐	☐
18. Words "Overpack Used" shown on the DGD [10.8.3.9.2, Step 8]	☐	☐	☐
Packing Instructions			
19. Category of package(s) and overpack if applicable [10.5.15.1 (a), 10.8.3.9.3, Step 9 (a) and Table 10.5.C]	☐	☐	
20. Transport Index and dimensions (preferably in sequence Length x Width x Height) for Category II and Category III only [10.8.3.9.3, Step 9 (b) and (c)]	☐	☐	☐
21. For Fissile Material the Criticality Safety Index (with, in addition and if applicable", reference to paragraphs 10.6.2.8.1.3 (a) to (c) or 10.6.2.8.1.4), or the words "Fissile Excepted" [10.8.3.9.3, Step 9 (d)]	☐	☐	☐
Authorizations			
22. Identification marks shown and a copy of the document in English attached to DGD for the following [10.5.7.2.3; 10.8.3.9.4, Step 10; 10.8.7]:			
22.1 – Special Form approval certificate	☐	☐	☐
22.2 – Type B package design approval certificate	☐	☐	☐
22.3 – Other approval certificates as required	☐	☐	☐
23. **Additional Handling Information** [10.8.3.11]	☐	☐	☐
24. **Name of Signatory and Date** indicated [10.8.3.13 and 10.8.3.14] and **Signature of** Shipper [10.8.3.15]	☐	☐	
25. **Amendment** or **alteration signed** by Shipper [10.8.1.7]	☐	☐	☐

61st EDITION, 1 JANUARY 2020

	YES	NO*	N/A
AIR WAYBILL–HANDLING INFORMATION			
26. The statement: "Dangerous goods as per attached Shipper's Declaration" or "Dangerous Goods as per attached DGD" [10.8.8.1(a)]	☐	☐	
27. "Cargo Aircraft Only" or CAO, if applicable [10.8.8.1(b)]	☐	☐	☐
28. Where non-dangerous goods are included, the number of pieces of dangerous goods shown [10.8.8.2]	☐	☐	☐
PACKAGE(S) AND OVERPACKS			
29. Same number and type of packagings and overpacks delivered as shown on DGD	☐	☐	
30. Unbroken transportation seal [10.8.2.4.1.2] and package in proper condition for carriage [9.1.3; 9.1.4]	☐	☐	☐
Marks			
31. UN number, preceded by prefix [10.7.1.3.1]	☐	☐	
32. The Proper Shipping Name and where Special Provision A78 applies, the supplementary information in brackets [10.7.1.3.1]	☐	☐	
33. The full name and address of the Shipper and Consignee [10.7.1.3.1]	☐	☐	
34. The permissible gross weight if the gross weight of the package exceeds 50 kg [10.7.1.3.1]	☐	☐	☐
35. Type A packages, marked as per 10.7.1.3.4	☐	☐	☐
36. Type B packages, marked as per 10.7.1.3.5	☐	☐	☐
37. Type C packages, Industrial Packages and packages containing Fissile material marked as per 10.7.1.3.6, 10.7.1.3.3 or 10.7.1.3.7	☐	☐	☐
Labelling			
38. Same category labels as per DGD properly affixed to two opposite sides of package. [10.7.4]	☐	☐	
38.1 – Symbol of radionuclide and/or LSA/SCO indicated as required. [10.7.3.3.1]	☐	☐	
38.2 – Activity in Bq (or multiples thereof). For Fissile material, the total mass in grams may be used instead [10.7.3.3.2]	☐	☐	
38.3 – For Category II & III, same TI as per DGD, rounded-up to one decimal place. [10.7.3.3.3]	☐	☐	☐
39. Applicable label(s) identifying the subsidiary hazard [10.7.3.2; 10.7.4.3]	☐	☐	☐
40. Two "Cargo Aircraft Only" labels, if required, on the same surface near the hazard labels [10.7.4.2.4; 10.7.4.3.1; 10.7.4.4.1]	☐	☐	☐
41. For fissile materials, two correctly completed Criticality Safety Index (CSI) labels on the same surface as the hazard labels [10.7.3.3.4; 10.7.4.3.1]	☐	☐	☐
42. Any irrelevant marks and labels removed or obliterated [10.7.1.1; 10.7.2.1]	☐	☐	
For Overpacks			
43. Package use marks and labels clearly visible or reproduced on the outside of the overpack [10.7.1.4.1; 10.7.4.4]	☐	☐	☐
44. The word "Overpack" marked if marks and labels are not visible on packages within the overpack [10.7.1.4.1]	☐	☐	☐
45. If more than one overpack is used, identification marks shown [10.7.1.4.3]	☐	☐	☐
46. Hazard labels reflect the content(s) and activity of each individual radionuclide and the TI of the overpack [10.7.3.4]	☐	☐	☐
GENERAL			
47. State and Operator variations complied with [2.6]	☐	☐	☐
48. Cargo Aircraft Only shipments, a cargo aircraft operates on all sectors	☐	☐	☐
49. Packages containing Carbon dioxide solid (dry ice), the marking, labelling and documentary requirements complied with [Packing Instruction 954; 7.1.4.1 (d); 7.2.3.9.1]	☐	☐	☐

Comments: _____

_____

Checked by: _____

Place: _____ Signature: _____

Date: _____ Time: _____

***IF ANY BOX IS CHECKED "NO", DO NOT ACCEPT THE SHIPMENT AND GIVE A DUPLICATE COPY OF THIS COMPLETED FORM TO THE SHIPPER.**

61st EDITION, 1 JANUARY 2020

2020
ACCEPTANCE CHECKLIST FOR DRY ICE (Carbon Dioxide, solid)
(For use when a Shipper's Declaration for Dangerous Goods is not required)

A checklist is required for all shipments of dangerous goods (9.1.4) to enable proper acceptance checks to be made. The following example checklist is provided to assist shippers and carriers with the acceptance of dry ice when packaged on its own or with non-dangerous goods.

Is the following information correct for each entry?

DOCUMENTATION

	YES	NO*	N/A
The Air Waybill contains the following information in the "Nature and Quantity of Goods" box [8.2.3]			
1. "UN1845"	☐	☐	
2. The words "Carbon dioxide, solid" or "Dry ice"	☐	☐	
3. Number of packages (unless these are the only packages within the consignment)	☐	☐	
4. The net weight of dry ice in kilograms	☐	☐	
Quantity			
5. The quantity of dry ice per package is 200 kg or less [4.2]	☐	☐	
PACKAGES AND OVERPACKS			
6. Same number of packages as shown on the Air Waybill	☐	☐	
7. Packages free from damage and leakage	☐	☐	
8. The packaging conforms with Packing Instruction 954 and the package is vented to permit the release of gas	☐	☐	
Marks & Labels			
9. "UN1845" marked [7.1.4.1(a)]	☐	☐	
10. The words "Carbon dioxide, solid" or "Dry ice" [7.1.4.1(a)]	☐	☐	
11. Full name and address of the shipper and consignee [7.1.4.1(b)]	☐	☐	
Note: The name and address of the shipper and consignee marked on the package may differ from that on the AWB.			
12. The net weight of dry ice within each package [7.1.4.1(d)]	☐	☐	
13. Class 9 label properly affixed [7.2.3.9, 7.2.6]	☐	☐	
14. Irrelevant marks and labels removed or obliterated [7.1.1(b); 7.2.1(a)]	☐	☐	☐
Note: The Marking and labelling requirements do not apply to ULDs containing dry ice			
For Overpacks			
15. Packaging Use marks and hazard and handling labels, as required must be clearly visible or reproduced on the outside of the overpack [7.1.7.1, 7.2.7]	☐	☐	☐
16. The word "Overpack" marked if marks and labels are not visible on packages within the overpack [7.1.7.1]	☐	☐	☐
17. The total net weight of carbon dioxide, solid (dry ice) in the overpack [7.1.7.1]	☐	☐	☐
Note: The Marking and labelling requirements do not apply to ULDs containing dry ice			
State and Operator Variations			
18. State and operator variations complied with [2.5]	☐	☐	☐

Comments: _____

_____

Checked by: _____

Place: _____ Signature: _____

Date: _____ Time: _____

***IF ANY BOX IS CHECKED "NO", DO NOT ACCEPT THE SHIPMENT AND GIVE A DUPLICATE COPY OF THIS COMPLETED FORM TO THE SHIPPER.**

61st EDITION, 1 JANUARY 2020

April 10, 2018

U.S. Department
of Transportation

East Building, PHH-30
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

Pipeline and Hazardous
Materials Safety Administration

DOT-SP 11110
(TWENTIETH REVISION)

EXPIRATION DATE: 2022-03-31

(FOR RENEWAL, SEE 49 CFR 107.109)

1. GRANTEE: United Parcel Service Co. (UPSCO)
Louisville, KY

2. PURPOSE AND LIMITATION:

a. This special permit authorizes the transportation in commerce of certain hazardous materials in an inaccessible location aboard an aircraft in quantities exceeding those authorized by § 175.75 subject to the conditions and limitations provided herein. This special permit authorizes the hazardous materials identified in paragraph 6 below, which are otherwise permitted to be carried aboard passenger-carrying aircraft, to be loaded:

(1) In any inaccessible cargo compartment;

(2) In any freight container within an accessible cargo compartment; and

(3) In any accessible cargo compartment in a cargo-only aircraft in a manner that makes them inaccessible in flight.

This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.

b. The safety analyses performed in development of this special permit only considered the hazards and risks associated with transportation in commerce.

Continuation of DOT-SP 11110 (20th Rev.)

c. Party status will not be granted to this special permit.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 171.8 (modified) and § 175.75 in that quantity limitations are exceeded.

5. BASIS: This special permit is based on United Parcel Service Co. (UPSCO)'s application dated February 21, 2018, submitted in accordance with § 107.105 and the public proceeding thereon.

6. HAZARDOUS MATERIALS (49 CFR 172.101):

Hazardous Materials Description			
Proper Shipping Name	**Hazard Class/ Division**	**Identification Number**	**Packing Group**
Division 1.4S hazardous materials*	1.4S	As appropriate	N/A
Class 8 hazardous materials not meeting the definition of any other hazard class*	8	As appropriate	III
Class 8 articles to which no packing group is assigned in the relevant entry of the § 172.101 Hazardous Materials Table*	8	UN2794, UN2795, UN2800, UN3028, UN3477 or UN3506	N/A

*The hazardous materials shipped under the terms of this special permit must be described by the specific chemical name or generic description, as appropriate.

Continuation of DOT-SP 11110 (20th Rev.)

7. PACKAGING AND SAFETY CONTROL MEASURES:

a. Hazardous materials must in all respects be acceptable for transport by passenger-carrying aircraft, including the quantity limitations specified in Column (9A) of the Hazardous Materials Table (§ 172.101); however, no package may exceed a gross mass of 32 kg (70 pounds).

b. Only combination packagings authorized by the HMR for the hazardous materials concerned are permitted (i.e., single packagings are not authorized) to be transported under terms of this special permit.

c. The following requirements apply to air carriers:

(1) Will Carry Status: Each carrier must certify that they are a "will carry" operator with a current, approved FAA hazardous material program.

(2) UPSCO Hazardous Material Program Review: Each carrier must certify that they have received and reviewed UPSCO's FAA approved hazardous material program.

(3) DOT-SP 11110: Each carrier must certify that they have received and reviewed a copy of DOT SP-11110 and provide a statement that they agree to and are prepared to operate under the terms specified in the permit.

(4) Identification of Additional Training Requirements: Each carrier must document any differences between the operator's hazardous material program and the UPSCO program that would require additional UPSCO employee training, or a statement that no differences exist and that additional training is not required.

(5) Operator Feedback: Each operator must agree to notify UPSCO of any incident involving a hazardous material package that is attributable to DOT SP-11110 conditions.

(6) Operator Program Changes: Each operator must agree to notify UPSCO of any significant change to their program that affects their ability to operate under the terms of the special permit.

Continuation of DOT-SP 11110 (20th Rev.)

8. MODES OF TRANSPORTATION AUTHORIZED: Cargo aircraft only (See paragraph 9.c. for the limited extension of the definition.)

9. MODAL REQUIREMENTS:

a. A current copy of this special permit must be carried aboard each aircraft used to transport packages covered by this special permit.

b. Hazardous materials may only be transported under the terms of this special permit aboard an aircraft either operated by United Parcel Service Company, or by an operator listed in the Appendix to this special permit when that aircraft is operated under contract to, and under the exclusive use of, UPSCO. An aircraft operated by an operator not listed in the Appendix to this special permit may, when operating under contract to, and under the exclusive use of UPSCO, transport hazardous materials under the terms of this special permit provided the operator has been identified to and acknowledged in writing by the Office of Hazardous Materials Approvals and Permits Division prior to engaging in such transport. An aircraft is considered to be operating under the exclusive use of UPSCO when, for a particular flight or series of flights, all initial, intermediate and final loading and unloading of all cargo carried aboard the aircraft is performed in accordance with UPSCO loading procedures either by UPSCO personnel, or by ground handling agents under direct contract to UPSCO to load aircraft (UPSCO-operated and contractor-operated) on behalf of UPSCO.

c. In addition to persons authorized aboard the aircraft according to the definition in § 171.8 for cargo aircraft only (i.e., crewmembers, company employees, authorized representatives of the United States, or persons accompanying a shipment), airline employees (of other carriers) that hold a current FAA Commercial Pilot or Airline Transport Pilot certificates are permitted onboard aircraft operating under the terms of this special permit.

10. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

- All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.

- Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.

- Registration required by § 107.601 et seq., when applicable.

Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by § 172.700 through § 172.704.

No person may use or apply this special permit, including display of its number, when the special permit has expired or is otherwise no longer in effect.

Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)- 'The Hazardous Materials Safety and Security Reauthorization Act of 2005' (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous materials transportation law by changing the term "exemption" to "special permit" and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

11. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR §§ 171.15 Immediate notice of certain hazardous materials incidents, and 171.16 Detailed hazardous materials incident reports. In addition, the grantee(s) of this

Continuation of DOT-SP 11110 (20th Rev.)

special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit.

Issued in Washington, D.C.:

for William Schoonover
Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Materials Safety Administration, Department of Transportation, Washington, D.C. 20590. Attention: PHH-31.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

PO: NICKS/SG

Continuation of DOT-SP 11110 (20th Rev.)

APPENDIX

SUPPLEMENTAL CARRIERS AUTHORIZED TO TRANSPORT UNDER THE TERMS OF DOT-SP 11110

21 Air, LLC, Greensboro, NC
ABX Air, Inc., Wilmington, OH
Air Cargo Carriers, Inc., Milwaukee, WI
Air Exec Inc., MT Pleasant, IA
Air Transport International LLC, Little Rock, AR
Alaska Central Express, Anchorage,
Alpine Air Express, Inc., Provo, UT
Ameriflight, Inc., Burbank, CA
Asia Pacific Airline, Barrigada, Guam
Atlas Air, Purchase, NY
Bemidji Aviation Services, Inc., Bemidji, MN
Business Aviation Courier d/b/a Encore Air Cargo, Sioux Falls, SD
Capital City Air Carrier, Inc., Pierre, SD
Centurion Air Cargo, Miami, FL
Cargojet Airways, Mississauga, Ontario, Canada
Dynamic Airways LLC, Greensboro, NC
El Aero Services Inc., Carson City, NV
El Aero Services, Inc., Elko, NV
Freight Runners Express, Inc., Milwaukee, WI
Gem Air LLC, Salmon, ID
Gulf & Caribbean Cargo Inc. d/b/a IFL Group, Waterford, MI
INTER-STATE AVIATION, INC., Pullman, WA
Island Wings, Fort Lauderdale, FL
Kalitta Air, Ypsilanti, MI
Kalitta Charters II LLC, Ypsilanti, MI
Key Lime Air Corporation, Englewood, CO
Martinaire Aviation, LLC DBA Martinaire, Addison, TX
National Air Cargo Group DBA National Airlines, Ypsilanti, MI
Northern Air Cargo, Anchorage, AK
Planemasters, Ltd., West Chicago, IL
Priority Air Charter LLC, Kidron, OH
Pro Aire Cargo & Consulting, Oshkosh, WI
Redding Aero Enterprises, Inc., Redding, CA
Richland Aviation, Sidney, MT
Sky Lease Inc., Greensboro, NC
Sky Way Enterprises Inc., Kissimmee, FL
South Aero, Inc., Albuquerque, NM
Southern Air, Columbus, OH
Suburban Air Freight, Inc., Omaha, NE
Transnorthern Aviation, Anchorage, AK
West Air Inc., Fresno, CA
Western Global Airlines, LLC, Estero, FL
Wiggins Airways, Inc., Manchester, NH

SECTION Q - EMERGENCY EVACUATION ASSISTANCE
[135.23(q)]

Persons who may need the assistance of another person to move expeditiously to an exit in an emergency will be additionally briefed by the Pilot-in-Command (PIC). If the handicapped person is accompanied by an attendant, the attendant will be briefed concurrently. This briefing will consist of:

1. Location of the nearest emergency exit.

2. Procedures to be followed so that the handicapped person is evacuated without delaying the evacuation of others on board the aircraft.

If a situation occurs that requires an emergency evacuation of the aircraft, the attendant, if there is one, will be solely responsible for the evacuation of the person requiring assistance. If there is no such attendant, then the Pilot In Command orSecond in Command if there is one, will assist that person to the exit after all able-bodied passengers have exited the aircraft.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION R - OTHER PROCEDURES AND POLICY INSTRUCTIONS
[135.23(r)]

GENERAL

All Martinaire flight operations shall be conducted in a professional and disciplined manner in the highest tradition of the air transportation industry. Safety of the aircraft and passenger comfort shall be considered of overriding and primary importance.

All applicable rules, regulations, procedures and policies will be carefully followed unless emergency considerations or very sound judgment recommends deviation. When confronted with a matter of choice or interpretation in determining a course of action where the decisions are a matter of judgment, the safer alternative will always be chosen.

Economic or service considerations cannot be allowed to compromise safety. However, this policy should not be interpreted as an invitation to disregard cost. If the Company is to succeed, all personnel must continually seek the most efficient and economical means of operation; however, it is to be interpreted as firm and standing instruction to the effect that safety and compliance with all safety regulations will always, without exception, take precedence over economic and all other considerations.

The policies and procedures contained herein provide basic operational philosophies and include general procedures and regulations applicable to all Company pilots. For more specific information on aircraft operating procedures, refer to the appropriate AFM.

HIGH MINIMUM CAPTAINS (FAR 135.225)

A captain qualified on any equipment type must observe higher landing minima for the first 100 hours of pilot-in-command flying in that aircraft type. The Captain shall notify the Company/Chief Pilot as soon as the 100 hours have been flown so that the restriction can be lifted. Captains who are not authorized to operate to the lowest weather minimums shall check forecast weather for scheduled stops on each route of flight as soon as practical after reporting for duty. If any risk of "high minimums" impact the ability to operate the flight normally, Martinaire Dispatch (866-623-2596) must be advised. The Pilot in Command must advise Martinaire Dispatch at the earliest possible time to allow the consideration of alternatives that might avoid service disruptions, and/or provide timely information to passengers.

The company does not utilize the combination of hours and landings to decrease the "high minimums" time below 100 hours. A newly upgraded Captain or a Captain flying a new aircraft type must log 100 hours prior to utilizing regular minima. Pilot-in-command time acquired in the employ of another air carrier will be credited toward the initial 100 hours PIC.

As per Company policy, each Pilot-In-Command with less than 100 hours flight time as pilot-in-command in make and model is limited to a takeoff minimum equal to the lowest authorized straight-in Category I Landing minimum.

Whenever a takeoff is conducted using lower-than-standard takeoff minimums, a takeoff alternate airport will be designated. The takeoff alternate airport weather conditions must meet the requirements of the operations specifications.

During the period of acquiring the initial 100 hours the PIC is not obligated to allow a first officer to takeoff, approach, or make a landing. While not restricted from "leg-swapping," this policy is intended to assist the captain in obtaining as much experience as possible in the type of aircraft.

STERILE COCKPIT REQUIREMENTS (FAR 135.100)

Crewmembers are prohibited from engaging in any duty or activity during a critical phase of flight, except those required for safe operation of the aircraft. "Critical phase of flight" includes all flight operations conducted below 10,000 feet (except for cruise flight), including ground operations. Examples of duties and activities prohibited are:

1. Radio calls concerning passenger connections, fuel loads, catering, etc.

   Note: Taxiing may be interrupted. An aircraft not moving on the ground is not considered to be in a critical phase of flight.

2. Announcements concerning sights of interest, proposed route, etc.

3. Non-critical paperwork.

4. Reading, except for appropriate charts.

5. Eating, drinking.

6. Nonessential cockpit conversation (remarks not pertinent to safe aircraft operation).

   Examples of duties and activities not prohibited are:

   A. Passenger briefings essential to safety of flight.
   B. Weight and balance corrections.
   C. Performance calculations.
   D. Use of checklists.
   E. Crew coordination procedures.
   F. Discussion of MEL items with Company or other personnel.
   G. Communications inside or outside the aircraft pertaining to safe operation.

Except for situations regarding the safety of the flight or the well-being of the passengers, a passenger may not visit the cockpit or communicate with the cockpit crew during a critical phase of flight. Generally speaking, the passengers should consider that time during which the seatbelt sign is illuminated to be consistent with sterile cockpit conditions, unless an announcement has been made that the flight is above 10,000 feet or at cruise flight but the seatbelt sign is being left on for turbulence.

GROUND OPERATIONS

As a defined "critical phase of flight" extreme caution should be exercised while conducting ground operations. Marshallers and wing-walkers will be utilized if such service is or should be provided. It is the responsibility of the Pilot in Command to ensure the safety of the aircraft and the cargo during any phase of flight, and making use of this service is a requirement during the final phases of any revenue portion of our operations involving movements in and out of gates and tie-down spots.

During non-revenue segments it rests solely with the Pilot in Command to ensure unobstructed and safe access to and exit from such areas should no assistance be available.

For specific customer ground operations procedures see this section under the heading UPS Ground Handling Procedures in this GOM.

STANDARDIZATION OF FLIGHT PROCEDURES

Crewmembers will at all times adhere to published standardized procedures in the conduct of flights. This will ensure that company aircraft will be operated according to procedures that the company deems to be safest. Standardization also facilitates crewmember expectations of other crewmembers, thereby maximizing crew coordination and efficiency, regardless of changes in crew pairings.

The substitution of procedures of personal preference, for those established by Martinaire, is considered a serious breach of the code of conduct expected of a Captain. Continued infractions after being otherwise counseled may result in termination of employment.

n instrument weather conditions, a pilot must continuously assess instrument information hroughout an approach to properly maneuver the aircraft (or monitor autopilot performance) ind to decide on the proper course of action at the decision point (DH or MDA/MAP).

ignificant speed and configuration changes during an approach can seriously omplicate tasks associated with aircraft control, increase the difficulty of properly valuating an approach as it progresses, and complicate the decision of the proper can o take at the decision point.

pilot must begin formulating a decision concerning the probable success of an approach efore reaching the decision point. The pilot's decision-making process requires the pilot to be ble to determine displacements from the course or glide path centerline, to mentally project e aircraft's three dimensional flight path by referring to flight instruments, and to then apply ntrol inputs as necessary to achieve and maintain the desired approach path. The process is nplified by maintaining a stable approach speed, descent rate, vertical flight path, and nfiguration during the final stages of an approach. **Maintaining a stable approach speed, escent rate, vertical flight path, and configuration is a procedure commonly referred to the stabilized approach concept.**

Configuration changes at low altitude should be limited to those changes that can be easily accommodated without adversely affecting pilot workload. A stabilized approach must be established before descending below the following minimum stabilized approach heights:

STABILIZED APPROACH HEIGHTS

1. 500 feet above the airport elevation during VFR or visual approaches and during straight-in instrument approaches in VFR weather conditions.

2. MDA or 500 feet above airport elevation, whichever is lower, if a circling maneuver is to be conducted after completing the instrument approach.

3. 1000 feet above the airport or TDZ elevation during any straight-in instrument approach in instrument flight conditions.

4. 1000 feet above the airport during contact approaches.

MINIMUM REQUIREMENTS AT STABILIZED APPROACH HEIGHT (and throughout approach)

1. Airspeed shall be approach speed +10 KIAS

2. Course Deviation Indicator no more than three-quarter scale deflection

3. Glide Slope Indicator no more than three-quarter scale deflection

FAILURE TO MEET THESE MINIMUMS REQUIRES EXECUTION OF A MISSED APPROACH OR GO AROUND!

PILOT'S RESPONSIBILITY DURING APPROACH PHASE

1. Prior to approach, the Pilot in Command shall brief himself on the instrument or visual approach procedure to be used, to include times, altitudes, and missed approach procedures in accordance with the In Range and Before Landing Checklist.

2. The Pilot in Command shall call out the altitude at the FAF, 500 feet above minimums, 100 feet above minimums and at the DH or MDA. He will verbally call out the field in sight as appropriate or calls for missed approach procedure if applicable.

The substitution of procedures of personal preference, over those established by Martinaire, will not be tolerated , except during inflight emergencies to the degree demanded to ensure continued flight or aircraft operation.

USE OF CHECKLISTS – SINGLE PILOT OPERATIONS

The use of checklists to assist in the proper operation of the aircraft is mandatory for all flights. Only those checklists accepted by the FAA for use by Martinaire will be acceptable, including methodology and procedures developed.

Single pilot operations by nature demand adherence to checklist procedures. Failure to perform the steps on printed inflight checklists can potentially cause accidents, often with fatal results.

Inflight checklists are arguably among the most ignored safety devices available to the pilot. This applies to single pilot operations more so than multiple crewmember served aircraft. Research shows that pilots as a group, tend to be independent and self-reliant personalities.

The printed inflight checklist becomes regarded as a crutch, with the pilot relying on flow, memory technique and an occasional mnemonic. In a high cockpit workload environment such as approach and departure from a busy terminal area with a mix of aircraft at night and in instrument conditions, memory can fail or distraction from flying tasks can cause a step to be missed or forgotten. **SUCH OVERSIGHTS DO NOT IN THEMSELVES NECESSARILY CAUSE ACCIDENTS, BUT THEY CAN BE THE FIRST LINK IN A SHORT CHAIN OF EVENTS LEADING TO CATASTROPHE.**

The inflight checklist is not a substitute for training and experience. It is designed as a complement to training and experience and used as a back up to flow, memory technique and mnemonics. It is an aid to remembering steps missed or forgotten in the high workload cockpit of scheduled FAR 135 single pilot operations. Transition to the desired flight regime (cruise climb or level flight), trim the aircraft or engage the autopilot and then, as workload permits, reference the appropriate inflight checklist. In the rare instance that human factors have caused a missed or forgotten step, those few seconds invested in using the inflight checklist are worth the effort.

Emergency inflight checklists require some items be performed immediately from memory. Subsequent to the accomplishment of memory items, the emergency checklists should be referenced to ensure all steps of the emergency procedure have been completed. **IT IS IMPERATIVE THAT THE PILOT FREQUENTLY REVIEW EMERGENCY CHECKLIST MEMORY ITEMS AND THEN GO THROUGH THEM USING THE PRETEND METHOD.**

SITUATIONAL AWARENESS – SINGLE PILOT OPERATIONS

The proper execution of any flight operation demands constant situational awareness. This is especially true in single pilot operations. Training, experience and adherence to standard operating procedures coupled with good situational awareness are the single pilot's only course to the absence of a second cockpit crew member.

Situational awareness is defined as "the sum total of the pilot's PERCEPTION of the facts and conditions affecting the safe outcome of a flight." By maintaining a high state of situational

awareness and planning as far in advance as flight conditions permit, the single pilot manages the cockpit by exception; anticipating and planning for events rather than reacting to them.

Situational awareness is a function of human factors (fatigue, stress, medication, alcohol and health), personality traits (machismo, invulnerability, impulsiveness, antiauthoritivism, defeatism and a "GO" mentality) and the sum of all external forces. Unfortunately, these same human factors, personality traits and external stressors tend to mask recognition of what is happening. Loss of situational awareness is communicated by indicators that make up a list of exceptions. If certain items on the list are not happening, situational awareness is high; if items begin to manifest themselves, the situation is becoming clouded.

The nine indicators are a means of measuring the level of situational awareness and recognizing when it is beginning to breakdown.

AMBIGUITY
Sources of information disagree – RMI says one thing HSI says another

PREOCCUPATION
Fixation to one task – watching the RMI and HSI and avoiding other duties

NOT COMMUNICATING
Not asking for or offering input
Talking but not listening

4. **CONFUSION**
Doubt about situation – which is correct RMI or HSI?
Not sure what to do next – lack of experience or knowledge to cope

5. **VIOLATING MINIMUMS**
Exceeding established limits – I can do it – I've done it a million times

6. **NOT FLYING AIRCRAFT**
Failure to monitor auto pilot

7. **FAILURE TO SET OR MEET TARGETS**
Aircraft performance – ignoring set performance limits
Flight parameters

8. **NOT ADDRESSING DISCREPANCIES**
Unresolved confusion – ie the RMI and HSI situation above
Questions and concerns – with no answers

9. **VIOLATING STANDARD OPERATING PROCEDURES**
Making things up as flight progresses rather than using the book AND experience.

Accidents are not the result of a single cause. Accidents occur because several indicators in the exception list above are allowed to go unresolved or continue unchecked. Loss of situational awareness is evident when the accident takes place. Incidents become linked, with a cumulative effect, until events exceed the capabilities of the pilot or airplane. With the detection of one link in the judgment chain, then perhaps the accident can be avoided.

LAND AND HOLD SHORT OPERATIONS
Land and Hold Short Operations LAHSO – ARE NOT AUTHORIZED AT MARTINAIRE.

COLLISION AVOIDANCE

When visibility is not restricted by meteorological conditions, each pilot is responsible for seeing and avoiding other traffic, terrain and obstacles, regardless of whether the aircraft is under radar control. When a TCAS II RA is received, pilots will follow the TCAS II RA and notify ATC as soon as possible.

VIEW LIMITING DEVICES (See handbook for info on this subject)

No simulated instrument operations with a view limiting device will be permitted, except during training flights.

Non-transparent devices are not to be used as sun shades.

CREW BRIEFINGS

Crew briefings help to standardize an operation and stimulate planning, supervision, teamwork, integrity, and redundancy. They are also a mechanical means of requiring a pilot to consider factors that might otherwise be overlooked. Accordingly, the following crew briefing scenarios will be effective:

ON DEPARTURE:

The flying pilot will outline to the non-flying pilot the takeoff and departure plan that is being contemplated for each takeoff. The briefing must include but not be limited to the following:

A. Takeoff techniques for conditions present and expected, contaminated runway, icing conditions, wind shear.
B. Management of power, systems and propellers during and immediately after takeoff (Power adjustments and recovery, anti-ice system initiation, backup for contaminated runway, etc.).
C. Plan to be executed in the event of an emergency occurring before and after Vr, including landing intentions if airborne (abort techniques, cleanup considerations, returning to airport of departure or proceeding to takeoff alternate, etc.).
D. Reconfirmation of the initial portion of the departure clearance, including assigned altitude and initial heading or fix as applicable.
E. Before beginning takeoff roll the Pilot in Command will verify that the heading indicators are aligned with the magnetic compass and the direction of the assigned runway.

Providing no crew change has taken place, an abbreviated response to briefing queries may be "previously briefed" or "standard briefing" on other than the initial leg of a trip.

2. **ON ARRIVAL:**

Prior to commencing an approach, regardless of the weather in IFR or VFR conditions, the pilot flying will brief the pilot not flying. The degree of detail may vary, according to the weather conditions, the experience of the first offica, the condition of the aircraft, etc., but every approach briefing will cover at least confirmation of the assigned runway and minimum altitudes. Approaches under IFR conditions will be afforded an expanded briefing, to include a review of the approach to be conducted, cross-checks of radio setups, agreement on headings, altitudes and speeds, as well as review of the missed approach procedures. Instructions to observe standard altitude callout procedures and timing will be included, if applicable.

This briefing, or as much of it as possible, should take place prior to the arrival in the terminal area, so that the crew may maximize its preparedness and be free to concentrate on the duties of that environment.

AUTHORIZED WEATHER SOURCES

Martinaire is authorized to use only those weather reports and forecasts in IFR operations that are prepared by the National Weather Service (NWS), or source approved by the National Weather Service, or other source approved by the FAA.

Sources approved by the NWS include the following:

1. NWS Field Facilities.
2. Flight Service Stations (FSS).
3. Supplemental Aviation Weather Reporting Stations (SWARS)
4. Limited Aviation Weather Reporting Stations (LAWRS).
5. Automated Surface Observations (See notes 1, 2, 3, and 4).

Sources approved by the FAA include the following:

1. Any meteorological office operated by a foreign state that subscribes to ICAO standards and practices.
2. Any U.S. Military weather reporting source.

Note 1: An AWOS cannot be used as an authorized weather source for IFR operations if the visibility is reported missing. IFR approaches will not be initiated if visibility is missing from the AWOS report. An AWOS is considered out-of-service if the time or altimeter setting is missing.

Note 2: AWOS-1 and AWOS-2 when operated as a "STAND ALONE" system ("STAND ALONE" meaning a system that is the only source of weather observations at a particular airport) is not approved as the sole official weather source.

Note 3: AWOS-3 installed, maintained, and operated by the FAA or NWS, and Non-Federal AWOS-3 installed, maintained, and operated in accordance with the standards and specifications contained in AC 150/5220-16 is approved for flight operations.

Note 4: NWS-operated Automated Surface Observation Systems (ASOS) are approved for flight operations.

ATC CLEARANCES/INSTRUCTION COMPLIANCE

Strict adherence to ATC instructions is essential to safety of flight. In today's air traffic environment, exposure to midair collision is a fact of life; however, flight crewmembers can reduce that exposure by working more closely with controllers in copying and reading back clearances, double checking their accuracy, and maintaining vigilance for conflicting clearances given other aircraft. Pilots are not to engage in arguments with controllers or badger them for favored handling. Avoid special requests in busy periods and always be courteous and professional. Personal derogatory comments will not be tolerated AT ANY TIME.

All initial ATC clearances are to be copied in writing.

All clearances and ATC instructions will be read back to the controller (unless otherwise instructed by ATC) and will include the full call sign of the aircraft.

Martinaire's official radio call sign is MARTEX followed by the appropriate flight number.

DISPATCH RE-ROUTING THROUGH ATC

Martinaire Dispatch may re-route any scheduled or non-scheduled flight through ATC Command Center, provided that the fuel on board, the weather enroute and at the new destination allows for continued safe operations. Weather enroute, as well as a combination of forecasted and actual weather reports for the new destination may be obtained from any approved weather source available.

No descent below the MEA, or no approach into the new destination may be initiated unless the Pilot in Command has made himself familiar with current local weather conditions as well as other local information of necessity to a safe completion of the re-assigned flight.

USE OF AVAILABLE COMMUNICATIONS – VFR FLIGHT FOLLOWING

All Martinaire flights, scheduled or unscheduled WILL OPERATE ON AN IFR FIGHT PLAN - if the PIC elects not to use an IFR flight plan he MUST USE ATC FLIGHT FOLLOWING WITH RADAR AND TRAFFIC ADVISORIES!

If the PIC elects and requests VFR Flight Following and ATC advises that traffic conditions do not permit "VFR Flight Following at this time", the PIC must IMMEDIATELY request an IFR clearance.

GROUND PROXIMITY POLICY

Except for takeoff and landing, no Martinaire pilot will descend below the minimum enroute altitude, the minimum obstruction clearance altitude, or the minimum sector altitude, whichever is higher when conducting enroute operations, EVEN IN VFR CONDTIONS. In addition, no Martinaire pilot will descend below the minimum descent altitude or decision altitude during an instrument approach unless the runway of intended landing is in sight and a normal landing can be executed. The PIC will at all times be alert of the terrain surrounding the departure and destination airports and underlying his route of flight.

Terrain awareness is particularly appropriate under the following conditions:

1. While maneuvering for an approach during night or instrument conditions.
2. When established on an approach where vertical guidance is unreliable.
3. In maneuvering for, or established upon an approach when turbulence or wind shear cause the approach to become unstabilized.

MAXIMUM WIND SPEED OPERATIONS

No Martinaire pilot will taxi, attempt a take-off, landing or approach any Martinaire aircraft when the reported wind velocity exceeds:

1. Gusts to 50 Knots
2. Sustained winds of 45 Knots

No takeoff or landing may be made when the crosswind component is greater than 25 knots.

No takeoff or landing may be made when the tail wind component if greater than 10 knots.

AFM limitations are primary.

MAXIMUM GROSS WEIGHT LIMITATION C-208 FOR FLIGHT INTO ICING CONDITIONS

For flight into icing conditions, Cessna C-208B aircraft will be operated at a max. gross takeoff weight of 8000 lbs or less for 600HP engine equipped aircraft and 8550 lbs or less for 675 hp engine equipped aircraft.

MONDAY MORNING CREW CALL-IN

Every Monday morning every Martinaire pilot shall call into dispatch to verify flight assignments and any other pertinent information that may need to be communicated. This call in must occur before 10AM and includes contract pilots.

MARTINAIRE SAFETY MANAGEMENT PROGRAM

It is the policy of Martinaire to operate with the highest of safety standards. Employees must operate within the scope of ALL company policies and Federal Aviation Regulations. The operations of the company are governed by the applicable parts of FARs 91 and 135 and the Operations Specifications approved by the FAA.

A policy of safety will be enforced by all supervisory personnel and safety will come first in all ground and flight operations. All ground and flight equipment and Martinaire facilities will be maintained in a high state of repair and operating condition. Safety will be promoted by thorough training of personnel, strict attention to duty, and the exercise of good judgment. The prevention of incidents and accidents will be achieved through RISK MANAGEMENT and the promotion of SAFETY AWARENESS.

Safety standards to be observed in flight operations include, but are not limited to, the following:

1. No pilot will land at other than an approved airport without permission of the Chief Pilot except in the event of an emergency.

2. No pilot may leave the controls of an aircraft with the engine running.

3. No pilot may taxi a Martinaire aircraft into a gate or tie-down spot without the assistance of marshaller(s) when such service is or should be provided. It is also the responsibility of the pilot to make use of wing-walker(s) should this be necessary for the safe progress of taxi operations.

4. AT ANY CUSTOMER GATEWAY AIRPORT SUCH AS DFW OR CVG, AIRCRAFT WILL NOT ENTER OR LEAVE PARKING GATES WITHOUT THE USE OF MARSHALLERS AND WINGWALKERS.

5. No pilot will allow the customer truck to back into the safety area (the area just inside the main wings) without being marshaled by the PIC AND unless the orange safety cones are in place in the safety area.

6. No pilot will accept a duty assignment with a medical deficiency affecting the safety of flight.

7. No pilot will takeoff any Martinaire aircraft without a preflight weather check.

8. No pilot will takeoff any Martinaire aircraft without checking current NOTAMS.

9. NO PILOT WILL PERMIT LOADING OF ANY MARTINAIRE AIRCRAFT WITHOUT THE TAILSTAND PROPERLY INSTALLED.

10. No pilot will takeoff any Martinaire aircraft before ensuring the aircraft is loaded within approved CG limits and the cargo is properly secured in accordance with the AFM.

11. No pilot will accept any hazardous material not meeting applicable regulations.

12. No pilot will takeoff any Martinaire aircraft with ice, snow, and/or frost adhering to any wing surface or flight control.

13. No pilot will leave an aircraft unattended without chocking the main wheels or securing the aircraft with mooring straps if it is the last flight of the day or in the event of high winds or bad weather occurring before the next flight segment.

14. No pilot, except in an emergency, will exceed the designed parameters of any Martinaire aircraft as specified in the AFM.

It is the responsibility of each Martinaire employee to bring to the immediate attention of the Director of Operations, Chief Pilot, and Director of Maintenance any unsafe practice or operating condition.

MARTINAIRE COMPANY ARINC

The Martinaire ARINC frequency is 128 87. This frequency should be monitored by company aircraft at all times while in flight. If the flight is within range of the receiver/transmitter at ADS then estimated arrival times and other operational information should be communicated to operations on this frequency.

CUSTOMER SERVICE – DEALING WITH DIFFICULT PEOPLE

At all times, contact with the customer is to be conducted in a courteous and professional manner. DO NOT try to handle a difficult situation with force or aggressiveness. Step back from the situation and advise the customer that you will check with Martinaire Dispatch to see what we can do to work out the problem. By stepping away and talking with Dispatch, you and the customer will have a moment to "cool" down and then with you consulting Dispatch a suitable solution can be worked out.

Remember that MOST people do not understand aviation lingo or for that matter the whole flying process. Take a moment to remember this. Always provide a smile and then an informative explanation. For example, if you have to delay due to weather being below minimums at the departure or destination airport, explain this thoughtfully and carefully. State that due to regulations mandated by the FAA that you will be delayed for a short while until the weather improves and that you will keep the customer advised as changes occur. A smile and an informative explanation GOES A LONG WAY TO PROVIDING SUPERB CUSTOMER SERVICE.

AT NO TIME are you to engage in terse words or conversation with the customer. If the smile and explanation do not work and you are being verbally abused then state thoughtfully that you ill check with Dispatch to see what can be done. DO NOT show anger. Just get away from the situation and let Martinaire Dispatch handle this.

If you see that the situation is going to mushroom into a problem – do not continue to try to remedy the problem yourself.
It is tough sometimes in freezing cold weather and rain to think about being hospitable and nice. But think about it this way, its just as cold and rain on the customer's ground crew. We are all in this together.
Always put your best effort forward to reasonably satisfy the customer's needs and expectations. Most of our customer's are only looking to get the freight on board the aircraft and off their ramp. They are the easy ones. Many times conflicts do arise due to excess freight and weather conditions that may cause us to be delayed. We know about these things because that is our job. Most of our customer's probably do not have the knowledge of this that we do. SO THEREFORE WE HAVE CONFLICT. What is the first step in conflict resolution – understanding the conflict and what is causing the conflict. We can make the first step in the resolution process by taking a moment with an edge of kindness and patiently explain WHY we are delaying the flight or WHY you may need to bump freight (weight limitations due to icing, etc.) Generally this will work and everyone will be happy. If not – WHAT'S THE ANSWER – LET ME CHECK WITH MARTINAIRE DISPATCH TO SEE IF WE CAN FIX THIS PROBLEM.

If you ever have personal difficulties with a customer's employee (ie. they just don't like how you look, etc) for some unknown reason, ALWAYS LET MARTINAIRE KNOW IMMEDIATELY!

FLIGHT CREW APPEARANCE

A professional appearance is mandatory. Full Martinaire uniform of blue slacks, black or blue socks, white or blue pilot shirt and black shoes IS REQUIRED anytime you are operating a flight.

No beards, blue jeans, ear rings, nose rings while on duty.

During the winter use the Martinaire issue heavy winter coat.

During the summer knee length blue or black shorts are acceptable with regular uniform shirt.

ABSOLUTELY NO JUMPSEATING IN SHORTS.

A tie is REQUIRED for jumpseating on another carrier.

JSE OF NAVIGATION CHARTS

is vitally important and required by regulation that the pilot in command (PIC) have the ertinent aeronautical charts on board your aircraft. The company will provide you with revisions s soon as practicable. Whenever possible the PIC will be mailed your revision in advance of hen it is scheduled to become effective. Sometimes there is a day or two delay due to ipping. That does not mean that the PIC can no longer use the charts you have. If you are nsure of the most recent status of a terminal chart or if the PIC is missing a specific chart, call RA dispatch and have them tell you the PIC the latest amendment number or have them fax ou a copy of the missing chart.
ou as PIC can also go to www.airnav.com and verify that the chart you plan use has not anged. The effective dates for enroute Jeppesen charts can be found at:
tp://www.jeppesen.com/download/mart/enroute_currency.pdf

When you, the PIC, use the aeronautical charts PUT THEM BACK in their proper places after each flight. DO NOT stuff the charts you used in the back of the binder for the next pilot to have to clean up. During, aircraft swaps, make sure the charts for the aircraft you are picking up are moved to the aircraft are dropping off unless the geographic area chart coverage is the same.

FILLING OUT COMPANY FORMS

A complete list, explanation and example of each company form is available in Section U of this GOM. When you fill these forms out IT IS MANDATORY THAT YOU FILL THEM OUT LEGIBLY! If you make a mistake, mark the mistake out with a single line and write in the correct wording remembering to initial the mistake. Use only blue or black ink on all forms.

DO NOT USE WHITE OUT ON ANY COMPANY FORMS.

ADDING OIL TO AIRCRAFT

Whenever you have to add oil to any Martinaire aircraft, let Martinaire maintenance know how much and when and where you added the oil.

AIRCRAFT MOORING KIT CONTENTS

Each Martinaire aircraft is provided with a mooring kit. This kit includes sufficient mooring straps for the aircraft type, paper towels, ICEX, fuel strainer, approved aircraft oil, contact cleaner, and window cleaner. If you notice that any of these items are running low let Martinaire maintenance know immediately. DO NOT leave the supplies depleted for the next pilot.

INVERTER EQUIPPED AIRCRAFT

On aircraft equipped with inverter power for avionics equipment (KFC-250) it is imperative that the aircraft NOT BE MOVED until the inverter switch is turned to either the ONE or TWO position. In other words make sure its turned on before you move the airplane. You can ensure that the inverter is turned on by the LOSS of the "Attitude Computer" flags. If the flags are still on then there is a malfunction in the system – DO NOT MOVE THE AIRCRAFT – contact Martinaire maintenance for further instructions.

Movement of the aircraft without the inverter properly operating can result in damage to the attitude indicator system and this is very expensive.

You cannot "reset" the attitude indicator UNTIL the aircraft has been completely shut down and the gyros have stopped spinning. You may the restart the aircraft and see if you get proper indications that the inverter system is in proper operation.
ALSO to use the inverters equally, select a different inverter with each flight segment. Such as leg one – inverter one; leg two – inverter two; leg three – inverter one, etc.

CHECKING AIRCRAFT AFTER UNLOADING FOR FREIGHT LEFT ON BOARD

It is imperative and the Pilot in Command's responsibility to ensure that ALL CARGO AREAS of the aircraft are unloaded at each destination.

You must visually check EACH CARGO POD after the customer's ground crew has unloaded the aircraft to ensure that they have COMPLETELY removed all freight.

You must check the MAIN CARGO AREA to ensure that all freight has been removed after the customer's ground crew has unloaded the aircraft. It is very important that you begin at the front of the cabin lifting up each cargo net and checking underneath. Check to see that freight has not slipped under the front cargo barrier between the cabin and cockpit. Check in the very rear section behind the hot plate.

TOUCH AND FEEL – you should not only look in the pods but physically get in and touch to the entry doors to the left and right and visually inspect. Do this in the main compartment as well.

This must be done on EACH FLIGHT LEG WITHOUT FAIL! The Company, and especially the pilot, looks very bad to the customer when freight is left on board OR even worse when we leave freight on board AND then fly it back from where it came.

BEING SPECIFIC WHEN WRITING UP AIRCRAFT MAINTENANCE ITEMS

After you have grounded an aircraft and written it up using the appropriate forms (See Section J) or you MEL an MELable item using the appropriate form it is necessary to confer immediately with Martinaire maintenance and inform them of the SPECIFICS of the write up.

When you have a maintenance item:

- State what item is in need of repair.
- Then state SPECIFICALLY what you have seen in regards to the item not working.

For instance state that the flaps are not working – but don't just leave it at this vague point – what exactly are the flaps doing wrong? – did you have to use standby flaps, etc.

This is critical especially with avionics items. For example, state that the ADI is not working – explain WHAT is not working on the ADI and what are the symptoms – this way the avionics technician can specifically look at that area for problems. Diagnostic expense is $75.00 per hour per item and an ADI can have MANY diagnostic tests that can be performed. If you specifically spell out what is wrong with the ADI then the problem can be fixed quicker and diagnostic costs will be greatly reduced.

MARTINAIRE/UPS FLIGHT CREW PROCEDURES AND RESPONSIBILITIES FOR LOADING AND UNLOADING AIRCRAFT

When performing ramp operations for UPS, specific guidelines are to be followed by UPS personnel and Martinaire pilots to ensure the safety of flight crews and aircraft. See Form 01A in Section U of this GOM.

The movement of any vehicle inside the perimeter of the aircraft (inside the wing area), with the pilot present, is the responsibility of the Pilot in Command. Failure of Martinaire pilots to follow the procedures listed below will result in disciplinary action. These procedures were established for the safety of the Martinaire pilot, UPS personnel, and the equipment we all use in our daily operations.

Specific Pilot Duties: Confirm aircraft is properly set up for the operation by ensuring the following:

1. Pilot is to have the aircraft preflighted and serviced and is to be present at the aircraft 30 minutes prior to departure for loading.

2. Check aircraft is properly chocked.

3. Check aircraft tail stand is installed properly.

4. Checks that all cargo doors and pods are opened.

5. When truck arrives, check that the truck stops outside the perimeter of the aircraft wing and tail (at least 15 feet from the aircraft).

6. Pylons and orange cones are to always be used and properly placed by UPS personnel to establish a safety zone around the aircraft loading door area. Three feet from the closest point of the aircraft.

IF PYLONS AND CONES ARE NOT AVAILABLE, THE TRUCK IS NOT TO ENTER THE PERIMETER OF THE AIRCRAFT WING AND TAIL. THE DRIVER WILL HAVE TO HAND-CARRY THE CARGO TO THE AIRCRAFT FOR LOADING.

THERE ARE NO EXCEPTIONS TO THIS RULE!

If used, check that the belt loader is no closer than 2 inches from the aircraft. No part of the belt loader can break the plain of the aircraft door.

Specific Pilot Duties: Guiding driver into safety zone

1. Never stand between the aircraft and vehicle when guiding the driver.
2. Check and ensure driver understands your guide signals.
3. Driver will sound horn twice prior to backing.

4. Check and ensure driver does not back closer than 3 feet from any part of the aircraft.

AT NO TIME IS ANY VEHICLE TO BE CLOSER THAN THREE FEET TO THE AIRCRAFT. VEHICLES MUST REMAIN OUTSIDE OF THE SAFETY ZONE. THE PILOT HAS THE ULTIMATE RESPONSIBILITY FOR MARSHALLING THE TRUCK IN THE VICINITY OF THE AIRCRAFT.

Check that driver chocks left hand vehicle tire.

Specific Pilot Duties: Exiting the safety zone

1. Guide the driver out of the safety zone.

2. Driver will sound horn once prior to forward movement.

3. If used, guide belt loader operator out of safety zone.

4. UPS personnel will remove pylons and cones.

PROHIBITION AGAINST CARRIAGE OF WEAPONS

Federal law provides that no person shall carry a deadly or dangerous weapon, either concealed or unconcealed, aboard an aircraft being operated by this company, except:

1. Employees or officials of municipal, state or federal governments, who are authorized or required to carry arms and who present proper identification.

2. Such other persons authorized by the company who present a letter of authorization signed by the Director of Operations or his designee.

3. Crewmember and other persons authorized by the company to carry arms.

In no case will authorization for the carrying of deadly or dangerous weapons be granted if such authorization is contradictory to state or local laws or Federal Aviation Regulations.

REW SCHEDULING

Flight crew members are required to be available for duty at all time except during scheduled rest periods or vacations. Flight crew members will be scheduled so that flight time is evenly distributed among those in the same crew position with consideration given to individual training and proficiency requirements. No crew member will scheduled so that his flight and duty time will exceed standards set forth in FAR 135.261, 135.263, 135.265 as appropriate for scheduled operations.

FILING OF FLIGHT PLANS

The Chief Dispatcher will file with the appropriate ATC controlling agency all flight plans for DAILY SCHEDULED flights. If a clearance is not available, file a flight plan with the AFSS at 800-992-7433. Advise the Chief Dispatcher that a clearance was not available for you. You may want to see if this occurs over a couple of days. Often times the FAA computer will remove canned clearances from the computer due to error or other operational problems.

It is not necessary to call Dispatch to inform them that a clearance does not exist. Simply call the AFSS at 800-992-7433 and file the flight plan yourself. This cuts down on unnecessary expense incurred from using the company toll free number.

In the event you are assigned a charter or a reroute every effort will be made to file a flight plan for your trip. However, if the weather is bad you can be assured that Dispatch will be busy and you should file the flight plan yourself with the AFSS at 800-992-7433. As a courtesy Dispatch tries to file flight plans but workload may not always allow this.

ALL MARTINAIRE FLIGHTS SHOULD BE CONDUCTED USING AN IFR FLIGHT PLAN, HOWEVER IT IS PERMISSABLE TO OPERATE UNDER VFR WHEN WEATHER PERMITS. WHEN OPERATING UNDER VFR WITH NO IFR FLIGHT PLAN, IT IS ABSOLUTELY MANDATORY THAT YOU REQUEST FROM ATC TO BE PUT UNDER VFR FLIGHT FOLLOWING WITH TRAFFIC ADVISORIES. IF THIS IS NOT AVAILABLE, THEN YOU MUST REQUEST TO BE PUT ON AN IFR FLIGHT PLAN. NO EXCEPTIONS!

In addition, if you are not going to be operating under an IFR flight plan, you must notify company Dispatch of your intended route of flight and any other pertinent information such as enroute problems such as weather or NOTAMS that may pose a problem to the flight. You must use VFR Flight Following as stated above.

OBTAINING A WEATHER BRIEFING

Prior to beginning ANY Martinaire flight, all Captains shall obtain a weather briefing and shall familiarize themselves with all the pertinent weather information regarding their intended route of flight, including NOTAMS. This is mandatory. It is absolutely critical that you obtain this information from DUATS or the AFSS or another approved source. Dispatch does not always have all of the current information that you may need for your flight.

OPERATIONS OUTSIDE THE 48 CONTIGUOUS STATES

When conducting international operations as authorized by Martinaire's Operations Specifications, Martinaire Dispatch will accomplish all required arrangements and ensure that all necessary forms are available.

1. MRA Airplane Flight Log AFL, showing routing with airports of entry

2. AIR CARGO MANIFEST (US Customs Form 7509)

3. GENERAL DECLARATION (US Customs Form 7507), as appropriate.

4. Proof of Insurance as required by the concerned country.

TRAFFIC ADVISORY PRACTICES AT AIRPORTS WITHOUT OPERATING CONTROL TOWERS

Be alert while in the vicinity of an airport. Look for other air/ground traffic and be sure to exchange information over the CTAF/UNICOM when approaching or departing an uncontrolled airport. The CTAF is located on your JEPP charts.

When inbound, Pilots will monitor and communicate as appropriate on the designated CTAF from 10 miles out from the airport until after landing and clear of the runway. Pilots of departing aircraft will monitor/communicate on CTAF from start-up, during taxi, and until 10 miles from the airport unless required otherwise.

Remember, UNICOM is a non-government air/ground radio communication station which may provide airport information at public use airports where there is no operating control tower. On pilot request, UNICOM stations may provide Pilots with weather information, wind direction, recommended runway, or other necessary information. If the UNICOM frequency is designated as the CTAF, it will be identified in your JEPP charts. Weather information can also be obtained from an AWOS facility as well as Weather Observers approved by Martinaire and the FAA.

Self Announce Position and/or Intentions

Self-Announce is a procedure whereby pilots broadcast their position or intended flight activity or ground operation on the designated CTAF.

Pilots will broadcast on the CTAF as follows:

. Departing the final approach fix outbound and/or inbound.

Established on the final approach segment and or immediately upon being released by ATC.

Upon completion or termination of the approach.

Upon the execution of a missed approach or go-around.

Upon the execution of a missed approach or go-around.

6. If arriving via an IFR visual approach, or VFR, upon early or turn onto downwind, base and final.

7. Upon the leaving of the runway

8. Cancel flight plans after landing.

FLIGHT CANCELLATIONS/DELAYS/DIVERSIONS

It is imperative that ADVANCE notice be given to Martinaire Dispatch when it becomes apparent that a flight will need to be cancelled, delayed, or diverted due to some unforeseen circumstance. When the PIC reports to the airport for his flight he should immediately check enroute weather and NOTAMS to see if these reports may indicate a need for a cancellation, etc. The PIC should then call in position and notify Dispatch of any need to cancel, delay or divert. The more notice Dispatch has the better the Company will look with it's customer who will then have ample time to decide what to do with the cargo.

In many cases an early enough notification will give the customer several options including the ability to send our flight to another Gateway Airport.

FLIGHT AND TREND SUBMISSION VOICE MAIL SYSTEM

Martinaire utilizes a telephone based Flight and Trend Submission Voice Mail System. This system allows you to call your flight and trend information into the company via a voice mail box. **THIS SYSTEM IS ONLY TO BE USED FOR SUBMITTING FLIGHT AND TREND INFORMATION. AT NO TIME SHALL ANY QUESTIONS, COMMENTS, OR MAINTENANCE DISCREPANCIES BE LEFT ON THIS VOICE MAIL SYSTEM. IF YOU HAVE ANY QUESTIONS OR COMMENTS OR HAVE A MAINTENANCE DISCREPANCY THEN YOU MUST HANG UP AND CALL AND TALK TO A LIVE DISPATCHER.**

To use this system simply call the main telephone number or the toll free number. Then select "1" for Flight Operations. You then select "3" for Flight and Trend Submission Voice Mail.

Once the greeting has ended and the audible tone has been heard, you may begin leaving your flight information. Speak clearly and deliberately an leave numbers at a normal speed of talking as you would if you were giving them to a live dispatcher. If you do not have a trend then state “NO TREND WX” or “TREND AM”. If you do not have any uplift, then state ‘UPLIFT AM” or “NO UPLIFT”.

Please use the following format when leaving your flight and trend information on the voice mail system: *reading from left to right.*

Flight Number	Tail Number	Date			
Duty Time	ON	OFF			
Hobbs	OUT	IN			
Flight Times	OUT	OFF	ON	IN	Weight/Bulk%
Fuel	GALLONS	STATION/FBO		TICKET #	
Trend	AIR TEMP TORQUE N1	PRESSURE ALT. Np FUEL FLOW		AIRSPEED ITT	

IMPORTANT COMPANY NUMBERS AND WEBSITE INFORMATION

Main Switchboard	972-349-5700		
Dispatch/Flight Operations	866-623-2596	FAX	972-349-5755
Accounting/Payroll	972-349-5706	FAX	972-349-5750
Maintenance	972-349-5733	FAX	972-349-5756
Public/Employee Website	www.martinaire.com		

AUTOMATED PILOT INFORMATION SYSTEM

Martinaire has an automated Pilot Information System which is used to keep pilot crewmembers informed of critical operating information and day-to-day operational concerns. In order to take advantage of this system you must have an email account. You may maintain a personal email account in which case you must keep your current email updated with the Flight Operations Administrator. If you are a new hire please submit your email address to the Chief Pilot, Flight Operations Administrator, or Dispatch. **IT IS IMPERATIVE THAT YOU CHECK YOUR EMAIL DAILY.**

REQUIREMENTS FOR MAINTENANCE OF AIRMEN QUALIFICATIONS

Pilots and Company are jointly responsible for each pilot's maintaining the qualifications necessary for pilot assignments. The Company will make every effort to notify pilots in advance of their qualifications becoming non-current. Pilots are required to know the current status of all required qualifications per applicable FAA regulation appropriate to their assigned duties.

Pilots shall immediately notify the Company in the event of any suspension, revocation or disqualification of their Airman's License or medical. Pilots shall also notify the Company of any pending FAA enforcement action.

The Company will notify pilots that there airmen medical is due on the 1st of the month in which it is due. However, the pilot is also responsible for ensuring that his medical is renewed at the appropriate time as mandated by Part 61 of the FAA regulations. Copies of new medicals are due by the 25th of each month and are to be sent to the Chief Pilot or the Flight Operations Administrator at ADS. Confirm receipt by calling (972) 349-5700. You may submit medicals by the following methods:

FAX (972) 349-5755 or
Mail: Martinaire/Pilot Medical
4553 Glenn Curtiss Drive
Addison, Texas 75001 or
Hand Deliver to ADS

Pilots that cannot deliver new medical records by the 25th of each month must respond to the Chief Pilot or Flight Operations Administrator with an expected date. Pilots that do not provide medical to ADS by 1700 on the last business day of the month will be removed from flight status effective the first day of the expired month and will not receive compensation for each day that the medical copy if not received past the last business day. Pilots that receive a physical exam, but do not pass, must make immediate notification to the Chief Pilot. It is good practice to get your medical accomplished before the 5th of the month in which it is due.

You must have a Commercial Pilot Certificate with appropriate category and class ratings and instrument rating or ATP to operate Martinaire aircraft. You must also possess a current FAA Second Class or better medical certificate to operate Martinaire aircraft.

Medical Due Chart

Issue Month	January	February	March	April	May	June
Due Month	January	February	March	April	May	June
Issue Month	July	August	September	October	November	December
Due Month	July	August	September	October	November	December

AUTHORIZED JUMP SEAT PASSENGERS

1. Carriage of passengers on cargo flights is specifically prohibited unless the individual falls into one of the eight (8) categories listed under FAR 135.85. These individuals include:

   a. Martinaire employees who are certificated airmen (pilots, mechanics, dispatchers) and Martinaire maintenance personnel under the supervision of an A&P mechanic.

   b. An animal handler, when carrying live animals.

   c. An individual necessary for the safe handling of Hazardous Materials (as defined under Subchapter C, CFR 49).

   d. A security or honor guard accompanying a shipment made by or under the authority of the U. S. Government.

   e. A military courier or supervisor carried in operations under a military cargo contract when specifically authorized by the appropriate military service.

   f. An authorized representative of the FAA who is authorized to conduct enroute inspections. (THIS DOES NOT INCLUDE ATC CONTROLLERS OR OTHER FAA EMPLOYEES WHO ARE NOT AUTHORIZED TO CONDUCT ENROUTE INSPECTIONS).

   g. A person, AUTHORIZED BY THE FAA, who is performing a duty connected with a cargo operation of Martinaire. (Persons who are carried under this authorization must be listed, by name, on a Letter of Authorization issued by the FAA, and on file in the Flight Operations Office.)

   h. An authorized representative of the DOD with the title "DOD Commercial Air Carrier Evaluator WITH identification credential, Form 110B

2. Passengers not meeting the criteria of paragraph 1 above will not be transported under any circumstances in cargo-only aircraft. All passengers meeting the criteria must be approved by a member of the Flight Operations Staff no later than twenty-four (24) hours prior to the intended flight.

3. ANY CAPTAIN CARRYING UNAUTHORIZED PASSENGERS WILL BE SUBJECT TO DISCIPLINARY ACTION BY THE COMPANY AND THE FAA.

4. NO JUMP SEAT RIDERS FROM OTHER AIR CARRIERS WILL BE ALLOWED ON ANY AIRCRAFT THAT IS NOT EQUIPPED WITH KFC-250 AUTOPILOT WITH THREE AXIS CAPABILITY. ANY JUMPSEAT REQUESTS MUST BE APPROVED BY THE DIRECTOR OF OPERATIONS AND/OR CHIEF PILOT.

ENGINE CONDITION TREND MONITORING

To ensure the computer generated trend is an accurate refection of the engine efficiency, it is important that all PIC's record the trend information using a standard format. This section sets forth the sequence of recording and reporting trend information.

1. On each flight day select a leg with a sufficiently long cruise segment preferably at a representative altitude (+ or - 5000 ft from a typical cruise altitude) and airspeed. Establish engine power and allow the power to stabilize for a minimum of five (5) minutes.

2. It is not required to target any specific Np, Ng, ITT, Wf or Tq. All that is required is to stabilize per the Maximum Cruise Torque Setting Chart for at least five (5) minutes without moving the engine power controls.

3. Prepare for recording the ECTM parameters by:
    1. Check the Inertial separator is stowed.
    2. Check that all other bleed-air equipment is OFF.
    3. Verify no visible moisture.
    4. Verify no turbulence condition
    5. Verify propeller RPM is at 1900.

NOTE: **If you cannot accomplish the any of the above items because of flight conditions, do not record trend parameters. Wait until later in the flight or another leg to record trend data.**

4. Record as accurately as possible the following parameters in the space provided on the Aircraft Flight Log (AFL):

CAUTION: Read the instruments carefully. Errors in reading small instruments, parallax, etc., can result in unusable trend data.

1. Outside Air Temperature in degrees C.
2. Indicated Airspeed (IAS) in Knots.
3. Pressure Altitude in Feet (Momentarily reset your Altimeter to 29.92).
4. Torque (Tq in Foot-Pounds)
5. Propeller speed (Np) in RPM.
6. Interturbine Temperature (ITT) in degrees C.
7. Gas Generator Speed (NG) in percent to 1 decimal place.
8. Fuel Flow (WF) in Pounds per Hour.
9. Oil Pressure and Oil Temperature.

5. Upon completion of the flight, call the Dispatch telephone recorder and read the trend information in the order it is recorded on the Aircraft Flight Log (AFL). Please remember to include the aircraft number.

COMPANY SMOKING POLICY

NO SMOKING

It is the policy of Martinaire that everyone will refrain from smoking inside the corporate offices and the hanger facility or any of its associated offices. It is recognized that the rights of those who do not smoke must be respected. All who desire to smoke must exit the building and upon completion of the smoke, deposit the butt in a suitable receptacle. In addition, smoking is not allowed in any Company aircraft. Do not throw the butts on the ground. Smoking is not allowed in company vehicles. In addition, it is no longer permissible to use smokeless tobacco products in any company aircraft or vehicle.

BLOOD DONATIONS

Due to a temporary lowering of oxygen carrying property of the blood following donation of blood, it is recommended that flight crew member do not give blood within 72 hours prior to any flight.

FAR135 and/or FAR91 determination

- Martinaire publishes route descriptions by route numbers for each contracted series of flights.
- In each route description, are the flight legs to be flown.
- Unless otherwise noted, all legs are flown under FAR135.
- If a leg is planned to be "empty", meaning nothing is carried for a customer for revenue or hire, the leg is operated under FAR91.
- There are times when a normally flown FAR135 leg may be flown under FAR91. This can only be accomplished under FAR91 if the aircraft is empty. For example: The current weather will not allow a flight under FAR135. The customer decides to ground ship the cargo or makes other arrangements. The aircraft then has to reposition to it's intended destination. As long as there is NO cargo onboard being carried for revenue or hire the aircraft may conduct the flight under FAR91.
- Other than the pre-designated FAR 91 legs listed in the route descriptions, the pilot and the company are to ensure that a record of the leg being operated under FAR91 is recorded prior to departure. The pilot will write the words "part 91" into the % and bulk block on the AFL for the leg being operated under FAR91. The company will make a notation in CALM for that particular leg.
- All training, maintenance, ferry and repositioning flights will be conducted under FAR91.

SECTION S - WINTER OPERATIONS

This section of the GOM details the specific Martinaire procedures for operating company aircraft during winter weather conditions. This section is divided into two parts. The first part is Martinaire's FAA Approved Winter Operations Procedures and the second section contains an informative brochure from Cessna Aircraft Corporation entitled *Cessna Caravan Cold Weather Operations.*

Table of Contents

OVERVIEW

INTRODUCTION

Operating aircraft in the winter requires extra vigilance and adherence to prescribed procedures. If we maintain this vigilance, and strive to conduct operations in the safest, most knowledgeable manner possible, we can go a long way toward ensuring that winter operations are as safe and efficient as they are during the summer.

This manual is designed as a course regarding winter operations and is not to be considered all inclusive. It is intended to supplement the line pilot's own review of winter operations and to point out a few noteworthy items regarding winter flying. It is divided, into two sections: A general section covering general operations and an aircraft specific section covering winter operation of the aircraft that you are currently flying.

WINTER WEATHER

Winter weather poses several different obstacles to the operation of aircraft on a scheduled basis. Frost and snow, structural ice, extreme cold, wind chills and severe restrictions to visibility are just a few examples of winter weather. Pilots must be aware of winter weather factors, and how to properly cope with them if operations are to be conducted safely, efficiently, and smoothly.

COLD WEATHER OPERATIONS PROGRAM ADMINISTRATION – SPECIFIC

The day to day operations of Martinaire aircraft during cold weather operations rests primarily with the Pilot In Command as outlined in Section A of this GOM Pages A-8 and A-9.

The Director of Operations and the Chief Pilot are primarily and respectively responsible for the implementation and oversight of the Martinaire Cold Weather Operations Program as outlined in this Section S. The duties and responsibilities specific to the Director of Operations and the Chief Pilot are outlined in Section A Pages A-4 and A-5 of this GOM and include the Martinaire Cold Weather Operations Program.

Martinaire will conduct cold weather operations training as specified in this Section S during Initial, Recurrent and Transition pilot training. The cold weather operations training performed will be maintained in the specific training folder of each pilot that successfully completes cold weather operations training.

COMPANY ISSUED FLASHLIGHTS FOR COLD WEATHER DETECTION

Martinaire pilots are required to carry a flashlight with 2 size d cell batteries to each pilot for the use of detecting ice accumulation on the ground during preflight at night and while airborne for additional ice detection aid in addition to the aircraft equipped ice detection light and also as back up in the event that the aircraft equipped ice detection light becomes inoperative.

ABBREVIATIONS

C	Celsius	F	Fahrenheit
OAT	Outside air temperature	FP	Freezing point
h	Hours	min	Minutes
SAE	Society of Automotive Engineers	FPD	Freezing Point Depressant

DEFINITIONS

AILERONS

Hinged surfaces on the outer trailing wing section of an aircraft which are controlled by the stick or yoke in the cockpit and determine the rate of turn.

ANTI-ICING

A precautionary procedure by which the application of certain types of anti-icing fluids provides protection against the formation of frost or ice and accumulation of snow or slush on clean surfaces of the aircraft for a limited period of time (holdover time).

APU

(Auxiliary Power Unit) An on board source of auxiliary power for an aircraft.

CLEAR ICE

Forms when, after initial impact, the remaining liquid portion of the drop flows out over the aircraft surface gradually freezing as a smooth sheet of solid ice.

DEICING

A procedure by which frost, ice, or snow is removed from the aircraft in order to provide clean surfaces. The procedure can be accomplished by the use of fluids or mechanical means.

ELEVATORS

Control surfaces located at the aft end of the airplane which are controlled by the stick or yoke. Depending on attitude, the elevator will cause the tail of the plane to rise or fall.

EMPENNAGE

The rear portion of an aircraft consisting of a vertical stabilizer, rudder, horizontal stabilizer, and elevator.

FLAPS

Surfaces installed on the inboard trailing edge portions of aircraft wing section which are used to change the camber of the airfoil. Flaps are used **during takeoff and landing** and in other flight maneuvers.

FREEZING FOG

Clouds of super-cooled water droplets that form a deposit of ice on objects in cold weather conditions.

FREEZE POINT DEPRESSANT

The point at which a diluted mixture of deicing fluid will freeze.

FREEZING PRECIPITATION

Snow, sleet, freezing rain, drizzle or hail which adheres to aircraft surfaces.

FREEZING RAIN

Water condensed from atmospheric vapor falling to earth in super-cooled drops, forming ice on contact.

FROST

(Including hoarfrost) is a crystallized deposit formed from water vapor on surfaces which are at or below 0 degrees Celsius (32'F).

FUSELAGE

The main body of an aircraft that provides a central attachment point for the wing, empennage, landing gear, and power plant.

HOLDOVER TIME

The estimated time the fluid will be effective in preventing the formation of frost, ice, or snow on the treated surfaces of an aircraft. Holdover time begins when aircraft ground deicing/anti-icing commences and expires when the deicing/anti-icing fluid applied to the

aircraft wings, control surfaces, propellers, engine inlets, and other critical surfaces loses its effectiveness.

HYDROMETER

Instrument for determining the freeze point of a water mixture with deicing fluid.

MIXED CLEAR OR RIME ICE

Forms when drops vary in size or when liquid drops are intermingled with snow or ice particles. It can form rapidly. Ice particles become imbedded in clear ice, building a very rough accumulation sometimes in a mushroom shape on leading edges.

NEWTONIAN FLUIDS

Fluids whose viscosities are shear independent and time independent. The shear rate of a Newtonian fluid is directly proportional to the shear stress. The fluid will begin to move immediately upon application of a stress; it has no yield stress which must be achieved before flow begins. Type I fluids are considered Newtonian type fluids.

NON-NEWTONIAN FLUIDS

Fluids whose viscosities are shear and time dependent and whose shear rate is directly proportional to its shear stress. The fluid will not begin to move immediately upon application of a stress; it has a yield stress which must be achieved before flow begins. Type II fluids are considered Non-Newtonian type fluids.

OAT

Outside air temperature.

PITOT TUBE/MAST

An opening on an aircraft surface which is used to measure the aircraft speed.

PRETAKEOFF CONTAMINATION INSPECTION

An inspection of the wings, and control surfaces, to ensure they are free of frost, ice, or snow and completed within five minutes prior to beginning takeoff. It may be accomplished from within or outside the aircraft and may be visual or tactile or a combination, as long as the check is adequate to ensure the absence of contamination.

PROPELLER

An airfoil driven by the power plant which converts engine shaft torque to thrust.

RADOME

Nose area of an aircraft.

RAIN OR HIGH HUMIDITY (ON COLD SOAKED WINGS)

Water forming ice or frost on the wing surface when the temperature of the aircraft wing surface is at or below 0 degrees Celsius (32'F).

RIME ICE

Forms when drops are small, such as those in stratified clouds or light drizzle. The liquid portion remaining after initial impact freezes rapidly before the drop has time to spread over the aircraft surface. The small frozen droplets trap air between them giving the ice a white appearance. Rime ice is lighter in weight than clear ice, its irregular shape and rough surface make it very effective for reducing lift and increasing drag. Rime ice is brittle and more easily removed than clear ice.

SNOW

Precipitation in the form of small ice crystals or flakes which may accumulate on aircraft surfaces.

STATIC PORT

Calibrated vents on the sides of the fuselage, providing reference pressure to numerous instruments.

STATIC WICK

Antenna-like device off the trailing edge of the wings and tail that discharge static electricity.

STRUT

A support extending from the fuselage to the wing on the aircraft.

TRIM TABS

A small hinged section on the aircraft elevator, ailerons, and rudder used to relieve certain control pressures and prevent pilot fatigue. The trim tabs are used to finely set the control

surfaces so that the airplane will maintain level flight, on its own, without the pilot having to apply undue force to the yoke.

TYPE I FLUID

Unthickened fluids that are normally applied as a mixture of glycol and water. These fluids mainly provide protection against refreezing when longer delays occur.

TYPE II FLUID

Fluid used extensively in Canada and Europe, and less commonly in the United States. Type II fluid is less difficult to apply and provides longer holdover times than Type I fluid. The drawback of Type II fluid is that it has a gel consistency that may reduce a runway's coefficient of friction, thereby reducing an airplanes braking capability. Type II fluids can only be used on aircraft with takeoff speeds (V_1/V_R) of 85 KTS or greater.

TYPE III FLUID

Type III deicing/anti-icing fluids are no longer available for this upcoming winter season. This fluid was specifically designed to be used with commuter category aircraft with rotation speeds lower than 85 knots or as recommended by the specific aircraft manufacturer. Type III fluids (formerly referred to as Type one and one-half) provide holdover times that are significantly greater than Type I fluids, however these holdover times are typically not as long as those provided by Type II or Type IV fluid. It is not clear, if and when Type III fluids will become commercially available again.

TYPE IV FLUID

Concentrated Type IV deicing/anti-icing fluids have significantly better holdover time performance when compared to Type II and Type I fluids. This is attributable, in part, to the addition of thickeners and/or other additives which facilitate a thicker application of the fluid. However, during tests with some Type IV fluids, residual fluids were observed to form a thick or high strength jell during "dry-out" and when rehydrated formed a slippery film. Also, some new Type IV fluids have exhibited poor aerodynamic (flow-off) qualities at colder temperatures. Whereas, Type II and some Type IV fluids with good "dry-out" and good aerodynamic elimination formed a white powdery or thin film residue upon "dry-out" that was not slippery when rehydrated.

UCAR ADF - II

Aircraft deicing fluid which is specially formulated ethylene glycol-base inhibited fluid, developed to defrost and deice aircraft and to prevent the formation of frost and ice.

VORTEX GENERATORS

Metal tabs on wing or tail section that increases flow of air over such surface.

WING

The major airfoil of an airplane containing the flaps and ailerons.

GENERAL

Icing is a major weather problem. It is difficult to forecast and its intensity can vary considerably. Rates of ice accumulation vary widely, from less than ½ inch per hour to as high as one inch per minute. Experiments have shown that ice accumulation of ½ inch on some airfoils will reduce lift by as much as 50%, increase drag by an equal amount, and greatly increase stalling speed.

There are only two requirements for ice formation on aircraft on the ground:

1. Temperature 0° Celsius or less and
2. Visible moisture

Water droplets below 0° Celsius are called "super-cooled" water droplets, and have been found as low as -19° Celsius. Super-cooled water increases the rate of icing and is essential to rapid accretion. Super-cooled water is in an unstable liquid state; when an aircraft strikes a super-cooled drop, part of the drop freezes instantaneously. The latent heat of fusion released by the freezing portion raises the temperature of the remaining portion to the melting point. Aerodynamic effects may cause the remaining portion to freeze. The way in which the remaining portion freezes determines the type of icing. The types of structural icing are clear, rime, and a mixture of the two. Each type has its identifying features. The heaviest icing will occur between 0° and -10° Celsius.

TYPES OF ICING

Clear Ice

Clear ice forms when, after initial impact, the remaining liquid portion of the drop flows out over the aircraft surface gradually freezing as a smooth sheet of solid ice. This type forms when drops are large, as in rain or cumuliform clouds. Clear ice is hard, heavy, and tenacious. Its removal by deicing equipment is especially difficult.

Rime Ice

Rime ice forms when drops are small, such as those in stratified clouds or light drizzle. The liquid portion remaining after initial impact freezes rapidly before the drop has time to spread over the aircraft surface. The small frozen droplets trap air between them giving the ice a whitish appearance.

Rime ice is lighter than clear ice and its weight is of little significance. However, its irregular shape and rough surface make it very effective in decreasing the aerodynamic efficiency of airfoils, thus reducing lift and increasing drag. Rime ice is brittle and more easily removed than clear ice.

Mixed; Clear and Rime Icing

Mixed ice forms when drops vary in size or when liquid drops are intermingled with snow or ice particles. It can form rapidly. Rime ice particles become imbedded in clear ice, building a very rough accumulation that sometimes forms in a mushroom shape on leading edges.

RATES OF ACCUMULATION

Trace

Ice becomes perceptible. Rate of accumulation is slightly greater than the rate of sublimation. Not hazardous unless encountered for over one hour without antiicing or deicing equipment.

Light

Rate of accumulation may create a problem if flight is prolonged in this environment. Occasional use of deicing equipment removes ice.

Moderate

Rate of accumulation is such that even short encounters become potentially hazardous and use of deicing equipment is necessary.

Severe

Rate of accumulation is such that antiicing/deicing equipment fails to reduce or control the hazard. Immediate diversion is necessary.

NOTE:

Use above terms only when reporting icing conditions (i.e. "Heavy icing " is not a valid report)

Frost

Frost is a hazard to flying long recognized in the aviation community. Experienced pilots have learned to remove all frost from airfoils prior to takeoff. Frost forms near the surface primarily in clear, stable air with light winds - conditions which in all other respects make weather ideal

for flying. Because of this, the real hazard is often minimized. Thin metal airfoils are especially vulnerable surfaces on which frost will form.

Frost does not change the basic aerodynamic shape of the wing, but the roughness of its surface spoils the. smooth flow of air, thus causing a slowing of the airflow. This slowing of the air causes early air flow separation over the affected airfoil, resulting in a loss of lift. Even a mild coat of hard frost can cause up to a 30 percent increase in stall speed. A small amount of frost on airfoils may even prevent an aircraft from becoming airborne at normal takeoff speeds. Also possible is that once airborne, an aircraft could have insufficient margin of airspeed above stall so that moderate gusts or turning flight could produce incipient to complete stalling.

Frost formation in flight offers a more complicated problem. The extent to which it will form is still a matter of conjecture. At most, it is comparatively rare.

Icing and Cloud Types

Basically, all clouds with subfreezing temperatures have icing potential. However, drop size, distribution, and aerodynamic effects of the aircraft influence ice formation. Ice may not form even though the potential exist.

The condition most favorable for very hazardous icing is the presence of many large, super-cooled water drops. Conversely, an equal or lesser number of smaller droplets favors a slower rate of icing.

Small water droplets occur most often in fog and low-level clouds. Drizzle or very light rain is evidence of the presence of small drops in such clouds; but in many cases there is no precipitation at all. The most common type of icing found in lower-level clouds is rime.

On the other hand, thick extensive stratified clouds that produce continuous rain such as altostratus and nimbostratus usually have an abundance of liquid water because of the relatively larger drop size and number. Such cloud systems in winter may cover thousands of square miles and present very serious icing conditions for protracted flights. Particularly in thick stratified clouds, concentrations of liquid water normally are greater with warmer temperatures. Thus, heaviest icing usually will be found at or slightly above the freezing level where temperature is never more than a few degrees below freezing. In layer type clouds, continuous icing conditions are rarely found to be more than 5,000 feet above the freezing level, and usually are two or three thousand feet thick.

The upward currents in cumuliform clouds are favorable for the formation and support of many large water drops. The size of rain drops and rainfall intensity normally experienced from showers and thunderstorms confirm this. When an aircraft enters the heavy water concentrations found in cumuliform clouds, the large drops break and spread rapidly over the

leading edge of the airfoil forming a film of water. If temperatures are freezing or colder, the water freezes quickly to form a solid sheet of clear ice. Pilots usually avoid cumuliform clouds when possible. Consequently, icing reports from such clouds are rare and do not indicate the frequency with which it can occur.

The updrafts in cumuliform clouds carry large amounts of liquid water far above the freezing level. On rare occasions icing has been encountered in thunderstorm clouds at altitudes of 30,000 to 40,000 feet where the free air temperature was colder than minus 40° C.

While an upper limit of critical icing potential cannot be specified in cumuliform clouds, the cellular distribution of such clouds usually limits the horizontal extent of icing conditions. An exception, of course, may be found in protracted flights through a broad zone of thunderstorms or heavy showers.

OTHER FACTORS IN ICING

In addition to the above, other factors also enter into icing. Some of the more important ones are discussed below.

Fronts

A condition favorable for rapid accumulation of clear icing is in freezing rain below a frontal surface. Rain forms above the frontal surface at temperatures warmer than freezing. Subsequently, it falls through air at temperatures below freezing and becomes super-cooled. The super-cooled drops freeze on impact with an aircraft surface. It may occur with either a warm front or a cold front. The icing can be critical because of the large amount of super-cooled water. Icing can also become serious in cumulonimbus clouds along a surface cold front, along a squall line, or embedded in the cloud shield of a warm front.

Terrain

Air blowing upslope is cooled adiabatically. When the air is cooled below the freezing point, the water becomes super-cooled. In stable air blowing up a gradual slope, the drops generally remain comparatively small since larger drops fall out as rain. Ice accumulation is rather slow and you should have ample time to get out of it before the accumulation becomes extremely dangerous. When air is unstable, convective clouds develop a more serious hazard for icing conditions.

Icing is more probable and more hazardous in mountainous regions than over other terrain. Mountain ranges cause rapid upward air motions on the windward side, and these vertical currents support large water drops. The movement of a frontal system across a mountain range often combines the normal frontal lift with the upslope effects of the mountains to create extremely hazardous icing zones. Each mountainous region has preferred areas of icing depending upon orientation of mountain ranges to the wind flow. The most dangerous icing takes place above the crest and to the windward side of the ridges. This zone usually extends about 5,000 feet above the tops of the mountains; but when clouds are cumuliform, the zone may extend much higher.

Seasons

Icing may occur during any season of the year; but in temperate climates such as those which cover most of the contiguous United States, icing is more frequent in winter. The freezing level is nearer the ground in winter than in summer leaving a smaller low-level layer of airspace free of icing conditions. Cyclonic storms also are more frequent in winter, and the resulting cloud systems are more extensive. Polar regions have the most dangerous icing condition in spring and fall. During the winter, the air is normally too cold in the polar regions to contain heavy concentrations of moisture necessary for icing, **and most clouds are** stratiform and are composed of ice crystals.

RESTRICTIONS TO VISIBILITY

Determination of Visibility

Prevailing visibility is determined by reference to known landmarks around the reporting station. Reported as the greatest visibility seen in half the circle around the station-not necessarily consecutive segments.

RVR-Runway Visual Range.

An instrumentally derived value that represents the horizontal distance a pilot will see down the runway from the approach end. RVR is a horizontal visual range, not a slant visual range. RVR is used in lieu of Runway Visibility Value (RVV) and/or prevailing visibility in determining minimums only for a particular runway.

Rain

Raindrops on the windshield and on approaching terrain can cause visual distortions which can lead to mismanagement of landing approaches. Two types of distortion are Refraction and Diffusion.

Refraction

Refraction is the change of direction of light beams as they pass from one medium to another-in this case from air to water. Water slows up the passage of light and causes it to "bend" (as in the example of placing a stick in water). Also familiar is the experience of visualizing objects at the bottom of a pool as being at a shallower depth than their true depth because of the refraction of light by water. In heavy rain, even though visibility may appear fairly good to the pilot, terrain contours or lights may seem lower than their actual elevation relative to the airplane.

Diffusion

Diffusion (haloing) refers to the tendency of lights to spread apart and appear less intense when seen through moisture and therefore farther away than their actual distance. Conversely, Diffusion under other circumstances, may cause approach lights to appear larger, and hence nearer, than they are.

The most critical time during an instrument approach is the moment the transition is made from instruments to visual references. The pilot may think he is too high and permit an excessive descent rate to develop. The distortion will vary according to the severity of weather and terrain conditions.

All precipitation can cause reduced visibility and visual distortion which can lead to disorientation.

Braking Action Reports

ATC furnishes pilots the quality of braking action received from pilots or the airport management. The quality of braking action is described by use of the terms "good", "medium", "poor", or "nil".

Pilots should describe the quality of braking action by using the terms noted above. In describing braking action for a portion of a runway, pilots should use descriptive terms that are easily understood, such as, "braking action poor the first half of the runway." Reports referenced to local landmarks, buildings, etc., should be avoided.

Braking Reports can be misleading. A B-747 has better braking friction than a B-727, mainly because of the extra tires and weight. Pilot reports also depend upon the speed at which the brakes were applied. An aircraft at 100 knots may give a "poor to nil" report while an aircraft at 60 knots may report "fair", and at 30 knots "good", all on the same contaminated surface. Therefore, it is important to question the tower about braking reports: What kind of aircraft made the report? Where did it turn off of the runway? Some pilots monitor the tower frequency many miles out from the airport in order to listen to the actual pilot report rather than rely on second hand information.

Braking Action Advisories

When airport operations conduct a braking action test, they issue a NOTAM for the braking action. As soon as test results are acquired or whenever weather conditions are conducive to deteriorating or rapidly changing runway braking conditions, the tower will include on the ATIS, "BRAKING ACTION ADVISORIES ARE IN EFFECT."

During the time that Braking Action Advisories are in effect, ATC will issue the latest braking action report for the active runways for each arriving and departing aircraft. Runway condition codes, one for each third of the landing runway surface, shall be relayed to operational aircraft in the form of #/#/#. (e.g. 4/3/3 indicating 'good to medium'/'medium'/'medium'). Condition codes range from '6' indicating 'dry'; to '0' indicating 'nil'. The 'Operational Runway Condition Assessment Matrix (RCAM) Braking Action Codes and Definitions' is included on the next page.

Restriction or Suspension of Operations

When the Captain of a flight becomes aware of conditions (including airport and runway conditions) which are hazardous to safe operations, he shall restrict or suspend operations until those conditions are corrected.

Flight crews shall avail themselves of all information concerning hazardous conditions regarding flight operations.

OPERATIONAL RUNWAY CONDITION ASSESSMENT MATRIX (RCAM) BRAKING ACTION CODES AND DEFINITIONS

Assessment Criteria		Control/Braking Assessment Criteria	
Runway Condition Description	**RwyCC**	**Deceleration or Directional Control Observation**	**Pilot Reported Braking Action**
• Dry	**6**	---	---
• Frost • Wet (Includes damp and 1/8 inch depth or less of water) ***1/8 inch (3mm) depth or less of:*** • Slush • Dry Snow • Wet Snow	**5**	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	Good
-15ºC and Colder outside air temperature: • Compacted Snow	**4**	Braking deceleration OR directional control is between Good and Medium.	Good to Medium
• Slippery When Wet (wet runway) • Dry Snow or Wet Snow (any depth) over Compacted Snow ***Greater than 1/8 inch (3 mm) depth of:*** • Dry Snow • Wet Snow ***Warmer than -15ºC outside air temperature:*** • Compacted Snow	**3**	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	Medium
Greater than 1/8 inch(3 mm) depth of: • Water • Slush	**2**	Braking deceleration OR directional control is between Medium and Poor.	Medium to Poor
• Ice	**1**	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	Poor
• Wet Ice • Slush over Ice • Water over Compacted Snow • Dry Snow or Wet Snow over Ice	**0**	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	Nil

NOTE: The unshaded portion of the RCAM is associated with how an airport operator conducts a runway condition assessment.
NOTE: The shaded portion of the RCAM is associated with the pilot's experience with braking action.
NOTE: The Operational RCAM illustration will differ from the RCAM illustration used by Airport Operators.
NOTE: Runway condition codes, one for each third of the landing surface, for example 4/3/3, represents the runway condition description as reported by the airport operator. The reporting of codes by runway thirds is expected to begin in October of 2016.

AIRCRAFT PREFLIGHT

Preflight Inspection

A thorough preflight inspection is extremely important under winter conditions. The PIC's responsibility is to make the decision on whether or not to takeoff based on operators developed guidance and procedures.

(1) Identification of surfaces to be checked/inspected during each type of check.

(2) Techniques for recognizing contamination on the aircraft.

Aircraft Surfaces and Critical Surfaces and Representative Surfaces

The aircraft surfaces, which should be clear of contaminates before takeoff, should be described in the aircraft manufactures' maintenance manual or other manufacturer developed documents, such as service or operations bulletins.

(1) Certificate holders should list in their approved training programs and operations manual (which are referenced in the operations specifications) for each type of aircraft used in their operations, the surfaces which should be checked on pilot-conducted preflight inspections and pre-takeoff contamination checks.

(2) Generally, the following aircraft critical surfaces should be clear of contaminants, if the aircraft manufacturer's data is not available:

(a) Propeller, windshield, wing, empennage, stabilizing, or control surfaces.

(b) Powerplant installation(s) including associated surfaces or systems such as engine inlets and fuel vents.

(c) Airspeed, altimeter, rate of climb, or flight attitude instrument including associated surfaces or systems such as pitot heads, static ports, and instrument sensor pickup points.

This airline utilizes the **"clean aircraft concept"** for the operation of all aircraft. This concept provides that the aircraft will be completely clear of snow, frost, or ice before takeoff. In addition, CFR 135.227 states that:

(a) No pilot may takeoff an aircraft with:

(1) Frost, snow, or ice adhering to any rotor blade, propeller, windshield, or powerplant installation, or to an airspeed, altimeter, rate of climb, or flight attitude instrument systems, or;

(2) Snow or ice adhering to the wings or stabilizing or control surfaces, or;

(3) Any frost adhering to the wings, or stabilizing or control surfaces, unless that frost has been polished to make it smooth.

It will be the responsibility of the Pilot in Command to see that these procedures are STRICTLY ADHERED TO:

(1) Check and remove any ice adhering to the fuselage, waste water drains and static port vents.

(2) Check and remove any tape, covers, and /or plugs previously installed on pitot-static probes, static ports, etc.

(3) No airplane will takeoff when any of the following have an adhering coating of ice, snow or frost:

- Propellers
- Windshield
- Wings
- Stabilizers
- Control surfaces
- Pitot and stall system probes
- Power plant installation

Check any other items required by the Aircraft Flight Manual or deemed necessary by the flight crew.

No airplane will takeoff with ice, snow or frost adhering to any part of the aircraft structure which, in the opinion of the PIC, might adversely affect airplane performance.

TAXI AND RAMP OPERATIONS

Winter weather can complicate ramp operations significantly. Slippery surface conditions, higher than normal break-away power, and extremely cold temperatures can combine to create a potentially hazardous situation. Measures can be taken to reduce this accident potential until the affected areas are properly cleared of snow and ice. These measures include:

Advise all personnel that when ramp areas are ice or snow covered, hazardous conditions exit and that extra vigilance and precautions are required.

Ensure that adequate ramp space is available for maneuvering because directional control and stopping capabilities are greatly reduced. All flight crews must exercise extreme caution during these times due to ramp congestion and surface conditions.

Care should be taken by the flight crew to ensure that sand, cinders, or other FOD is not drawn into the engines while taxiing.

After completing a long taxi, enough heat may be retained in the aircraft brakes, wheels, and tires to melt snow or ice in the brakes and under tires after the aircraft is parked. The area in which an aircraft is to be parked should be cleaned of excess snow and slush. If this is impractical, the areas around the main and nose wheels should be cleaned of snow and slush to reduce the possibility of the tires being frozen to the ground.

Taxi slowly on icy runways and taxiways as if no brakes were available, and exercise caution when braking. Ice makes stopping difficult, nose wheel steering less effective, and can make precise parking a problem due to directional control problems and covered ramp markings. If you cannot see ramp markings, neither could the pilot that you are parking next to. In close quarters, always request the assistance of wing tip spotters, but remember that the flight crew is ultimately responsible for the safe operation of the aircraft.

Surface conditions away from the ramp may differ from those existing at the gate because deicing fluids dripping from airplanes tend to melt the ramp ice and snow. When snow piles up along the edges of taxiways, it can cover taxi aids, such as signs or lighting, can interfere with paths of travel, and may even block or obscure the taxiways themselves.

Be aware that if you taxi through jet or prop blast in light blowing snow, enough snow can be blown onto the fuselage to melt and then refreeze in a thin film over static ports.

Flap operation on the ground should be altered in snow or slush conditions. During taxi-out, the flaps should be left retracted until completing the taxi to the takeoff runway if the appropriate checklists allow. On taxi-in after landing where there is snow, ice, or slush on the runway, the Captain may elect to leave the flaps extended to the approach position to prevent damage upon retraction. Upon arrival at the gate, closely inspect the flap area and deice as necessary to remove any slush or snow that may have accumulated, then retract the flaps to prevent contamination from forming while the aircraft is parked on the ramp.

Snow banks resulting from newly plowed runways are another taxi hazard. the danger is greatest when airports have just been reopened after a heavy snowfall. Adopt an extremely conservative attitude towards taxi clearances at times like these to ensure that the taxi route will provide safe operation of your aircraft type.

HOLDOVER TIME TABLES AND PROCEDURES FOR THEIR USE

CFR 135.227 allows for a deice/anti-ice program including holdover time tables. The holdover time tables are for use in preflight planning only and are to be used in conjunction with pretakeoff check procedures by the flight crew.

Holdover times are only an estimate of time of effectiveness of deicing/anti-icing fluids and are based on a number of variables. Use of these time tables requires a pretakeoff check of the wings or representative surfaces to be completed by the flight crew prior to takeoff and within the holdover time range.

Because of differences in performance of the various Type IV deicing/anti-icing fluids, four different Type IV holdover tables are approved for use. If the specific brand of Type IV fluid can be positively determined, use of the manufacturer specific table is permitted. If the specific brand of Type IV fluid is not known, use of the SAE Type IV fluid holdover timetable is required.

Deicing/anti-icing fluids do not provide any protection from contamination once the aircraft is airborne.

PRE-TAKEOFF CONTAMINATION CHECK

Pre-takeoff contamination check procedures for each specific type of aircraft operated by Martinaire, Inc. must be established by the Company, approved by Martinaire, Inc.'s Principal Operations Inspector (POI) and referenced within the Company's Operations Specifications.

A pre-takeoff contamination check is required any time ground icing conditions exist. The aircraft's wings or representative aircraft surfaces are checked for contamination prior to takeoff. The pretakeoff contamination check must be completed within 5 minutes before takeoff and may be performed either by the flight crew from within the aircraft (under certain conditions), or by a qualified person from the exterior of the aircraft.

If there is reasonable expectation that the only type of accumulation adhering to the aircraft would be rime ice, the pretakeoff contamination inspection may be performed from the flight deck.

Should there be reasonable expectation that there could be an accumulation of clear ice adhering to the aircraft, the pretakeoff contamination inspection must be performed by a qualified individual from outside the aircraft. Because of the variables involved in the determination of holdover times, it is necessary for the flight crew to look outside the aircraft to assess current weather or other situational conditions, including the aircraft condition, and not rely on the holdover times as the sole determinate that the aircraft is free of contaminates.

An internal inspection is approved if the pilot in command is assured, by inspection from inside the aircraft by a flight crewmember, that the aircraft is "clean".

That inspection will be conducted in accordance with the applicable aircraft flight manual as follows:

CE-208 POH Supplement S1

Crewmembers must ensure the aircraft wings, control surfaces and other critical surfaces remain free of frost, ice or snow. The PIC's responsibility is to make the decision on whether or not to takeoff based on developed guidance and procedures.

EFFECTS OF FLUIDS ON AIRCRAFT PERFORMANCE AND FLIGHT CHARACTERISTICS

The pilot should be aware that Deicing fluids may cause the following:

- Increased rotation speeds/field lengths
- Increased control pressures on takeoff
- Increased stall speeds
- Lift loss during climbout/higher pitch attitude
- Increased drag during acceleration and climb

PILOT NOTIFICATION OF AIRCRAFT DEICE/ANTI-ICE

SAE TYPE I % _____ Fluid/Water

SAE TYPE II % _____ Fluid/Water

SAE TYPE IV % _____ Fluid/Water

UNION CARBIDE ULTRA+ Type IV % _____ Fluid/Water
OCTAGON* MAX-FLIGHT Type IV % _____ Fluid/Water
KILFROST ABC-S Type IV % _____ Fluid/Water
SAFEWING MP IV 1957-Green Type IV % _____ Fluid/Water

Aircraft deicing was performed by:_____
Signature:_____ Company:_____
Location:_____

The above aircraft deicing was performed under the direction and supervision of the Pilot In Command.

NOTE: If specific brand of Type IV fluid used cannot be positively determined, use SAE Type IV holdover timetable. If specific brand of Type IV fluid used can be determined, use the appropriate manufacturer specific holdover timetable.

FINAL STEP START TIME (Hours:Minutes) _____

POST DEICING/ANTI-ICING CHECK RESULTS _____

NOTE: Receipt of this form indicates the Deicing/Anti-icing post application check is complete.

NOTE: Additional copies of this form are available in each GOM or on the Martinaire.NET website.

TAKEOFF OPERATIONS

Takeoff Run

Acceleration to the takeoff safety speed, directional control on the takeoff run, and deceleration to a complete stop in the event of an aborted takeoff are of great concern during a winter takeoff.

There are a few ways to compensate for slippery runways that are length limited. Always ensure that full takeoff power is used. This is not the time to consider the saving of fuel and maintenance times by using a reduced power setting on takeoff. Slush on the runway can reduce acceleration to the point that the aircraft may never reach takeoff speed. Slush can build up in front of the wheels like a snow plow to the point that acceleration becomes negative and the aircraft starts decelerating. When standing water, slush, or wet snow exist on the runway, the Aircraft Flight Manual (AFM) should be consulted to determine if a takeoff on that runway is within limits. In addition, the aircraft performance charts should also be consulted to determine if the takeoff can be made under existing conditions.

Crosswinds

Crosswinds are another factor to be considered during winter takeoffs. Crosswind limitations are established on bare and dry runways. Generally, the maximum crosswind limits can be used on contaminated runways with sanded, packed snow conditions, however any AFM or performance limitations for the specific aircraft type must always be adhered to. On aircraft without specifically reduced crosswind limitations, the maximum crosswind component should be reduced by 50 percent on unsanded snow-covered runways and by 75 percent on wet, icy runways. These figures are only approximate and should be tempered by the crew's experience and good judgement. Very high snow banks can hide the effect of a crosswind on takeoff and some aircraft have been forced into the banks just after liftoff when hit by its full force.

Another important consideration on the takeoff run is hydroplaning. Every rainy season provides the potential for a few incidents of aircraft sliding off the end of the runway. It is important that all flight crewmembers become familiar with the theory of hydroplaning and how it affects taxi, takeoff and landing operations. For a detailed explanation of the types of hydroplaning and precautionary measures to be utilized, refer to the landing section of this document.

After Takeoff

One eighth of an inch of ice adhering to ailerons, elevator, or rudder can cause control flutter. Small amounts of ice inside the control surfaces can cause a weight imbalance and also cause flutter. Control flutter is a violent instability, and can destroy an aircraft as speed is increased

or decreased. If flutter should occur, first attempt to decrease airspeed even though that speed may be close to the stall. This is a drastic decision, but it is much more desirable than the consequences of flutter. The best way to avoid flutter is to ensure that all surfaces are completely free of any contamination.

Slush or wet snow can work its way up into the wheel wells during taxi and takeoff. It can then refreeze enroute and prevent the undercarriage form extending. If this is suspected during the takeoff, recycle the gear so that the airstream can blow away as much of the substance as possible prior to freezing.

If a slight buffet is felt when the flaps are retracted during the climb, immediately return the flaps to their prior position. There may be ice on the wings causing a disturbance of airflow, and the change in flap position changes the airflow to a nearly stalled condition. Gain some more altitude, increase airspeed, and then retract the flaps. Remember that until the ice that caused the airflow disturbance melts away the same problem will occur.

Cold temperatures can affect attitude and directional gyros. They can become sluggish and therefore give false readings. Always ensure that all gyros have attained proper operating speed and are behaving normally before takeoff.

A frozen pitot tube is another consideration during winter flying. If the ram air input is blocked, the indicated airspeed may drop to zero. If the ram air input and the drain hole are blocked, the trapped pressure in the system will change the airspeed indicator into an altimeter. During climb the indicated airspeed will increase and during a descent it will decrease. During level flight indicated airspeed will not change even if the actual airspeed increases or decreases. If a static port or line should become blocked, the airspeed indications will be exactly the opposite of a blocked pitot system. Pitot and static port heating should always be selected ON, both on the ground and in-flight.

ENROUTE OPERATIONS

Enroute Icing

In clouds or visible moisture, any temperature between +1O° C and -40° C can produce some form of icing. The greatest occurrence is between +5° C and -10° C with the highest risk being just below the freezing point.

While icing can also occur at any altitude, severe icing areas are usually about two hundred feet thick. Therefore an altitude change of one thousand feet will usually show noticeable improvement. Heavy icing is sometimes associated with turbulence at the bases and tops of cumulus clouds. Be aware of the possibility that significant icing may occur in an area of intermittent or no precipitation, just beyond the boundaries of a widespread area of steady precipitation, and much less icing within the precipitation area itself.

Propeller Ice

Propeller ice is bad news because we cannot see it forming. By the time we realize that we have propeller icing it is almost too late to do anything about it. The best cure is to turn on the propeller deicing system prior to entering icing conditions. If what seems to be engine roughness occurs during flight in icing conditions, consider the possibility of propeller icing. Refer to the AFM for the specific aircraft type for more detailed information.

Tail Icing

Tail icing is similar to propeller icing in that we cannot see it forming. On some aircraft the tail will ice up prior to any other part of the aircraft. This is due to the change in temperature and pressure of the air as it flows over the wing. Tail icing can blank out the effectiveness of the elevator. It will most likely be noticed as flaps are extended for landing or as speed is reduced for landing. During the approach, if the elevator control feels mushy, suspect tail icing and activate the deicing system. A higher approach and landing speed may be necessary if tail icing is confirmed and the ice cannot be shed. Refer to the AFM for the specific aircraft type for more detailed information.

Wing Deicing

Continuous use of some pneumatic deicing boot systems could adversely effect the removal of ice from wings and tail of some aircraft. If the boots are left inflated or the inflation cycle is continuous, ice can build up beyond the expanded position making ice removal impossible. The proper use of these pneumatic deicing boot systems is to let the ice build up to approximately 1/2 to 1 inch accumulation, then cycle the boots, repeating as required. Refer to the AFM for the specific aircraft type for more detailed information.

Engine Anti-ice

The lip of most turbine engines have some sort of anti-icing system (electric, hot air, or pneumatic) and a situation known as "Runback", can create a ridge just inside the lip which can disturb the smooth flow of air into the engine. Poor performance and possibly engine flameout could occur. Late selection of engine anti-ice can also produce a special problem, in that removal of large amounts of ice have been known to cause flame-outs. If caught with ice on the inlets, activate the engine anti-ice one engine at a time. Wait about one minute before selecting the next engine. Continuous ignition, if installed, should be selected ON prior to use of engine anti-icing. Refer to the AFM for precise procedures on your aircraft.

Ice and ATC

In severe icing conditions, when the only way to handle the situation is to reverse course and/or change altitude, a request must be made with ATC. When placing this request with

ATC, ensure they understand that you will be making the changes with or without their approval. In extreme circumstances it may be necessary to declare an emergency. This is not the approach to use under most icing scenarios, however when the safety of flight is being undermined by operating in these conditions, the flight crew must be firm in doing what is necessary to ensure the safety of the flight.

Snow Static

Heavy snow static can be a nuisance and even hazardous. Radio static and St. Elmo's Fire are common in heavy snow and cold cumulus clouds. A static discharge is capable of burning holes in the airframe, exploding fuel tanks, and a host of other hazardous events. An electrical charge can build up faster than the aircraft's static wicks can handle it. The excess build up can then discharge with a bang of up to 450 thousand volts.

The best prevention is to avoid cumulus clouds when the OAT is between -5° C and +5° C. An inch or so of St. Elmo's fire is acceptable, but if there is a sudden build up, reduce airspeed by at least 20 knots immediately and then call ATC for an altitude change. The voltage should drop, but to be safe, place one earphone off or forward of the ear to prevent deafness and turn up the white cockpit lights to prevent blindness. If a large discharge does occur, land as soon as possible for a complete maintenance inspection.

APPROACH AND LANDING

When there is risk of ice accretion, proper use of the anti-icing systems must be observed. If they are left OFF inadvertently or they malfunction, the resultant accumulation of ice will increase stall speeds. Therefore, the safety margin between stalling speed and approach and landing reference speeds will be reduced. It should be remembered that speed adjustments made in recognition of this effect will correspondingly increase landing distance.

Reduced Visibility

Reduced visibility is a frequent occurrence in the winter season and will necessitate more instrument approaches and associated low visibility landings. Obviously the successful completion of any instrument approach, whether precision or nonprecision, depends on a number of factors, beginning with the early establishment of the prescribed "slot" position; i.e. maintaining the proper descent rate, proper airspeed for existing conditions, proper runway alignment, steady state power settings, and the aircraft set up in the landing configuration a safe distance from the runway threshold. Successful instrument approaches under low visibility conditions depend upon the completion of the above factors, as well as knowing how much of the approach light system you can expect to see after breaking out of the clouds.

Pilots have reported illusory visual effects experienced during landing in snowy conditions. The effects of strobe lights at night when flying in snow can be very disorienting. The effect of

swirling snow can produce vertigo, and also a "white-out" in which ground and sky merge and become indistinguishable. The most reliable visual horizontal guidance will be from crossbar approach lights.

Landing Considerations

Landings on wet or icy runways require much greater stopping distances. Slippery runways are not always the result of precipitation accompanied by low temperatures. Fuel and rubber residue with a measure of moisture added can produce a surprisingly slick surface. This mixture has produced numerous overruns and with the presence of a strong crosswind, caused aircraft to slide off the side of the runway.

Recommended Technique for Wet Runway Landings

Utilize the greatest flap setting allowed to permit the minimum approach speed to be used. Do not attempt to hold the aircraft off to make a smooth landing. Make a firm touchdown. Apply maximum reverse thrust as soon as possible after touchdown. When using aircraft braking, utilize the anti-skid system properly by applying maximum braking and holding steady brake pedal pressure.

In addition to the problem of hydroplaning, splashing water or slush can cause damage to flaps or other parts of the airframe. Water of slush can also freeze to actuating mechanisms, causing them to cease functioning.

PERFORMANCE CALCULATIONS

It is imperative that each flight crewmember be completely familiar with all performance considerations for their specific aircraft type and weigh these carefully in their planning. All performance charts and calculations should be consulted and completed fully and accurately. They should then be applied to all applicable operations.

ANTISKID SYSTEM

Since brakes have little or no effect during the high speed portion of the deceleration roll, many pilots do not even touch the brakes until near or below the hydroplaning speed for their aircraft. This ensures that the wheels are turning and good antiskid control is then available.

REVERSE THRUST

Reverse thrust can be a bonus for winter operations if it works as planned. The reversing mechanisms can be slow to engage on one side. In dry snow it can blow the snow forward, reducing visibility to zero.

During crosswind landings, the aircraft will tend to weathervane and reverse thrust will intensify this tendency.

Reverse thrust is most effective at the highest speeds (just the opposite of the brakes). At the highest speeds, the steering control of the aircraft will be primarily that of the flight controls. Therefore, on touch down, reverse thrust should be applied, ensuring that all systems have engaged. Then gently increase reverse thrust while maintaining directional control. During this transition period, it is very important that the pilot ensures that adequate control is available. Maximum reverse thrust can be applied even under crosswind conditions as long as the flight controls can keep the aircraft tracking down the runway centerline. As the flight controls lose their effectiveness, differential reverse thrust may be used, or reverse thrust may be reduced in order to maintain directional control.

CAUTION SHOULD BE USED ON CONTAMINATED RUNWAY SURFACES AS DEBRIS MAY BE INGESTED WHILE IN REVERSE THRUST

POSTFLIGHT INSPECTION AND AIRCRAFT PREPARATION

When an aircraft is to be exposed to extreme cold for any length of time, extra care in addition to that normally provided should be taken to protect the aircraft. All covers for engines, air conditioning system intakes, pitot and static system openings, and ram air inlets should be installed to prevent snow and ice accumulations. Small covers should be conspicuously marked or tagged so that they are not likely to be overlooked during preflight inspection.

DEICING/ANTI-ICING METHODS AND PROCEDURES

These procedures establish the recommended methods for deicing/anti-icing of aircraft on the ground to provide a safe takeoff.

When aircraft surfaces are contaminated by frozen moisture, they will be deiced prior to departure. When freezing precipitation exists and the precipitation is adhering to the surfaces at the time of departure, aircraft surfaces will be deiced/anti-iced.

For maximum deicing effect, heated fluids will be applied close to the surface of the aircraft skin to minimize heat loss. The heat in the fluid effectively melts any frost as well as light deposits of slush, snow, and ice. Heavier accumulations require the heat to break the bond between the frozen deposits and the structure; the hydraulic force of the fluid will prevent refreezing for a period of time depending on aircraft skin temperature, OAT, the fluid used, and the weather.

A nozzle setting giving a solid cone spray is recommended for removal of frost and light ice. This ensures the largest pattern available, thus retaining the maximum heat in the fluid. Provided the hot fluid is applied close to the aircraft's skin, a minimal amount of fluid will be required to melt the deposit.

A nozzle setting sufficient to flush off deposits is recommended for removal of snow. The method adopted will depend on the equipment available and the depth and type of snow, i.e. light and dry or wet and heavy. In general, the heavier the deposits the heavier the fluid flow that will be required to effectively and efficiently remove it from the aircraft surfaces. For light deposits of both wet and dry snow, adopt a similar procedure as for frost removal. Wet snow is more difficult to remove than dry snow and unless deposits are relatively light, selection of a high fluid flow will be found to be more effective. Under certain conditions it will be possible to use the heat, combined with the hydraulic force of the fluid spray, to melt and subsequently flush off frozen deposits. Heavy accumulations of snow will always be difficult to remove from aircraft surfaces and vast quantities of fluid will invariably be consumed in the attempt.

Under these conditions, serious consideration should be give to manually removing the worst of the snow before attempting a normal deicing procedure.

Heated fluid will be used for the removal of ice. The high thermal conductivity of the metal skin is utilized, and a jet of hot fluid is directed at close range onto one spot until the bare metal is just exposed. This bare metal will then transmit the heat laterally in all directions, raising the temperature above the freezing point, and thereby breaking the adhesion of the frozen mass with the aircraft surface. By repeating this procedure a number of times the adhesion of a large area of frozen snow or glazed ice can be broken. The deposits can then be flushed off with either a low or high flow, depending on the amount of the deposit.

Ground personnel or flight crews, if necessary, may remove dry snow with brooms, brushes, etc. provided no frozen deposits remain on the aircraft.

On receipt of a frost, snow, freezing rain, or freezing fog warning from a local meteorological service, anti-icing fluid may be applied to clean aircraft surfaces prior to the start of freezing precipitation. This will minimize the possibility of snow and ice bonding, or reduce the accumulation of frozen precipitation on aircraft surfaces and facilitate subsequent deicing. Anti-icing should be carried out as near to the departure time as possible in order to maintain holdover time.

A. During periods of precipitation, the deicing process is normally started at the rear of the left wing of the aircraft and continued clockwise around the aircraft (single unit). This allows the flight crew the advantage of observing from the cockpit the rate of precipitation accumulation.

B. Spray the flaps and the fuselage. Attention should be given to the underside of the flaps, the fuselage, and the trailing edge of the wing. Continue around the left wing tip, deicing as necessary.

C. Next, position the deicer at a 45 degree angle between the left wing tip and nose of the aircraft. This will enable the person to spray the leading edge of the wing, props and fuselage. Attention should be given to the main gear and the underside of the wing.

D. Position the deicer in front of the aircraft. The nose and the front end of the fuselage tend to pickup the most ice and snow. It is extremely important that all ice and snow is eliminated from this area to prevent obstruction of the pilot's view during takeoff.

E. Continue around the right wing tip deicing as necessary, positioning the deicer between the front of the right wing and the fuselage. Spray the leading edge of the wing, props, and fuselage. Attention should be given to the main gear and the underside of the wing.

F. Position the deicer between the fuselage and the rear of the right wing. Spray the flaps, the fuselage and the front of the tail section. Attention should be given to the underside of the flaps and the trailing edge of the wing.

G. Continue around and position the deicer at the rear of the tail. Spray tail flight controls and top of tail surface.

H. Deicing should be complete. Communicate to the Captain that deicing has been completed and ask for his or her approval. The Captain will either (1) acknowledge completion of deicing or (2) ask that the procedure be repeated.

I. DO NOT SPRAY ANY PART OF THE AIRCRAFT WHILE PASSENGERS ARE BOARDING, WHILE ANY DOORS ARE OPEN, OR WITH ANY ENGINE RUNNING.

J. Do not spray directly into an engine intake.

K. Do not spray directly into the pitot tubes, static ports, or directly on vortex generators.

L. Never spray directly onto window surfaces with a hard stream of fluid as this can cause cracking. Removal of snow and ice from windows can be accomplished by spraying directly above the window and letting the fluid mixture flow down the window.

M. For areas that are unable to be directly sprayed, one may deice these areas by applying the glycol mixture to a cloth and wipe the area in question.

N. Ice can build up on aircraft surfaces during flight through dense clouds or precipitation. When ground OAT at the destination is low, it is possible for flaps and other moveable surfaces to be retracted and accumulations of ice to remain undetected between stationary and movable surfaces. It is therefore important that these areas are checked prior to departure and any frozen deposits removed.

0. A flight control check shall be preformed after deicing.

P. During periods of precipitation, the deicing process (two units) is normally started at the nose of the aircraft on each side. Moving towards the rear of the aircraft, position the deicer units between the front of both wings and the fuselage. Spray the leading edge of the wings, props, and the fuselage. Attention should be given to the main gear and the underside of the wing.

Q. Continue around and position the deicer units between the fuselage and the rear of both wings. Spray the flaps, the fuselage and the front of the tail section. Attention should be given to the underside of the flaps and the trailing edge of the wings.

R. Continue around and position the deicer units at the rear of the tail. Spray tail flight controls and top of tail surfaces.

PRACTICES FOR PILOTS TO ENSURE A CLEAN AIRCRAFT

Be knowledgeable of the adverse effects of surface roughness on aircraft performance and flight characteristics.

Be knowledgeable of ground deicing and anti-icing practices and procedures being used on your aircraft, whether this service is being performed by your company, a service contractor, a fixed-based operator, or others.

Do not allow deicing and anti-icing until you are familiar with the ground deicing practices and quality control procedures of the service organization.

Be knowledgeable of critical areas of your aircraft and ensure that these areas are properly deiced and anti-iced.

Ensure that proper precautions are taken during the deicing process to avoid damage to aircraft components and surfaces.

Ensure that a thorough post deicing inspection is performed prior to takeoff even though this may also be the responsibility of other personnel.

Be knowledgeable of the function, capabilities, limitations, and operations of the installed aircraft ice protection systems.

Perform additional preflight deicing checks related to deicing or anti-icing as necessary or as required.

Be aware that the time of effectiveness of FPD deicing or anti-icing treatments can only be estimated because of the many variables that influence this time.

Be knowledgeable of the variables that can reduce time of effectiveness (holdover time) and the general effects of these variables.

Ensure that deicing and anti-icing are performed at the latest possible time before taxi to the takeoff position.

Do not start engines or propellers until it has been ascertained that all ice deposits have been removed. Ice particles shed from rotating components under centrifugal and aerodynamic forces can be damaging and lethal.

Be aware that certain operations may produce recirculation of ice crystals, snow, or moisture.

Be aware that operations in close proximity to other aircraft can induce snow, other ice particles, or moisture to be blown onto critical aircraft components, or can cause dry snow to melt and refreeze.

Do not takeoff if snow or slush is observed splashing onto critical areas of the aircraft, such as wing leading edges, during taxi.

Do not takeoff if positive evidence of a clean aircraft cannot be ascertained.

Be aware that fluid used for ground deicing/anti-icing is not intended for and does not provide any protection from contamination during flight.

FAA
HOLDOVER TIME GUIDELINES

WINTER 2021-2022
ORIGINAL ISSUE: AUGUST 4, 2021

The information contained in this document serves as the official FAA guidance, Holdover Times and Allowance Times for use during the 2021-2022 winter season.

Questions concerning FAA aircraft ground de/anti-icing requirements or Flight Standards policies should be addressed to charles.j.enders@faa.gov or 202-267-4557.

Questions on the technical content of the holdover time tables should be addressed to warren.underwood@faa.gov or 404-305-7267.

Questions regarding editorial content or web access issues should be addressed to sung.shin@faa.gov or 202-267-8086.

The Holdover Times Tables and related information can be found at the FAA's Aircraft Ground Deicing website. To receive notifications on updates to the Holdover Times Tables and related information, subscribe to the Aircraft Ground Deicing website by clicking on this link.

This document is intended to be used in conjunction with the FAA N 8900 series notice "Revised FAA-Approved Deicing Program Updates, Winter 2021-2022."

CHANGE CONTROL RECORDS

This page indicates any changes made to individual pages within the document. Changed pages have the appropriate revision date in the footer. Sidebars are shown to assist in identifying where significant changes have been made on these pages.

It is the responsibility of the end user to periodically check the following website for updates:
https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/.

REVISION	*DATE*	*DESCRIPTION OF CHANGES*	*AFFECTED PAGES*	*AUTHOR*

TABLE OF CONTENTS

HOW TO USE THIS DOCUMENT

Complementary Documents

This document is designed to be used in conjunction with the FAA N 8900 series notice "Revised FAA-Approved Deicing Program Updates, Winter 2021-2022." The two documents complement each other and should be used together for a thorough understanding of the subject matter.

Beginning in the winter of 2021-22, the FAA has published an annual database of degree-specific holdover times (DSHOTs) for snow and snow-related precipitation conditions (including snow, snow grains, and snow pellets). The DSHOT database contains an expanded set of snow precipitation HOTs for all undiluted Type II, III and IV anti-icing fluids listed in the FAA HOT Guidelines. This database can be found at the following website: https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/.
Guidance and conditions on the use of DSHOT data can be found in the FAA N 8900 series notice "Revised FAA-Approved Deicing Program Updates, Winter 2021-2022".

Applicability

A new version of this document is published for each winter operating season, typically in early August preceding the winter operating season. Updates to the winter's document may be published at any time after the Original Issue document is published. When a new document is published, either mid-season or each new season, the previous document becomes obsolete. It is the responsibility of the end user to periodically check for document updates on the following website:
https://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/deicing/.

Main Document Structure and Content

This document is divided into several sections.

- Change Control Records: Provides details of any changes made to the document in mid-season document updates.
- Table of Contents: Provides a list of sections, tables, and appendices in the document.
- How to Use This Document: Provides top-level guidance on how to use the document.
- Highlights and Changes for Winter 2021-2022: Describes key changes made to the document for the current winter operating season.
- Holdover Time Guidelines: Series of tables that provide estimated holdover times (in hh:mm). Fluids are divided by fluid type (Type I, II, III, and IV), aircraft construction materials (Type I only), fluid brand (Type II, III, IV), aircraft rotation speed (Type III only), and fluid application temperature (Type III only). Columns in the tables divide the information by precipitation type; rows in the tables divide the information by temperature and fluid dilution.
- Allowance Times Tables: Tables that provide allowance times (in minutes) for Type III and Type IV fluids. Rows in the tables divide the information by precipitation type; columns in the tables divide the information by temperature.
- Supplementary Guidance: Series of tables that provide supplementary information for using the holdover time guidelines and allowance times tables. Includes a table for estimating snowfall intensity from prevailing visibility, tables of fluid information (one table per fluid type), and tables of fluid application guidance (by fluid type).

Appendices

The appendices contain complementary content.

- Appendix A: Provides adjusted holdover time guidelines (holdover time guidelines and allowance times tables) for operations when flaps and slats are deployed prior to de/anti-icing.
- Appendix B: Provides information on laboratories involved in testing de/anti-icing fluids.

HIGHLIGHTS AND CHANGES FOR WINTER 2021-2022

CHANGED FROM PREVIOUS YEAR

The principal changes from the previous year are briefly indicated herein.

How to Use this Document

- A paragraph was added to the “Complementary Documents” section describing where to find the degree-specific holdover times and related guidance material.

Holdover Time Tables

- Fluid-specific HOT guidelines have been created for nine new fluids: ROMCHIM ADD-PROTECT NG Type II (Type II), AVIAFLUID AVIAFlight EG (Type IV), AVIAFLUID AVIAFlight PG (Type IV), AllClear ClearWing ECO (Type IV), ASGlobal 4Flite EG (Type IV), ASGlobal 4Flite PG (Type IV), CHEMCO ChemR Nordik IV (Type IV), JSC RCP Nordix Defrost NORTH 4 (Type IV), and Newave Aerochemical FCY-EGIV (Type IV).
- The HOT guidelines for Kilfrost Ice Clear II and LNT Solution E450 have been removed.
- Minor decreases have been made to the Type II generic holdover times as a result of the new fluids and data.
- Several decreases have been made to the Type IV generic holdover times as a result of the new fluids and data.
- Further testing in very cold snow conditions has enabled fluid-specific holdover times to be provided in very cold snow (below -14 °C) for the ten Type II/IV fluids listed below.
    - AVIAFLUID AVIAFlight EG (Type IV)
    - AVIAFLUID AVIAFlight PG (Type IV)
    - AllClear ClearWing ECO (Type IV)
    - AllClear ClearWing EG (Type IV)
    - Aviation Shaanxi Cleanwing II (Type II)
    - CHEMCO ChemR EG IV (Type IV)
    - CHEMCO ChemR Nordik IV (Type IV)
    - Cryotech Polar Guard Xtend (Type IV)
    - Newave Aerochemical FCY 9311 (Type IV)
    - Newave Aerochemical FCY-EGIV (Type IV)
- The HOT table for Aviation Shaanxi Cleanwing II (Type II) has been expanded to include 3 columns in snow. Holdover times have been added and updated for Light, Very Light, and Moderate snow as a result of additional data being collected.
- The “Freezing Fog or Ice Crystals” column has been modified to “Freezing Fog, Freezing Mist or Ice Crystals” and a note was added to all HOT tables to address Freezing Mist. Freezing mist is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below. Freezing mist is best confirmed by observation. Mist must be reported alone in order to use the holdover times in the “Freezing Fog, Freezing Mist, or Ice Crystals” column in the holdover time tables. If mist is reported mixed with another precipitation condition these holdover times do not apply and mist could be treated as an obscuration.
- Notes 5, in the Type I and Type III holdover time (HOT) tables, and 4 in the Type II and Type IV HOT tables have been modified to allow for the use of light freezing rain holdover times in conditions of very light or light snow mixed with drizzle.

Allowance Times Tables

- A separate ice pellet allowance time table for Type IV EG based fluids was created and editorial changes were made to the notes in both the Type IV EG and Type IV PG allowance time tables to reflect this change.
- Precipitation intensity designators were added to mixed condition second precipitation types in all allowance times tables.
- A column was added to all allowance times tables to indicate the applicable METAR codes for each precipitation type.
- The notes in all allowance times tables related to Light Ice Pellets Mixed with Rain, and Moderate Ice Pellets (or Small Hail) Mixed with Rain have been reworded to indicate that no allowance times exist in these conditions for temperatures of 0°C and below.
- The note in all allowance times tables related to small hail has been expanded to explain the differences in reporting small hail in the United States and outside of the United States.

Supplemental Guidance

- The list of fluids (Tables 51, 52, 53 and 54) has been updated to reflect the latest information available on all de/anti-icing fluids.
- Minor editorial changes have been made to the Type I fluid application table to clarify the procedure for 1-step de/anti-icing.

UNCHANGED FROM PREVIOUS YEAR

Holdover Time Tables

- The active frost holdover time (HOT) guidelines are unchanged.

Supplemental Guidance

- The Type II/III/IV fluid application tables are unchanged.

HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2021-2022

TABLE 1: ACTIVE FROST HOLDOVER TIMES FOR SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS

Outside Air Temperature[1,2,3]	Type I
-1 °C and above (30 °F and above)	0:45 *(0:35)*[5]
below -1 to -3 °C (below 30 to 27 °F)	
below -3 to -10 °C (below 27 to 14 °F)	
below -10 to -14 °C (below 14 to 7 °F)	
below -14 to -21 °C (below 7 to -6 °F)	
below -21 to -25 °C (below -6 to -13 °F)	
below -25 °C to LOUT (below -13 °F to LOUT)	

Outside Air Temperature[2,3]	Concentration Fluid/Water By % Volume	Type II	Type III[4]	Type IV
-1 °C and above (30 °F and above)	100/0	8:00	2:00	12:00
	75/25	5:00	1:00	5:00
	50/50	2:00	0:30	3:00
below -1 to -3 °C (below 30 to 27 °F)	100/0	8:00	2:00	12:00
	75/25	5:00	1:00	5:00
	50/50	1:30	0:30	3:00
below -3 to -10 °C (below 27 to 14 °F)	100/0	8:00	2:00	10:00
	75/25	4:00	1:00	5:00
below -10 to -14 °C (below 14 to 7 °F)	100/0	6:00	2:00	6:00
	75/25	1:00	1:00	1:00
below -14 to -21 °C (below 7 to -6 °F)	100/0	3:00	2:00	6:00
below -21 to -25 °C (below -6 to -13 °F)	100/0	2:00	2:00	4:00
below -25 °C (below -13 °F)	100/0	No Holdover Time Guidelines Exist		

NOTES

1 Type I Fluid / Water Mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 Changes in outside air temperature (OAT) over the course of longer frost events can be significant; the appropriate holdover time to use is the one provided for the coldest OAT that has occurred in the time between the de/anti-icing fluid application and takeoff.
4 To use the Type III fluid frost holdover times, the fluid brand being used must be known. AllClear AeroClear MAX must be applied unheated.
5 Value in parentheses is for aircraft with critical surfaces that are predominantly or entirely constructed of composite materials.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 2: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF ALUMINUM

Outside Air Temperature[1,2]	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	0:11 - 0:17	0:18 - 0:22	0:11 - 0:18	0:06 - 0:11	0:09 - 0:13	0:02 - 0:05	0:02 - 0:05	
below -3 to -6 °C (below 27 to 21 °F)	0:08 - 0:13	0:14 - 0:17	0:08 - 0:14	0:05 - 0:08	0:05 - 0:09	0:02 - 0:05	CAUTION: No holdover time guidelines exist	
below -6 to -10 °C (below 21 to 14 °F)	0:06 - 0:10	0:11 - 0:13	0:06 - 0:11	0:04 - 0:06	0:04 - 0:07	0:02 - 0:05		
below -10 °C (below 14 °F)	0:05 - 0:09	0:07 - 0:08	0:04 - 0:07	0:02 - 0:04				

NOTES

1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 3: HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES

Outside Air Temperature[1,2]	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	0:09 - 0:16	0:12 - 0:15	0:06 - 0:12	0:03 - 0:06	0:08 - 0:13	0:02 - 0:05	0:01 - 0:05	
below -3 to -6 °C (below 27 to 21 °F)	0:06 - 0:08	0:11 - 0:13	0:05 - 0:11	0:02 - 0:05	0:05 - 0:09	0:02 - 0:05	CAUTION: No holdover time guidelines exist	
below -6 to -10 °C (below 21 to 14 °F)	0:04 - 0:08	0:09 - 0:12	0:05 - 0:09	0:02 - 0:05	0:04 - 0:07	0:02 - 0:05		
below -10 °C (below 14 °F)	0:04 - 0:07	0:07 - 0:08	0:04 - 0:07	0:02 - 0:04				

NOTES

1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 4: GENERIC HOLDOVER TIMES FOR SAE TYPE II FLUIDS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:55 - 1:50	0:25 - 0:50	0:30 - 1:00	0:20 - 0:35	0:07 - 0:45	
	75/25	0:25 - 0:55	0:15 - 0:25	0:15 - 0:40	0:10 - 0:20	0:04 - 0:25	
	50/50	0:15 - 0:25	0:05 - 0:10	0:08 - 0:15	0:06 - 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 0:45	0:20 - 0:35	0:20 - 0:45	0:15 - 0:20		
	75/25	0:25 - 0:50	0:10 - 0:20	0:15 - 0:25	0:08 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 0:45	0:15 - 0:30	0:20 - 0:45[8]	0:15 - 0:20[8]		
	75/25	0:25 - 0:50	0:08 - 0:20	0:15 - 0:25[8]	0:08 - 0:15[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:20	0:02 - 0:07				
below -18 to -25 °C[9] (below 0 to -13 °F)	100/0	0:15 - 0:20	0:01 - 0:03				
below -25 °C to LOUT[9] (below -13 °F to LOUT)	100/0	0:15 - 0:20	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).
9 If the LOUT is unknown, no holdover time guidelines exist below -25 °C (-13 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 5: TYPE II HOLDOVER TIMES FOR ABAX ECOWING AD-2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:20 - 3:00	2:25 - 2:55	1:15 - 2:25	0:40 - 1:15	0:40 - 1:40	0:30 - 0:45	0:09 - 1:25	
	75/25	1:15 - 1:25	1:45 - 2:10	0:55 - 1:45	0:25 - 0:55	0:35 - 1:05	0:20 - 0:30	0:04 - 0:50	
	50/50	0:15 - 0:30	0:35 - 0:40	0:15 - 0:35	0:07 - 0:15	0:09 - 0:15	0:06 - 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 2:30	2:00 - 2:25	1:00 - 2:00	0:30 - 1:00	0:25 - 1:10	0:20 - 0:30		
	75/25	0:35 - 1:55	1:40 - 2:05	0:50 - 1:40	0:25 - 0:50	0:15 - 0:55	0:20 - 0:35		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 2:30	1:45 - 2:05	0:55 - 1:45	0:30 - 0:55	0:25 - 1:10[8]	0:20 - 0:30[8]		
	75/25	0:35 - 1:55	1:35 - 2:00	0:50 - 1:35	0:25 - 0:50	0:15 - 0:55[8]	0:20 - 0:35[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:40	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:40	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:15 - 0:40	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 6: TYPE II HOLDOVER TIMES FOR AVIATION SHAANXI HI-TECH CLEANWING II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:55 - 1:50	1:35 - 1:55	0:55 - 1:35	0:30 - 0:55	0:35 - 1:05	0:25 - 0:35	0:10 - 0:55	
	75/25	0:50 - 1:20	1:20 - 1:40	0:45 - 1:20	0:25 - 0:45	0:35 - 1:00	0:20 - 0:30	0:07 - 0:50	
	50/50	0:35 - 1:00	0:50 - 1:05	0:25 - 0:50	0:15 - 0:25	0:20 - 0:40	0:10 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 1:50	1:20 - 1:35	0:40 - 1:20	0:25 - 0:40	0:30 - 0:55	0:20 - 0:25		
	75/25	0:40 - 1:45	1:20 - 1:35	0:45 - 1:20	0:25 - 0:45	0:35 - 0:40	0:20 - 0:25		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 1:50	1:05 - 1:20	0:35 - 1:05	0:20 - 0:35	0:30 - 0:55[8]	0:20 - 0:25[8]		
	75/25	0:40 - 1:45	1:20 - 1:35	0:45 - 1:20	0:25 - 0:45	0:35 - 0:40[8]	0:20 - 0:25[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:50	0:45 - 1:00	0:25 - 0:45	0:15 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 0:50	0:30 - 0:35	0:15 - 0:30	0:07 - 0:15				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 7: TYPE II HOLDOVER TIMES FOR BEIJING YADILITE AVIATION YD-102 TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:10 - 2:00	1:40 - 2:00	0:50 - 1:40	0:25 - 0:50	0:40 - 1:15	0:35 - 0:40	0:10 - 1:00	
	75/25	0:25 - 0:55	0:50 - 1:05	0:25 - 0:50	0:15 - 0:25	0:15 - 0:40	0:10 - 0:20	0:04 - 0:25	
	50/50	0:15 - 0:25	0:25 - 0:30	0:10 - 0:25	0:05 - 0:10	0:08 - 0:15	0:07 - 0:09	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 1:30	1:15 - 1:30	0:35 - 1:15	0:20 - 0:35	0:35 - 0:50	0:25 - 0:25		
	75/25	0:30 - 0:50	0:40 - 0:50	0:20 - 0:40	0:10 - 0:20	0:15 - 0:25	0:09 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 1:30	1:00 - 1:15	0:30 - 1:00	0:15 - 0:30	0:35 - 0:50[8]	0:25 - 0:25[8]		
	75/25	0:30 - 0:50	0:35 - 0:45	0:20 - 0:35	0:08 - 0:20	0:15 - 0:25[8]	0:09 - 0:15[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:45	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 0:45	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:20 - 0:45	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 8: TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	3:30 - 4:00	2:35 - 3:00	1:35 - 2:35	1:00 - 1:35	1:20 - 2:00	0:45 - 1:25	0:10 - 1:30	
	75/25	1:50 - 2:45	2:35 - 3:00	1:20 - 2:35	0:40 - 1:20	1:10 - 1:30	0:30 - 0:55	0:06 - 0:50	
	50/50	0:55 - 1:45	0:45 - 0:55	0:25 - 0:45	0:10 - 0:25	0:20 - 0:30	0:10 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 1:45	2:05 - 2:30	1:15 - 2:05	0:45 - 1:15	0:35 - 1:30	0:25 - 0:45		
	75/25	0:25 - 1:05	1:45 - 2:10	0:55 - 1:45	0:30 - 0:55	0:25 - 1:10	0:20 - 0:35		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 1:45	1:50 - 2:10	1:05 - 1:50	0:40 - 1:05	0:35 - 1:30[8]	0:25 - 0:45[8]		
	75/25	0:25 - 1:05	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40	0:25 - 1:10[8]	0:20 - 0:35[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	1:10 - 1:40	0:25 - 1:10	0:08 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:30 - 0:40	0:10 - 0:30	0:03 - 0:10				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 0:50	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 9: TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:40 - 4:00	0:50 - 1:50	1:25 - 2:00	0:45 - 1:00	0:15 - 2:00	
	75/25	2:35 - 4:00	1:00 - 1:45	1:35 - 2:00	0:50 - 1:15	0:15 - 1:15	
	50/50	1:05 - 2:20	0:15 - 0:25	0:30 - 1:05	0:15 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:40 - 2:20	0:40 - 1:30	0:35 - 1:25	0:35 - 0:55		
	75/25	0:30 - 1:45	1:00 - 1:40	0:25 - 1:10	0:30 - 0:45		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:40 - 2:20	0:35 - 1:15	0:35 - 1:25[8]	0:35 - 0:55[8]		
	75/25	0:30 - 1:45	0:55 - 1:40	0:25 - 1:10[8]	0:30 - 0:45[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:40	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 0:40	0:01 - 0:03				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:20 - 0:40	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 10: TYPE II HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:50 - 4:00	3:00 - 3:00	1:55 - 3:00	1:05 - 1:55	1:35 - 2:00	1:15 - 1:30	0:15 - 2:00	
	75/25	2:30 - 4:00	3:00 - 3:00	1:25 - 3:00	0:40 - 1:25	1:40 - 2:00	0:40 - 1:10	0:09 - 1:40	
	50/50	0:50 - 1:25	1:10 - 1:35	0:25 - 1:10	0:10 - 0:25	0:20 - 0:45	0:09 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:30	2:25 - 2:50	1:25 - 2:25	0:50 - 1:25	0:35 - 1:35	0:35 - 0:45		
	75/25	0:40 - 1:30	2:20 - 3:00	1:05 - 2:20	0:30 - 1:05	0:25 - 1:05	0:35 - 0:45		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:30	2:00 - 2:20	1:10 - 2:00	0:40 - 1:10	0:35 - 1:35[8]	0:35 - 0:45[8]		
	75/25	0:40 - 1:30	2:00 - 2:30	0:55 - 2:00	0:25 - 0:55	0:25 - 1:05[8]	0:35 - 0:45[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:50	1:35 - 2:15	0:35 - 1:35	0:10 - 0:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:50	0:40 - 0:55	0:15 - 0:40	0:04 - 0:15				
below -25 to -30.5 °C (below -13 to -23 °F)	100/0	0:25 - 0:50	0:25 - 0:30	0:07 - 0:25	0:02 - 0:07				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 11: TYPE II HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST PG 2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:55 - 1:50	1:50 - 2:15	0:55 - 1:50	0:30 - 0:55	0:30 - 1:00	0:20 - 0:35	0:10 - 1:20	
	75/25	1:05 - 2:00	1:45 - 2:15	0:45 - 1:45	0:20 - 0:45	0:25 - 0:50	0:15 - 0:30	0:06 - 0:35	
	50/50	1:00 - 1:50	2:10 - 2:40	1:00 - 2:10	0:30 - 1:00	0:30 - 0:50	0:15 - 0:30	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 1:25	1:25 - 1:45	0:45 - 1:25	0:25 - 0:45	0:35 - 0:50	0:20 - 0:30		
	75/25	0:40 - 1:20	1:10 - 1:30	0:30 - 1:10	0:15 - 0:30	0:25 - 0:40	0:15 - 0:20		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 1:25	1:15 - 1:30	0:40 - 1:15	0:20 - 0:40	0:35 - 0:50[8]	0:20 - 0:30[8]		
	75/25	0:40 - 1:20	0:55 - 1:05	0:25 - 0:55	0:10 - 0:25	0:25 - 0:40[8]	0:15 - 0:20[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:05	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:05	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:35 - 1:05	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 12: TYPE II HOLDOVER TIMES FOR KILFROST ABC-K PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:15 - 3:45	1:00 - 1:40	1:50 - 2:00	1:00 - 1:25	0:20 - 2:00	
	75/25	1:40 - 2:30	0:35 - 1:10	1:25 - 2:00	0:50 - 1:10	0:15 - 2:00	
	50/50	0:35 - 1:05	0:07 - 0:15	0:20 - 0:30	0:10 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 1:05	0:55 - 1:30	0:25 - 1:00	0:15 - 0:35		
	75/25	0:25 - 1:25	0:35 - 1:05	0:20 - 0:55	0:09 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 1:05	0:50 - 1:25	0:25 - 1:00[8]	0:15 - 0:35[8]		
	75/25	0:25 - 1:25	0:35 - 1:05	0:20 - 0:55[8]	0:09 - 0:30[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:55	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:55	0:01 - 0:03				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 0:55	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 13: TYPE II HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:15 - 2:25	0:30 - 0:55	0:35 - 1:05	0:25 - 0:35	0:08 - 0:45	
	75/25	0:50 - 1:30	0:20 - 0:40	0:25 - 0:45	0:15 - 0:25	0:05 - 0:25	
	50/50	0:25 - 0:35	0:15 - 0:25	0:10 - 0:20	0:07 - 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 1:30	0:20 - 0:40	0:20 - 0:45	0:15 - 0:20		
	75/25	0:30 - 1:05	0:15 - 0:25	0:15 - 0:30	0:08 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 1:30	0:15 - 0:30	0:20 - 0:45[8]	0:15 - 0:20[8]		
	75/25	0:30 - 1:05	0:10 - 0:20	0:15 - 0:30[8]	0:08 - 0:15[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:35	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:35	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:25 - 0:35	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 14: TYPE II HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-2 BIO+

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:25 - 2:30	2:20 - 2:55	1:05 - 2:20	0:30 - 1:05	0:50 - 1:20	0:25 - 0:45	0:08 - 1:15	
	75/25	0:45 - 1:20	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40	0:25 - 0:50	0:15 - 0:25	0:06 - 0:35	
	50/50	0:15 - 0:30	0:25 - 0:30	0:15 - 0:25	0:08 - 0:15	0:10 - 0:20	0:08 - 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:40 - 1:30	1:25 - 1:50	0:40 - 1:25	0:20 - 0:40	0:35 - 1:05	0:15 - 0:30		
	75/25	0:30 - 1:05	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25	0:20 - 0:35	0:15 - 0:20		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:40 - 1:30	1:00 - 1:15	0:30 - 1:00	0:15 - 0:30	0:35 - 1:05[8]	0:15 - 0:30[8]		
	75/25	0:30 - 1:05	0:35 - 0:45	0:20 - 0:35	0:08 - 0:20	0:20 - 0:35[8]	0:15 - 0:20[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 1:00	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 1:00	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:20 - 1:00	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 15: TYPE II HOLDOVER TIMES FOR ROMCHIM ADD-PROTECT NG TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:10 - 2:25	2:35 - 3:00	1:10 - 2:35	0:35 - 1:10	0:50 - 1:20	0:35 - 0:50	0:07 - 1:10	
	75/25	1:00 - 1:50	1:55 - 2:25	0:55 - 1:55	0:25 - 0:55	0:40 - 1:15	0:25 - 0:40	0:07 - 0:55	
	50/50	0:25 - 0:55	0:55 - 1:05	0:30 - 0:55	0:15 - 0:30	0:20 - 0:35	0:10 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 1:35	1:50 - 2:20	0:50 - 1:50	0:25 - 0:50	0:35 - 1:10	0:25 - 0:35		
	75/25	0:55 - 1:25	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40	0:25 - 1:05	0:20 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 1:35	1:25 - 1:50	0:40 - 1:25	0:20 - 0:40	0:35 - 1:10[8]	0:25 - 0:35[8]		
	75/25	0:55 - 1:25	1:05 - 1:25	0:30 - 1:05	0:15 - 0:30	0:25 - 1:05[8]	0:20 - 0:30[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:20	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:20	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:15 - 0:20	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 16: TYPE II HOLDOVER TIMES FOR ROMCHIM ADD-PROTECT TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:40 - 3:30	1:55 - 2:25	1:00 - 1:55	0:30 - 1:00	0:40 - 1:35	0:25 - 0:45	0:09 - 0:50	
	75/25	0:40 - 1:10	1:00 - 1:10	0:30 - 1:00	0:15 - 0:30	0:25 - 0:40	0:15 - 0:25	0:05 - 0:25	
	50/50	0:20 - 0:35	0:30 - 0:35	0:15 - 0:30	0:09 - 0:15	0:10 - 0:30	0:08 - 0:10	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 0:45	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40	0:25 - 0:50	0:20 - 0:30		
	75/25	0:30 - 0:55	0:40 - 0:50	0:25 - 0:40	0:10 - 0:25	0:20 - 0:30	0:15 - 0:20		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 0:45	1:05 - 1:20	0:35 - 1:05	0:15 - 0:35	0:25 - 0:50[8]	0:20 - 0:30[8]		
	75/25	0:30 - 0:55	0:35 - 0:40	0:20 - 0:35	0:09 - 0:20	0:20 - 0:30[8]	0:15 - 0:20[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:25	0:20 - 0:30	0:07 - 0:20	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:25	0:09 - 0:15	0:03 - 0:09	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:15 - 0:25	0:05 - 0:07	0:01 - 0:05	0:00 - 0:01				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 17: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON LOW SPEED AIRCRAFT[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	100/0	0:45 - 1:55	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40	0:25 - 0:50	0:14 - 0:25	0:05 - 0:40	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -10 °C (below 27 to 14 °F)	100/0	0:50 - 1:40	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40	0:25 - 0:45	0:15 - 0:25		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -10 to -16 °C (below 14 to 3 °F)	100/0	0:40 - 1:45	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40				

NOTES

1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 18: TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON HIGH SPEED AIRCRAFT[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	100/0	0:45 - 1:55	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40	0:25 - 0:50	0:14 - 0:25	0:05 - 0:40	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -10 °C (below 27 to 14 °F)	100/0	0:50 - 1:40	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40	0:25 - 0:45	0:15 - 0:25		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -10 to -25 °C (below 14 to -13 °F)	100/0	0:40 - 1:45	1:20 - 1:45	0:40 - 1:20	0:18 - 0:40				
below -25 to -35 °C (below -13 to -31 °F)	100/0	0:25 - 1:00	0:45 - 1:00	0:20 - 0:45	0:10 - 0:20				

NOTES

1 These holdover times are for aircraft conforming to the SAE AS5900 high speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 47: provides allowance times for ice pellets and small hail for SAE Type III fluids, applied unheated).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 19: GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:15 - 2:40	1:55 - 2:20	1:00 - 1:55	0:30 - 1:00	0:40 - 1:10	0:20 - 0:35	0:08 - 1:05	
	75/25	1:25 - 2:40	2:05 - 2:25	1:15 - 2:05	0:40 - 1:15	0:50 - 1:20	0:30 - 0:45	0:09 - 1:15	
	50/50	0:30 - 0:55	1:00 - 1:10	0:25 - 1:00	0:10 - 0:25	0:15 - 0:40	0:09 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:20 - 1:35	1:45 - 2:05	0:55 - 1:45	0:25 - 0:55	0:25 - 1:10	0:20 - 0:25		
	75/25	0:30 - 1:20	1:50 - 2:10	1:00 - 1:50	0:30 - 1:00	0:20 - 1:05	0:15 - 0:25		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:20 - 1:35	1:20 - 1:40	0:45 - 1:20	0:25 - 0:45	0:25 - 1:10[8]	0:20 - 0:25[8]		
	75/25	0:30 - 1:20	1:40 - 2:00	0:45 - 1:40	0:20 - 0:45	0:20 - 1:05[8]	0:15 - 0:25[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:35	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C[9] (below 0 to -13 °F)	100/0	0:20 - 0:35	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 °C to LOUT[9] (below -13 °F to LOUT)	100/0	0:20 - 0:35	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids and Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).
9 If the LOUT is unknown, no holdover time guidelines exist below -23.5 °C (-10 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 20: TYPE IV HOLDOVER TIMES FOR ABAX ECOWING AD-49

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	3:20 - 4:00	3:00 - 3:00	1:55 - 3:00	1:00 - 1:55	1:25 - 2:00	1:00 - 1:25	0:10 - 1:55	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:20 - 1:35	2:55 - 3:00	1:30 - 2:55	0:45 - 1:30	0:25 - 1:25	0:20 - 0:25		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:20 - 1:35	2:25 - 3:00	1:15 - 2:25	0:40 - 1:15	0:25 - 1:25[8]	0:20 - 0:25[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:40	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:40	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:25 - 0:40	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

CAUTION: No holdover time guidelines exist

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 21: TYPE IV HOLDOVER TIMES FOR ALLCLEAR CLEARWING ECO

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:00 - 4:00	3:00 - 3:00	1:45 - 3:00	0:50 - 1:45	1:50 - 2:00	1:20 - 1:40	0:20 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:00 - 2:30	2:40 - 3:00	1:20 - 2:40	0:40 - 1:20	0:55 - 2:00	0:45 - 1:15		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:00 - 2:30	2:10 - 2:40	1:05 - 2:10	0:30 - 1:05	0:55 - 2:00[8]	0:45 - 1:15[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:45	1:05 - 1:20	0:35 - 1:05	0:15 - 0:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:45	0:30 - 0:35	0:15 - 0:30	0:07 - 0:15				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:25 - 0:45	0:25 - 0:35	0:15 - 0:25	0:07 - 0:15				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 22: TYPE IV HOLDOVER TIMES FOR ALLCLEAR CLEARWING EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:50 - 3:15	2:40 - 3:00	1:20 - 2:40	0:40 - 1:20	1:10 - 1:35	0:30 - 1:00	0:10 - 1:30	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:35 - 3:45	2:25 - 3:00	1:10 - 2:25	0:35 - 1:10	1:05 - 1:30	0:30 - 1:00		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:35 - 3:45	2:15 - 2:45	1:05 - 2:15	0:30 - 1:05	1:05 - 1:30[8]	0:30 - 1:00[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:55 - 2:00	1:35 - 2:05	0:45 - 1:35	0:20 - 0:45				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:55 - 2:00	0:55 - 1:10	0:25 - 0:55	0:15 - 0:25				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:55 - 2:00	0:45 - 0:55	0:20 - 0:45	0:10 - 0:20				

CAUTION: No holdover time guidelines exist

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 23: TYPE IV HOLDOVER TIMES FOR ASGLOBAL 4FLITE EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:35 - 3:15	2:05 - 2:35	1:00 - 2:05	0:30 - 1:00	0:40 - 1:10	0:20 - 0:35	0:08 - 1:05	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:25 - 2:45	1:50 - 2:15	0:55 - 1:50	0:25 - 0:55	0:40 - 1:10	0:20 - 0:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:25 - 2:45	1:35 - 2:00	0:50 - 1:35	0:25 - 0:50	0:40 - 1:10[8]	0:20 - 0:35[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:50 - 1:25	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:50 - 1:25	0:40 - 0:55	0:15 - 0:40	0:05 - 0:15				
below -25 to -30 °C (below -13 to -22 °F)	100/0	0:30 - 1:05	0:25 - 0:35	0:08 - 0:25	0:02 - 0:08				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 24: TYPE IV HOLDOVER TIMES FOR ASGLOBAL 4FLITE PG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:50 - 3:15	2:45 - 3:00	1:35 - 2:45	0:55 - 1:35	1:10 - 1:35	0:45 - 1:05	0:15 - 1:20	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 1:55	2:00 - 2:25	1:10 - 2:00	0:40 - 1:10	0:55 - 1:10	0:35 - 0:55		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 1:55	1:35 - 1:55	0:55 - 1:35	0:30 - 0:55	0:55 - 1:10[8]	0:35 - 0:55[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:45	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:45	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:30 - 0:45	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

CAUTION: No holdover time guidelines exist

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 25: TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:30 - 3:05	1:55 - 2:20	1:10 - 1:55	0:40 - 1:10	1:05 - 2:00	0:30 - 0:50	0:10 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:20 - 3:00	1:45 - 2:05	1:00 - 1:45	0:35 - 1:00	0:55 - 1:30	0:35 - 0:50		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:20 - 3:00	1:35 - 1:55	0:55 - 1:35	0:30 - 0:55	0:55 - 1:30[8]	0:35 - 0:50[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:45	1:40 - 2:00	0:50 - 1:40	0:25 - 0:50				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:45	1:20 - 1:35	0:40 - 1:20	0:20 - 0:40				
below -25 to -31 °C (below -13 to -24 °F)	100/0	0:35 - 1:05	0:35 - 0:45	0:20 - 0:35	0:09 - 0:20				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 26: TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT PG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:15 - 4:00	3:00 - 3:00	1:40 - 3:00	0:55 - 1:40	2:00 - 2:00	1:10 - 1:55	0:20 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 2:10	2:00 - 2:25	1:05 - 2:00	0:35 - 1:05	0:35 - 1:55	0:45 - 1:05		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 2:10	1:30 - 1:50	0:50 - 1:30	0:25 - 0:50	0:35 - 1:55[8]	0:45 - 1:05[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:35	0:50 - 1:00	0:25 - 0:50	0:15 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 0:35	0:25 - 0:30	0:15 - 0:25	0:06 - 0:15				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:20 - 0:35	0:25 - 0:30	0:10 - 0:25	0:06 - 0:10				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 27: TYPE IV HOLDOVER TIMES FOR CHEMCO CHEMR EG IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:05 - 3:35	3:00 - 3:00	1:15 - 3:00	0:35 - 1:15	0:45 - 1:40	0:25 - 0:40	0:09 - 1:45	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:25 - 3:40	3:00 - 3:00	1:15 - 3:00	0:35 - 1:15	1:00 - 1:35	0:35 - 0:50		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:25 - 3:40	3:00 - 3:00	1:15 - 3:00	0:35 - 1:15	1:00 - 1:35[8]	0:35 - 0:50[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:40 - 1:25	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:40 - 1:25	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:40 - 1:25	1:25 - 1:45	0:40 - 1:25	0:20 - 0:40				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 28: TYPE IV HOLDOVER TIMES FOR CHEMCO CHEMR NORDIK IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:15 - 4:00	3:00 - 3:00	1:45 - 3:00	0:55 - 1:45	1:20 - 2:00	0:55 - 1:20	0:25 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:50 - 4:00	3:00 - 3:00	1:45 - 3:00	0:55 - 1:45	1:15 - 2:00	0:45 - 1:20		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:50 - 4:00	3:00 - 3:00	1:45 - 3:00	0:55 - 1:45	1:15 - 2:00[8]	0:45 - 1:20[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:40 - 1:30	3:00 - 3:00	1:35 - 3:00	0:50 - 1:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:40 - 1:30	2:10 - 2:40	1:05 - 2:10	0:35 - 1:05				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:40 - 1:30	1:50 - 2:15	0:55 - 1:50	0:30 - 0:55				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 29: TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT 04

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:40 - 4:00	3:00 - 3:00	2:45 - 3:00	1:25 - 2:45	2:00 - 2:00	1:10 - 1:30	0:20 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:50 - 2:30	3:00 - 3:00	1:40 - 3:00	0:50 - 1:40	0:25 - 1:30	0:20 - 0:40		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:50 - 2:30	2:20 - 2:50	1:10 - 2:20	0:35 - 1:10	0:25 - 1:30[8]	0:20 - 0:40[8]	CAUTION: No holdover time guidelines exist	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:45	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -23.5 °C (below 0 to -10 °F)	100/0	0:20 - 0:45	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 30: TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT AVIA

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	3:05 - 4:00	3:00 - 3:00	1:45 - 3:00	1:00 - 1:45	1:25 - 2:00	0:55 - 1:10	0:09 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:45 - 3:55	2:30 - 3:00	1:25 - 2:30	0:50 - 1:25	1:10 - 2:00	0:55 - 1:30		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:45 - 3:55	2:10 - 2:35	1:15 - 2:10	0:40 - 1:15	1:10 - 2:00[8]	0:55 - 1:30[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:25	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:25	0:40 - 0:55	0:15 - 0:40	0:05 - 0:15				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:35 - 1:25	0:25 - 0:35	0:08 - 0:25	0:02 - 0:08				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 31: TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT SNEG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:25 - 4:00	3:00 - 3:00	1:40 - 3:00	0:55 - 1:40	2:00 - 2:00	0:50 - 1:40	0:20 - 1:30	
	75/25	4:00 - 4:00	2:25 - 2:50	1:30 - 2:25	0:55 - 1:30	1:30 - 2:00	1:05 - 1:20	0:15 - 1:45	
	50/50	1:30 - 3:30	1:45 - 2:20	0:45 - 1:45	0:20 - 0:45	0:35 - 1:10	0:15 - 0:30	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:45 - 2:20	2:25 - 2:55	1:20 - 2:25	0:45 - 1:20	0:30 - 1:25	0:25 - 0:40		
	75/25	0:30 - 1:25	1:55 - 2:15	1:10 - 1:55	0:45 - 1:10	0:20 - 1:05	0:20 - 0:40		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:45 - 2:20	2:05 - 2:30	1:10 - 2:05	0:40 - 1:10	0:30 - 1:25[8]	0:25 - 0:40[8]		
	75/25	0:30 - 1:25	1:40 - 2:00	1:00 - 1:40	0:40 - 1:00	0:20 - 1:05[8]	0:20 - 0:40[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:20 - 0:50	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:20 - 0:50	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:20 - 0:50	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 32: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING EG IV NORTH

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:20 - 3:55	3:00 - 3:00	1:40 - 3:00	0:50 - 1:40	1:30 - 2:00	0:50 - 0:55	0:08 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:45 - 4:00	2:50 - 3:00	1:30 - 2:50	0:50 - 1:30	1:05 - 1:50	0:55 - 1:25		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:45 - 4:00	2:45 - 3:00	1:30 - 2:45	0:50 - 1:30	1:05 - 1:50[8]	0:55 - 1:25[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:40 - 1:20	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:40 - 1:20	0:40 - 0:55	0:15 - 0:40	0:05 - 0:15				
below -25 to -30 °C (below -13 to -22 °F)	100/0	0:40 - 1:20	0:25 - 0:35	0:08 - 0:25	0:02 - 0:08				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 33: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	4:00 - 4:00	2:50 - 3:00	1:45 - 2:50	1:05 - 1:45	1:30 - 2:00	1:00 - 1:40	0:15 - 1:40	
	75/25	3:40 - 4:00	3:00 - 3:00	1:45 - 3:00	1:00 - 1:45	1:40 - 2:00	0:45 - 1:15	0:10 - 1:45	
	50/50	1:25 - 2:45	1:25 - 1:40	0:45 - 1:25	0:25 - 0:45	0:30 - 0:50	0:20 - 0:25	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:00 - 1:55	2:25 - 2:50	1:30 - 2:25	0:55 - 1:30	0:35 - 1:40	0:25 - 0:45		
	75/25	0:40 - 1:20	2:40 - 3:00	1:30 - 2:40	0:50 - 1:30	0:25 - 1:10	0:25 - 0:45		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:00 - 1:55	2:10 - 2:30	1:20 - 2:10	0:50 - 1:20	0:35 - 1:40[8]	0:25 - 0:45[8]		
	75/25	0:40 - 1:20	2:25 - 2:55	1:25 - 2:25	0:45 - 1:25	0:25 - 1:10[8]	0:25 - 0:45[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	1:15 - 1:45	0:20 - 1:15	0:06 - 0:20				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:30 - 0:50	0:20 - 0:30	0:06 - 0:20	0:01 - 0:06				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 34: TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	3:55 - 4:00	3:00 - 3:00	2:05 - 3:00	0:55 - 2:05	2:00 - 2:00	1:00 - 2:00	0:20 - 2:00	
	75/25	3:55 - 4:00	3:00 - 3:00	1:55 - 3:00	0:50 - 1:55	2:00 - 2:00	1:20 - 1:25	0:20 - 1:50	
	50/50	1:15 - 1:50	1:35 - 2:00	0:45 - 1:35	0:20 - 0:45	0:25 - 1:00	0:15 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:15	3:00 - 3:00	1:40 - 3:00	0:45 - 1:40	0:25 - 1:35	0:25 - 0:40		
	75/25	0:40 - 2:00	3:00 - 3:00	1:30 - 3:00	0:35 - 1:30	0:20 - 1:05	0:20 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:15	3:00 - 3:00	1:25 - 3:00	0:40 - 1:25	0:25 - 1:35[8]	0:25 - 0:40[8]		
	75/25	0:40 - 2:00	2:55 - 3:00	1:15 - 2:55	0:30 - 1:15	0:20 - 1:05[8]	0:20 - 0:30[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:50	1:15 - 1:50	0:25 - 1:15	0:07 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:50	0:30 - 0:45	0:09 - 0:30	0:03 - 0:09				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:25 - 0:50	0:20 - 0:30	0:06 - 0:20	0:02 - 0:06				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 35: TYPE IV HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® ADVANCE

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:50 - 4:00	3:00 - 3:00	1:55 - 3:00	1:05 - 1:55	1:35 - 2:00	1:15 - 1:30	0:15 - 2:00	
	75/25	2:30 - 4:00	3:00 - 3:00	1:25 - 3:00	0:40 - 1:25	1:40 - 2:00	0:40 - 1:10	0:09 - 1:40	
	50/50	0:50 - 1:25	1:10 - 1:35	0:25 - 1:10	0:10 - 0:25	0:20 - 0:45	0:09 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:30	2:25 - 2:50	1:25 - 2:25	0:50 - 1:25	0:35 - 1:35	0:35 - 0:45		
	75/25	0:40 - 1:30	2:20 - 3:00	1:05 - 2:20	0:30 - 1:05	0:25 - 1:05	0:35 - 0:45		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:30	2:00 - 2:20	1:10 - 2:00	0:40 - 1:10	0:35 - 1:35[8]	0:35 - 0:45[8]		
	75/25	0:40 - 1:30	2:00 - 2:30	0:55 - 2:00	0:25 - 0:55	0:25 - 1:05[8]	0:35 - 0:45[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:50	1:35 - 2:15	0:35 - 1:35	0:10 - 0:35				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:50	0:40 - 0:55	0:15 - 0:40	0:04 - 0:15				
below -25 to -30.5 °C (below -13 to -23 °F)	100/0	0:25 - 0:50	0:25 - 0:30	0:07 - 0:25	0:02 - 0:07				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 36: TYPE IV HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® XTEND

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:30 - 4:00	3:00 - 3:00	2:00 - 3:00	1:05 - 2:00	2:00 - 2:00	1:00 - 1:50	0:20 - 1:45	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:00 - 1:50	2:50 - 3:00	1:35 - 2:50	0:50 - 1:35	0:35 - 1:40	0:50 - 0:55		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:00 - 1:50	2:25 - 2:55	1:20 - 2:25	0:45 - 1:20	0:35 - 1:40[8]	0:50 - 0:55[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:40	1:20 - 1:40	0:40 - 1:20	0:20 - 0:40				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:40	0:30 - 0:40	0:15 - 0:30	0:06 - 0:15				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:25 - 0:40	0:20 - 0:25	0:09 - 0:20	0:04 - 0:09				

CAUTION: No holdover time guidelines exist

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 37: TYPE IV HOLDOVER TIMES FOR DOW CHEMICAL UCAR™ ENDURANCE EG106

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:05 - 3:10	2:45 - 3:00	1:20 - 2:45	0:40 - 1:20	1:10 - 2:00	0:50 - 1:15	0:20 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:50 - 3:20	2:25 - 3:00	1:10 - 2:25	0:35 - 1:10	0:55 - 1:50	0:45 - 1:10		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:50 - 3:20	2:10 - 2:45	1:05 - 2:10	0:30 - 1:05	0:55 - 1:50[8]	0:45 - 1:10[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 1:05	1:45 - 2:15	0:50 - 1:45	0:25 - 0:50				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 1:05	1:30 - 1:55	0:40 - 1:30	0:20 - 0:40				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 1:05	1:20 - 1:45	0:40 - 1:20	0:20 - 0:40				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 38: TYPE IV HOLDOVER TIMES FOR DOW CHEMICAL UCAR™ FLIGHTGUARD AD-49

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	3:20 - 4:00	3:00 - 3:00	1:55 - 3:00	1:00 - 1:55	1:25 - 2:00	1:00 - 1:25	0:10 - 1:55	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:20 - 1:35	2:55 - 3:00	1:30 - 2:55	0:45 - 1:30	0:25 - 1:25	0:20 - 0:25		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:20 - 1:35	2:25 - 3:00	1:15 - 2:25	0:40 - 1:15	0:25 - 1:25[8]	0:20 - 0:25[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:25 - 0:40	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:25 - 0:40	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:25 - 0:40	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 39: TYPE IV HOLDOVER TIMES FOR INLAND TECHNOLOGIES ECO-SHIELD®

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:15 - 2:40	2:25 - 2:50	1:20 - 2:25	0:45 - 1:20	0:40 - 1:30	0:35 - 0:40	0:15 - 1:35	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:10 - 2:35	2:05 - 2:30	1:10 - 2:05	0:40 - 1:10	0:50 - 1:25	0:30 - 0:40		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:10 - 2:35	1:55 - 2:15	1:05 - 1:55	0:35 - 1:05	0:50 - 1:25[8]	0:30 - 0:40[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 1:00	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 1:00	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:30 - 1:00	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 40: TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST ECO 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:30 - 2:40	2:30 - 3:00	1:15 - 2:30	0:35 - 1:15	1:05 - 1:30	0:40 - 1:05	0:15 - 1:10	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 2:35	2:15 - 2:45	1:05 - 2:15	0:35 - 1:05	0:50 - 1:20	0:35 - 0:50		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 2:35	2:05 - 2:35	1:00 - 2:05	0:30 - 1:00	0:50 - 1:20[8]	0:35 - 0:50[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:30 - 0:50	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 41: TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST EG 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:45 - 4:00	3:00 - 3:00	2:25 - 3:00	1:25 - 2:25	2:00 - 2:00	1:00 - 1:45	0:20 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	2:20 - 4:00	3:00 - 3:00	2:05 - 3:00	1:15 - 2:05	1:00 - 2:00	1:20 - 1:50		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	2:20 - 4:00	3:00 - 3:00	1:55 - 3:00	1:10 - 1:55	1:00 - 2:00[8]	1:20 - 1:50[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:45 - 2:25	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:45 - 2:25	0:40 - 0:55	0:15 - 0:40	0:05 - 0:15				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:45 - 2:25	0:25 - 0:35	0:08 - 0:25	0:02 - 0:08				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 42: TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST NORTH 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:10 - 4:00	2:55 - 3:00	1:25 - 2:55	0:40 - 1:25	1:05 - 2:00	0:30 - 0:50	0:09 - 1:55	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	2:40 - 4:00	2:55 - 3:00	1:25 - 2:55	0:40 - 1:25	1:05 - 2:00	0:40 - 1:00		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	2:40 - 4:00	2:55 - 3:00	1:25 - 2:55	0:40 - 1:25	1:05 - 2:00[8]	0:40 - 1:00[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:45 - 1:55	0:50 - 1:05	0:25 - 0:50	0:10 - 0:25				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:45 - 1:55	0:40 - 0:55	0:15 - 0:40	0:05 - 0:15				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:45 - 1:55	0:25 - 0:35	0:08 - 0:25	0:02 - 0:08				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 43: TYPE IV HOLDOVER TIMES FOR KILFROST ABC-S PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:10 - 4:00	3:00 - 3:00	2:05 - 3:00	1:15 - 2:05	1:50 - 2:00	1:05 - 2:00	0:25 - 2:00	
	75/25	1:25 - 2:40	2:05 - 2:25	1:15 - 2:05	0:45 - 1:15	1:00 - 1:20	0:30 - 0:50	0:10 - 1:20	
	50/50	0:30 - 0:55	1:00 - 1:10	0:30 - 1:00	0:15 - 0:30	0:15 - 0:40	0:15 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:55 - 3:30	3:00 - 3:00	1:50 - 3:00	1:05 - 1:50	0:25 - 1:35	0:20 - 0:30		
	75/25	0:45 - 1:50	1:50 - 2:10	1:05 - 1:50	0:40 - 1:05	0:20 - 1:10	0:15 - 0:25		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:55 - 3:30	2:55 - 3:00	1:45 - 2:55	1:00 - 1:45	0:25 - 1:35[8]	0:20 - 0:30[8]		
	75/25	0:45 - 1:50	1:45 - 2:00	1:00 - 1:45	0:35 - 1:00	0:20 - 1:10[8]	0:15 - 0:25[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:40 - 1:00	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:40 - 1:00	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:40 - 1:00	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 44: TYPE IV HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY 9311

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:55 - 4:00	2:20 - 2:55	1:10 - 2:20	0:35 - 1:10	1:10 - 2:00	0:40 - 1:05	0:15 - 1:25	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:35 - 2:05	1:50 - 2:20	0:55 - 1:50	0:30 - 0:55	0:35 - 1:20	0:20 - 0:35		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:35 - 2:05	1:35 - 2:00	0:50 - 1:35	0:25 - 0:50	0:35 - 1:20[8]	0:20 - 0:35[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:55	1:00 - 1:15	0:30 - 1:00	0:15 - 0:30				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:55	0:35 - 0:40	0:15 - 0:35	0:07 - 0:15				
below -25 to -29.5 °C (below -13 to -21 °F)	100/0	0:30 - 0:55	0:30 - 0:40	0:15 - 0:30	0:06 - 0:15				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 45: TYPE IV HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-EGIV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:35 - 4:00	2:35 - 3:00	1:10 - 2:35	0:35 - 1:10	1:20 - 2:00	0:40 - 1:05	0:15 - 2:00	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:25 - 3:25	2:10 - 2:45	1:00 - 2:10	0:25 - 1:00	0:50 - 2:00	0:45 - 1:05		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:25 - 3:25	1:55 - 2:25	0:50 - 1:55	0:25 - 0:50	0:50 - 2:00[8]	0:45 - 1:05[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:35 - 1:55	1:35 - 2:05	0:40 - 1:35	0:15 - 0:40				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:35 - 1:55	1:10 - 1:35	0:30 - 1:10	0:15 - 0:30				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:35 - 1:55	1:00 - 1:20	0:25 - 1:00	0:10 - 0:25				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE 46: TYPE IV HOLDOVER TIMES FOR SHAANXI CLEANWAY AVIATION CLEANSURFACE IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:50 - 4:00	3:00 - 3:00	1:55 - 3:00	1:00 - 1:55	2:00 - 2:00	1:25 - 1:30	0:15 - 2:00	
	75/25	2:35 - 4:00	3:00 - 3:00	1:35 - 3:00	0:45 - 1:35	0:50 - 2:00	0:35 - 0:45	0:09 - 1:15	
	50/50	1:05 - 2:25	1:40 - 2:20	0:40 - 1:40	0:15 - 0:40	0:25 - 0:50	0:15 - 0:20	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:00 - 3:05	2:00 - 2:25	1:05 - 2:00	0:35 - 1:05	0:35 - 1:45	0:20 - 0:35		
	75/25	0:50 - 1:55	2:15 - 2:55	1:00 - 2:15	0:30 - 1:00	0:30 - 1:20	0:25 - 0:40		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:00 - 3:05	1:20 - 1:40	0:45 - 1:20	0:25 - 0:45	0:35 - 1:45[8]	0:20 - 0:35[8]		
	75/25	0:50 - 1:55	1:40 - 2:10	0:45 - 1:40	0:20 - 0:45	0:30 - 1:20[8]	0:25 - 0:40[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:50	0:30 - 0:45	0:09 - 0:30	0:02 - 0:09				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:50	0:10 - 0:20	0:03 - 0:10	0:01 - 0:03				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:30 - 0:50	0:07 - 0:10	0:02 - 0:07	0:00 - 0:02				

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table 49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

ALLOWANCE TIMES TABLES FOR WINTER 2021-2022

TABLE 47: ALLOWANCE TIMES FOR SAE TYPE III FLUIDS[1]

Precipitation Types or Combinations	Applicable METAR Codes	Outside Air Temperature		
		-5 °C and above	Below -5 to -10 °C	Below -10 °C[2]
Light Ice Pellets	**-PL**	10 minutes	10 minutes	**Caution: No allowance times currently exist**
Light Ice Pellets Mixed with Light Snow	**-PLSN, -SNPL**	10 minutes	10 minutes	
Light Ice Pellets Mixed with Light Freezing Drizzle or Moderate Freezing Drizzle	**-PLFZDZ, -FZDZPL, FZDZPL**	7 minutes	5 minutes	
Light Ice Pellets Mixed with Light Freezing Rain	**-PLFZRA, -FZRAPL**	7 minutes	5 minutes	
Light Ice Pellets Mixed with Light Rain	**-PLRA, -RAPL**	7 minutes[3]		
Moderate Ice Pellets (or Small Hail[4])	**PL, GS**	5 minutes	5 minutes	

NOTES

1 These allowance times are for use with undiluted (100/0) fluids applied unheated on aircraft with rotation speeds of 100 knots or greater.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 No allowance times exist in this condition for temperatures of 0 °C and below; consider use of light ice pellets mixed with light freezing rain.
4 In the US, small hail is included with regular hail and the remarks section is used saying “GR LESS THAN ¼”. Outside of the US the code GS is used when the hail is less than 5 mm and GR when it is 5mm or greater. If no intensity is reported with small hail, use the “moderate ice pellets or small hail” allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the “light ice pellets” allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: light freezing drizzle, moderate freezing drizzle, light freezing rain, or light rain.

TABLE 48: ALLOWANCE TIMES FOR SAE TYPE IV ETHYLENE GLYCOL (EG) FLUIDS[1]

Precipitation Types or Combinations	Applicable METAR Codes	Outside Air Temperature			
		-5 °C and above	Below -5 to -10 °C	Below -10 to -16 °C	Below -16 to -22 °C[2]
Light Ice Pellets	**-PL**	70 minutes	50 minutes	30 minutes	30 minutes
Light Ice Pellets Mixed with Light Snow	**-PLSN, -SNPL**	50 minutes	30 minutes	15 minutes	
Light Ice Pellets Mixed with Light Freezing Drizzle or Moderate Freezing Drizzle	**-PLFZDZ, -FZDZPL, FZDZPL**	40 minutes	30 minutes	**Caution: No allowance times currently exist**	
Light Ice Pellets Mixed with Light Freezing Rain	**-PLFZRA, -FZRAPL**	40 minutes	30 minutes		
Light Ice Pellets Mixed with Light Rain	**-PLRA, -RAPL**	40 minutes[3]	**Caution: No allowance times currently exist**		
Moderate Ice Pellets (or Small Hail[4])	**PL, GS**	35 minutes	25 minutes	10 minutes	10 minutes
Moderate Ice Pellets (or Small Hail[4]) Mixed with Moderate Freezing Drizzle	**PLFZDZ, GSFZDZ,**	20 minutes	10 minutes	**Caution: No allowance times currently exist**	
Moderate Ice Pellets (or Small Hail[4]) Mixed with Moderate Rain	**PLRA, GSRA, RAPL, RAGS**	15 minutes[5]	**Caution: No allowance times currently exist**		

NOTES

1 These allowance times are for use with undiluted (100/0) ethylene glycol based fluids applied on aircraft with rotation speeds of 100 knots or greater. The following fluids are ethylene glycol based; AllClear ClearWing EG, ASGlobal 4Flite EG, AVIAFLUID AVIAFlight EG, CHEMCO ChemR EG IV, CHEMCO ChemR Nordik IV, Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106, JSC RCP Nordix Defrost EG 4, JSC RCP Nordix Defrost NORTH 4, and Newave Aerochemical FCY-EGIV. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used.

2 Ensure that the lowest operational use temperature (LOUT) is respected.

3 No allowance times exist in this condition for temperatures of 0 °C and below; consider use of light ice pellets mixed with light freezing rain.

4 In the US, small hail is included with regular hail and the remarks section is used saying “GR LESS THAN ¼”. Outside of the US the code GS is used when the hail is less than 5 mm and GR when it is 5mm or greater. If no intensity is reported with small hail, use the “moderate ice pellets or small hail” allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the “light ice pellets” allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

5 No allowance times exist in this condition for temperatures of 0 °C and below.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: light freezing drizzle, moderate freezing drizzle, light freezing rain, or light rain

TABLE 49: ALLOWANCE TIMES FOR SAE TYPE IV PROPYLENE GLYCOL (PG) FLUIDS[1]

Precipitation Types or Combinations	Applicable METAR Codes	Outside Air Temperature			
		-5 °C and above	Below -5 to -10 °C	Below -10 to -16 °C	Below -16 to -22 °C[2]
Light Ice Pellets	**-PL**	50 minutes	30 minutes	30 minutes[3]	30 minutes[3]
Light Ice Pellets Mixed with Light Snow	**-PLSN, -SNPL**	40 minutes	15 minutes	15 minutes[3]	
Light Ice Pellets Mixed with Light Freezing Drizzle or Moderate Freezing Drizzle	**-PLFZDZ, -FZDZPL, FZDZPL**	25 minutes	10 minutes	**Caution: No allowance times currently exist**	
Light Ice Pellets Mixed with Light Freezing Rain	**-PLFZRA, -FZRAPL**	25 minutes	10 minutes		
Light Ice Pellets Mixed with Light Rain	**-PLRA, -RAPL**	25 minutes[4]			
Moderate Ice Pellets (or Small Hail[5])	**PL, GS**	15 minutes	10 minutes	10 minutes[3]	
Moderate Ice Pellets (or Small Hail[5]) Mixed with Moderate Freezing Drizzle	**PLFZDZ, GSFZDZ**	10 minutes	7 minutes	**Caution: No allowance times currently exist**	
Moderate Ice Pellets (or Small Hail[5]) Mixed with Moderate Rain	**PLRA, GSRA, RAPL, RAGS**	10 minutes[6]			

NOTES

1 These allowance times are for use with undiluted (100/0) propylene glycol based fluids applied on aircraft with rotation speeds of 100 knots or greater. All Type IV fluids are propylene glycol based with the exception of AllClear ClearWing EG, ASGlobal 4Flite EG, AVIAFLUID AVIAFlight EG, CHEMCO ChemR EG IV, CHEMCO ChemR Nordik IV, Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106, JSC RCP Nordix Defrost EG 4,JSC RCP Nordix Defrost NORTH 4, and Newave Aerochemical FCY-EGIV, which are ethylene glycol based. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used.

2 Ensure that the lowest operational use temperature (LOUT) is respected.

3 No allowance times exist for propylene glycol (PG) fluids when used on aircraft with rotation speeds less than 115 knots.

4 No allowance times exist in this condition for temperatures of 0 °C and below; consider use of light ice pellets mixed with light freezing rain.

5 In the US, small hail is included with regular hail and the remarks section is used saying “GR LESS THAN ¼”. Outside of the US the code GS is used when the hail is less than 5 mm and GR when it is 5mm or greater. If no intensity is reported with small hail, use the “moderate ice pellets or small hail” allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the “light ice pellets” allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

6 No allowance times exist in this condition for temperatures of 0 °C and below.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: light freezing drizzle, moderate freezing drizzle, light freezing rain, or light rain.

SUPPLEMENTAL GUIDANCE FOR WINTER 2021-2022

TABLE 50: SNOWFALL INTENSITIES AS A FUNCTION OF PREVAILING VISIBILITY

Time of Day	Temp.		Visibility in Statute Miles (Meters)									
	Degrees Celsius	Degrees Fahrenheit	≥ 2 1/2 (≥ 4000)	2 (3200)	1 3/4 (2800)	1 1/2 (2400)	1 1/4 (2000)	1 (1600)	3/4 (1200)	1/2 (800)	≤ 1/4 (≤ 400)	Snowfall Intensity
Day	colder/equal -1	colder/equal 30	Very Light	Very Light	Very Light	Light	Light	Light	Moderate	Moderate	**Heavy**	
	warmer than -1	warmer than 30	Very Light	Light	Light	Light	Light	Moderate	Moderate	**Heavy**	**Heavy**	
Night	colder/equal -1	colder/equal 30	Very Light	Light	Light	Moderate	Moderate	Moderate	Moderate	**Heavy**	**Heavy**	
	warmer than -1	warmer than 30	Very Light	Light	Moderate	Moderate	Moderate	Moderate	**Heavy**	**Heavy**	**Heavy**	

NOTE 1: This table is for estimating snowfall intensity. It is based upon the technical report, "The Estimation of Snowfall Rate Using Visibility," Rasmussen, et al., Journal of Applied Meteorology, October 1999 and additional in situ data.

NOTE 2: This table is to be used with Type I, II, III, and IV fluid guidelines.

NOTE 3: The use of Runway Visual Range (RVR) is not permitted for determining visibility used with the holdover tables.

NOTE 4: Some METARS contain tower visibility as well as surface visibility. Whenever surface visibility is available from an official source, such as a METAR, in either the main body of the METAR or in the Remarks ("RMK") section, the preferred action is to use the surface visibility value.

NOTE 5: If visibility from a source other than the METAR is used, round to the nearest visibility in the table, rounding down if it is right in between two values. For example, .6 and .625 (5/8) would both be rounded to .5 (1/2).

HEAVY = Caution—No Holdover Time Guidelines Exist

During snow conditions alone, the use of Table 50 in determining snowfall intensities does not require pilot company coordination or company reporting procedures since this table is more conservative than the visibility table used by official weather observers in determining snowfall intensities.

Because the FAA Snowfall Intensities Table, like the FMH-1 Table, uses visibility to determine snowfall intensities, if the visibility is being reduced by snow along with other forms of obscuration such as fog, haze, smoke, etc., the FAA Snowfall Intensities Table does not need to be used to estimate the snowfall intensity for HOT determination during the presence of these obscurations. Use of the FAA Snowfall Intensities as a Function of Prevailing Visibility Table under these conditions may needlessly overestimate the actual snowfall intensity. Therefore, the snowfall intensity being reported by the weather observer or automated surface observing system (ASOS), from the FMH-1 Table, may be used.

TABLE 51:
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	LOWEST OPERATIONAL USE TEMPERATURE[3]				
				DILUTION[4,5] (FLUID/WATER)	LOW SPEED AERODYNAMIC TEST[6]		HIGH SPEED AERODYNAMIC TEST[6]	
					°C	°F	°C	°F
ABAX Industries	DE-950	PG	22-04-25	71/29	-26	-15	-31	-24
ADDCON EUROPE GmbH	*IceFree I.80*	*PG*	*21-03-14[9]*	*70/30*	*-26*	*-15*	*-32*	*-26*
ALAB Industries[10]	WDF 1	EG	22-03-02	70/30	-40	-40	-45	-49
AllClear Systems LLC	Lift-Off E-188	EG	22-05-15	70/30	-40	-40	-41.5	-43
AllClear Systems LLC	Lift-Off P-88	PG	22-05-15	70/30	-24.5	-12	-29.5	-21
Arcton Ltd.[10]	Arctica DG ready-to-use	DEG	22-03-26	as supplied	-26	-15	-26	-15
ASGlobal	Sky-Go EG	EG	22-05-27	70/30	-31	-24	-40	-40
ASGlobal	Sky-Go PG	PG	22-02-17	70/30	-21.5	-7	-30.5	-23
AVIAFLUID International Ltd.	*AVIAFLO EG*	*EG*	*21-06-19[12]*	*70/30*	*-40.5*	*-41*	*-44*	*-47*
AVIAFLUID International Ltd.	AVIAFLO PG	PG	22-02-10	70/30	Not tested[11]	Not tested[11]	-30	-22
Aviation Shaanxi Hi-Tech Physical Chemical Co. Ltd.	Cleanwing I	PG	23-05-14	75/25	Not tested[11]	Not tested[11]	-39.5	-39
Aviation Xi'an High-Tech Physical Chemical Co. Ltd.	Cleanwing E	EG	22-07-09	75/25	Not tested[11]	Not tested[11]	-37	-35
Aviation Xi'an High-Tech Physical Chemical Co. Ltd.	Cleanwing S-92	EG	22-06-03	75/25	Not tested[11]	Not tested[11]	-40	-40
Aviation Xi'an High-Tech Physical Chemical Co. Ltd.	KHF-1	PG	23-05-24	75/25	Not tested[11]	Not tested[11]	-38.5	-37
Beijing Wangye Aviation Chemical Product Co Ltd.[10]	*KLA-1*	*EG*	*19-09-08[9]*	*60/40*	*Not tested[11]*	*Not tested[11]*	*-30.5*	*-23*
Beijing Wangye Aviation Chemical Product Co Ltd.[10]	KLA-1A	EG	22-05-22	60/40	Not tested[11]	Not tested[11]	-32	-26
Beijing Yadilite Aviation Advanced Materials Corporation	*YD-101 Type I*	*PG*	*21-03-07[9]*	*60/40*	*Not tested[11]*	*Not tested[11]*	*-30*	*-22*
Beijing Yadilite Aviation Advanced Materials Corporation	YD-101A Type I	EG	25-02-26	70/30	Not tested[11]	Not tested[11]	-38	-36
Boryszew S.A.	*Borygo Plane I*	*PG*	*17-12-04[9]*	*75/25*	*-25*	*-13*	*-30*	*-22*
CHEMCO Inc.	CHEMR EG I	EG	24-04-17	70/30	-37	-35	-43	-45
CHEMCO Inc.	CHEMR REG I	EG	22-05-25	75/25	-36.5	-34	-43.5	-46
Clariant Produkte (Deutschland) GmbH	Octaflo EF Concentrate	PG	22-03-28	65/35	-25	-13	-33	-27
Clariant Produkte (Deutschland) GmbH	*Octaflo EG Concentrate*	*EG*	*17-07-23[9]*	*70/30*	*-40.5*	*-41*	*-44*	*-47*
Clariant Produkte (Deutschland) GmbH	*Octaflo LYOD*	*EG*	*20-03-16[12]*	*70/30*	*-40*	*-40*	*-45.5*	*-50*

TABLE 51 (CONT'D):
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	LOWEST OPERATIONAL USE TEMPERATURE[3]				
				DILUTION[4,5] (FLUID/WATER)	LOW SPEED AERODYNAMIC TEST[6]		HIGH SPEED AERODYNAMIC TEST[6]	
					°C	°F	°C	°F
Clariant Produkte (Deutschland) GmbH	Safewing EG I 1996 (88)	EG	23-11-19	70/30	-39.5	-39	-41.5	-43
Clariant Produkte (Deutschland) GmbH	Safewing MP I 1938 ECO	PG	24-07-02	65/35	-25.5	-14	-32	-26
Clariant Produkte (Deutschland) GmbH	Safewing MP I 1938 ECO (80)	PG	24-06-23	71/29	-25	-13	-32.5	-27
Clariant Produkte (Deutschland) GmbH	Safewing MP I 1938 ECO (80) Premix 55% i.g. ready-to-use	PG	25-04-01	as supplied	Not tested[11]	Not tested[11]	-19	-2
Clariant Produkte (Deutschland) GmbH	Safewing MP I ECO PLUS (80)	PG	23-04-12	71/29	-25	-13	-33	-27
Clariant Produkte (Deutschland) GmbH	Safewing MP I LFD 80	PG	25-04-15	71/29	-26	-15	-33	-27
Clariant Produkte (Deutschland) GmbH	Safewing MP I LFD 88	PG	23-06-12	65/35	-26	-15	-33	-27
Cryotech Deicing Technology	*Polar Plus®*	*PG*	*20-01-13[9]*	*63/37*	*-27*	*-17*	*-32*	*-26*
Cryotech Deicing Technology	Polar Plus® LT	PG	24-01-21	63/37	-27	-17	-33	-27
Cryotech Deicing Technology	Polar Plus® LT (80)	PG	24-06-15	70/30	-27	-17	-33	-27
Cryotech Deicing Technology	*Polar Plus® (80)*	*PG*	*17-09-12[9]*	*70/30*	*-24.5*	*-12*	*-32.5*	*-27*
Dow Chemical Company	UCAR™ ADF Concentrate	EG	23-03-26	75/25	-36	-33	-45	-49
Dow Chemical Company	UCAR™ ADF XL54[13]	EG	23-03-26	as supplied	-33	-27	-33	-27
Dow Chemical Company	UCAR™ PG ADF Concentrate	PG	23-04-16	65/35	-25	-13	-32	-26
Dow Chemical Company	UCAR™ PG ADF Dilute 55/45[14]	PG	23-04-16	as supplied	-24	-11	-25	-13
Gansu xiexin huineng Science and technology development Co., Ltd.[10]	*XHN-1*	*PG DEG*	*19-10-04[9]*	*75/25*	*Not tested[11]*	*Not tested[11]*	*-36*	*-33*
Heilongjiang Hangjie Aero-chemical Technology Co. Ltd.[10]	*HJF-1*	*EG*	*21-06-14[9]*	*65/35*	*Not tested[11]*	*Not tested[11]*	*-42*	*-44*
HOC Industries	SafeTemp® ES Plus	PG	24-06-30	65/35	-25.5	-14	-29	-20
Inland Technologies	DuraGly-E Type I ADF Concentrate	EG	23-02-08	60/40	-33	-27	-33	-27
Inland Technologies	Inland ADF Concentrate (Multiple Location)	EG	Y-M-D[15]	75/25	-36	-33	-42.5	-45
Inland Technologies	SafeTemp® ES Plus (Multiple Location)	PG	Y-M-D[16]	65/35	-25.5	-14	-31	-24
JSC RCP Nordix	*DEFROST EG 88.1*	*EG*	*21-04-25[12]*	*70/30*	*-40.5*	*-41*	*-44.5*	*-48*
JSC RCP Nordix	DEFROST PG 1	PG	23-11-21	70/30	-24.5	-12	-31.5	-25
Kilfrost Limited	Kilfrost DF Plus	PG	23-06-18	69/31	-25.5	-14	-32	-26

TABLE 51 (CONT'D):
TYPE I FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	LOWEST OPERATIONAL USE TEMPERATURE[3]				
				DILUTION[4,5] (FLUID/WATER)	LOW SPEED AERODYNAMIC TEST[6]		HIGH SPEED AERODYNAMIC TEST[6]	
					°C	°F	°C	°F
Kilfrost Limited	Kilfrost DF Plus (80)	PG	24-07-14	69/31	-26	-15	-31.5	-25
Kilfrost Limited	Kilfrost DF Plus (88)	PG	23-06-05	63/37	-25.5	-14	-32	-26
Kilfrost Limited	*Kilfrost DF Sustain*	*NCG*	*19-08-06[9]*	*68/32*	*-34*	*-29*	*-41*	*-42*
Kilfrost Limited	Kilfrost Ice Clear I	PG	23-04-20	70/30	-26	-15	-33	-27
LNT Solutions[10]	LNT E188	EG	21-08-22	70/30	-30.5	-23	-41	-42
LNT Solutions[10]	LNT P180	PG	22-11-02	69/31	-26	-15	-32	-26
LNT Solutions[10]	*LNT P188*	*PG*	*18-11-28[9]*	*70/30*	*-24.5*	*-12*	*-31.5*	*-25*
MKS DEVO KIMYA SANAYI TIC AS.	COREICEPHOB TYPE I	PG	22-10-16	71/29	Not tested[11]	Not tested[11]	-32.5	-27
Newave Aerochemical Co. Ltd.	FCY-1A	EG	23-04-08	75/25	-40	-40	-40	-40
Newave Aerochemical Co. Ltd.	FCY-1Bio+	EG	24-07-28	75/25	Not tested[11]	Not tested[11]	-40.5	-41
ROMCHIM PROTECT SRL	ADD-PROTECT NG Type I	EG	22-03-03	60/40	Not tested[11]	Not tested[11]	-22	-8
ROMCHIM PROTECT SRL	ADD-PROTECT Type I	PG	24-12-17	70/30	-25.5	-14	-31	-24
Shaanxi Cleanway Aviation Chemical Co., Ltd	Cleansurface I	EG	25-06-07	75/25	Not tested[11]	Not tested[11]	-40.5	-41
Shaanxi Cleanway Aviation Chemical Co., Ltd	Cleansurface I-BIO	EG	22-05-02	75/25	Not tested[11]	Not tested[11]	-37	-35
Xinjiang Zhongtian Liyang Chemical Technology Co., Ltd[10]	Clearice-I	EG	23-10-24	60/40	Not tested[11]	Not tested[11]	-30	-22

TABLE 52:
TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	DILUTION (FLUID/WATER)	LOWEST OPERATIONAL USE TEMPERATURE[3]		LOWEST ON-WING VISCOSITY[7,8] (mPa.s)	
					HIGH SPEED AERODYNAMIC TEST[6]		MANUFACTURER METHOD	AS 9968 METHOD
					°C	°F		
ABAX Industries	ECOWING AD-2	PG	23-03-29	100/0	-27	-17	5 750 (a)	5 750 (a)
				75/25	-15	5	12 000 (c)	12 000 (c)
				50/50	-3	27	7 500 (a)	7 500 (a)
Aviation Shaanxi Hi-Tech Physical Chemical Co. Ltd.	Cleanwing II	PG	23-06-01	100/0	-25	-13	4 650 (d)	4 500 (a)
				75/25	-15	5	9 450 (d)	10 000 (a)
				50/50	-4.5	24	10 150 (d)	10 200 (a)
Beijing Yadilite Aviation Advanced Materials Corporation	*YD-102 Type II*	*PG*	*18-02-26[9]*	*100/0*	*-29*	*-20*	*4 500 (a)*	*4 500 (a)*
				75/25	*-14*	*7*	*12 850 (a)*	*12 850 (a)*
				50/50	*-3*	*27*	*820 (a)*	*300 (m)*
Clariant Produkte (Deutschland) GmbH	Safewing MP II FLIGHT	PG	22-03-06	100/0	-29	-20	3 340 (a)	3 340 (a)
				75/25	-14	7	12 900 (c)	12 900 (c)
				50/50	-3.5	26	11 500 (a)	11 500 (a)
Clariant Produkte (Deutschland) GmbH	*Safewing MP II FLIGHT PLUS*	*PG*	*20-02-26[9]*	*100/0*	*-29*	*-20*	*3 650 (n)*	*3 100 (a)*
				75/25	*-14.5*	*6*	*12 400 (n)*	*10 450 (a)*
				50/50	*-4*	*25*	*7 800 (n)*	*7 050 (a)*
Cryotech Deicing Technology	Polar Guard® II	PG	23-04-09	100/0	-30.5	-23	4 400 (e)	4 050 (a)
				75/25	-14	7	11 600 (e)	9 750 (a)
				50/50	-3.5	26	80 (a)	80 (a)
JSC RCP Nordix	*Defrost PG 2*	*PG*	*20-06-27[9]*	*100/0*	*-27*	*-17*	*4 450 (a)*	*4 450 (a)*
				75/25	*-16*	*3*	*8 000 (a)*	*8 000 (a)*
				50/50	*-4*	*25*	*17 900 (g)*	*25 400 (c)*
Kilfrost Limited	ABC-K Plus	PG	23-02-15	100/0	-29	-20	2 850 (d)	2 640 (a)
				75/25	-14.5	6	12 650 (d)	12 650 (c)
				50/50	-3.5	26	4 200 (d)	5 260 (a)
Newave Aerochemical Co. Ltd.	FCY-2	PG	23-07-08	100/0	-28	-18	7 000 (d)	8 920 (a)
				75/25	-14.5	6	18 550 (d)	18 550 (c)
				50/50	-4.5	24	6 750 (d)	7 030 (a)
Newave Aerochemical Co. Ltd.	*FCY-2 Bio+*	*PG*	*19-04-10[9]*	*100/0*	*-28.5*	*-19*	*7 210 (a)*	*7 210 (a)*
				75/25	*-14*	*7*	*21 400 (c)*	*21 400 (c)*
				50/50	*-3*	*27*	*1 900 (a)*	*1 900 (a)*

TABLE 52 (CONT'D):
TYPE II FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	DILUTION (FLUID/WATER)	LOWEST OPERATIONAL USE TEMPERATURE[3]		LOWEST ON-WING VISCOSITY[7,8] (mPa.s)	
					HIGH SPEED AERODYNAMIC TEST[6]		MANUFACTURER METHOD	AS 9968 METHOD
					°C	°F		
ROMCHIM PROTECT SRL	ADD-PROTECT NG Type II	PG	22-01-29	100/0	-28	-18	5 200 (a)	5 200 (a)
				75/25	-14.5	6	8 250 (a)	8 250 (a)
				50/50	-3	27	5 850 (a)	5 850 (a)
ROMCHIM PROTECT SRL	ADD-PROTECT Type II	PG	22-11-30	100/0	-28	-18	4 000 (a)	4 000 (a)
				75/25	-14	7	7 700 (a)	7 700 (a)
				50/50	-3	27	14 500 (a)	14 500 (a)

TABLE 53:
TYPE III FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	DILUTION (FLUID/WATER)	LOWEST OPERATIONAL USE TEMPERATURE[3]				LOWEST ON-WING VISCOSITY[7,8] (mPa.s)	
					LOW SPEED AERODYNAMIC TEST[6]		HIGH SPEED AERODYNAMIC TEST[6]		MANUFACTURER METHOD	AS 9968 METHOD
					°C	°F	°C	°F		
AllClear Systems LLC	AeroClear MAX	EG	23-03-23	100/0	-16	3	-35	-31	7 800 (I)	Not Available[17]
				75/25	Dilution Not Applicable		Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable		Dilution Not Applicable	

TABLE 54:
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	DILUTION (FLUID/WATER)	LOWEST OPERATIONAL USE TEMPERATURE[3]		LOWEST ON-WING VISCOSITY[7,8] (mPa.s)	
					HIGH SPEED AERODYNAMIC TEST[6]		MANUFACTURER METHOD	AS 9968 METHOD
					°C	°F		
ABAX Industries	ECOWING AD-49	PG	22-05-28	100/0	-26	-15	12 150 (g)	11 000 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
AllClear Systems LLC	ClearWing ECO	PG	23-03-29	100/0	-26	-15	37 600 (i)	42 000 (c)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
AllClear Systems LLC	ClearWing EG	EG	23-03-17	100/0	-29	-20	35 500 (k)	13 350 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
ASGlobal	4Flite EG	EG	22-04-28	100/0	-30	-22	6 600 (a)	6 600 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
ASGlobal	4Flite PG	PG	23-06-29	100/0	-26	-15	26 100 (c)	26 100 (c)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
AVIAFLUID International Ltd.	AVIAFlight EG	EG	22-04-28	100/0	-31	-24	5 600 (a)	5 600 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
AVIAFLUID International Ltd.	AVIAFlight PG	PG	23-07-01	100/0	-25.5	-14	28 600 (c)	28 600 (c)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
CHEMCO Inc.	ChemR EG IV	EG	23-04-07	100/0	-27	-17	46 400 (j)	19 450 (c)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
CHEMCO Inc.	ChemR Nordik IV	EG	23-05-17	100/0	-29	-20	60 800 (k)	43 100 (c)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Clariant Produkte (Deutschland) GmbH	*Max Flight 04*	*PG*	*19-01-09*[9]	*100/0*	*-23.5*	*-10*	*5 540 (b)*	*5 540 (a)*
				75/25	*Dilution Not Applicable*		*Dilution Not Applicable*	
				50/50	*Dilution Not Applicable*		*Dilution Not Applicable*	

TABLE 54 (CONT'D):
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	DILUTION (FLUID/WATER)	LOWEST OPERATIONAL USE TEMPERATURE[3]		LOWEST ON-WING VISCOSITY[7,8] (mPa.s)	
					HIGH SPEED AERODYNAMIC TEST[6]		MANUFACTURER METHOD	AS 9968 METHOD
					°C	°F		
Clariant Produkte (Deutschland) GmbH	Max Flight AVIA	EG	22-12-18	100/0	-28.5	-19	1 000 (m)	1 000 (m)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Clariant Produkte (Deutschland) GmbH	Max Flight SNEG	PG	22-06-09	100/0	-29	-20	8 700 (o)	8 050 (a)
				75/25	-14	7	20 200 (p)	21 800 (c)
				50/50	-3	27	13 600(p)	15 000 (c)
Clariant Produkte (Deutschland) GmbH	Safewing EG IV NORTH	EG	22-11-18	100/0	-30	-22	830 (m)	830 (m)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Clariant Produkte (Deutschland) GmbH	Safewing MP IV LAUNCH	PG	22-03-12	100/0	-28.5	-19	7 550 (a)	7 550 (a)
				75/25	-14	7	18 000 (a)	18 000 (a)
				50/50	-3.5	26	17 800 (a)	17 800 (a)
Clariant Produkte (Deutschland) GmbH	Safewing MP IV LAUNCH PLUS	PG	23-03-12	100/0	-29	-20	8 700 (o)	8 450 (a)
				75/25	-14	7	18 800 (p)	17 200 (c)
				50/50	-3.5	26	9 700 (o)	12 150 (a)
Cryotech Deicing Technology	Polar Guard® Advance	PG	23-04-07	100/0	-30.5	-23	4 400 (e)	4 050 (a)
				75/25	-14	7	11 600 (e)	9 750 (a)
				50/50	-3.5	26	80 (a)	80 (a)
Cryotech Deicing Technology	Polar Guard® Xtend	PG	23-04-13	100/0	-29	-20	6 000 (e)	6 350 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Dow Chemical Company	UCAR™ Endurance EG106 De/Anti-Icing Fluid	EG	23-03-21	100/0	-29	-20	24 850 (h)	2 230 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Dow Chemical Company	UCAR™ FlightGuard AD-49	PG	23-05-27	100/0	-26	-15	12 150 (g)	11 000 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Inland Technologies	*ECO-SHIELD®*	*PG*	*20-08-16[12]*	*100/0*	*-25.5*	*-14*	*11 050 (a)*	*11 050 (a)*
				75/25	*Dilution Not Applicable*		*Dilution Not Applicable*	
				50/50	*Dilution Not Applicable*		*Dilution Not Applicable*	

TABLE 54 (CONT'D):
TYPE IV FLUIDS TESTED FOR ANTI-ICING PERFORMANCE AND AERODYNAMIC ACCEPTANCE

(see cautions and notes on pages 70 and 71)

COMPANY NAME	FLUID NAME	TYPE OF GLYCOL[1]	EXPIRY[2] (Y-M-D)	DILUTION (FLUID/WATER)	LOWEST OPERATIONAL USE TEMPERATURE[3]		LOWEST ON-WING VISCOSITY[7,8] (mPa.s)	
					HIGH SPEED AERODYNAMIC TEST[6]		MANUFACTURER METHOD	AS 9968 METHOD
					°C	°F		
JSC RCP Nordix	Defrost ECO 4	*PG*	22-06-08[18]	100/0	-25.5	-14	9 800 (g)	12 350 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
JSC RCP Nordix	Defrost EG 4	EG	22-08-26	100/0	-26	-15	12 000 (g)	12 950 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
JSC RCP Nordix	Defrost NORTH 4	EG	23-06-01	100/0	-26	-15	2 500 (a)	2 500 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Kilfrost Limited	ABC-S Plus	PG	23-06-09	100/0	-28	-18	17 900 (d)	17 900 (c)
				75/25	-14.5	6	18 300 (d)	18 300 (c)
				50/50	-3.5	26	7 500 (d)	7 500 (a)
Newave Aerochemical Co. Ltd.	FCY 9311	PG	22-05-20	100/0	-29.5	-21	14 100 (c)	14 100 (c)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Newave Aerochemical Co. Ltd.	FCY-EGIV	EG	22-03-04	100/0	-29	-20	24 800 (f)	6 300 (a)
				75/25	Dilution Not Applicable		Dilution Not Applicable	
				50/50	Dilution Not Applicable		Dilution Not Applicable	
Shaanxi Cleanway Aviation Chemical Co., Ltd	*Cleansurface IV*	*PG*	*19-02-24[9]*	*100/0*	*-28.5*	*-19*	*15 200 (c)*	*15 200 (c)*
				75/25	*-19*	*-2*	*28 500 (c)*	*28 500 (c)*
				50/50	*-6.5*	*20*	*17 500 (c)*	*17 500 (c)*

CAUTIONS AND NOTES FOR TABLES 51, 52, 53, 54

CAUTIONS

- These tables list fluids that have been tested with respect to endurance time performance (Holdover Times), anti-icing performance (Water Spray Endurance Testing/High Humidity Endurance Testing) and aerodynamic acceptance (Type I: SAE ARP6207 §3.4.1, AMS1424 §3.5.2 and §3.5.3; Type II/ III/ IV: SAE ARP5718 §FOREWARD, AMS1428 §3.2.4 and §3.2.5) only. These tests were conducted by APS Aviation Inc. (www.apsaviation.ca) and Anti-icing Materials International Laboratory (AMIL) (www.uqac.ca/amil). The end user is responsible for contacting the fluid manufacturer to confirm all other SAE AMS1424/1428 technical requirement tests, such as fluid stability, toxicity, materials compatibility, etc. have been conducted. These technical requirement tests are typically conducted by Scientific Material International (SMI) (www.smiinc.com) and AMIL, or any acceptable source.
- LOUT data provided in these tables is based strictly on the manufacturer's data; the end user is responsible for verifying the validity of this data.
- Type I fluids supplied in concentrated form must not be used in that form and must be diluted.

NOTES

1 PG = conventional glycol (propylene glycol); EG = conventional glycol (ethylene glycol); DEG = conventional glycol (diethylene glycol); NCG = non-conventional glycol (organic non-ionic diols and triols, e.g. 1,3-propanediol, glycerine) and mixtures of non-conventional glycol and conventional glycol; NG = non-glycol (e.g. organic salts) and mixtures of non-glycol and glycol.

2 Expiry date is the earlier expiry date of the Aerodynamic Test(s) or Water Spray Endurance Test. Fluids that are tested after the issuance of this list will appear in a later update.

3 The values in this table were determined using test results from pre-production fluid samples when available. In some cases, the fluid manufacturer requested the publication of a more conservative value than the pre-production test value. The lowest operational use temperature (LOUT) for a given fluid is the higher (warmer) of:

a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
b) The actual freezing point of the fluid plus its freezing point buffer (Type I = 10 °C/18 °F; Type II/III/IV = 7 °C/13 °F).

Note: LOUTs are rounded to the nearest half degree Celsius and the values in degrees Fahrenheit are calculated to the nearest whole degree.

4 The LOUT for Type I fluids that are intended to be diluted is derived from a dilution that provides the lowest operational use temperature. For other Type I dilutions, determine the freezing point of the fluid and add a 10 °C freezing point buffer, as a dilution will usually yield a higher and more restrictive operational use temperature. Consult the fluid manufacturer or fluid documentation for further clarification and guidance on establishing the appropriate operational use temperature of a diluted fluid.

5 Type I concentrate fluids have also been tested at 50/50 (glycol/water) dilution.

6 If uncertain whether the aircraft to be treated conforms to the low speed or the high speed aerodynamic test, consult the aircraft manufacturer. The aerodynamic test is defined in SAE AS5900 (latest version).

7 The viscosity values in this table are those of the fluids provided by the manufacturers for holdover time testing. For the holdover times to be valid, the viscosity of the fluid on the wing shall not be lower than that in this table. The user should periodically ensure that the viscosity of a fluid sample taken from the wing surface is not lower than that listed.

8 The SAE AS9968 viscosity method should only be used for field verification and auditing purposes; when in doubt as to which method is appropriate, use the manufacturer method. Viscosity measurement methods are indicated as letters (in parentheses) beside each viscosity value. Details of each measurement method are shown in the table below. The exact measurement method (spindle, container, fluid volume, temperature, speed, duration) must be used to compare the viscosity of a sample to a viscosity given in this table.

Method	Brookfield Spindle*	Container	Fluid Volume	Temp.**	Speed	Duration
a	LV1 (with guard leg)	600 mL low form (Griffin) beaker	575 mL***	20 °C	0.3 rpm	10.0 minutes
b	LV1 (with guard leg)	600 mL low form (Griffin) beaker	575 mL***	20 °C	0.3 rpm	33.3 minutes
c	LV2-disc (with guard leg)	600 mL low form (Griffin) beaker	425 mL***	20 °C	0.3 rpm	10.0 minutes
d	LV2-disc (with guard leg)	150 mL tall form (Berzelius) beaker	135 mL***	20 °C	0.3 rpm	10.0 minutes
e	SC4-34/13R	small sample adapter	10 mL	20 °C	0.3 rpm	10.0 minutes
f	SC4-34/13R	small sample adapter	10 mL	0 °C	0.3 rpm	30.0 minutes
g	SC4-31/13R	small sample adapter	10 mL	20 °C	0.3 rpm	10.0 minutes
h	SC4-31/13R	small sample adapter	10 mL	0 °C	0.3 rpm	10.0 minutes
i	SC4-31/13R	small sample adapter	9 mL	20 °C	0.3 rpm	15.0 minutes
j	SC4-31/13R	small sample adapter	9 mL	0 °C	0.3 rpm	10.0 minutes
k	SC4-31/13R	small sample adapter	9 mL	0 °C	0.3 rpm	30.0 minutes
l	SC4-31/13R	small sample adapter	9 mL	0 °C	0.3 rpm	65.0 minutes
m	LV0	ultra low adapter	16 mL	20 °C	0.3 rpm	10.0 minutes
n	LV1	big sample adapter	50 mL	20 °C	0.3 rpm	10.0 minutes
o	LV1	big sample adapter	55 mL	20 °C	0.3 rpm	10.0 minutes
p	LV2-disc	big sample adapter	60 mL	20 °C	0.3 rpm	10.0 minutes

* Spindle must be attached to a Brookfield viscometer model equipped with an LV spring.
** Sample temperature will affect readings; ensure sufficient time is allowed for sample to reach thermal equilibrium before starting test. Use of a cooling bath strongly recommended.
*** If necessary, adjust fluid volume to ensure fluid is level with notch on the spindle shaft.

CAUTIONS AND NOTES FOR TABLES 51, 52, 53, 54 (CONT'D)

9 Fluids listed in italics have expired and will be removed from this listing four years after expiry.

10 Manufacturer has not provided fluid information as required in SAE ARP5718B; fluid may be removed from this listing in subsequent revisions.

11 Manufacturer has indicated fluid was not tested.

12 Currently in the test/re-test process. Contact the manufacturer for latest information.

13 For UCAR™ ADF XL54, refer to primary site qualification of UCAR™ ADF Concentrate.

14 For UCAR™ PG ADF Dilute 55/45, refer to primary site qualification of UCAR™ PG ADF Concentrate.

15 Dow UCAR™ ADF Concentrate, sold under the product name Inland ADF Concentrate, qualified from 2015-09-04.

16 Refer to preproduction qualification of SafeTemp® ES Plus submitted by HOC Industries, qualified from 2017-11-20.

17 Measurements using the SAE AS9968 method do not provide stable, reliable results. Use the manufacturer method to evaluate viscosity.

18 This fluid has been requalified according to multiple location test requirements; additional testing is required.

19 Fluid was not retested for low speed aerodynamics. This data will be removed four years after the expiry of the last low speed test.

TABLE 55: GUIDELINES FOR THE APPLICATION OF SAE TYPE I FLUID

<table>
<tr><th rowspan="2">Outside Air Temperature (OAT)[1]</th><th rowspan="2">One-Step Procedure De/Anti-icing[2]</th><th colspan="2">Two-Step Procedure</th></tr>
<tr><th>First Step: Deicing</th><th>Second Step: Anti-icing[3]</th></tr>
<tr><td>0 °C (32 °F) and above</td><td rowspan="2">Fluid/water mixture heated to at least 60°C (140°F) at the nozzle with a freezing point of at least 10°C (18°F) below OAT</td><td>Heated water or a heated fluid/water mixture</td><td rowspan="2">Fluid/water mixture heated to at least 60°C (140°F) at the nozzle with a freezing point of at least 10°C (18°F) below OAT</td></tr>
<tr><td>Below 0 °C (32 °F) to LOUT</td><td>Heated fluid/water mixture with a freezing point at OAT or below</td></tr>
</table>

NOTES

1 Fluids must not be used at temperatures below their lowest operational use temperature (LOUT).

2 When anti-icing using the one-step procedure, a minimum quantity of 1 litre/m^2 (~2 gal./100 sq. ft.) of Type I fluid mixture heated to at least 60°C (140°F) is required after all frozen contamination is removed. This is achieved using a continuous process. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times.

3 To be applied before first-step fluid freezes, typically within 3 minutes. This time may be higher than 3 minutes in some conditions, but potentially lower in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area (sectionally).

CAUTIONS

- This table is applicable for the use of Type I holdover time guidelines in all conditions, including active frost. If holdover times are not required, a temperature of 60 °C (140 °F) at the nozzle is desirable.
- If holdover times are required, the temperature of water or fluid/water mixtures shall be at least 60 °C (140 °F) at the nozzle. Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- To use Type I Holdover Times Guidelines in all conditions including active frost, an additional minimum of 1 liter/m^2 (~2 gal./100 sq. ft.) of heated Type I fluid mixture must be applied to the surfaces after all frozen contamination is removed. This application is necessary to heat the surfaces, as heat contributes significantly to the Type I fluid holdover times. The required protection can be provided using a 1-step method by applying more fluid than is strictly needed to just remove all of the frozen contamination (the same additional amount stated above is required).
- The lowest operational use temperature (LOUT) for a given Type I fluid is the higher (warmer) of:
  a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
  b) The actual freezing point of the fluid plus a freezing point buffer of 10 °C (18 °F).
- Wing skin temperatures may be colder or warmer than the OAT. Causes can include: radiation cooling, cold-soaked wing, or hangar storage. Consult the appropriate guidance (HOT Tables and FAA N 8900.XXX series notice "Revised FAA-Approved Deicing Program Updates, Winter 2021-2022") for the contaminant in question.
- When conducting aircraft deicing using a Type I fluid and not using the 10℃/18℉ buffer, procedures must be developed and approved to ensure refreezing does not occur prior to takeoff.

TABLE 56: GUIDELINES FOR THE APPLICATION OF SAE TYPE II AND IV FLUID

(FLUID CONCENTRATIONS IN % VOLUME)

Outside Air Temperature (OAT)[1]	One-Step Procedure De/Anti-icing	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing[2]
0 °C (32 °F) and above	100/0, 75/25 or 50/50 Heated[3] Type II or IV fluid/water mixture	Heated water or a heated Type I, II, III, or IV fluid/water mixture	100/0, 75/25 or 50/50 Heated or unheated Type II or IV fluid/water mixture
Below 0 °C (32 °F) to -3 °C (27 °F)	100/0, 75/25 or 50/50 Heated[3] Type II or IV fluid/water mixture	Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0, 75/25 or 50/50 Heated or unheated Type II or IV fluid/water mixture
Below -3 °C (27 °F) to -14 °C (7 °F)	100/0 or 75/25 Heated[3] Type II or IV fluid/water mixture	Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0 or 75/25 Heated or unheated Type II or IV fluid/water mixture
Below -14 °C (7 °F) to LOUT	100/0 Heated[3] Type II or IV fluid	Heated Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0 Heated or unheated Type II or IV fluid

NOTES

1 Fluids used for the anti-icing procedure must not be used at temperatures below their lowest operational use temperature (LOUT). First step fluids must not be used below their freezing points. Consideration should be given to the use of Type I/III fluid when Type II/IV fluid cannot be used due to LOUT limitations (see Tables 55 and 57). The LOUT for a given Type II/IV fluid is the higher (warmer) of:

a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
b) The actual freezing point of the fluid plus its freezing point buffer of 7 °C (13 °F).

Although some LOUTs are lower than the temperatures stated in the HOT table, holdover times do not apply when anti-icing below the lowest temperature stated in the band.

2 To be applied before first step fluid freezes, typically within 3 minutes. Time may be longer than 3 minutes in some conditions, but potentially shorter in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area (sectionally).

3 Clean aircraft may be anti-iced with unheated fluid.

CAUTIONS

- For heated fluids, a fluid temperature not less than 60 °C (140 °F) at the nozzle is desirable.
- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- Wing skin temperatures may be colder or warmer than the OAT. Causes can include: radiation cooling, cold-soaked wing, or hangar storage. Consult the appropriate guidance (HOT Tables and FAA N 8900.XXX series notice "Revised FAA-Approved Deicing Program Updates, Winter 2021-2022") for the contaminant in question.
- Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold-soaked wing, the 50/50 dilutions of Type II or IV shall not be used for the anti-icing step because fluid freezing may occur.
- An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.
- When conducting aircraft deicing using a Type I fluid and not using the 10 ℃/18 ℉ buffer, procedures must be developed and approved to ensure refreezing does not occur prior to takeoff.

TABLE 57: GUIDELINES FOR THE APPLICATION OF UNHEATED SAE TYPE III FLUID

(FLUID CONCENTRATIONS IN % VOLUME)

Outside Air Temperature (OAT)[1]	Anti-icing Only[4]	Two-Step Procedure	
		First Step: Deicing	Second Step: Anti-icing[2]
0 °C (32 °F) and above	100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture	Heated[3] water or a heated[3] Type I, II, III, or IV fluid/water mixture	100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture
Below 0 °C (32 °F) to -3 °C (27 °F)	100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture	Heated[3] Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0, 75/25 or 50/50 Unheated Type III fluid/water mixture
Below -3 °C (27 °F) to -10 °C (14 °F)	100/0 or 75/25 Unheated Type III fluid/water mixture	Heated[3] Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0 or 75/25 Unheated Type III fluid/water mixture
Below -10 °C (14 °F) to LOUT	100/0 Unheated Type III fluid	Heated[3] Type I, II, III, or IV fluid/water mixture with a freezing point at OAT or below	100/0 Unheated Type III fluid

NOTES

1 Fluids used for the anti-icing procedure must not be used at temperatures below their lowest operational use temperature (LOUT). First step fluids must not be used below their freezing points. Consider the use of Type I when Type III fluid cannot be used (see Table 55). The LOUT for a given Type III fluid is the higher (warmer) of:

   a) The lowest temperature at which the fluid meets the aerodynamic acceptance test for a given aircraft type; or
   b) The actual freezing point of the fluid plus its freezing point buffer of 7 °C (13 °F).

   Although the LOUTs may be lower than the temperatures stated in the HOT table, holdover times do not apply when anti-icing below the lowest temperature stated in the band.

2 To be applied before first step fluid freezes, typically within 3 minutes. This time may be longer than 3 minutes in some conditions, but potentially shorter in heavy precipitation, colder temperatures, or for critical surfaces constructed of composite materials. If necessary, the second step shall be applied area by area (sectionally).

3 For heated fluids, a fluid temperature not less than 60 °C (140 °F) at the nozzle is desirable.

4 Anti-icing only with unheated Type III fluid is only possible on a clean aircraft. If deicing is required, a two-step procedure must be used.

CAUTIONS

- Upper temperature limit shall not exceed fluid and aircraft manufacturers' recommendations.
- Wing skin temperatures may be colder or warmer than the OAT. Causes can include: radiation cooling, cold-soaked wing, or hangar storage. Consult the appropriate guidance (HOT Tables and FAA N 8900.XXX series notice "Revised FAA-Approved Deicing Program Updates, Winter 2021-2022") for the contaminant in question.
- Whenever frost or ice occurs on the lower surface of the wing in the area of the fuel tank, indicating a cold-soaked wing, the 50/50 dilutions of Type III shall not be used for the anti-icing step because fluid freezing may occur.
- An insufficient amount of anti-icing fluid may cause a substantial loss of holdover time. This is particularly true when using a Type I fluid mixture for the first step in a two-step procedure.
- When conducting aircraft deicing using a Type I fluid and not using the 10℃/18℉ buffer, procedures must be developed and approved to ensure refreezing does not occur prior to takeoff.

APPENDIX A:
ADJUSTED HOLDOVER TIME (HOT) GUIDELINES

These tables are for use when flaps/slats are deployed prior to de/anti-icing. Holdover and allowance times have been adjusted to 76 percent of standard times. Standard holdover and allowance times can be used if flaps and slats are deployed as close to departure as safety allows.

Note: Industry data indicates the possibility of increased takeoff misconfigurations when the selection of takeoff flaps is delayed later in the taxi regime. If an air carrier chooses to select the flaps/slats to the takeoff configuration prior to beginning the anti-icing process, operators should have robust procedures in place to ensure that the aircraft is properly configured prior to takeoff. Air Carriers should follow the airframe manufacturer's recommended procedures regarding anti-icing operations and the configuration of flaps/slats while taxiing.

ADJUSTED HOLDOVER TIME (HOT) GUIDELINES FOR WINTER 2021-2022

TABLE ADJ-1: ADJUSTED ACTIVE FROST HOLDOVER TIMES FOR SAE TYPE I, TYPE II, TYPE III, AND TYPE IV FLUIDS

Outside Air Temperature[1,2,3]	Type I
-1 °C and above (30 °F and above)	0:34 *(0:27)*[5]
below -1 to -3 °C (below 30 to 27 °F)	
below -3 to -10 °C (below 27 to 14 °F)	
below -10 to -14 °C (below 14 to 7 °F)	
below -14 to -21 °C (below 7 to -6 °F)	
below -21 to -25 °C (below -6 to -13 °F)	
below -25 °C to LOUT (below -13 °F to LOUT)	

Outside Air Temperature[2,3]	Concentration Fluid/Water By % Volume	Type II	Type III[4]	Type IV
-1 °C and above (30 °F and above)	100/0	6:05	1:31	9:07
	75/25	3:48	0:46	3:48
	50/50	1:31	0:23	2:17
below -1 to -3 °C (below 30 to 27 °F)	100/0	6:05	1:31	9:07
	75/25	3:48	0:46	3:48
	50/50	1:08	0:23	2:17
below -3 to -10 °C (below 27 to 14 °F)	100/0	6:05	1:31	7:36
	75/25	3:02	0:46	3:48
below -10 to -14 °C (below 14 to 7 °F)	100/0	4:34	1:31	4:34
	75/25	0:46	0:46	0:46
below -14 to -21 °C (below 7 to -6 °F)	100/0	2:17	1:31	4:34
below -21 to -25 °C (below -6 to -13 °F)	100/0	1:31	1:31	3:02
below -25 °C (below -13 °F)	100/0	No Holdover Time Guidelines Exist		

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Type I Fluid / Water Mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 Changes in outside air temperature (OAT) over the course of longer frost events can be significant; the appropriate holdover time to use is the one provided for the coldest OAT that has occurred in the time between the de/anti-icing fluid application and takeoff.
4 To use the Type III fluid frost holdover times, the fluid brand being used must be known. AllClear AeroClear MAX must be applied unheated.
5 Value in parentheses is for aircraft with critical surfaces that are predominantly or entirely constructed of composite materials.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-2: ADJUSTED HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF ALUMINUM

Outside Air Temperature[1,2]	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	0:08 - 0:13	0:14 - 0:17	0:08 - 0:14	0:05 - 0:08	0:07 - 0:10	0:02 - 0:04	0:02 - 0:04	
below -3 to -6 °C (below 27 to 21 °F)	0:06 - 0:10	0:11 - 0:13	0:06 - 0:11	0:04 - 0:06	0:04 - 0:07	0:02 - 0:04	CAUTION: No holdover time guidelines exist	
below -6 to -10 °C (below 21 to 14 °F)	0:05 - 0:08	0:08 - 0:10	0:05 - 0:08	0:03 - 0:05	0:03 - 0:05	0:02 - 0:04		
below -10 °C (below 14 °F)	0:04 - 0:07	0:05 - 0:06	0:03 - 0:05	0:02 - 0:03				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-3: ADJUSTED HOLDOVER TIMES FOR SAE TYPE I FLUID ON CRITICAL AIRCRAFT SURFACES COMPOSED PREDOMINANTLY OF COMPOSITES

Outside Air Temperature[1,2]	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	0:07 - 0:12	0:09 - 0:11	0:05 - 0:09	0:02 - 0:05	0:06 - 0:10	0:02 - 0:04	0:01 - 0:04	
below -3 to -6 °C (below 27 to 21 °F)	0:05 - 0:06	0:08 - 0:10	0:04 - 0:08	0:02 - 0:04	0:04 - 0:07	0:02 - 0:04	CAUTION: No holdover time guidelines exist	
below -6 to -10 °C (below 21 to 14 °F)	0:03 - 0:06	0:07 - 0:09	0:04 - 0:07	0:02 - 0:04	0:03 - 0:05	0:02 - 0:04		
below -10 °C (below 14 °F)	0:03 - 0:05	0:05 - 0:06	0:03 - 0:05	0:02 - 0:03				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Type I fluid / water mixture must be selected so that the freezing point of the mixture is at least 10 °C (18 °F) below outside air temperature.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-4: ADJUSTED GENERIC HOLDOVER TIMES FOR SAE TYPE II FLUIDS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:42 - 1:24	0:19 - 0:38	0:23 - 0:46	0:15 - 0:27	0:05 - 0:34	
	75/25	0:19 - 0:42	0:11 - 0:19	0:11 - 0:30	0:08 - 0:15	0:03 - 0:19	
	50/50	0:11 - 0:19	0:04 - 0:08	0:06 - 0:11	0:05 - 0:07	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:23 - 0:34	0:15 - 0:27	0:15 - 0:34	0:11 - 0:15		
	75/25	0:19 - 0:38	0:08 - 0:15	0:11 - 0:19	0:06 - 0:11		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:23 - 0:34	0:11 - 0:23	0:15 - 0:34[8]	0:11 - 0:15[8]		
	75/25	0:19 - 0:38	0:06 - 0:15	0:11 - 0:19[8]	0:06 - 0:11[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:11 - 0:15	0:02 - 0:05				
below -18 to -25 °C[9] (below 0 to -13 °F)	100/0	0:11 - 0:15	0:01 - 0:02				
below -25 °C to LOUT[9] (below -13 °F to LOUT)	100/0	0:11 - 0:15	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).
9 If the LOUT is unknown, no holdover time guidelines exist below -25 °C (-13 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-5: ADJUSTED TYPE II HOLDOVER TIMES FOR ABAX ECOWING AD-2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:01 - 2:17	1:50 - 2:13	0:57 - 1:50	0:30 - 0:57	0:30 - 1:16	0:23 - 0:34	0:07 - 1:05	
	75/25	0:57 - 1:05	1:20 - 1:39	0:42 - 1:20	0:19 - 0:42	0:27 - 0:49	0:15 - 0:23	0:03 - 0:38	
	50/50	0:11 - 0:23	0:27 - 0:30	0:11 - 0:27	0:05 - 0:11	0:07 - 0:11	0:05 - 0:07	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:34 - 1:54	1:31 - 1:50	0:46 - 1:31	0:23 - 0:46	0:19 - 0:53	0:15 - 0:23		
	75/25	0:27 - 1:27	1:16 - 1:35	0:38 - 1:16	0:19 - 0:38	0:11 - 0:42	0:15 - 0:27		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:34 - 1:54	1:20 - 1:35	0:42 - 1:20	0:23 - 0:42	0:19 - 0:53[8]	0:15 - 0:23[8]		
	75/25	0:27 - 1:27	1:12 - 1:31	0:38 - 1:12	0:19 - 0:38	0:11 - 0:42[8]	0:15 - 0:27[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:11 - 0:30	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:11 - 0:30	0:07 - 0:11	0:02 - 0:07	0:01 - 0:02				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:11 - 0:30	0:04 - 0:05	0:01 - 0:04	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-6: ADJUSTED TYPE II HOLDOVER TIMES FOR AVIATION SHAANXI HI-TECH CLEANWING II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:42 - 1:24	1:12 - 1:27	0:42 - 1:12	0:23 - 0:42	0:27 - 0:49	0:19 - 0:27	0:08 - 0:42	
	75/25	0:38 - 1:01	1:01 - 1:16	0:34 - 1:01	0:19 - 0:34	0:27 - 0:46	0:15 - 0:23	0:05 - 0:38	
	50/50	0:27 - 0:46	0:38 - 0:49	0:19 - 0:38	0:11 - 0:19	0:15 - 0:30	0:08 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:34 - 1:24	1:01 - 1:12	0:30 - 1:01	0:19 - 0:30	0:23 - 0:42	0:15 - 0:19		
	75/25	0:30 - 1:20	1:01 - 1:12	0:34 - 1:01	0:19 - 0:34	0:27 - 0:30	0:15 - 0:19		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:34 - 1:24	0:49 - 1:01	0:27 - 0:49	0:15 - 0:27	0:23 - 0:42[8]	0:15 - 0:19[8]		
	75/25	0:30 - 1:20	1:01 - 1:12	0:34 - 1:01	0:19 - 0:34	0:27 - 0:30[8]	0:15 - 0:19[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:38	0:34 - 0:46	0:19 - 0:34	0:11 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:38	0:23 - 0:27	0:11 - 0:23	0:05 - 0:11				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-7: ADJUSTED TYPE II HOLDOVER TIMES FOR BEIJING YADILITE AVIATION YD-102 TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:53 - 1:31	1:16 - 1:31	0:38 - 1:16	0:19 - 0:38	0:30 - 0:57	0:27 - 0:30	0:08 - 0:46	
	75/25	0:19 - 0:42	0:38 - 0:49	0:19 - 0:38	0:11 - 0:19	0:11 - 0:30	0:08 - 0:15	0:03 - 0:19	
	50/50	0:11 - 0:19	0:19 - 0:23	0:08 - 0:19	0:04 - 0:08	0:06 - 0:11	0:05 - 0:07	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:34 - 1:08	0:57 - 1:08	0:27 - 0:57	0:15 - 0:27	0:27 - 0:38	0:19 - 0:19		
	75/25	0:23 - 0:38	0:30 - 0:38	0:15 - 0:30	0:08 - 0:15	0:11 - 0:19	0:07 - 0:11		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:34 - 1:08	0:46 - 0:57	0:23 - 0:46	0:11 - 0:23	0:27 - 0:38[8]	0:19 - 0:19[8]		
	75/25	0:23 - 0:38	0:27 - 0:34	0:15 - 0:27	0:06 - 0:15	0:11 - 0:19[8]	0:07 - 0:11[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:34	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:34	0:07 - 0:11	0:02 - 0:07	0:01 - 0:02				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:15 - 0:34	0:04 - 0:05	0:01 - 0:04	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-8: ADJUSTED TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:40 - 3:02	1:58 - 2:21	1:12 - 1:58	0:46 - 1:12	1:01 - 1:31	0:34 - 1:05	0:08 - 1:08	
	75/25	1:24 - 2:05	1:58 - 2:24	1:01 - 1:58	0:30 - 1:01	0:53 - 1:08	0:23 - 0:42	0:05 - 0:38	
	50/50	0:42 - 1:20	0:34 - 0:42	0:19 - 0:34	0:08 - 0:19	0:15 - 0:23	0:08 - 0:11	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 1:20	1:35 - 1:54	0:57 - 1:35	0:34 - 0:57	0:27 - 1:08	0:19 - 0:34		
	75/25	0:19 - 0:49	1:20 - 1:39	0:42 - 1:20	0:23 - 0:42	0:19 - 0:53	0:15 - 0:27		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 1:20	1:24 - 1:39	0:49 - 1:24	0:30 - 0:49	0:27 - 1:08[8]	0:19 - 0:34[8]		
	75/25	0:19 - 0:49	1:01 - 1:16	0:30 - 1:01	0:15 - 0:30	0:19 - 0:53[8]	0:15 - 0:27[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:38	0:53 - 1:16	0:19 - 0:53	0:06 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:38	0:23 - 0:30	0:08 - 0:23	0:02 - 0:08				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:23 - 0:38	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-9: ADJUSTED TYPE II HOLDOVER TIMES FOR CLARIANT SAFEWING MP II FLIGHT PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:02 - 3:02	0:38 - 1:24	1:05 - 1:31	0:34 - 0:46	0:11 - 1:31	
	75/25	1:58 - 3:02	0:46 - 1:20	1:12 - 1:31	0:38 - 0:57	0:11 - 0:57	
	50/50	0:49 - 1:46	0:11 - 0:19	0:23 - 0:49	0:11 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 1:46	0:30 - 1:08	0:27 - 1:05	0:27 - 0:42		
	75/25	0:23 - 1:20	0:46 - 1:16	0:19 - 0:53	0:23 - 0:34		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 1:46	0:27 - 0:57	0:27 - 1:05[8]	0:27 - 0:42[8]		
	75/25	0:23 - 1:20	0:42 - 1:16	0:19 - 0:53[8]	0:23 - 0:34[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:30	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:30	0:01 - 0:02				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:15 - 0:30	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-10: ADJUSTED TYPE II HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:09 - 3:02	2:28 - 2:59	1:27 - 2:28	0:49 - 1:27	1:12 - 1:31	0:57 - 1:08	0:11 - 1:31	
	75/25	1:54 - 3:02	2:17 - 2:55	1:05 - 2:17	0:30 - 1:05	1:16 - 1:31	0:30 - 0:53	0:07 - 1:16	
	50/50	0:38 - 1:05	0:53 - 1:12	0:19 - 0:53	0:08 - 0:19	0:15 - 0:34	0:07 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 1:54	1:50 - 2:09	1:05 - 1:50	0:38 - 1:05	0:27 - 1:12	0:27 - 0:34		
	75/25	0:30 - 1:08	1:46 - 2:17	0:49 - 1:46	0:23 - 0:49	0:19 - 0:49	0:27 - 0:34		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 1:54	1:31 - 1:46	0:53 - 1:31	0:30 - 0:53	0:27 - 1:12[8]	0:27 - 0:34[8]		
	75/25	0:30 - 1:08	1:31 - 1:54	0:42 - 1:31	0:19 - 0:42	0:19 - 0:49[8]	0:27 - 0:34[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:38	1:12 - 1:43	0:27 - 1:12	0:08 - 0:27				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:38	0:30 - 0:42	0:11 - 0:30	0:03 - 0:11				
below -25 to -30.5 °C (below -13 to -23 °F)	100/0	0:19 - 0:38	0:19 - 0:23	0:05 - 0:19	0:02 - 0:05				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-11: ADJUSTED TYPE II HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST PG 2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:42 - 1:24	1:24 - 1:43	0:42 - 1:24	0:23 - 0:42	0:23 - 0:46	0:15 - 0:27	0:08 - 1:01	
	75/25	0:49 - 1:31	1:20 - 1:43	0:34 - 1:20	0:15 - 0:34	0:19 - 0:38	0:11 - 0:23	0:05 - 0:27	
	50/50	0:46 - 1:24	1:39 - 2:02	0:46 - 1:39	0:23 - 0:46	0:23 - 0:38	0:11 - 0:23	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 1:05	1:05 - 1:20	0:34 - 1:05	0:19 - 0:34	0:27 - 0:38	0:15 - 0:23		
	75/25	0:30 - 1:01	0:53 - 1:08	0:23 - 0:53	0:11 - 0:23	0:19 - 0:30	0:11 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 1:05	0:57 - 1:08	0:30 - 0:57	0:15 - 0:30	0:27 - 0:38[8]	0:15 - 0:23[8]		
	75/25	0:30 - 1:01	0:42 - 0:49	0:19 - 0:42	0:08 - 0:19	0:19 - 0:30[8]	0:11 - 0:15[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:27 - 0:49	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:27 - 0:49	0:07 - 0:11	0:02 - 0:07	0:01 - 0:02				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:27 - 0:49	0:04 - 0:05	0:01 - 0:04	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-12: ADJUSTED TYPE II HOLDOVER TIMES FOR KILFROST ABC-K PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:43 - 2:51	0:46 - 1:16	1:24 - 1:31	0:46 - 1:05	0:15 - 1:31	
	75/25	1:16 - 1:54	0:27 - 0:53	1:05 - 1:31	0:38 - 0:53	0:11 - 1:31	
	50/50	0:27 - 0:49	0:05 - 0:11	0:15 - 0:23	0:08 - 0:11	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:23 - 0:49	0:42 - 1:08	0:19 - 0:46	0:11 - 0:27		
	75/25	0:19 - 1:05	0:27 - 0:49	0:15 - 0:42	0:07 - 0:23		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:23 - 0:49	0:38 - 1:05	0:19 - 0:46[8]	0:11 - 0:27[8]		
	75/25	0:19 - 1:05	0:27 - 0:49	0:15 - 0:42[8]	0:07 - 0:23[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:42	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:42	0:01 - 0:02				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:23 - 0:42	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-13: ADJUSTED TYPE II HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-2

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Snow, Snow Grains or Snow Pellets[3,4]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:57 - 1:50	0:23 - 0:42	0:27 - 0:49	0:19 - 0:27	0:06 - 0:34	
	75/25	0:38 - 1:08	0:15 - 0:30	0:19 - 0:34	0:11 - 0:19	0:04 - 0:19	
	50/50	0:19 - 0:27	0:11 - 0:19	0:08 - 0:15	0:05 - 0:08	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:34 - 1:08	0:15 - 0:30	0:15 - 0:34	0:11 - 0:15		
	75/25	0:23 - 0:49	0:11 - 0:19	0:11 - 0:23	0:06 - 0:11		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:34 - 1:08	0:11 - 0:23	0:15 - 0:34[8]	0:11 - 0:15[8]		
	75/25	0:23 - 0:49	0:08 - 0:15	0:11 - 0:23[8]	0:06 - 0:11[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:27	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:27	0:01 - 0:02				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:19 - 0:27	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-14: ADJUSTED TYPE II HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-2 BIO+

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:05 - 1:54	1:46 - 2:13	0:49 - 1:46	0:23 - 0:49	0:38 - 1:01	0:19 - 0:34	0:06 - 0:57	
	75/25	0:34 - 1:01	1:01 - 1:16	0:30 - 1:01	0:15 - 0:30	0:19 - 0:38	0:11 - 0:19	0:05 - 0:27	
	50/50	0:11 - 0:23	0:19 - 0:23	0:11 - 0:19	0:06 - 0:11	0:08 - 0:15	0:06 - 0:08	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:30 - 1:08	1:05 - 1:24	0:30 - 1:05	0:15 - 0:30	0:27 - 0:49	0:11 - 0:23		
	75/25	0:23 - 0:49	0:38 - 0:49	0:19 - 0:38	0:08 - 0:19	0:15 - 0:27	0:11 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:30 - 1:08	0:46 - 0:57	0:23 - 0:46	0:11 - 0:23	0:27 - 0:49[8]	0:11 - 0:23[8]		
	75/25	0:23 - 0:49	0:27 - 0:34	0:15 - 0:27	0:06 - 0:15	0:15 - 0:27[8]	0:11 - 0:15[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:46	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:46	0:07 - 0:11	0:02 - 0:07	0:01 - 0:02				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:15 - 0:46	0:04 - 0:05	0:01 - 0:04	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-15: ADJUSTED TYPE II HOLDOVER TIMES FOR ROMCHIM ADD-PROTECT NG TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:53 - 1:50	1:58 - 2:28	0:53 - 1:58	0:27 - 0:53	0:38 - 1:01	0:27 - 0:38	0:05 - 0:53	
	75/25	0:46 - 1:24	1:27 - 1:50	0:42 - 1:27	0:19 - 0:42	0:30 - 0:57	0:19 - 0:30	0:05 - 0:42	
	50/50	0:19 - 0:42	0:42 - 0:49	0:23 - 0:42	0:11 - 0:23	0:15 - 0:27	0:08 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 1:12	1:24 - 1:46	0:38 - 1:24	0:19 - 0:38	0:27 - 0:53	0:19 - 0:27		
	75/25	0:42 - 1:05	1:05 - 1:20	0:30 - 1:05	0:15 - 0:30	0:19 - 0:49	0:15 - 0:23		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 1:12	1:05 - 1:24	0:30 - 1:05	0:15 - 0:30	0:27 - 0:53[8]	0:19 - 0:27[8]		
	75/25	0:42 - 1:05	0:49 - 1:05	0:23 - 0:49	0:11 - 0:23	0:19 - 0:49[8]	0:15 - 0:23[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:11 - 0:15	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:11 - 0:15	0:07 - 0:11	0:02 - 0:07	0:01 - 0:02				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:11 - 0:15	0:04 - 0:05	0:01 - 0:04	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-16: ADJUSTED TYPE II HOLDOVER TIMES FOR ROMCHIM ADD-PROTECT TYPE II

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:16 - 2:40	1:27 - 1:50	0:46 - 1:27	0:23 - 0:46	0:30 - 1:12	0:19 - 0:34	0:07 - 0:38	
	75/25	0:30 - 0:53	0:46 - 0:53	0:23 - 0:46	0:11 - 0:23	0:19 - 0:30	0:11 - 0:19	0:04 - 0:19	
	50/50	0:15 - 0:27	0:23 - 0:27	0:11 - 0:23	0:07 - 0:11	0:08 - 0:23	0:06 - 0:08	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:23 - 0:34	1:01 - 1:16	0:30 - 1:01	0:15 - 0:30	0:19 - 0:38	0:15 - 0:23		
	75/25	0:23 - 0:42	0:30 - 0:38	0:19 - 0:30	0:08 - 0:19	0:15 - 0:23	0:11 - 0:15		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:23 - 0:34	0:49 - 1:01	0:27 - 0:49	0:11 - 0:27	0:19 - 0:38[8]	0:15 - 0:23[8]		
	75/25	0:23 - 0:42	0:27 - 0:30	0:15 - 0:27	0:07 - 0:15	0:15 - 0:23[8]	0:11 - 0:15[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:11 - 0:19	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:11 - 0:19	0:07 - 0:11	0:02 - 0:07	0:01 - 0:02				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:11 - 0:19	0:04 - 0:05	0:01 - 0:04	0:00 - 0:01				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type II fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-17: ADJUSTED TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON LOW SPEED AIRCRAFT[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	100/0	0:34 - 1:27	1:01 - 1:20	0:30 - 1:01	0:14 - 0:30	0:19 - 0:38	0:11 - 0:19	0:04 - 0:30	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -10 °C (below 27 to 14 °F)	100/0	0:38 - 1:16	1:01 - 1:20	0:30 - 1:01	0:14 - 0:30	0:19 - 0:34	0:11 - 0:19		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -10 to -16 °C (below 14 to 3 °F)	100/0	0:30 - 1:20	1:01 - 1:20	0:30 - 1:01	0:14 - 0:30				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 These holdover times are for aircraft conforming to the SAE AS5900 low speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-18: ADJUSTED TYPE III HOLDOVER TIMES FOR ALLCLEAR AEROCLEAR MAX APPLIED UNHEATED ON HIGH SPEED AIRCRAFT[1]

Outside Air Temperature[2]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[3], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[4,5]	Light Snow, Snow Grains or Snow Pellets[4,5]	Moderate Snow, Snow Grains or Snow Pellets[4]	Freezing Drizzle[6]	Light Freezing Rain	Rain on Cold-Soaked Wing[7]	Other[8]
-3 °C and above (27 °F and above)	100/0	0:34 - 1:27	1:01 - 1:20	0:30 - 1:01	0:14 - 0:30	0:19 - 0:38	0:11 - 0:19	0:04 - 0:30	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -10 °C (below 27 to 14 °F)	100/0	0:38 - 1:16	1:01 - 1:20	0:30 - 1:01	0:14 - 0:30	0:19 - 0:34	0:11 - 0:19		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -10 to -25 °C (below 14 to -13 °F)	100/0	0:30 - 1:20	1:01 - 1:20	0:30 - 1:01	0:14 - 0:30			CAUTION: No holdover time guidelines exist	
below -25 to -35 °C (below -13 to -31 °F)	100/0	0:19 - 0:46	0:34 - 0:46	0:15 - 0:34	0:08 - 0:15				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 These holdover times are for aircraft conforming to the SAE AS5900 high speed aerodynamic test criterion. Fluid must be applied unheated to use these holdover times. No holdover times exist for this fluid applied heated.
2 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type III fluid cannot be used.
3 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
4 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
5 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
6 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
7 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
8 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-47 provides allowance times for ice pellets and small hail for SAE Type III fluids, applied unheated).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-19: ADJUSTED GENERIC HOLDOVER TIMES FOR SAE TYPE IV FLUIDS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:57 - 2:02	1:27 - 1:46	0:46 - 1:27	0:23 - 0:46	0:30 - 0:53	0:15 - 0:27	0:06 - 0:49	
	75/25	1:05 - 2:02	1:35 - 1:50	0:57 - 1:35	0:30 - 0:57	0:38 - 1:01	0:23 - 0:34	0:07 - 0:57	
	50/50	0:23 - 0:42	0:46 - 0:53	0:19 - 0:46	0:08 - 0:19	0:11 - 0:30	0:07 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:15 - 1:12	1:20 - 1:35	0:42 - 1:20	0:19 - 0:42	0:19 - 0:53	0:15 - 0:19		
	75/25	0:23 - 1:01	1:24 - 1:39	0:46 - 1:24	0:23 - 0:46	0:15 - 0:49	0:11 - 0:19		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:15 - 1:12	1:01 - 1:16	0:34 - 1:01	0:19 - 0:34	0:19 - 0:53[8]	0:15 - 0:19[8]		
	75/25	0:23 - 1:01	1:16 - 1:31	0:34 - 1:16	0:15 - 0:34	0:15 - 0:49[8]	0:11 - 0:19[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:27	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C[9] (below 0 to -13 °F)	100/0	0:15 - 0:27	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25° C to LOUT[9] (below -13° F to LOUT)	100/0	0:15 - 0:27	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids and Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).
9 If the LOUT is unknown, no holdover time guidelines exist below -23.5 °C (-10 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-20: ADJUSTED TYPE IV HOLDOVER TIMES FOR ABAX ECOWING AD-49

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:32 - 3:02	2:47 - 3:00	1:27 - 2:47	0:46 - 1:27	1:05 - 1:31	0:46 - 1:05	0:08 - 1:27	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:15 - 1:12	2:13 - 2:40	1:08 - 2:13	0:34 - 1:08	0:19 - 1:05	0:15 - 0:19		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:15 - 1:12	1:50 - 2:17	0:57 - 1:50	0:30 - 0:57	0:19 - 1:05[8]	0:15 - 0:19[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:30	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:30	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:19 - 0:30	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-21: ADJUSTED TYPE IV HOLDOVER TIMES FOR ALLCLEAR CLEARWING ECO

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:31 - 3:02	2:43 - 3:00	1:20 - 2:43	0:38 - 1:20	1:24 - 1:31	1:01 - 1:16	0:15 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:46 - 1:54	2:02 - 2:32	1:01 - 2:02	0:30 - 1:01	0:42 - 1:31	0:34 - 0:57		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:46 - 1:54	1:39 - 2:02	0:49 - 1:39	0:23 - 0:49	0:42 - 1:31[8]	0:34 - 0:57[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:34	0:49 - 1:01	0:27 - 0:49	0:11 - 0:27				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:34	0:23 - 0:27	0:11 - 0:23	0:05 - 0:11				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:19 - 0:34	0:19 - 0:27	0:11 - 0:19	0:05 - 0:11				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-22: ADJUSTED TYPE IV HOLDOVER TIMES FOR ALLCLEAR CLEARWING EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:24 - 2:28	2:02 - 2:32	1:01 - 2:02	0:30 - 1:01	0:53 - 1:12	0:23 - 0:46	0:08 - 1:08	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:12 - 2:51	1:50 - 2:17	0:53 - 1:50	0:27 - 0:53	0:49 - 1:08	0:23 - 0:46		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:12 - 2:51	1:43 - 2:05	0:49 - 1:43	0:23 - 0:49	0:49 - 1:08[8]	0:23 - 0:46[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:42 - 1:31	1:12 - 1:35	0:34 - 1:12	0:15 - 0:34				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:42 - 1:31	0:42 - 0:53	0:19 - 0:42	0:11 - 0:19				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:42 - 1:31	0:34 - 0:42	0:15 - 0:34	0:08 - 0:15				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-23: ADJUSTED TYPE IV HOLDOVER TIMES FOR ASGLOBAL 4FLITE EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:12 - 2:28	1:35 - 1:58	0:46 - 1:35	0:23 - 0:46	0:30 - 0:53	0:15 - 0:27	0:06 - 0:49	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 2:05	1:24 - 1:43	0:42 - 1:24	0:19 - 0:42	0:30 - 0:53	0:15 - 0:27		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 2:05	1:12 - 1:31	0:38 - 1:12	0:19 - 0:38	0:30 - 0:53[8]	0:15 - 0:27[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:38 - 1:05	0:38 - 0:49	0:19 - 0:38	0:08 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:38 - 1:05	0:30 - 0:42	0:11 - 0:30	0:04 - 0:11				
below -25 to -30 °C (below -13 to -22 °F)	100/0	0:23 - 0:49	0:19 - 0:27	0:06 - 0:19	0:02 - 0:06				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-24: ADJUSTED TYPE IV HOLDOVER TIMES FOR ASGLOBAL 4FLITE PG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:24 - 2:28	2:05 - 2:32	1:12 - 2:05	0:42 - 1:12	0:53 - 1:12	0:34 - 0:49	0:11 - 1:01	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:49 - 1:27	1:31 - 1:50	0:53 - 1:31	0:30 - 0:53	0:42 - 0:53	0:27 - 0:42		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:49 - 1:27	1:12 - 1:27	0:42 - 1:12	0:23 - 0:42	0:42 - 0:53[8]	0:27 - 0:42[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:34	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:34	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:23 - 0:34	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-25: ADJUSTED TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT EG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:08 - 2:21	1:27 - 1:46	0:53 - 1:27	0:30 - 0:53	0:49 - 1:31	0:23 - 0:38	0:08 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:01 - 2:17	1:20 - 1:35	0:46 - 1:20	0:27 - 0:46	0:42 - 1:08	0:27 - 0:38		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:01 - 2:17	1:12 - 1:27	0:42 - 1:12	0:23 - 0:42	0:42 - 1:08[8]	0:27 - 0:38[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:27 - 1:20	1:16 - 1:31	0:38 - 1:16	0:19 - 0:38				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:27 - 1:20	1:01 - 1:12	0:30 - 1:01	0:15 - 0:30				
below -25 to -31 °C (below -13 to -24 °F)	100/0	0:27 - 0:49	0:27 - 0:34	0:15 - 0:27	0:07 - 0:15				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-26: ADJUSTED TYPE IV HOLDOVER TIMES FOR AVIAFLUID AVIAFLIGHT PG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:43 - 3:02	2:17 - 2:47	1:16 - 2:17	0:42 - 1:16	1:31 - 1:31	0:53 - 1:27	0:15 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:49 - 1:39	1:31 - 1:50	0:49 - 1:31	0:27 - 0:49	0:27 - 1:27	0:34 - 0:49		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:49 - 1:39	1:08 - 1:24	0:38 - 1:08	0:19 - 0:38	0:27 - 1:27[8]	0:34 - 0:49[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:27	0:38 - 0:46	0:19 - 0:38	0:11 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:27	0:19 - 0:23	0:11 - 0:19	0:05 - 0:11				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:15 - 0:27	0:19 - 0:23	0:08 - 0:19	0:05 - 0:08				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-27: ADJUSTED TYPE IV HOLDOVER TIMES FOR CHEMCO CHEMR EG IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:35 - 2:43	2:17 - 2:55	0:57 - 2:17	0:27 - 0:57	0:34 - 1:16	0:19 - 0:30	0:07 - 1:20	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 2:47	2:17 - 2:55	0:57 - 2:17	0:27 - 0:57	0:46 - 1:12	0:27 - 0:38		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 2:47	2:17 - 2:55	0:57 - 2:17	0:27 - 0:57	0:46 - 1:12[8]	0:27 - 0:38[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 1:05	1:05 - 1:20	0:30 - 1:05	0:15 - 0:30				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 1:05	1:05 - 1:20	0:30 - 1:05	0:15 - 0:30				
below -25 to -27 °C (below -13 to -17 °F)	100/0	0:30 - 1:05	1:05 - 1:20	0:30 - 1:05	0:15 - 0:30				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-28: ADJUSTED TYPE IV HOLDOVER TIMES FOR CHEMCO CHEMR NORDIK IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:43 - 3:02	2:28 - 3:00	1:20 - 2:28	0:42 - 1:20	1:01 - 1:31	0:42 - 1:01	0:19 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:24 - 3:02	2:28 - 3:00	1:20 - 2:28	0:42 - 1:20	0:57 - 1:31	0:34 - 1:01		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:24 - 3:02	2:28 - 3:00	1:20 - 2:28	0:42 - 1:20	0:57 - 1:31[8]	0:34 - 1:01[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 1:08	2:21 - 2:51	1:12 - 2:21	0:38 - 1:12				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 1:08	1:39 - 2:02	0:49 - 1:39	0:27 - 0:49				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:30 - 1:08	1:24 - 1:43	0:42 - 1:24	0:23 - 0:42				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-29: ADJUSTED TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT 04

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:02 - 3:02	3:00 - 3:00	2:05 - 3:00	1:05 - 2:05	1:31 - 1:31	0:53 - 1:08	0:15 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:38 - 1:54	2:28 - 3:00	1:16 - 2:28	0:38 - 1:16	0:19 - 1:08	0:15 - 0:30		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:38 - 1:54	1:46 - 2:09	0:53 - 1:46	0:27 - 0:53	0:19 - 1:08[8]	0:15 - 0:30[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:34	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -23.5 °C (below 0 to -10 °F)	100/0	0:15 - 0:34	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-30: ADJUSTED TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT AVIA

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:21 - 3:02	2:17 - 2:43	1:20 - 2:17	0:46 - 1:20	1:05 - 1:31	0:42 - 0:53	0:07 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:20 - 2:59	1:54 - 2:17	1:05 - 1:54	0:38 - 1:05	0:53 - 1:31	0:42 - 1:08		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:20 - 2:59	1:39 - 1:58	0:57 - 1:39	0:30 - 0:57	0:53 - 1:31[8]	0:42 - 1:08[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:27 - 1:05	0:38 - 0:49	0:19 - 0:38	0:08 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:27 - 1:05	0:30 - 0:42	0:11 - 0:30	0:04 - 0:11				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:27 - 1:05	0:19 - 0:27	0:06 - 0:19	0:02 - 0:06				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail)..
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-31: ADJUSTED TYPE IV HOLDOVER TIMES FOR CLARIANT MAX FLIGHT SNEG

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:50 - 3:02	2:17 - 2:47	1:16 - 2:17	0:42 - 1:16	1:31 - 1:31	0:38 - 1:16	0:15 - 1:08	
	75/25	3:02 - 3:02	1:50 - 2:09	1:08 - 1:50	0:42 - 1:08	1:08 - 1:31	0:49 - 1:01	0:11 - 1:20	
	50/50	1:08 - 2:40	1:20 - 1:46	0:34 - 1:20	0:15 - 0:34	0:27 - 0:53	0:11 - 0:23		
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:34 - 1:46	1:50 - 2:13	1:01 - 1:50	0:34 - 1:01	0:23 - 1:05	0:19 - 0:30		
	75/25	0:23 - 1:05	1:27 - 1:43	0:53 - 1:27	0:34 - 0:53	0:15 - 0:49	0:15 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:34 - 1:46	1:35 - 1:54	0:53 - 1:35	0:30 - 0:53	0:23 - 1:05[8]	0:19 - 0:30[8]		
	75/25	0:23 - 1:05	1:16 - 1:31	0:46 - 1:16	0:30 - 0:46	0:15 - 0:49[8]	0:15 - 0:30[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:15 - 0:38	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:15 - 0:38	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:15 - 0:38	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

CAUTION: No holdover time guidelines exist

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-32: ADJUSTED TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING EG IV NORTH

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:46 - 2:59	2:17 - 2:47	1:16 - 2:17	0:38 - 1:16	1:08 - 1:31	0:38 - 0:42	0:06 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A		
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:20 - 3:02	2:09 - 2:40	1:08 - 2:09	0:38 - 1:08	0:49 - 1:24	0:42 - 1:05		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:20 - 3:02	2:05 - 2:32	1:08 - 2:05	0:38 - 1:08	0:49 - 1:24[8]	0:42 - 1:05[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 1:01	0:38 - 0:49	0:19 - 0:38	0:08 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 1:01	0:30 - 0:42	0:11 - 0:30	0:04 - 0:11				
below -25 to -30 °C (below -13 to -22 °F)	100/0	0:30 - 1:01	0:19 - 0:27	0:06 - 0:19	0:02 - 0:06				

CAUTION: No holdover time guidelines exist

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-33: ADJUSTED TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	3:02 - 3:02	2:09 - 2:32	1:20 - 2:09	0:49 - 1:20	1:08 - 1:31	0:46 - 1:16	0:11 - 1:16	
	75/25	2:47 - 3:02	2:21 - 2:47	1:20 - 2:21	0:46 - 1:20	1:16 - 1:31	0:34 - 0:57	0:08 - 1:20	
	50/50	1:05 - 2:05	1:05 - 1:16	0:34 - 1:05	0:19 - 0:34	0:23 - 0:38	0:15 - 0:19	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:46 - 1:27	1:50 - 2:09	1:08 - 1:50	0:42 - 1:08	0:27 - 1:16	0:19 - 0:34		
	75/25	0:30 - 1:01	2:02 - 2:28	1:08 - 2:02	0:38 - 1:08	0:19 - 0:53	0:19 - 0:34		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:46 - 1:27	1:39 - 1:54	1:01 - 1:39	0:38 - 1:01	0:27 - 1:16[8]	0:19 - 0:34[8]		
	75/25	0:30 - 1:01	1:50 - 2:13	1:05 - 1:50	0:34 - 1:05	0:19 - 0:53[8]	0:19 - 0:34[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:38	0:57 - 1:20	0:15 - 0:57	0:05 - 0:15				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:38	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:23 - 0:38	0:15 - 0:23	0:05 - 0:15	0:01 - 0:05				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-34: ADJUSTED TYPE IV HOLDOVER TIMES FOR CLARIANT SAFEWING MP IV LAUNCH PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:59 - 3:02	3:00 - 3:00	1:35 - 3:00	0:42 - 1:35	1:31 - 1:31	0:46 - 1:31	0:15 - 1:31	
	75/25	2:59 - 3:02	3:00 - 3:00	1:27 - 3:00	0:38 - 1:27	1:31 - 1:31	1:01 - 1:05	0:15 - 1:24	
	50/50	0:57 - 1:24	1:12 - 1:31	0:34 - 1:12	0:15 - 0:34	0:19 - 0:46	0:11 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 1:43	2:51 - 3:00	1:16 - 2:51	0:34 - 1:16	0:19 - 1:12	0:19 - 0:30		
	75/25	0:30 - 1:31	2:40 - 3:00	1:08 - 2:40	0:27 - 1:08	0:15 - 0:49	0:15 - 0:23		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 1:43	2:28 - 3:00	1:05 - 2:28	0:30 - 1:05	0:19 - 1:12[8]	0:19 - 0:30[8]		
	75/25	0:30 - 1:31	2:13 - 2:55	0:57 - 2:13	0:23 - 0:57	0:15 - 0:49[8]	0:15 - 0:23[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:38	0:57 - 1:24	0:19 - 0:57	0:05 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:38	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:19 - 0:38	0:15 - 0:23	0:05 - 0:15	0:02 - 0:05				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-35: ADJUSTED TYPE IV HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® ADVANCE

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:09 - 3:02	2:28 - 2:59	1:27 - 2:28	0:49 - 1:27	1:12 - 1:31	0:57 - 1:08	0:11 - 1:31	
	75/25	1:54 - 3:02	2:17 - 2:55	1:05 - 2:17	0:30 - 1:05	1:16 - 1:31	0:30 - 0:53	0:07 - 1:16	
	50/50	0:38 - 1:05	0:53 - 1:12	0:19 - 0:53	0:08 - 0:19	0:15 - 0:34	0:07 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 1:54	1:50 - 2:09	1:05 - 1:50	0:38 - 1:05	0:27 - 1:12	0:27 - 0:34		
	75/25	0:30 - 1:08	1:46 - 2:17	0:49 - 1:46	0:23 - 0:49	0:19 - 0:49	0:27 - 0:34		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 1:54	1:31 - 1:46	0:53 - 1:31	0:30 - 0:53	0:27 - 1:12[8]	0:27 - 0:34[8]		
	75/25	0:30 - 1:08	1:31 - 1:54	0:42 - 1:31	0:19 - 0:42	0:19 - 0:49[8]	0:27 - 0:34[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:38	1:12 - 1:43	0:27 - 1:12	0:08 - 0:27				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:38	0:30 - 0:42	0:11 - 0:30	0:03 - 0:11				
below -25 to -30.5 °C (below -13 to -23 °F)	100/0	0:19 - 0:38	0:19 - 0:23	0:05 - 0:19	0:02 - 0:05				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-36: ADJUSTED TYPE IV HOLDOVER TIMES FOR CRYOTECH POLAR GUARD® XTEND

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:54 - 3:02	2:43 - 3:00	1:31 - 2:43	0:49 - 1:31	1:31 - 1:31	0:46 - 1:24	0:15 - 1:20	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:46 - 1:24	2:09 - 2:36	1:12 - 2:09	0:38 - 1:12	0:27 - 1:16	0:38 - 0:42		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:46 - 1:24	1:50 - 2:13	1:01 - 1:50	0:34 - 1:01	0:27 - 1:16[8]	0:38 - 0:42[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:30	1:01 - 1:16	0:30 - 1:01	0:15 - 0:30				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:30	0:23 - 0:30	0:11 - 0:23	0:05 - 0:11				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:19 - 0:30	0:15 - 0:19	0:07 - 0:15	0:03 - 0:07				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-37: ADJUSTED TYPE IV HOLDOVER TIMES FOR DOW CHEMICAL UCAR™ ENDURANCE EG106

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:35 - 2:24	2:05 - 2:40	1:01 - 2:05	0:30 - 1:01	0:53 - 1:31	0:38 - 0:57	0:15 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:24 - 2:32	1:50 - 2:17	0:53 - 1:50	0:27 - 0:53	0:42 - 1:24	0:34 - 0:53		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:24 - 2:32	1:39 - 2:05	0:49 - 1:39	0:23 - 0:49	0:42 - 1:24[8]	0:34 - 0:53[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:49	1:20 - 1:43	0:38 - 1:20	0:19 - 0:38				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:49	1:08 - 1:27	0:30 - 1:08	0:15 - 0:30				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:23 - 0:49	1:01 - 1:20	0:30 - 1:01	0:15 - 0:30				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures

TABLE ADJ-38: ADJUSTED TYPE IV HOLDOVER TIMES FOR DOW CHEMICAL UCAR™ FLIGHTGUARD AD-49

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:32 - 3:02	2:47 - 3:00	1:27 - 2:47	0:46 - 1:27	1:05 - 1:31	0:46 - 1:05	0:08 - 1:27	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:15 - 1:12	2:13 - 2:40	1:08 - 2:13	0:34 - 1:08	0:19 - 1:05	0:15 - 0:19		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:15 - 1:12	1:50 - 2:17	0:57 - 1:50	0:30 - 0:57	0:19 - 1:05[8]	0:15 - 0:19[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:19 - 0:30	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:19 - 0:30	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:19 - 0:30	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-39: ADJUSTED TYPE IV HOLDOVER TIMES FOR INLAND TECHNOLOGIES ECO-SHIELD®

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	0:57 - 2:02	1:50 - 2:09	1:01 - 1:50	0:34 - 1:01	0:30 - 1:08	0:27 - 0:30	0:11 - 1:12	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:53 - 1:58	1:35 - 1:54	0:53 - 1:35	0:30 - 0:53	0:38 - 1:05	0:23 - 0:30		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:53 - 1:58	1:27 - 1:43	0:49 - 1:27	0:27 - 0:49	0:38 - 1:05[8]	0:23 - 0:30[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:46	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:46	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:23 - 0:46	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-40: ADJUSTED TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST ECO 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:08 - 2:02	1:54 - 2:24	0:57 - 1:54	0:27 - 0:57	0:49 - 1:08	0:30 - 0:49	0:11 - 0:53	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 1:58	1:43 - 2:05	0:49 - 1:43	0:27 - 0:49	0:38 - 1:01	0:27 - 0:38		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 1:58	1:35 - 1:58	0:46 - 1:35	0:23 - 0:46	0:38 - 1:01[8]	0:27 - 0:38[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:38	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:38	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -25.5 °C (below -13 to -14 °F)	100/0	0:23 - 0:38	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-41: ADJUSTED TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST EG 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:05 - 3:02	3:00 - 3:00	1:50 - 3:00	1:05 - 1:50	1:31 - 1:31	0:46 - 1:20	0:15 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:46 - 3:02	2:43 - 3:00	1:35 - 2:43	0:57 - 1:35	0:46 - 1:31	1:01 - 1:24		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:46 - 3:02	2:28 - 2:59	1:27 - 2:28	0:53 - 1:27	0:46 - 1:31[8]	1:01 - 1:24[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:34 - 1:50	0:38 - 0:49	0:19 - 0:38	0:08 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:34 - 1:50	0:30 - 0:42	0:11 - 0:30	0:04 - 0:11				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:34 - 1:50	0:19 - 0:27	0:06 - 0:19	0:02 - 0:06				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-42: ADJUSTED TYPE IV HOLDOVER TIMES FOR JSC RCP NORDIX DEFROST NORTH 4

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:39 - 3:02	2:13 - 2:51	1:05 - 2:13	0:30 - 1:05	0:49 - 1:31	0:23 - 0:38	0:07 - 1:27	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	2:02 - 3:02	2:13 - 2:51	1:05 - 2:13	0:30 - 1:05	0:49 - 1:31	0:30 - 0:46		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	2:02 - 3:02	2:13 - 2:51	1:05 - 2:13	0:30 - 1:05	0:49 - 1:31[8]	0:30 - 0:46[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:34 - 1:27	0:38 - 0:49	0:19 - 0:38	0:08 - 0:19				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:34 - 1:27	0:30 - 0:42	0:11 - 0:30	0:04 - 0:11				
below -25 to -26 °C (below -13 to -15 °F)	100/0	0:34 - 1:27	0:19 - 0:27	0:06 - 0:19	0:02 - 0:06				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-43: ADJUSTED TYPE IV HOLDOVER TIMES FOR KILFROST ABC-S PLUS

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:39 - 3:02	2:43 - 3:00	1:35 - 2:43	0:57 - 1:35	1:24 - 1:31	0:49 - 1:31	0:19 - 1:31	
	75/25	1:05 - 2:02	1:35 - 1:50	0:57 - 1:35	0:34 - 0:57	0:46 - 1:01	0:23 - 0:38	0:08 - 1:01	
	50/50	0:23 - 0:42	0:46 - 0:53	0:23 - 0:46	0:11 - 0:23	0:11 - 0:30	0:11 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:42 - 2:40	2:24 - 2:51	1:24 - 2:24	0:49 - 1:24	0:19 - 1:12	0:15 - 0:23		
	75/25	0:34 - 1:24	1:24 - 1:39	0:49 - 1:24	0:30 - 0:49	0:15 - 0:53	0:11 - 0:19		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:42 - 2:40	2:13 - 2:40	1:20 - 2:13	0:46 - 1:20	0:19 - 1:12[8]	0:15 - 0:23[8]		
	75/25	0:34 - 1:24	1:20 - 1:31	0:46 - 1:20	0:27 - 0:46	0:15 - 0:53[8]	0:11 - 0:19[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:30 - 0:46	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:30 - 0:46	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -28 °C (below -13 to -18 °F)	100/0	0:30 - 0:46	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-44: ADJUSTED TYPE IV HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY 9311

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:27 - 3:02	1:46 - 2:13	0:53 - 1:46	0:27 - 0:53	0:53 - 1:31	0:30 - 0:49	0:11 - 1:05	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:27 - 1:35	1:24 - 1:46	0:42 - 1:24	0:23 - 0:42	0:27 - 1:01	0:15 - 0:27		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:27 - 1:35	1:12 - 1:31	0:38 - 1:12	0:19 - 0:38	0:27 - 1:01[8]	0:15 - 0:27[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:42	0:46 - 0:57	0:23 - 0:46	0:11 - 0:23				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:42	0:27 - 0:30	0:11 - 0:27	0:05 - 0:11				
below -25 to -29.5 °C (below -13 to -21 °F)	100/0	0:23 - 0:42	0:23 - 0:30	0:11 - 0:23	0:05 - 0:11				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-45: ADJUSTED TYPE IV HOLDOVER TIMES FOR NEWAVE AEROCHEMICAL FCY-EGIV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	1:58 - 3:02	1:58 - 2:32	0:53 - 1:58	0:27 - 0:53	1:01 - 1:31	0:30 - 0:49	0:11 - 1:31	
	75/25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	50/50	N/A	N/A	N/A	N/A	N/A	N/A	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	1:05 - 2:36	1:39 - 2:05	0:46 - 1:39	0:19 - 0:46	0:38 - 1:31	0:34 - 0:49		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -8 to -14 °C (below 18 to 7 °F)	100/0	1:05 - 2:36	1:27 - 1:50	0:38 - 1:27	0:19 - 0:38	0:38 - 1:31[8]	0:34 - 0:49[8]		
	75/25	N/A	N/A	N/A	N/A	N/A	N/A		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:27 - 1:27	1:12 - 1:35	0:30 - 1:12	0:11 - 0:30				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:27 - 1:27	0:53 - 1:12	0:23 - 0:53	0:11 - 0:23				
below -25 to -29 °C (below -13 to -20 °F)	100/0	0:27 - 1:27	0:46 - 1:01	0:19 - 0:46	0:08 - 0:19				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-48 provides allowance times for Type IV EG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-46: ADJUSTED TYPE IV HOLDOVER TIMES FOR SHAANXI CLEANWAY AVIATION CLEANSURFACE IV

Outside Air Temperature[1]	Fluid Concentration Fluid/Water By % Volume	Freezing Fog, Freezing Mist[2], or Ice Crystals	Very Light Snow, Snow Grains or Snow Pellets[3,4]	Light Snow, Snow Grains or Snow Pellets[3,4]	Moderate Snow, Snow Grains or Snow Pellets[3]	Freezing Drizzle[5]	Light Freezing Rain	Rain on Cold-Soaked Wing[6]	Other[7]
-3 °C and above (27 °F and above)	100/0	2:09 - 3:02	2:43 - 3:00	1:27 - 2:43	0:46 - 1:27	1:31 - 1:31	1:05 - 1:08	0:11 - 1:31	
	75/25	1:58 - 3:02	2:40 - 3:00	1:12 - 2:40	0:34 - 1:12	0:38 - 1:31	0:27 - 0:34	0:07 - 0:57	
	50/50	0:49 - 1:50	1:16 - 1:46	0:30 - 1:16	0:11 - 0:30	0:19 - 0:38	0:11 - 0:15	CAUTION: No holdover time guidelines exist	
below -3 to -8 °C (below 27 to 18 °F)	100/0	0:46 - 2:21	1:31 - 1:50	0:49 - 1:31	0:27 - 0:49	0:27 - 1:20	0:15 - 0:27		
	75/25	0:38 - 1:27	1:43 - 2:13	0:46 - 1:43	0:23 - 0:46	0:23 - 1:01	0:19 - 0:30		
below -8 to -14 °C (below 18 to 7 °F)	100/0	0:46 - 2:21	1:01 - 1:16	0:34 - 1:01	0:19 - 0:34	0:27 - 1:20[8]	0:15 - 0:27[8]		
	75/25	0:38 - 1:27	1:16 - 1:39	0:34 - 1:16	0:15 - 0:34	0:23 - 1:01[8]	0:19 - 0:30[8]		
below -14 to -18 °C (below 7 to 0 °F)	100/0	0:23 - 0:38	0:23 - 0:34	0:07 - 0:23	0:02 - 0:07				
below -18 to -25 °C (below 0 to -13 °F)	100/0	0:23 - 0:38	0:08 - 0:15	0:02 - 0:08	0:01 - 0:02				
below -25 to -28.5 °C (below -13 to -19 °F)	100/0	0:23 - 0:38	0:05 - 0:08	0:02 - 0:05	0:00 - 0:02				

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. HOLDOVER TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 Ensure that the lowest operational use temperature (LOUT) is respected. Consider use of Type I fluid when Type IV fluid cannot be used.
2 Freezing mist is best confirmed by observation. It is never reported by METAR however it can occur when mist is present at 0 °C (32 °F) and below.
3 To determine snowfall intensity, the Snowfall Intensities as a Function of Prevailing Visibility table (Table 50) is required.
4 Use light freezing rain holdover times in conditions of very light or light snow mixed with light rain or drizzle.
5 Includes light, moderate and heavy freezing drizzle. Use light freezing rain holdover times if positive identification of freezing drizzle is not possible.
6 No holdover time guidelines exist for this condition for 0 °C (32 °F) and below.
7 Heavy snow, ice pellets, moderate and heavy freezing rain, small hail and hail (Table Adj-49 provides allowance times for Type IV PG fluids in ice pellets and small hail).
8 No holdover time guidelines exist for this condition below -10 °C (14 °F).

CAUTIONS

- The responsibility for the application of these data remains with the user.
- The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity, or jet blast may reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than outside air temperature.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.

TABLE ADJ-47: ADJUSTED ALLOWANCE TIMES FOR SAE TYPE III FLUIDS[1]

Precipitation Types or Combinations	Applicable METAR Codes	Outside Air Temperature		
		-5 °C and above	Below -5 to -10 °C	Below -10 °C[2]
Light Ice Pellets	**-PL**	8 minutes	8 minutes	**Caution: No allowance times currently exist**
Light Ice Pellets Mixed with Light Snow	**-PLSN, -SNPL**	8 minutes	8 minutes	
Light Ice Pellets Mixed with Light Freezing Drizzle or Moderate Freezing Drizzle	**-PLFZDZ, -FZDZPL, FZDZPL**	5 minutes	4 minutes	
Light Ice Pellets Mixed with Light Freezing Rain	**-PLFZRA, -FZRAPL**	5 minutes	4 minutes	
Light Ice Pellets Mixed with Light Rain	**-PLRA, -RAPL**	5 minutes[3]		
Moderate Ice Pellets (or Small Hail[4])	**PL, GS**	4 minutes	4 minutes	

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. ALLOWANCE TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 These allowance times are for use with undiluted (100/0) fluids applied unheated on aircraft with rotation speeds of 100 knots or greater.
2 Ensure that the lowest operational use temperature (LOUT) is respected.
3 No allowance times exist in this condition for temperatures of 0 °C and below; consider use of light ice pellets mixed with light freezing rain.
4 In the US, small hail is included with regular hail and the remarks section is used saying “GR LESS THAN ¼”. Outside of the US the code GS is used when the hail is less than 5 mm and GR when it is 5mm or greater. If no intensity is reported with small hail, use the “moderate ice pellets or small hail” allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the “light ice pellets” allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: light freezing drizzle, moderate freezing drizzle, light freezing rain, or light rain.

TABLE ADJ-48: ADJUSTED ALLOWANCE TIMES FOR SAE TYPE IV ETHYLENE GLYCOL (EG) FLUIDS[1]

Precipitation Types or Combinations	Applicable METAR Codes	Outside Air Temperature			
		-5 °C and above	Below -5 to -10 °C	Below -10 to -16 °C	Below -16 to -22 °C[2]
Light Ice Pellets	**-PL**	53 minutes	38 minutes	23 minutes	23 minutes
Light Ice Pellets Mixed with Light Snow	**-PLSN, -SNPL**	38 minutes	23 minutes	11 minutes	
Light Ice Pellets Mixed with Light Freezing Drizzle or Moderate Freezing Drizzle	**-PLFZDZ, -FZDZPL, FZDZPL**	30 minutes	23 minutes	**Caution: No allowance times currently exist**	
Light Ice Pellets Mixed with Light Freezing Rain	**-PLFZRA, -FZRAPL**	30 minutes	23 minutes		
Light Ice Pellets Mixed with Light Rain	**-PLRA, -RAPL**	30 minutes[3]			
Moderate Ice Pellets (or Small Hail[4])	**PL, GS**	27 minutes	19 minutes	8 minutes	8 minutes
Moderate Ice Pellets (or Small Hail[4]) Mixed with Moderate Freezing Drizzle	**PLFZDZ, GSFZDZ**	15 minutes	8 minutes	**Caution: No allowance times currently exist**	
Moderate Ice Pellets (or Small Hail[4]) Mixed with Moderate Rain	**PLRA, GSRA, RAPL, RAGS**	11 minutes[5]			

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. ALLOWANCE TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 These allowance times are for use with undiluted (100/0) ethylene glycol based fluids applied on aircraft with rotation speeds of 100 knots or greater. The following fluids are ethylene glycol based; AllClear ClearWing EG, ASGlobal 4Flite EG, AVIAFLUID AVIAFlight EG, CHEMCO ChemR EG IV, CHEMCO ChemR Nordik IV, Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106, JSC RCP Nordix Defrost EG 4, JSC RCP Nordix Defrost NORTH 4, and Newave Aerochemical FCY-EGIV. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used.

2 Ensure that the lowest operational use temperature (LOUT) is respected.

3 No allowance times exist in this condition for temperatures of 0 °C and below; consider use of light ice pellets mixed with light freezing rain.

4 In the US, small hail is included with regular hail and the remarks section is used saying “GR LESS THAN ¼”. Outside of the US the code GS is used when the hail is less than 5 mm and GR when it is 5mm or greater. If no intensity is reported with small hail, use the “moderate ice pellets or small hail” allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the “light ice pellets” allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

5 No allowance times exist in this condition for temperatures of 0 °C and below.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: light freezing drizzle, moderate freezing drizzle, light freezing rain, or light rain

TABLE ADJ-49: ADJUSTED ALLOWANCE TIMES FOR SAE TYPE IV PROPYLENE GLYCOL (PG) FLUIDS[1]

Precipitation Types or Combinations	Applicable METAR Codes	Outside Air Temperature			
		-5 °C and above	Below -5 to -10 °C	Below -10 to -16 °C	Below -16 to -22 °C[2]
Light Ice Pellets	**-PL**	38 minutes	23 minutes	23 minutes[3]	23 minutes[3]
Light Ice Pellets Mixed with Light Snow	**-PLSN, -SNPL**	30 minutes	11 minutes	11 minutes[3]	
Light Ice Pellets Mixed with Light Freezing Drizzle or Moderate Freezing Drizzle	**-PLFZDZ, -FZDZPL, FZDZPL**	19 minutes	8 minutes	**Caution: No allowance times currently exist**	
Light Ice Pellets Mixed with Light Freezing Rain	**-PLFZRA, -FZRAPL**	19 minutes	8 minutes		
Light Ice Pellets Mixed with Light Rain	**-PLRA, -RAPL**	19 minutes[4]			
**Moderate Ice Pellets (or Small Hail[5]) **	**PL, GS**	14 minutes	8 minutes	8 minutes[3]	
Moderate Ice Pellets (or Small Hail[5]) Mixed with Moderate Freezing Drizzle	**PLFZDZ, GSFZDZ**	8 minutes	5 minutes	**Caution: No allowance times currently exist**	
Moderate Ice Pellets (or Small Hail[5]) Mixed with Moderate Rain	**PLRA, GSRA, RAPL, RAGS**	8 minutes[6]			

THIS TABLE IS FOR USE WHEN FLAPS/SLATS ARE DEPLOYED PRIOR TO DE/ANTI-ICING. ALLOWANCE TIMES HAVE BEEN ADJUSTED TO 76 PERCENT.

NOTES

1 These allowance times are for use with undiluted (100/0) propylene glycol based fluids applied on aircraft with rotation speeds of 100 knots or greater. All Type IV fluids are propylene glycol based with the exception of AllClear ClearWing EG, ASGlobal 4Flite EG, AVIAFLUID AVIAFlight EG, CHEMCO ChemR EG IV, CHEMCO ChemR Nordik IV, Clariant Max Flight AVIA, Clariant Safewing EG IV NORTH, Dow EG106, JSC RCP Nordix Defrost EG 4, JSC RCP Nordix Defrost NORTH 4, and Newave Aerochemical FCY-EGIV, which are ethylene glycol based. If the glycol type is unknown, the allowance times for SAE Type IV PG fluids should be used.

2 Ensure that the lowest operational use temperature (LOUT) is respected.

3 No allowance times exist for propylene glycol (PG) fluids when used on aircraft with rotation speeds less than 115 knots.

4 No allowance times exist in this condition for temperatures of 0 °C and below; consider use of light ice pellets mixed with light freezing rain.

5 In the US, small hail is included with regular hail and the remarks section is used saying “GR LESS THAN ¼”. Outside of the US the code GS is used when the hail is less than 5 mm and GR when it is 5mm or greater. If no intensity is reported with small hail, use the “moderate ice pellets or small hail” allowance times. If an intensity is reported with small hail, the ice pellet condition with the equivalent intensity can be used, e.g. if light small hail is reported, the “light ice pellets” allowance times can be used. This also applies in mixed conditions, e.g. if light small hail mixed with light snow is reported, use the “light ice pellets mixed with light snow” allowance times.

6 No allowance times exist in this condition for temperatures of 0 °C and below.

CAUTIONS

- The responsibility for the application of these data remains with the user.
- Fluids used during ground de/anti-icing do not provide in-flight icing protection.
- This table is for departure planning only and should be used in conjunction with pretakeoff check procedures.
- Allowance time cannot be extended by an inspection of the aircraft critical surfaces.
- Takeoff is allowed up to 90 minutes after start of fluid application if the precipitation stops at or before the allowance time expires and does not restart. The OAT must not decrease during the 90 minutes to use this guidance in conditions of light ice pellets mixed with either: light freezing drizzle, moderate freezing drizzle, light freezing rain, or light rain.

APPENDIX B:
TESTING LABORATORIES

TESTING LABORATORIES

The following laboratories are known to provide testing for de/anti-icing fluids given they verifiably adhere to internationally accepted standards and recommended practices that are associated with the holdover times published by the FAA.

Please enquire directly with the laboratories for a full list of testing available.

- **Anti-icing Materials International Laboratory (AMIL):** 555, boulevard de l'Université, Chicoutimi, Québec, G7H 2B1, Canada, 418-545-5011 ext. 2406, www.amillaboratory.ca. Provides testing for anti-icing performance (described in AMS1424, AMS1428, and AS5901), aerodynamic acceptance (described in AMS1424, AMS1428 and AS5900), physical properties including fluid stability (described in AMS1424 and AMS1428), environmental information (described in AMS1424 and AMS1428) and most of tests to evaluate materials compatibility (described in AMS1424 and AMS1428).

- **APS Aviation Inc.:** 6700, chemin de la Côte-de-Liesse, Suite 102, Saint-Laurent, Quebec, H4T 2B5, Canada, 514-878-4388 www.apsaviation.ca. Provides endurance time testing (described in ARP5485B and ARP5945A).

- **Scientific Material International (SMI):** 12219 SW 131st Avenue, Miami, Florida, USA 33186-6401; 305-971-7047, www.smiinc.com. Provides testing for physical properties including fluid stability (described in AMS1424 and AMS1428), environmental information (described in AMS1424 and AMS1428) and most of tests to evaluate materials compatibility (described in AMS1424 and AMS1428).

CESSNA CARAVAN

Cessna
A Textron Company

Caravan

Cold-Weather Operations

September 1999

Caravan Cold-Weather Operations

Table of Contents

Forward

Since the first Caravan's Captain Course Seminar in 1993, additional experiences have been shared with us by our operators in dealing with cold weather encounters. From extreme Siberian climates to those of Canada, each bit of information has been retained and readied to share with all that may experience cold weather environments.

The information collected since the last seminar has been compiled into a revised Cold Weather Operations Manual. Additional topics have been added that we feel will strengthen and broaden cold weather knowledge for Cessna operators as well as the aviation community in general.

Updating important techniques and procedures to ensure the safest and most reliable operation of the Caravan Fleet is continuous. With your input, we hope to provide the most complete information toward making every flight on-schedule and without incident.

We at Cessna are committed to being reactive to your concerns and proactive as leaders in the industry. Should we bring one of our seminars be in your area, please be ready to share your experiences with cold weather - we are ready to listen.

GROUND OPERATIONS

Parking/Storing

When ice, snow or heavy frost is forecast, the use of a hangar is recommended, where available. In many cases, the use of a hangar would be more economical than the use of a de-icing service.

If the aircraft was stored in a warm hangar, be alert for ice formation when moving aircraft from warm hangar to snow conditions.

If no hangar is available, be alert for snow, ice or hoarfrost on the wings and fuselage. When the aircraft is parked for extended periods make sure that all water and other liquids (including sodas, wine/beer/milk, etc.) are removed from the aircraft and stored in a area in which they will not freeze.

Use engine covers, pitot covers and windshield covers, if extended parking is anticipated. These covers reduce the need to de-ice these areas.

Use chocks. Do not set brakes as they may freeze after exposure to ice or snow.

One operator reported that, upon setting the brakes for parking shortly after landing on a very cold day, the aircraft started rolling. Apparently the brakes had cooled down at a faster than typical rate and released enough to allow the aircraft to move on the inclined ramp. Another good reason to always use chocks when parking.

Remove oxygen masks and personal gear in extreme cold.

Filling fuel tanks at low temperatures then moving aircraft into a warm hangar can cause a fire hazard with fuel expansion and overflow.

Tires will appear to have low pressure in cold weather; use a tire gage and verify pressures. A good rule-of-thumb is that the tire pressure will drop one PSI for every ten degrees F drop in ambient temperature.

When parking the airplane on a slick ramp, position it so that the airplane will not have to make sharp turns during taxiing to exit the parking area. Aiming the airplane directly at a taxi-way will minimize turns and allow for lower power settings which reduce blowing snow and Foreign Object Damage (FOD).

Towing

During the winter months, there are many additional concerns for maintenance personnel. The operation of towing and fueling equipment is one thing which is particularly affected by winter weather. During winter, darkness, reduced visibility, and poor traction are added hazards. Stopping distances are also greatly increased. Maintaining your equipment in good condition helps prevent unnecessary delays or potential accidents.

Use proper tow bar. Have someone in the cockpit. Use proper tow vehicle with chains, when appropriate. Remember, the presence of ice will cause wheel chocks to slide.

Dry snow gives better towing traction than wet snow. The wet snow thaws and refreezes to cause hazardous driving conditions. In any snow, however, heavy traffic or the exhaust from parked vehicles can warm an ice or snow covered ramp and make it wet and slippery. Traction is lost with fast starts that spin the wheels of a vehicle. Make gradual turns and steer smoothly.

Approach the stopping area slowly. Stopping distances on a slick surface can be as much as ten times greater that on dry surface. Try brakes occasionally while driving at slow speeds to get a feel of the roadway and find out how slippery the surface is. If the brakes must be used on a slippery surface, use a fast, light-pumping action. This shortens stopping distances and keeps the vehicle under control.

When towing, there is a tendency for the towed vehicle to jackknife, if brakes are applied suddenly or too hard. On hard-packed snow, apply brakes until wheels start to slide, then release them slightly to slow down and keep the vehicle under control.

Preheating

Preheat is recommended when the ambient temperature is below 0°F (-18°C), apply heat to engines, cabin, and cockpit. Engine preheating is best accomplished by installing the engine covers and directing hot air through the inertial separator exit. (ensure the inertial separator is in BYPASS position) The use of an external pre-heater reduces wear and abuse to the engine and the electrical system. Pre-heat will reduce the viscosity of the oil trapped in the oil cooler, prior to starting in extremely cold temperatures.

With sufficient hose length, the cabin and cockpit area can be warmed through the pilot's or front passenger door. Preheating may be accomplished by propping the cabin door(s) closed as much as possible and shielding the open space with canvas.

Use of a GPU is recommended for starting the engine when ambient temperatures are below 0°F (-18°C). Assure that oil temperature is in the green arc (10°C to 99°C) prior to takeoff. If a start is attempted and the starter will not motor to 12 percent Ng minimum, terminate the start. Advancing the Fuel Condition Lever below 12 percent Ng can be damaging to the engine.

A warm cabin and cockpit prevents fogging-over of instruments and windows from condensation, after crew and passengers board the aircraft. Extremely cold temperatures reduce fuel/water solubility and super-cools any water particles in the fuel, increasing the possibility of fuel system icing. The tank and fuel filter drains should be drained frequently and thoroughly. It is possible for water to settle in the sump and freeze, blocking the drain. Heat should be applied until fuel flows freely. Maintain heat after flow begins to ensure that all particles have melted and collect the drainage in a clear, clean container to inspect for water globules.

After the engine is running, allow enough time to warm instruments and avionics before taxi-out. The cabin can be heated more quickly, after engine start, by using a high idle, ramp and taxi-way conditions permitting, to get maximum bleed air from the engine. However, consider icy taxi-ways and runways as previously mentioned.

GROUND DE-ICING/ANTI-ICING

Complete de-icing/anti-icing procedures may be found in the Caravan Maintenance Manual **Chapter 12, Servicing** and the **Pilot's Operating Handbook (POH) Section 8 Handling, Service, and Maintenance.**

When operating in cold weather conditions, airplane downtime/delays can be minimized by a program of preventive servicing.

* Be aware that some facilities located at warmer geographical locations may not have appropriate de-icing/anti-icing equipment. Calling ahead may save valuable time and money in the event adverse cold weather conditions strike.

De-icing fluid is classified as Type I (De-icing) and Type II and Type IV (Anti-Icing). There are two methods of airplane de-icing. The one-step method of airplane de-icing utilizes only Type I fluid. The two-step approach to airplane de-icing utilizes Type I fluid to de-ice the plane, followed by application of Type II or Type IV fluid to delay the onset of refreezing.

Type I, Type II and Type IV fluids have time limitations before refreezing begins. This time limitation is referred to as "holdover time", and Type II or Type IV anti-icing fluids have a much longer holdover time than Type I de-icing fluids. Because holdover time is highly dependent on a number of factors, charts can provide only approximate estimates. Refer to specific manufacturer's data sheets for holdover times. It remains the responsibility of the flight crew to determine the effectiveness of any de-icing or anti-icing procedures.

CAUTION: TYPE I, TYPE II AND TYPE IV FLUIDS ARE NOT COMPATIBLE AND MAY NOT BE MIXED. ADDITIONALLY, MOST MANUFACTURERS PROHIBIT MIXING OF BRANDS WITHIN A TYPE.

De-icing

De-icing may be accomplished using the ambient temperature available from a heated hangar or by mechanical means using a glycol-based Freezing Point Depressant (FPD) Type I fluid.

> A heated hangar is an excellent option to de-ice airplanes and should be utilized whenever possible. Care must be exercised, however, to ensure that all melted precipitation is removed from the airplane to prevent refreezing once the airplane is moved from the hangar to the flight line.

Type I de-icing fluids are applied in a temperature range from 160°F to 180°F (71°C to 82°C) using a moderate to high pressure washer. Heated solutions of Freezing Point Depressant are more effective than unheated solutions because thermal energy is used to melt the ice, snow or frost formations. Type I de-icing fluids are used in the diluted state, with specific ratios of fluid-to-water dependent on ambient temperature. Type I de-icing fluids have a very limited holdover time.

NOTE: It is the heat of the de-icing fluid that melts ice and snow. The only function of the glycol in the de-icing solution is to lower the freezing point of the fluid which remains on the airplane.

Anti-Icing

Anti-Icing is accomplished by using Type II or Type IV fluids, and their purpose is to delay the reformation of ice, snow or frost on the airplane. This is accomplished by using chemically thickened formulas with pseudo-plastic properties. This feature enables the fluid to form a protective film on treated surfaces of the airplane, and is designed to flow off airplane surfaces at high speeds.

CAUTION: TYPE II AND TYPE IV FLUIDS ARE DESIGNED FOR USE ON AIRPLANES WITH A V_R SPEED OF 85 KNOTS OR GREATER. TYPE II AND TYPE IV FLUIDS ARE USED UNDILUTED AND ARE TYPICALLY APPLIED TO THE AIRPLANE UNHEATED. HOLDOVER TIMES FOR TYPE II AND TYPE IV FLUID CAN VARY WIDELY BASE ON ATMOSPHERIC CONDITIONS. CONSULT SPECIFIC MANUFACTURER'S CHARTS FOR HOLDOVER TIME.

NOTE: Type II and Type IV Fluid may not be readily available at all locations. If this is the case, unheated Type I Fluids may be used for anti-icing, but provide very limited anti-icing protection.

Type II or Type IV anti-icing fluid should be applied within three minutes after de-icing is completed due to the limited holdover time of Type I de-icing fluid. If Type II or Type IV anti-icing fluid has been applied and the airplane has not been dispatched before new ice has formed, the airplane must be completely de-iced again and a second Type II or Type IV anti-icing treatment be applied immediately. **Holdover time starts when application has begun.**

Example of holdover time charts for Type I, Type II or Type IV fluids.

TYPE I FLUID

OAT		Approximate Holdover Times Anticipated Under Various Weather Conditions (hours:minutes)				
°C	°F	FROST	FREEZING FOG	SNOW	FREEZING RAIN	RAIN ON COLD SOAKED WING
0 & Above	32 & Above	0:18-0:45	0:12-0:30	0:06-0:15	0:02-0:05	0:06-0:15
Below 0 to -7	Below 32 to 19	0:18-0:45	0:06-0:15	0:06-0:15	0:01-0:03	CAUTION! [illegible] may require touch for confirmation
Below -7	Below 19	0:12-0:30	0:06-0:15	0:06-0:15	[illegible]	

TYPE II FLUID

OAT		Type II Fluid Concentration Neat-Fluid/Water (% by Volume)	Approximate Holdover Times Anticipated Under Various Weather Conditions (hours:minutes)				
°C	°F		FROST	FREEZING FOG	SNOW	FREEZING RAIN	RAIN ON COLD SOAKED WING
0 & Above	32 & Above	100/0	12:00	1:15 - 3:00	0:25 - 1:00	0:08 - 0:20	0:24 - 1:00
		75/25	6:00	0:50 - 2:00	0:20 - 0:45	0:04 - 0:10	0:18 - 0:45
		50/60	4:00	0:35 - 1:30	0:15 - 0:30	0:02 - 0:05	0:12 - 0:30
Below 0 to -7	Below 32 to 19	100/0	8:00	0:35 - 1:30	0:20 - 0:45	0:08 - 0:20	CAUTION! [illegible]
		75/25	5:00	0:25 - 1:00	0:15 - 0:30	0:04 - 0:10	
		50/50	3:00	0:20 - 0:45	0:05 - 0:15	0:01 - 0:03	
Below -7 to -14	Below 19 to 7	100/0	8:00	0:35 - 1:30	0:20 - 0:45		
		75/25	5:00	0:25 - 1:00	0:15 - 0:30		
Below -14 to -25	Below 7 to -13	100/0	8:00	0:35 - 1:30	0:20 - 0:45		
Below -25	Below -13	100/0 @ 7° C (13° F) Buffer is maintained	A Buffer of at least 7°C (13°F) is maintained for TypeII used for anti-icing at OAT below -25°C (-13° F). Consider use of Type I fluids where SAE or ISO Type II cannot be used.				

TYPE IV ANTI-ICE FLUID

OAT		SAE Type IV Fluid Concentration	Approximate Holdover Times Under Various Weather Conditions (hours-minutes)					
°C	°F	Neat-Fluid/Water (Vol%/Vol%)	*Frost	Freezing Fog	Snow	**Freezing Drizzle	Light Freezing Rain	Rain on Cold Soaked Wing
Above 0	Above 32	100/0	10:00	2:00-3:00	0:55-1:40	0:45-1:50	0:30-1:00	0:20-0:40
		75/25	6:00	0:40-2:00	0:20-1:00	0:20-1:00	0:15-0:30	0:10-0:25
		50/50	4:00	0:15-0:45	0:05-0:25	0:07-0:15	0:05-0:10	
0 to -3	32 to 27	100/0	12:00	2:00-3:00	0:45-1:40	0:45-1:50	0:30-1:00	
		75/25	5:00	0:40-2:00	0:15-1:00	0:20-1:00	0:15-0:30	CAUTION:
		50/50	3:00	0:15-0:45	0:05-0:20	0:07-0:15	0:05-0:10	
Below -3 to -14	Below 27 to 7	100/0	12:00	2:00-3:00	0:35-1:15	**0:45-1:50	**0:30-0:55	Clear Ice May require
		75/25	5:00	0:40-2:00	0:15-1:00	**0:20-1:00	**0:10-0:25	
Below -14 to -25	Below 7 to -13	100/0	12:00	1:00-2:00	0:30-1:10		touch for confirmation	
Below -25	Below -13	100/0	SAE Type IV fluid may be used below -25°C (-13°F) provided the freezing point of the fluid is at least 7°C (13°F) below the OAT and the aerodynamic acceptance criteria are met. Consider use of SAE Type I where SAE Type IV fluids cannot be used.					

Vol - Volume

* - During conditions that apply to aircraft protection for ACTIVE FROST

** - The lowest use temperature is limited to -10°C (14°F)

*** - Use light freezing rain holdover times if positive identification of freezing drizzle is not possible

Aircraft operators are solely responsible for ensuring that holdover timetables contain current data. The tables are for use in departure planning only and should be used in conjunction with pretakeoff contamination check procedures. The time of protection will be shortened in heavy weather conditions. High wind velocity may cause degradation of the protective film.

De-icing and anti-icing procedures must be closely coordinated between the pilot in command and ground crews, and carried out in a timely manner. The first area to be de-iced and anti-iced should be visible from the cockpit and should be used to provide a conservative estimate for subsequent ice accumulations on unseen areas of the airplane before initiating takeoff. Due to weight and CG changes that occur while de-icing the airplane, a tail stand should be used.

De-icing and anti-icing fluids are not intended for use in removing snow deposits. Snow is best removed by mechanically sweeping or brushing it from the airplane structure.

Ultimate responsibility for safety of flight rests with the flight crew, and any decisions to de-ice/anti-ice an airplane must be accomplished under their direct supervision. **A pretakeoff contamination check should be conducted by the pilot in command within 5 minutes of takeoff, preferably just prior to taxing onto the active runway.**

De-icing/Anti-Icing Materials

Currently available Type I, II, and IV De-icing/Anti-icing Fluids are listed in Table 1, 2, and 3:

Table 1. SAE Type I De-icing Fluids and ISO Type I De-icing Fluids

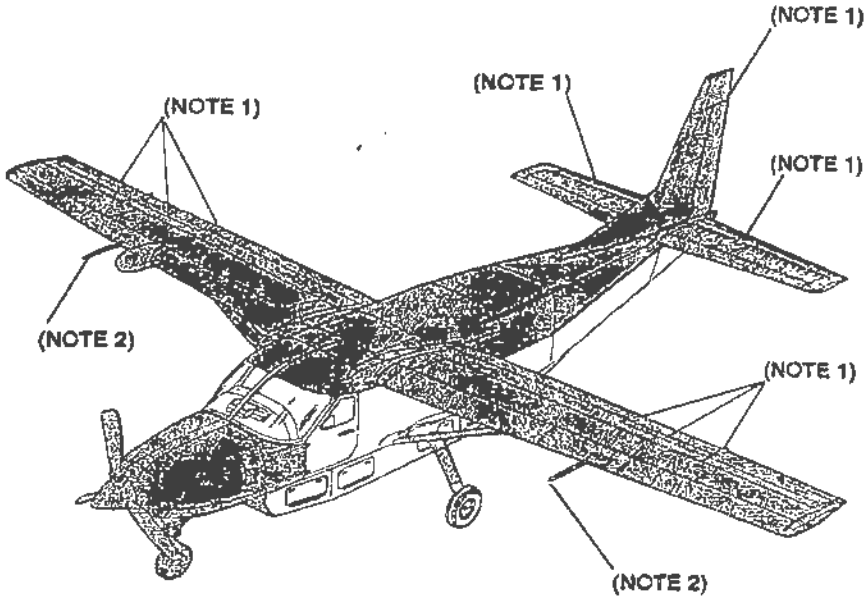
NAME	MANUFACTURER	COLOR	CHEMICAL BASE
UCAR ADF Concentrate	Union Carbide 10235 West Little York Rd. Suite 300 Houston, TX 77040	Orange	Ethylene-glycol
UCAR ADF 50/50	Union Carbide	Orange	Ethylene-glycol
ARCOPLUS Dilute	ARCO Chemical Co. 3801 West Chester Pike Newtown Square, PA 19073	Orange	Propylene-glycol
ARCOPLUS	ARCO Chemical Co.	Orange	Propylene-glycol

Table 2. SAE Type II Anti-Icing Fluids

NAME	MANUFACTURER	COLOR	CHEMICAL BASE
KILFROST ABC-3	ARCO Chemical Co. 3801 West Chester Pike Newton Square, PA 19073	Pale Amber	Propylene-glycol
UCAR UC5-1	Union Carbide 10235 West Little York Rd. Houston, TX 77040	Pale Yellow	Ethylene-glycol
UCAR AAF ULTRA	Union Carbide	Emerald Green	Ethylene-glycol

Table 3. SAE Type IV De-icing/Anti-Icing Fluids

UCAR ADF/AAF ULTRA+	Union Carbide 10235 West Little York Suite 300 Houston, TX 77040	Emerald Green	Ethylene-glycol



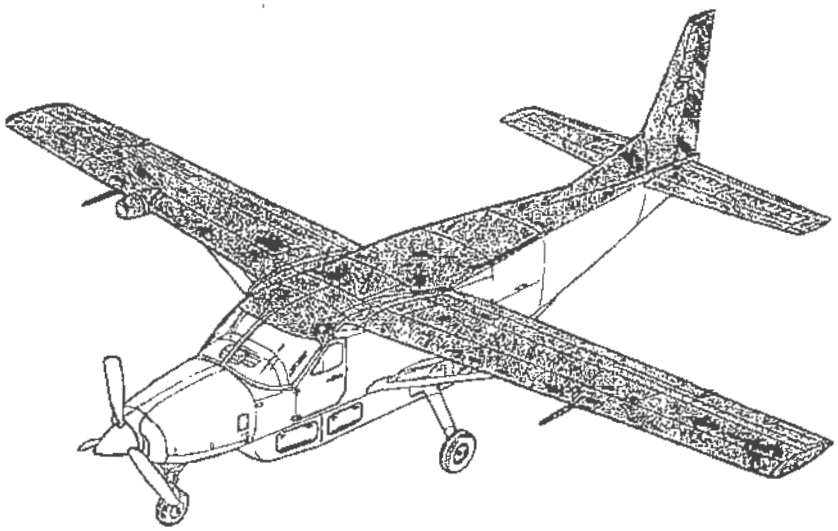
NOTE 1: GIVE SPECIAL ATTENTION TO THE GAPS BETWEEN THE FLIGHT CONTROLS. ALL SNOW, ICE AND SLUSH MUST BE REMOVED FROM THESE GAPS.

NOTE 2: REMOVE SNOW, ICE AND SLUSH FROM PITOT TUBES BY HAND ONLY.

SHADED AREAS INDICATE ESSENTIAL AREAS TO BE DEICED.

DIRECT SPRAY AVOIDANCE AREAS:	ENGINE INLETS AND EXHAUST, BRAKES, PITOT STATIC TUBES, WINDSHIELDS, CABIN WINDOWS, AND STALL WARNING VANE.

Essential Areas to be De-iced

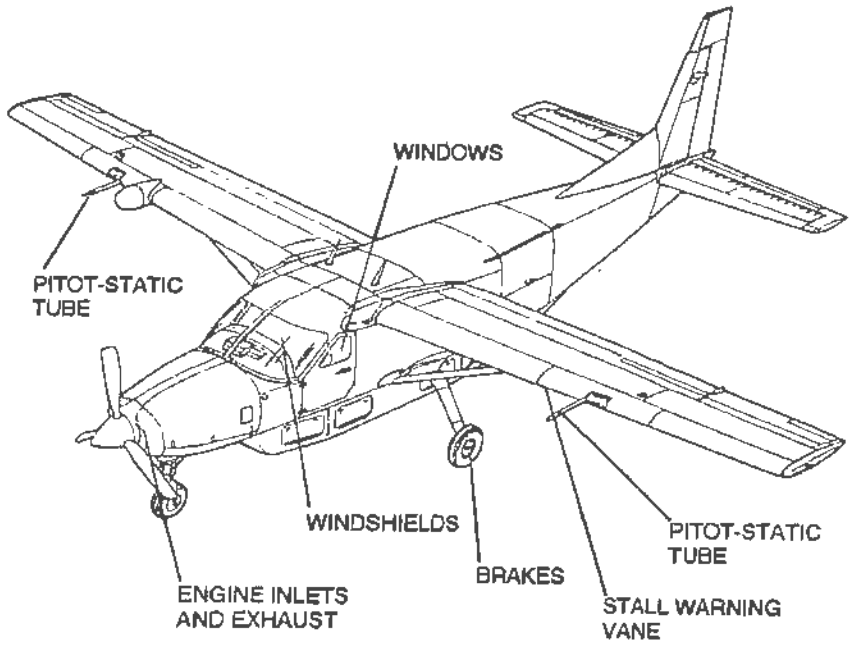


NOTE : ANTI-ICE FLUID SHOULD BE APPLIED AT LOW PRESSURE TO FORM A THIN FILM ON SURFACES. FLUID SHOULD JUST COVER AIRPLANE WITHOUT RUNOFF.

SHADED AREAS INDICATE ESSENTIAL AREAS WHERE ANTI-ICE FLUID IS APPLIED.

DIRECT SPRAY AVOIDANCE AREAS:	PITOT STATIC TUBES, WINDSHIELDS, CABIN WINDOWS, AND STALL WARNING VANE.

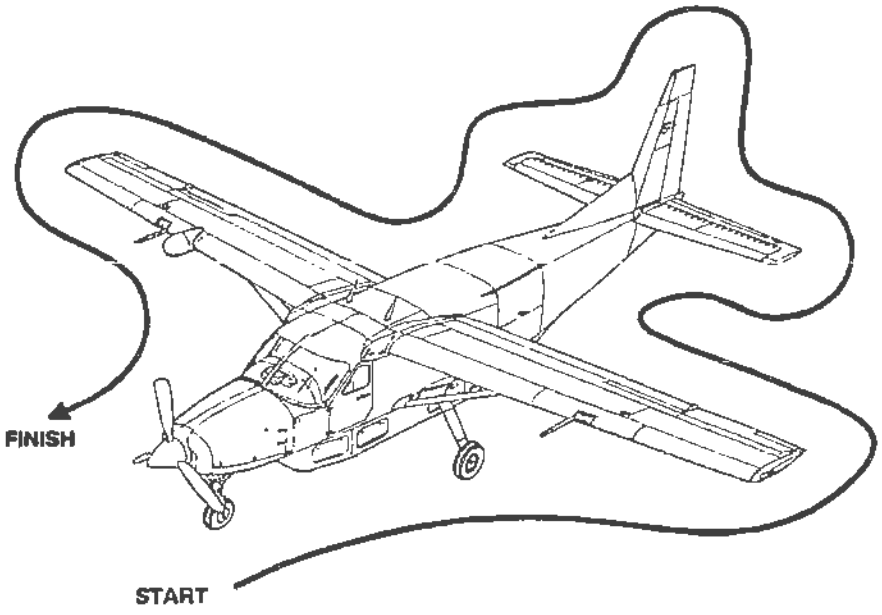
Essential Areas to Apply Anti-ice Fluid



DIRECT SPRAY AVOIDANCE AREAS:	ENGINE INLETS AND EXHAUST, BRAKES, PITOT STATIC TUBES, WINDSHIELDS, CABIN WINDOWS, AND STALL WARNING VANE.

De-ice and Anti-ice Fluid Direct Spray Avoidance Areas

NOTE: BY STARTING DEICE AND ANTI-ICE APPLICATION AT THE LEFT-FRONT AREA OF THE AIRPLANE, THE PILOT CAN GET A CONSERVATIVE ESTIMATE OF ICE REFORMATION FROM INSIDE THE COCKPIT. SINCE THIS WAS THE FIRST AREA DEICED OR ANTI-ICED, IT WILL BE THE FIRST AREA WHERE ICE WILL REFORM.



De-icing and Anti-icing Application

The effectiveness of any Freezing Point Depressant (FPD) de-icing or anti-icing treatment can only be estimated because of the many variables that influence holdover time. Those variables are:

- Ambient Temperature
- Airplane surface temperature
- Freezing Point Depressant fluid application procedure
- Freezing Point Depressant solution strength
- Freezing Point Depressant film thickness
- Freezing Point Depressant fluid temperature
- Freezing Point Depressant fluid type
- Operation in close proximity to other airplanes, equipment and structures
- Operation on snow, slush, wet ramps, taxiways and runways
- Precipitation type and rate
- Residual moisture on airplane surface
- Relative humidity
- Solar radiation
- Wind velocity and direction

Before Type I de-icing procedures begin, maintenance personnel should familiarize themselves with areas to be sprayed and areas to avoid a direct spray of fluid. Refer to Figure 1 for areas to de-iced. Refer to Figure 2 for areas to be anti-iced.

Type I de-icing fluids should never be used full strength (undiluted). Undiluted glycol fluid is quite viscous below 14°F (-10°C) and can actually produce lift restrictions of about 20 percent. Additionally, undiluted glycol has a higher freezing point than glycol/water mixture.

If de-icing/anti-icing procedures are performed with engines running, all cabin air intakes and bleed air valves should be turned off.

It should be understood that even high concentrates provide protection from further adherence of ice, snow or frost for only approximately 15 minutes. A pretakeoff check should be conducted by the PIC/SIC within 5 minutes of takeoff, preferable just prior to taxiing onto the active runway. Critical areas of the aircraft such as the empennage, wing, windshield and control surfaces should be checked to ensure they are free of ice, slush and snow or that the de-ice/anti-ice fluids are still protecting the aircraft.

When Type II or Type IV fluid is applied to the airplane, a rotation speed of **83 KIAS** with 0° flaps is required. Use of 0° flaps allows the airplane to accelerate to a high rotation speed without any liftoff tendencies, which is required for the Type II or Type IV fluid to be effective. Takeoff performance data shown in Section 5 of the POH is based on this speed and configuration.

Airworthiness Directive 96-09-15 - Icing Conditions

96-09-15 Cessna Aircraft Company: Amendment 39-9591; Docket No. 96-CE-05-AD.
{As corrected at 61-30505}
{As corrected at 61-26425}
Applicability: Models 208 and 208B airplanes (all serial numbers), certificated in any category.

Note 1: This AD applies to each airplane identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the requirements of this AD. For airplanes that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must request approval for an alternative method of compliance in accordance with paragraph (d) of this AD. The request should include an assessment of the effect of the modification, alteration, or repair on the unsafe condition addressed by this AD; and, if the unsafe condition has not been eliminated, the request should include specific proposed actions to address it.

Compliance: Required as indicated, unless accomplished previously.

To minimize the potential hazards associated with operating the airplane in severe icing conditions by providing more clearly defined procedures and limitations associated with such conditions, accomplish the following:

(a) Within 30 days after the effective date of this AD, accomplish the requirements of paragraphs (a)(1) and (a)(2) of this AD.

Note 2: Operators must initiate action to notify and ensure that flight crewmembers are apprised of this change.

(1) Revise the FAA-approved Airplane Flight Manual (AFM) by incorporating the following into the Limitations Section of the AFM. This may be accomplished by inserting a copy of this AD in the AFM.

"WARNING

Severe icing may result from environmental conditions outside of those for which the airplane is certificated. Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid water and ice crystals) may result in ice build-up on protected surfaces exceeding the capability of the ice protection system, or may result in ice forming aft of the protected surfaces. This ice may not be shed using the ice protection systems, and may seriously degrade the performance and controllability of the airplane.

* During flight, severe icing conditions that exceed those for which the airplane is certificated shall be determined by the following visual cues. If one or more of these visual cues exists, immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the icing conditions. --Unusually extensive ice accreted on the airframe in areas not normally observed to collect ice.

--Accumulation of ice on the lower surface of the wing aft of the protected area. {Was, "--Accumulation of ice on the upper surface...". - Ed.}

{Beginning of old text deleted at 61-30505}

--Accumulation of ice on the propeller spinner farther aft than normally observed.

* Since the autopilot may mask tactile cues that indicate adverse changes in handling characteristics, use of the autopilot is prohibited when any of the visual cues specified above exist, or when unusual lateral trim requirements or autopilot trim warnings are encountered while the airplane is in icing conditions.
* All icing detection lights must be operative prior to flight into icing conditions at night. [NOTE: This supersedes any relief provided by the Master Minimum Equipment List (MMEL).]"

(2) Revise the FAA-approved AFM by incorporating the following into the Procedures Section of the AFM. This may be accomplished by inserting a copy of this AD in the AFM.

"THE FOLLOWING WEATHER CONDITIONS MAY BE CONDUCIVE TO SEVERE IN-FLIGHT ICING:

* Visible rain at temperatures below 0 degrees Celsius ambient air temperature.
* Droplets that splash or splatter on impact at temperatures below 0 degrees Celsius ambient air temperature.

PROCEDURES FOR EXITING THE SEVERE ICING ENVIRONMENT:

These procedures are applicable to all flight phases from takeoff to landing. Monitor the ambient air temperature. While severe icing may form at temperatures as cold as -18 degrees Celsius, increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified in the Limitations Section of the AFM for identifying severe icing conditions are observed, accomplish the following:

* Immediately request priority handling from Air Traffic Control to facilitate a route or an altitude change to exit the severe icing conditions in order to avoid extended exposure to flight conditions more severe than those for which the airplane has been certificated.
* Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
* Do not engage the autopilot.
* If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.
* If an unusual roll response or uncommanded roll control movement is observed, reduce the angle-of-attack.

* Do not extend flaps during extended operation in icing conditions. Operation with flaps extended can result in a reduced wing angle-of-attack, with the possibility of ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area.
* If the flaps are extended, do not retract them until the airframe is clear of ice.
* Report these weather conditions to Air Traffic Control."(b) Incorporating the AFM revisions, as required by this AD, may be performed by the owner/operator holding at least a private pilot certificate as authorized by section 43.7 of the Federal Aviation Regulations (14 CFR 43.7), and must be entered into the aircraft records showing compliance with this AD in accordance with section 43.11 of the Federal Aviation Regulations (14 CFR 43.11).

(c) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the airplane to a location where the requirements of this AD can be accomplished.

(d) All persons affected by this directive may examine information related to this AD at the FAA, Central Region, Office of the Assistant Chief Counsel, Room 1558, 601 E. 12th Street, Kansas City, Missouri 64106.

Preflight

Preflight Planning

- Plan the flight to spend the least amount of time possible in the icing conditions. Treat all icing conditions as conditions to be penetrated, not for sustained flight.
- When preflight planning, look for exit routes from the icing conditions. Departures from icing conditions along the route should always be planned for in the event of deteriorating conditions or ice protection system failures.
- Thoroughly de-ice aircraft prior to departure
- Avoid freezing drizzle and freezing rain
- Avoid building cumulus clouds
- Avoid orographic lifting clouds around mountain ranges, they may contain large amounts of moisture
- Avoid the tops of stratus icing clouds, these are likely to contain the most moisture
- Penetrate any suspected or known icing cloud by the shortest possible route. This may be horizontally, vertically, or perhaps a combination of both.
- Stay alert for abnormal performance losses such as unrecoverable speed losses or loss of climb rate. These are cues to depart the icing conditions.
- Disconnect the autopilot periodically to detect any out of trim conditions.
- Maintain minimum speeds in icing conditions.
- Be aware that PIREPS are aircraft dependent. Light icing in a transport category aircraft would likely be reported as moderate or severe in a smaller aircraft.
- Plan extra fuel to offset performance losses due to drag.

Preflight (cont.)

Rapid changes in ceiling, visibilities, freezing levels, winds and runway conditions are typical of winter weather. Additional time must be allotted to preflight planning, with special emphasis on obtaining the latest most complete information concerning field condition, braking-action reports, facility status, weather, alternates and fuel requirements. Allow extra time, also, to complete a more careful walk-around inspection.

- Ensure brakes, windshield, empennage, wings, and flaps are free of snow or ice.
- Ensure engine air inlet, propeller blades and control surfaces are free of snow or ice.
- Ensure critical areas are de-iced. (Refer to Section 8 in the Pilot Information Manual)
- Use GPU after extended cold soak below -18°C (0°F).
- Minimize drain on aircraft battery prior to start.
- Ensure that heavy clothing and plenty of food are on board.

ATC has implemented procedures that provide priority handling when ground icing conditions are present. ATC will provide a hard departure time that will eliminate ground delays. The crew should request a departure slot and be prepared to meet that time.

Taxiing

Reduce taxi speeds on snow or ice and keep engine and taxi operations to a minimum on ice or snow covered ramps. In addition to normal "blasting" dangers when pulling away from ramp, ice or snow being blown about constitutes a hazard to personnel and equipment. Also, be aware your propeller blast may "ice up" adjacent aircraft and ground equipment.

Do not use so much power starting into a turn that the turn cannot be stopped without excessive braking.

Avoid taxiing in deep snow; more power is required, steering is more difficult and there is always the danger of becoming mired down. Also, strain on the gear is increased and snow may lodge in brake assemblies with subsequent freezing. Taxi at slow speeds with caution; remember that braking and nose-wheel steering may be poor or non-existent.

Watch for snow banks, runway or taxi lights, etc. Spotty ice cover on taxi surfaces may be difficult to see at night or during bright sunshine, when the glare of white snow makes it difficult to see. Ice may be covered by a thin layer of light snow. Exercise care when taxiing behind jet aircraft when snow is falling. Heat from jet blast may cause snow to melt and refreeze on your aircraft.

Even though the latest weather reports have not indicated a hazardous runway condition, the approach end of the runway is usually more slippery than other areas because of the melting and refreezing of ice and snow after each aircraft takeoff and landing.

Some of the taxi rules-of-thumb to follow are:

- Allow greater distance between parked aircraft.
- Use care taxiing through snow or near snow banks.
- Snow or slush can freeze up brakes or flaps.
- Check and verify that icing systems are working.
- Ensure pitot heaters are operational and ON before takeoff.

Takeoff and Climb

Advisory Circulars AC91-6A (Water, Slush and Snow on the Runway) and AC91-13C (Cold Weather Operation of Aircraft) provide additional cold weather information.

Check and comply with the requirements of the Adverse Weather Chart. Remember that these are minimum restrictions - feel free to be more stringent, if (in your judgment) it is necessary.

Before takeoff, be sure runway is free of such hazards as snowdrifts, glazed ice and ruts. When taking off from an icy runway, maintain directional control with rudder, rather than depending on nose-wheel steering.

Optimum performance of the de-ice and anti-ice boots is dependent on keeping the boots clean and coated with an ice adhesion depressant such as ICEX II. Snow, slush or standing water may have the viscosity and resistance of molasses. They create wheel drag, which increases takeoff distance considerably.

No attempt should be made to takeoff with a load of ice or snow. Ice and snow on the wings will change the shape of the airfoil and disturb the flow of air over the wings, reducing available lift and airspeeds. Do not assume that light snow will melt or blow off during taxi-out or the takeoff run. Even if it does, it may reveal ice or frost beneath.

Prior to takeoff, as mentioned earlier, ensure that pitot heat is ON and operating. Additionally, engine ignition should be ON. Monitor all applicable anti-icing and de-icing systems as soon as practical. Inertial separator and anti-icing systems should be operated in anticipation of operating in icing conditions.

When setting takeoff power on extremely cold days, make sure that the engine power does not exceed the maximum allowable. Be especially vigilant when setting Torque that the other engine instruments confirm the takeoff power setting.

Remember that maximum icing occurs when OAT is between 0° and -10°C. The cockpit temperature gauge may have errors. Watch those temperatures just above freezing, as well as those below.

When ice accumulation develops, increased thrust (rather than increasing angle-of-attack) should be used to maintain altitude and airspeed. However, if large or continual increases of thrust are required, take alternative action such as leaving the icing environment.

Some of the takeoff/climb rules-of-thumb are:

* Don't go in freezing rain.
* Be aware of runway condition - standing water?
* What is the reported braking action - refused takeoff?
* Is the runway grooved?
* What adverse runway factors should I use? (Consult Airplane POH)

<u>Operating in Icing Conditions</u>

Flight into known icing is the intentional flight into icing conditions that are known to exist by either visual observation or pilot weather report information. Icing conditions exist any time the OAT is +10°C to -30°C, and visible moisture in any form is present. Cessna Caravans, which have properly installed and operating anti-ice and de-ice equipment, are approved to operate in maximum intermittent and maximum continuous icing conditions as defined by FAR 25, Appendix C. The equipment has not been designed to provide protection against freezing rain or severe conditions of mixed or clear ice. During all operations, the pilot is expected to exercise good judgement and be prepared to alter the flight plan if conditions exceed the capability of the aircraft and equipment.

Ice accumulations significantly alter the shape of airfoils and increases the weight of the aircraft. Flight with ice accumulated on the aircraft will increase stall speeds and alter the speeds for optimum performance. Flight at high angle-of-attack (low airspeed) can result in ice building on the underside of the wings and the horizontal tail aft of areas protected by boots or leading edge anti-ice systems. Prolonged flight with the flaps extended is not recommended. Trace or light amounts of icing on the horizontal tail can significantly alter airfoil characteristics which will affect stability and control of the aircraft.

The autopilot may be used in icing conditions. However, every 10 - 15 minutes the autopilot should be disconnected to detect any out of trim conditions caused by ice build up. If significant out of trim conditions are detected, the autopilot should remain off for the remainder of the icing encounter so that the pilot may monitor for additional force build up. Autopilot operation is prohibited when operating in icing conditions that are outside the envelope defined by FAR Part 25, Appendix C.

Aircraft should not depart, continue to operate enroute or land when, in the opinion of the Pilot, icing conditions are expected to be met which might adversely affect the safety of the flight.

> *One of the best ways of determining existing icing conditions along your route is through the pilot report or PIREP. Giving and receiving pilot reports of conditions encountered during flight is valuable information to other pilots and to air traffic controllers assisting in weather avoidance.*

Aircraft shall not takeoff when frost, snow or ice is adhering to the wings or control surfaces.

Aircraft shall not land at an airport where moderate or heavy freezing rain or moderate or heavy freezing drizzle is falling.

The Caravan POH recommended minimum airspeed in sustained flight in icing conditions is as follows:

Caravan **105 KIAS** (Minimizes ice build up on the underside of wings and fuselage)

When holding in icing conditions, the flaps must be up. Autopilot operation is prohibited when operating in icing conditions that are outside the envelope defined by FAR Part 25, Appendix C.

Terminology for reporting the intensity and type of icing

A. **Trace** - Ice becomes perceptible. Rate of accumulation is slightly greater than the rate of sublimation. It is not hazardous even though de-icing/anti-icing equipment is not utilized unless encountered for an extended period of time (over 1 hour).

B. **Light** - The rate of accumulation may create a problem if flight is prolonged in this environment (over 1 hour). Occasional use of de-icing/anti-icing equipment removes/prevents accumulation. It does not present a problem if the de-icing/anti-icing equipment is used.

C. **Moderate** - The rate of accumulation is such that even short encounters become potentially hazardous and use of de-icing/anti-icing equipment or flight diversion is necessary.

D. **Severe** - The rate of accumulation is such that de-icing/anti-icing equipment fails to reduce or control the hazard. Immediate flight diversion is necessary.

Type of Ice

A. **Rime Ice** - Pure rime; hard, porous, whitish, opaque ice consisting of small grains, air space and frostline crystals. usually forms on the leading edges of wings, tail surfaces, wing struts, engine inlets, antennas, etc.

B. **Clear Ice** - A hard, clear ice; solid. Freezing rain and clear ice will be deposited in layers over the entire surface of the airplane and can "run back" over control surfaces before freezing.

C. **Mix Ice** - A mixture of rime and clear.

Know your systems. Are they de-icers or anti-icers?

Anti-Ice for Caravans	De-ice for Caravans
Pitot Tubes	Wing De-ice Boots
Static Ports	Wing Strut De-ice Boots
Engine Inertial Separator	Horizontal Stab De-ice Boots
Windshield Anti-ice Panel	Vertical Stab De-ice Boots
Stall Warning System	Cargo Pod Nose Cap De-ice Boot
Propeller Anti-ice Boots	Main Landing Gear De-ice Boots

Approach and Landing

Plan Instrument approaches ahead, with respect to minima. Review missed approach procedures. Remember that, with lighting aids inoperative or obscured by snow, minima may be changed.

A slight propeller vibration occurring at the start of the propeller anti-ice ON cycle and lasting 20-30 seconds is due to propeller blade anti-ice shedding characteristics and is considered normal. Rapid cycling of the propeller control lever from 1900 RPM to 1600 RPM and back to 1900 RPM will aid the propeller anti-ice boots in shedding any residual ice.

NOTE

Large changes in performance may occur with ice accumulation. Make appropriate allowances for the possibility of these losses occurring when planning a flight into or through forecast or reported icing conditions.

When making a landing approach using a 10 KIAS higher airspeed than normal, expect a 25% increase in landing distance. Use the engine anti-ice system as recommended in the POH and select continuous ignition, when applicable.

Observe applicable notes in the Performance section of the basic handbook for performance losses associated with the inertial separator in bypass and cabin heat on. If going into icing conditions, use and monitor anti-ice and de-ice systems.

If a landing is performed with flaps up, increase the approach speed by 15 KIAS and allow for 40% longer landing distances and use the conservative runway (if practical).

After a light rime ice encounter, maintain extra airspeed (10-20 KIAS) on approach to compensate for the increased pre-stall buffet associated with ice on the unprotected areas and the increased weight. Under moderate or severe rime icing conditions, limit flap setting to no more than required by available field length. With flaps up, maintain a **MINIMUM** approach speed of **105 KIAS**.

Before Landing – SELECT MINIMUM FLAP SETTING AND MAINTAIN EXTRA AIR-SPEED consistent with available field length. Do not extend flaps during **extended** operation in icing conditions. Operation with flaps extended can result in a reduced AOA, with the possibility of ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area. If the flaps are extended, do not retract them until the airframe is clear of ice.

Be aware of the possibility of tail plane icing during the landing approach. Ice formed on the tail plane may be of an amount that will not aerodynamically affect the airplane until flaps are lowered to the approach or landing position. At this time, a downward pitching may occur which must be counteracted by the retraction of flaps to a lesser setting. Judicious use of the anti-icing systems and stabilizing flap settings and airspeed farther out will guard against this danger.

Wind shear on the approach or near the threshold is unpredictable and intensity will vary with wind speed. Wind shear on the tail or letdown tends to produce runway overshoot; on the nose, be alert for a momentary increase in performance and short landing. Surface winds are hazardous because they consist of countless eddies and currents, continually changing in velocity and direction. Unfortunately, the pilot cannot predict the exact wind speed which will be encountered during the approach and landing flare.

The pilot will often find it impossible to judge height above the ground due to snow not serving as a solid reference. Featureless terrain or snow can give the illusion of the aircraft being higher than actual. A runway may be clearly visible from directly above. During the approach, however, the runway may "disappear" because the white runway with its plowed banks and the white terrain all blend together. Visibility is impaired not only from the glare, but the usual visual clues are hard to distinguish. Snow contours are especially difficult to differentiate at night and on heavily overcast days because terrain appears flat. Lighting at night plays tricks, when obscured or reflected by snow moving through the air or lying on the ground.

Drifting snow also reduces visibility. Winds of 9 to 12 mph raise the snow a few feet off the ground, and the blowing snow obscures surface objects such as ruts and runway markers. This is particularly true where there is nothing to break the wind. Winds of 15 mph raise snow high enough to obscure buildings. Fine blowing snow, suspended in the air by winds of 20 mph or more, reflects and diffuses sunlight, greatly reducing visibility.

Whiteout - A visibility restricting phenomenon that occurs in the Arctic when a layer of cloudiness of uniform thickness overlies a snow or ice covered surface. The result is a loss of depth perception that make takeoff or landing on snow covered surfaces very dangerous.

During Landing Rollout – DO NOT USE REVERSE THRUST, unless required, to prevent residual ice on the airframe from being drawn into the propeller.

Leave inertial separator in BYPASS mode after landing to preclude any possible ingestion of ice being shed from internal inlet ducting.

Landing on a slush-covered runway is another problem. The first 200 feet of roll is the most critical, since most airplanes tend to hydroplane at high speeds. Wheel braking during this period would be ineffective because the wheels would not be making contact with the runway. If the airplane should begin to skid or yaw, directional control must be maintained by use of the rudder until the tires make solid contact with the runway surface and begin to maintain control. Then, wheel braking can be used cautiously. Reverse power under skidding conditions can increase the rate at which an airplane slides off the side of the runway.

Because of the relatively low landing speeds, Caravan aircraft are not as susceptible to hydroplaning as some other aircraft. However, hydroplaning can and does occur. In wet-runway conditions, make firm contact landings to break through the water and make firm contact with hard surfaces. Keep tire pressure up and make sure tires have good tread depth.

Wing flaps should generally be raised as soon as practical after touchdown to increase braking coefficient and prevent sideways sliding, due to crosswinds, acting against the flaps. Clear the runway slowly.

Reminders and Checklist items for Approach and Landing:

- If going into icing conditions, use de-ice and anti-ice systems. Monitor anti-ice systems.
- Keep Power UP!

NOTE: Published checklist takes priority over all suggestions

Quick Turnarounds

Ensure all ice is removed from aircraft. Ensure flaps, landing gear, and brakes are free of excess slush or snow buildups.

The decision to takeoff or land, under marginal airport or runway conditions, rests finally with the Captain. It is not a responsibility which can be taken lightly. The Captain must assess the situation based on runway conditions, braking action and wind reports.

AVIONICS, ELECTRICAL AND INSTRUMENT SYSTEM CONSIDERATIONS

Some extreme cold weather conditions to look for are:

1. Sluggish motor movements - all types of analog indication.
2. Sluggish antenna scan - radar
3. Wires become brittle in extreme cold and are easy to break.
4. Possible lack of indications until units have warmed.
5. ON/OFF and volume controls hard to turn.
6. Gyros may take longer to erect (horizontal and vertical).
7. Cockpit indicator lights may be dim, due to poor contacts during extreme cold.
8. Indicator glasses may fog in units not hermetically sealed.
9. Contraction of avionic mounting racks is possible during extreme cold. This can cause multiple intermittent malfunctions in any avionic/instrument system.
10. A cold engine requires more starter torque, and has higher current drain on the battery or GPU.
11. Sluggish operation of start relays and power relays can cause arcing at relay contacts with possible welding of contacts.
12. A warm battery provides some benefit, and the heater hose can be placed in the engine cowl with the door propped close as far as possible to minimize heat loss.

The avionics may require warmup after cold soak. Over twenty minutes may be required at temperatures below -30°C (-22°F). Proper warmup is indicated by the following:

a. Frequency/code displays illuminate normally with pilot control of brightness.

b. Audio reception is available on all applicable avionics. In the absence of a suitable station, background static on each applicable avionics radio is an acceptable demonstration of reception.

Take care in blowing snow that the static ports have not been obstructed or had an ice buildup form around them. Check especially if it has been necessary to brush snow off the fuselage.

Battery connections, engine and other ground wire terminals should be checked regularly for corrosion and/or loose connections.

ENGINE CONSIDERATIONS

Operators report that, in severe cold (-25° to -45°C) the engines can produce blue smoke from the exhaust. Pratt & Whitney says this is a function of the fuel and has no effect on the engine or its performance.

MAINTENANCE PRACTICES

Potential Cold-Weather Operating Symptoms:

A. Mechanical Systems and Components:

1. Hydraulic components develop leaks more rapidly. Nose strut and bottles should be serviced to the top limit in a warm hangar. Cold hydraulic fluid and cold components should operate normally after fluid and components become warmer.

2. Flaps are slow to operate.

3. Hydroplaning.

   Cause: Tires are under-inflated. Service tires to the correct pressure. As operating temperatures decrease, the pressure in tires, struts, and oxygen bottles will decrease. These items must be periodically reserviced.

FUEL ANTI-ICE ADDITIVE CONSIDERATIONS

Fuel Temperatures

Good judgement should be used in determining whether or not the actual fuel temperatures are acceptable for aircraft start, takeoff and enroute operation.

Models 208, 208A, 208B

FUEL GRADE	FUEL SPECIFICATION	MINIMUM FUEL TEMPERATURE FOR TAKEOFF-°C	SPECIFIC WEIGHT (POUNDS PER U.S. GALLON AT 15° C)	COLOR
JET A	ASTM-D1655	-35	6.7	COLORLESS
JET A-1	ASTM-D1655	-40	6.7	COLORLESS
JET B	ASTM-D1655	-45	6.5	COLORLESS
JP-1	MIL-L-5616	-35	6.7	COLORLESS
JP-4	MIL-T-5616	-54	6.5	COLORLESS
JP-5	MIL-T-5624	-40	6.8	COLORLESS
JP-8	MIL-T-83133	-40	6.7	COLORLESS
AVIATION GASOLINE (ALL GRADES) (3)	MIL-G-5572 ASTM-D910	-54	6.0	80/87 Red 100 LL Blue 100/130 Green

Specific fuel temperature operating limits may be found in the applicable Limitations section of the approved Airplane Flight Manual.

Fuel Anti-Ice Additives

Fuel used must contain anti-icing fuel additive in compliance with MIL-I-27686 (EGME), MIL-I-85470 (DIEGME), or Phillips PFA 55MB.

Some fuels such as JP4 and JP5 per MIL-T-5624 and JP8 fuel per MIL-T-83133A contain the correct premixed quantity of an approved type of anti-icing fuel additive and no additional anti-ice compounds should be added.

Minimum starting temperature is that given or the minimum allowable oil temperature (-40°C), whichever is warmer. Starts may be attempted with fuel at lower temperatures providing other specified engine limitations are not exceeded.

ANTI-ICING ADDITIVES CONTAINING Ethylene Glycol Monomethyl Ether (EGME) OR Diethylene Glycol Monomethyl Ether (DIEGME) ARE HARMFUL IF INHALED, SWALLOWED, OR ABSORBED THROUGH THE SKIN, AND WILL CAUSE EYE IRRITATION. ALSO, THEY ARE COMBUSTIBLE. BEFORE USING THESE

CAUTION

ENSURE THAT THE ADDITIVE IS DIRECTED INTO THE FLOWING FUEL STREAM AND THAT THE ADDITIVE IS STARTED AFTER THE FUEL FLOW STARTS AND IS STOPPED BEFORE FUEL FLOW STOPS. DO NOT ALLOW CONCENTRATED ADDITIVE TO CONTACT COATED INTERIOR OF FUEL TANK OR AIRPLANE PAINTED SURFACE. USE NOT LESS THAN 20 FLUID OUNCES OF ADDITIVE PER 156 GALLONS OF FUEL OR MORE THAN 20 FLUID OUNCES OF ADDITIVE PER 104 GALLONS OF FUEL.

Insufficient additive concentrations may result in fuel system icing. Excessive additive may cause fuel tank damage or erroneous fuel quantity indications.

Procedure for Checking Fuel Additive

1. Prolonged storage of the airplane will result in a water buildup in the fuel which "leaches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps.

The minimum additive concentration shall be 0.10 percent by volume and maximum concentration shall be 0.15 percent by volume. Fuel, when added to the tank, should have a minimum concentration of 0.10 percent by volume.

Fueling Note: Some operators have reported that when over-the-wing fueling is used and the fueling equipment incorporates automatic anti-ice additive dispensing, fueling at lower flow rates may not properly dispense the additive. Proper dispensing of the additive may be verified by the audible "whish" sound heard indicating the additive pump is actuating.

Proper fueling flow rates for aerosol can additive dispensing are specified by the additive manufacturer. For example, the fuel flow rate when using a can of additive meeting MIL-I-27686 (EGME) should be 30-60 GPM (gallons per minute). The fuel flow rate when using a can of additive meeting MIL-I-85470 (DiEGME) should be 30-45 GPM.

Proper mixing of EGME or DIEGME compound with the fuel is extremely important. A concentration in excess of that recommended (0.15 percent by volume maximum.) will result in detrimental effects to the fuel tanks, such as deterioration of protective primer and sealants and damage to o-rings and seals in the fuel system and engine components. Use only blending equipment that is recommended by the manufacture to obtain proper proportioning.

Attach additive to refuel nozzle, making sure blender tube discharges in the refueling stream. Start refueling while simultaneously fully depressing and slipping ring over trigger of blender.

Situational Awareness

One "Buzz" phrase of today's aviation industry. Simply put, to know exactly what your current situation is at all times while exercising your profession. The actions you take may positively or negatively affect your outcome. To anticipate the consequences of your decisions and actions is to be in control of the situation.

Knowing intimately what you and your machine's capabilities are during any operation, not just cold weather, increases your awareness toward a given situation. Complacency could be called the carbon monoxide of any safety-critical profession; odorless, colorless, tasteless-it just sneaks in. However, with a deliberate and conscious effort to be aware of what is going on around us, complacency can be thwarted.

Know yourself, your machine, and your situation at all times. Leaving yourself an "out" still applies. Which alternate course of action should be taken depends on each situation. Better yet, think of the possibilities toward avoiding a negative situation instead of having to act on one.

Situational Awareness is not just a phrase, it is a practice. You can only get better!

Tailwinds and Happy Landings

MARTINAIRE AVIATION, L.L.C.

4553 GLENN CURTISS DRIVE
ADDISON, TEXAS 75001

ANTI – DRUG PROGRAM

ALCOHOL MISUSE

AND

PREVENTION PROGRAM

POLICY HANDBOOK

Revised March, 2013

SUBSTANCE ABUSE POLICY

Martinaire Aviation L.L.C. is committed to providing reliable and safe service to our customers, and a safe and productive work environment for all employees. It is the policy of this company that employees shall not be involved in the unlawful use, possession, sale, or transfer of drugs or narcotics in any manner that may impair their ability to perform assigned duties or otherwise adversely impact the company's business. Further, employees shall not possess alcoholic beverages in the workplace or consume alcoholic beverages in association with the workplace or during working time. Any employee who tests positive or refuses a drug or alcohol test will be terminated.

Additionally, the company is committed to comply with regulations set forth by the Department of Transportation (DOT) and the Federal Aviation Administration (FAA). Accordingly, the scope of our commitment to ensure a drug-free work environment is broadened by specific drug-testing regulations.

Refusal to Submit to Testing:

The company is required to notify the FAA within 2 working days of any instance in which a 14 CFR Part 61, 63, or 65 certificate holder refused to submit to a required drug test. This does not apply to refusals to submit to pre-employment or return to duty drug tests.

Notification of refusals should be sent to:

FAA/Drug Abatement Division/AAM-820
800 Independence Ave., S.W.
Washington, D.C. 20591

Employers are NOT required to notify the FAA of refusals to submit to pre-employment or return to duty drug tests.

Permanent Disqualification from Service:

There are two circumstances under which employees who engage in prohibited use of drugs are absolutely barred from performance of the same duties performed before the determination of such prohibited use.

1. Two Verified Positive Drug Tests

If an employee is determined to have two (2) verified positive drug tests after September 19, 1994, then he/she is permanently precluded from performing the safety-sensitive function he/she performed before the second drug test. The bar on two-time violators applies to both person who have gone through rehabilitation and to those, who, after evaluation, were determined not to need treatment.

2. On Duty Use of a Prohibited Drug

If an employee is determined to have used a prohibited drug while performing a safety-sensitive function after September 19, 1994, then he/she is permanently precluded from performing that safety-sensitive function for an employer.

Performing (a safety-sensitive function): an employee is considered to be performing a safety-sensitive function during any period in which he or she is actually performing, ready to perform, or immediately available to perform such function.

Notice to the Federal Air Surgeon: Any covered employee who holds an airman certificate issued under 14 CFR Part 67 and violates the provisions of the rule will be reported to the Federal Air Surgeon.

Removal from Performing a Safety-Sensitive Function:

A covered employee who receives one (1) positive drug test result or refused an FAA drug test **will be immediately removed from performing safety-sensitive functions.** He/she will be given information of available resources for help. The employee will not be allowed to return to perform a safety-sensitive function without the Medical Review Officer (MRO) or Substance Abuse Professional's (SAP) evaluation, recommendation, and completion of any rehabilitation program, if required. The employee must receive a verified negative test result on a return to duty test before returning to performing safety-sensitive functions. The employee will also be subject to follow-up testing.

MARTINAIRE
DRUG ABUSE POLICY STATEMENT

Martinaire, Inc. is committed to providing a safe work environment and to fostering the well-being and health of its employees. That commitment is jeopardized when any Martinaire employee illegally uses drugs on the job, comes to work under their influence, or possesses, distributes or sells drugs in the workplace. Therefore, Martinaire has established the following policy:

1. It is a violation of company policy for any employee to posses, sell, trade, or offer for sale illegal drugs or otherwise engage in the illegal use of drugs on the job.
2. It is a violation of company policy for anyone to report to work under the influence of illegal drugs.
3. It is a violation of the company policy for anyone to use prescription drugs illegally. (However, nothing in this policy precludes the appropriate use of legally prescribed medications.)
4. Violations of this policy are subject to disciplinary action up to and including termination.

It is the responsibility of the company's supervisors to counsel employees whenever they see changes in performance or behavior that suggest and employee has a drug problem. Although it is not the supervisor's job to diagnose personal problems, the supervisor should encourage such employees to seek help and advise them about available resources for getting help. Everyone shares responsibility for maintaining a safe work environment and co-workers should encourage anyone who may have a drug problem to seek help.

The goal of this policy is to balance our respect for individuals with the need to maintain a safe, productive and drug-free environment. The intent of this policy is to offer a helping hand to those who need it, while sending a clear message that the illegal use of drugs is incompatible with employment at Martinaire.

DONOR CHECKLIST

- The collection of your urine will be conducted under procedures mandated by the Department of Transportation. The DOT regulations provide for your individual privacy unless there is a reason to believe that you may or may have altered or substituted the urine specimen.
- Please take a few minutes to read the following information which describes your role in the collection process.
- Present required photo identification to the collector – if you do not have a photo ID and employer representative will be asked to identify you.
- You may ask the collector to show his/her ID.
- Remove any unnecessary outer garments, e.g. coat, and jacket. All personal belongings (e.g. purse, briefcase) must remain with outer garment(s). You may retain your wallet. You may ask for a receipt.
- When instructed by a collector, wash and dry your hands.
- You will be provided a sealed specimen bottle or collection container, or the collector may unwrap it in your presence.
- You may provide the specimen in the privacy of a stall or otherwise petitioned area that allows for individual privacy.
- You should observe the entire collection procedure. The collector will check the specimen for volume, temperature, and color. The collector will then seal the bottle.
- You should initial the identification label on the specimen bottle to certify that it is your specimen.
- You should complete the information on copies 3 through 6 of the custody and control form. You will be given a copy of the completed form after the collector has completed his/her collection.

  You should NOT list medications/prescriptions on any other copy of the form except the copy which you are given for your records.

  The results of the laboratory analysis will be forwarded to your employer's Medical Review Officer (MRO). If the laboratory results are negative, the MRO will notify your employer. If the laboratory results are positive, the MRO will contact you at the phone number you provided to give you the opportunity to discuss the test results and to submit information demonstrating authorized use of the drug(s) in question

ANTI – DRUG PLAN
BSW 00060 S

MARTINAIRE AVIATION, L.L.C.

4553 GLENN CURTISS DRIVE
ADDISON, TEXAS 75001

This Anti-Drug Plan is submitted by Martinaire Aviation, L.L.C. hereinafter called "the Company", in compliance with the requirements of FAR 135 Appendix I, as amended, for an Anti-Drug Plan. This Company is committed to a drug-free work place and the right of the flying public it serves to safe and efficient air transportation free from the safety degrading effects of drugs. To this end, the Company has prepared this Anti-Drug Plan as part of its overall Anti-Drug Program. All employees of this Company who perform safety sensitive and/or security related functions are required to comply with the provisions of this Plan as a condition of employment with the Company.

DEFINITIONS

ACCIDENTS – An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which any aircraft receives substantial damage.

AIRCRAFT MAINTENANCE – As used in this Plan means inspection, overhaul, repair, preservation, and the replacement of parts, but excludes preventive maintenance.

ALIQUOT – A portion of specimen used for testing.

ANNUALIZED RATE – For the purpose of unannounced testing of employees based on random selection, annualized rate means the percentage of specimen collection and testing of employees performing covered functions during a calendar year. The Company shall determine the annualized percentage rate by referring to the total number of employees performing a safety-sensitive or security related function for the Company at the beginning of a calendar year (or by an alternative method specified in the Anti-Drug Plan and approved by the FAA).

ANTI – DRUG PLAN – The plan drafted and submitted to the Federal Aviation Administration to comply with the requirements of Federal Aviation Regulation 121 Appendix I, hereinafter referred to as "The Plan".

ANTI – DRUG PROGRAM – The program established by the Company to provide the necessary elements to promote a drug-free working environment, hereinafter referred to as "The Program".

CHAIN OF CUSTODY – Procedures to account for the integrity of each urine specimen by tracking its handling and storage from point of specimen collection to final disposition of the specimen. These procedures shall require that an approved chain of custody form(s) account for the sample aliquots within the laboratory.

COLLECTION SITE – A place designated by the Company and meeting the DHHS requirements, where individuals present themselves for the purpose of providing a specimen of their urine to be analyzed for the presence of drug abuse.

COLLECTION PERSON – A person who instructs and assists individuals at a collection site and who receives and makes initial examination of the urine specimen provided by those individuals.

CONFIRMATION TEST – A second analytical procedure to identify the presence of a specific or metabolite which is independent of the initial test and which uses a different technique and chemical principal from that of the initial test in order to ensure reliability and accuracy. Currently, gas chromatography/mass spectrometry (GS/MS) is the only authorized confirmation method for cocaine, marijuana, opiates, amphetamines, and phencyclidine (PCP).

COVERED EMPLOYEES – As used in this Plan, includes all employees directly employed by the Company and contract employees under the Companies Anti-Drug Program who perform a safety-sensitive and/or security related function. The number of covered employees both direct and contract, required to be tested under this Plan are listed on Schedules A and B respectively.

CONTRACT COMPANY – An individual, company, or organization with whom the Company has a written or verbal contract for services, and who's employees are required to be subjected to drug testing. Contract company employees are required to be tested either under this Plan or under a plan approved by the FAA for that company. A company is not considered to be a contract company, and therefore not required to be listed on Schedule C of this Plan, if it provides services only on a limited or one time basis.

DHHS – Department of Health and Human Services.

DOT – Department of Transportation

DRUG DEPENDENT – A condition in which a person is addicted to or dependent on drugs other than alcohol, tobacco, or ordinary caffeine-containing beverages, as evidenced by habitual use or a clear sense of need for the drug.

DRUG METABOLITE – The specific substance produced when the human body metabolizes a given drug as it passes through the body and is excreted in urine.

FAA – Federal Aviation Administration.

FAILING A TEST – Failing a test means that the results show positive evidence of the presence of a prohibited drug metabolite in an employee's system.

FAR – Federal Aviation Regulations.

MEDICAL REVIEW OFFICER (MRO) – A licensed physician responsible for receiving laboratory testing results of tested specimens, who has knowledge of substance abuse disorders and has appropriate medical training to interpret and evaluate and individual's

positive test result together with his/her medical history and any other relevant information.

NON-CONTRACT COMPANY – An individual or organization not listed in this Plan, but who provides services to the Company on a limited or one time basis as per the FAR.

PASSING A DRUG TEST – Passing a drug test means that the test result does not show positive evidence of a prohibited drug or drug metabolite in a employee's system.

POSITIVE EVIDENCE – The presence of a drug metabolite in a urine sample at or above the levels listed in the FAA Anti-Drug rule.

PREVENTIVE MAINTENANCE – As used in this Plan means simple or minor preservation operations and the replacement of small standard parts not involving complex assembly operations.

PROHIBITED DRUG – As used in this Plan refers to marijuana, cocaine, opiates, phencyclidine (PCP), and amphetamines.

SAFETY-SENSITIVE OR SECURITY RELATED FUNCTION – Those positions or functions identified as having a bearing on the safety and/or security of operations conducted by the Company. These include but are not limited to: pilots, flight engineers; flight navigators; flight attendants; instructors (ground and flight); flight test personnel; aircraft dispatchers and personnel whose duties are related to the preparation of a dispatch document, flight release, overhaul, replacement or repair of aircraft or aircraft parts; preventive maintenance load manifest or flight plan; aircraft maintenance personnel who perform inspection, personnel; security and screening personnel.

OPERATING CERTIFICATES

The company holds the following operating certificates or is engaged in safety-sensitive and/or security related functions which require it to have an approved Anti-Drug Plan in effect.

AIR CARRIER OPERATING CERTIFICATE

Number: MT9A828W

Issued:MAY 13, 1998

ANTI – DRUG PROGRAM MANAGER (ADPM)

In compliance with the requirements of the FAR's the Company has appointed the following Anti-Drug Program Manager to oversee the Company's Anti-Drug Program:

Mr. Alan Rusinowitz
Martinaire Aviation L.L.C.
4553 Glenn Curtiss Drive
Addison, Texas 75001
972-349-5700

The duties of the Anti-Drug Program Manager (ADPM) will be to oversee the Company's Anti-Drug Program with the emphasis on compliance. The ADPM will work closely with the Company management and the Medical Review Officer (MRO) to ensure that all elements of the Anti-Drug Program are followed as they pertain to employee testing, training, record keeping, and reporting. The ADPM shall be the FAA/NTSB contact within the Company on matters pertaining to this Anti-Drug Program. He/she will be highly knowledgeable on the contents of the Program and the Company's policies and procedures as they pertain to the employee relations on drug matters.

The ADPM will establish a system of secured, positive controlled record keeping to safeguard an individual employee's right to privacy of test results. This system will require that all test results be forwarded by the Medical Review Officer (MRO) to the ADPM who will secure the results in a locked file to which only the ADPM will have access.

Employees having any questions or suggestions on the Anti-Drug Program should address them to the ADPM in person or in writing to the above address.

RELEASE OF TEST RESULTS

The ADPM will upon request, provide test results to an authorized representative of the FAA Administrator or on post accident cases the National Transportation Safety Board. Requests for test results or any other information regarding and employee's participation in the Company's Anti-Drug Program by any other company or individual will only be provided with the specific written authorization of the employee involved. This written authorization must be provided in duplicate by the employee and included the specific name and address of the person to whom this information may be released. One copy of the authorization will be kept in the employee's Anti-Drug Program file and the other sent along with the copy of the requested test results to the authorized recipient.

EMPLOYEES SUBJECT TO TESTING

Any covered employee who performs one or more of the safety sensitive and/or security related functions listed below, must be tested for the use of prohibited drugs in accordance with the provision of this Plan.

1. Flight crewmember duties which include pilots, flight engineers, and flight navigators.
2. Flight instructors and ground instructors.
3. Flight test/checks, and airman certification duties
4. Personnel performing aircraft dispatch (duties related to the preparation of a dispatch document, flight release, load manifest, or flight plan).
5. Personnel performing aircraft maintenance or preventive maintenance duties.
6. Personnel performing security or screening duties.
7. Air traffic control duties performed by non-FAA or non military personnel.
8. Personnel performing any of the following operations as listed in FAR 135.1 (c):
   a. Student instruction
   b. Nonstop sightseeing flights that begin and end at the same point.
   c. Ferry or training flights
   d. Aerial work operations, including crop dusting, seeding, bird chasing, banner towing, aerial photography or survey, fire fighting, powerline and pipeline patrol and other types of patrol by the FAA.
   e Helicopter operations in construction or repair work (but not including transportation to and from the site of operations.)
   f. Powerline and pipeline patrol, or similar types of patrol approved by the FAA.

g. flights conducted in hot air ballons carrying persons for the purpose of intentional parachute jumps.
h. Helicopter flights conducted within a 25-statute-mile radius of the airport of departure.
i. Rotocraft operations conducted under FAR Part 133.
j. Federal election campaign operations conducted under provision of FAR 91.59.

CONTRACT COMPANIES

Attached as Schedule C to this Plan is a list of those companies which have contracts with the Company and have employees performing safety-sensitive and/or security related functions. Schedule C shows for each contract company whether its employees are tested under this Plan or under another plan.

NON – CONTRACT COMPANIES

The Company may obtain services from an individual, organization or company that is not listed on Schedule C of this Plan provided that the individual, organization or company is covered under and FAA approved Anti-Drug Plan.

REQUIRED TESTING

In accordance with the requirements of the FAR, the Company will provide the following types of drug testing in the manner prescribed. The costs of drug testing will be the responsibility of the Company. The cost for an applicant or covered employee requested specimen retest will be the responsibility of the applicant or employee.

PRE – EMPLOYEEMENT TESTING

All applicants, new or employees being considered for rehire by the Company who will be employed in a safety-sensitive and/or security related function, will have this Program explained and the need for pre-employment testing contained herein.

In the event a prospective covered employee fails a drug test, then the Company will not hire or rehire the individual at that time. However, this does not prevent the Company from hiring the individual at a later date if he/she has shown satisfactory completion of a Drug Rehabilitation Program to the satisfaction of the Company's MRO and:

1. In the case of a covered employee not required to hold a medical certificate issued under the provisions of FAR Part 67, been recommended for hire or rehire by the MRO or
2. In the case of a covered employee required to hld a medical certificate issued under the provisions of FAR Part 67:
   a. Has been determined to be non drug dependent by the MRO and recommended for hire or rehire by the MRO or
   b. Has been determined to be probably drug dependent by the MRO, in which case a recommendation for hire or rehire must come from the Federal Air Surgeon.

If the Company desires to hire or rehire a prospective covered employee after complying with the above requirements, it is mandatory that the employee pass a drug test prior to performing a covered function and subsequently be tested in accordance with the provisions of the Return to Duty Testing requirements of this Plan.

PERIODIC TESTING

Each covered employee who is required to hold a medical certificate under FAR Part 67, will submit to drug testing once annually until a program of Random Testing is initiated. This drug test will be conducted on the same date when the covered employee presents himself/herself for a medical examination under FAR Part 67. For covered employees holding a first class medical certificate, the drug test will be conducted at the first time he/she presents himself/herself for a medical examination under FAR Part 67 after the implementation of the Company's Anti-Drug Program.

The Company will continue Periodic Testing until such a time as it has implemented a program of Random Testing and the annualized rate of Random Testing has reached fifty (25%) of covered employees with the final specimen collection of the year.

RANDOM TESTING

The Company will conduct Random Testing for all covered employees performing a safety-sensitive and/or security related function:

1. immediately upon the implementation of the Company Anti-Drug Program if the Company employs fifty-one (51) or more covered employees at the time of implementation or
2. commencing no later than six months after the implementation of the Company Anti-Drug Program if the Company employs eleven to fifty (11-50) covered employees at the time of implementation; or
3. immediately upon the implementation of the Company Anti-Drug Program if the Company employs ten (10) or less employees at the time of the implementation.

The Random Testing, once begun, will provide for testing of at least twenty-five percent (25%) of all employees to be tested during the first twelve months of Random Testing, with this testing being reasonably spaced over the period, and with the last collection of specimens representative of an annualized rate of at least fifty percent (25%) of covered employees.

The annualized rate for Random Testing following the first twelve months after implementation of the testing, will be no less than fifty percent (25%).

The Company will use the following method to accomplish the random selection of employees and effected contract employees:

Employee's will be selected for Random Testing from a computer generated random number selector. The selection will be made from a list of required covered employees, the program will make a selection from the list of covered employees using the column on the list which contains the employee's identification number. After an employee has been selected for random selection his name will be returned to the pool to ensure there will be an equal chance of selection for all employees on subsequent random test selections. The date and time of testing will remain unknown until just prior to collection.

REASONABLE CAUSE/SUSPICION TESTING

A covered employee will submit to drug testing based on reasonable cause/suspicion when:

1. the Company employees fifty-one (51) or more covered employees, at least two supervisors, one of whom is trained in detecting the indicators of drug use, substantiate and concur in the decision to test a covered employee who is reasonably suspected of drug use; or
2. the Company employs fifty (50) or less covered employees, one supervisor who has been trained in detecting the indicators of drug use, substantiates the decision to test a covered employee who is reasonably suspected of drug use.

This suspicion must be based on specific contemporaneous physical, behavioral, or performance indicators of probable drug use. Some of the circumstances that might require Reasonable Cause/Suspicion Testing are evidence of repeated errors on the job, regulatory or Company rule violations, or unsatisfactory time and attendance patterns, if coupled with a specific, contemporaneous event that indicates probable drug use.

RETURN TO DUTY TESTING

A covered employee or applicant, who is not required to hold a medical certificate issued under FAR Part 67, who has failed a drug test and has satisfactorily completed a rehabilitation program acceptable to the MRO, may, at the sole discretion of the Company, and with the recommendation of the MRO, return to duty or be hired into a safety-sensitive and/or security related function.

A covered employee or applicant who is required to hold a medical certificate issued under FAR Part 67, and who has failed a drug test satisfactorily completed a rehabilitation program may:

1. if the covered employee of applicant is determined to be non drug dependent by the MRO, at the sole discretion of the Company, and with the recommendation of the MRO, return to duty or be hired into a safety-sensitive and/or security related function; or
2. if the covered employee of applicant is determined to be probably drug dependent by the MRO, at the sole discretion of the Company, and with the recommendation of the Federal Air Surgeon, return to duty or be hired into a safety-sensitive and/or security related function.

If the Company elects to hire an applicant for, or allow an employee to return to, a safety-sensitive and/or security related function after failing a drug test under this program, it is mandatory that the covered employee must first pass a drug test and subsequently submit to a program of unannounced testing for a period of not more than sixty (60) months from the date of hire or return to duty.

The MRO will determine the schedule of unannounced testing for any covered employee who must be tested under the provisions of Return To Duty Testing.

FAILURE OF A DRUG TEST

If a covered employee or applicant for a covered function fails any required drug test, the Company will not hire, promote, transfer, assign, reassign, or continue to utilize that individual in any capacity in a safety-sensitive and/or security related function requiring testing under this Plan, and may, at the sole discretion of the Company:

1. terminate the covered employee, or refuse to hire the applicant; or
2. in the case of a covered employee or applicant who is not required to hold a medical certificate issued under FAR Part 67, remove the covered employee from duty or refuse to hire the applicant until, he/she has satisfactorily completed a rehabilitation program acceptable to the MRO, passed a drug test, and been recommended for return to duty, or hire by the MRO; or
3. in the case of a covered employee or applicant who is required to hold a medical certificate issued under FAR Part 67, remove the covered employee from duty or refuse to hire the applicant until, he/she has completed a drug rehabilitation program acceptable to the MRO, passed a drug test, and;

a. if determined to be non drug dependent by the MRO, be recommended for return to duty or hire by the MRO; or
b. if determined to be probably drug dependent by the MRO, be recommended for return to duty or hire by the Federal Air Surgeon; or

4. continue to employ the covered employee, or hire the applicant, in a non-safety and/or non-security related function.

Any covered employee of applicant for a covered function who has failed a drug test under this Program and is returned to duty, hired or rehired by the Company in accordance with the above provisions, will be required to be tested in accordance with the requirements of Return To Duty Testing listed in this Plan.

REFUSAL TO SUBMIT TO DRUG TESTING

If a covered employee or applicant for a covered function refuses to submit to any required drug test, the Company will not hire, promote, transfer, assign, reassign, or continue to utilize that individual in any capacity in a safety-sensitive and/or security related function requiring testing under this Plan, and may, at the sole discretion of the Company:

1. terminate the covered employee, or refuse to hire the applicant; or
2. remove from duty the covered employee, or refuse to hire the applicant until he/she has passed a drug test; or
3. continue to employ the covered employee, or hire the applicant, in a non safety-sensitive and/or non-security related function not requiring drug testing under this Plan.

Any covered employee or applicant for a covered function who has refused to submit to a drug test under this Program and is subsequently returned to duty or hired after submitting to and passing a drug test, will be required to submit to drug testing under the provision of Return To Duty Testing in this Plan.

MEDICAL REVIEW OFFICER

The Company has contracted with the following physician to serve as the MRO for the Company's Anti-Drug Program with his/her duties and responsibilities described below:

Lexis Nexis Medical Review Services
Stuart Hoffman, MD
480 Quadrangle, Suite D
Bolingbrook, IL 60440
PH (800) 939-4782
FAX (630) 679-5635

In addition to performing the duties and functions outlined below, the MRO will comply with the requirements of 14 CFR Part 61 and 49 CFR Part 40.

The primary responsibility of the MRO is to review and interpret positive test results obtained through the Company's Anti-Drug Program.

Upon notification by the testing laboratory of a positive test result, the MRO will review the documentation showing continuity in the chain of custody of the specimen, and contract, by the most expedient means available, the employee affected to advise him/her of the positive test result.

The MRO must provide the covered employee an opportunity for an interview, in person or via telephone, with the MRO to discuss the possible reasons for the positive test result, and to advise the covered employee of his/her right to request a retest of the specimen, at his/her expense by another DHHS approved laboratory.

If the covered employee submits medical records in defense of a positive result, the MRO will review those records and contact the employee's physician to answer any questions contained therein.

If any question arises about the accuracy or validity of a positive test result, the MRO will review that laboratories record to determine whether the required procedures were followed. This will require collaboration with the testing laboratory director, the analysts, and any expert consultants as the MRO determines necessary.

Once the MRO has reviewed all the above information, he/she will make a determination as to whether the result is scientifically sufficient to take further action. However, if the records from the collection site or laboratory raise doubts about the handling of the sample, the MRO may decide the urinary evidence is insufficient and no further actions

would be taken. In this case, the MRO will declare the test to be negative, and shall note the possible errors in laboratory analysis or chain of custody procedures, and will notify the proper officials to correct the errors or procedures as necessary.

If the MRO determines that there is no reasonable medical or scientific reason for a positive test result, and after verification of the proper procedures being followed, he/she will declare the test to be a verified positive and notify the Company's Anti-Drug Program Manager (ADPM) of this fact.

In order for a covered employee who is not required to hold a medical certificate issued under FAR Part 67 to be returned to duty or rehired, or an applicant hired by the Company into a safety-sensitive and/or security related function after failing a drug test, the MRO must review the results of the covered employee's or applicant's drug rehabilitation program and certify in writing that he/she is approved for return to duty or for hire. In addition, the MRO will establish a schedule for unannounced Return To Duty Testing for the covered employee or applicant and coordinate with the ADPM for notification of the individual when testing is to be accomplished.

In order for a covered employee or applicant who is required to hold a medical certificate issued under FAR Part 67 to be returned to duty, hired or rehired by the Company, the MRO must determine if the covered employee or applicant is:

1. non drug dependent, in which case the MRO will review the results of his/her drug rehabilitation program and, if found satisfactory, establish a schedule for Return To Duty, Hire or Rehire; or
2. probably drug dependent, in which case the recommendation for Return To Duty, Hire or Rehire must come from the Federal Air Surgeon, with the MRO establishing the schedule for unannounced Return To Duty Testing.

ANTI – DRUG PROGRAM REPORTING

The ADPM will prepare and submit to the FAA Drug Abatement Branch (AAM-220), Office of Aviation Medicine, 800 Independence Avenue, SW, Washington, DC 20591, annual reports summarizing the results of the Company's drug testing program. The annual report covering the period from 1 January through 31 December will be submitted no later than 15 March of each year.

TESTING LABORATORY

The Company has contracted with the below listed DHHS certified laboratory for the analysis of specimens collected:

Concentra Medical Centers
15810 Midway Road
Addison, Texas 75001
(972) 458-8111 Fax: (972) 458-7776

The laboratory will conduct all requirements for chain of custody, testing, reporting and specimen retention in accordance with the provisions of 49 CFR Part 40. The laboratory will report all test results directly to the MRO designated in this Plan.

COLLECTION SITE(S)

The Company has designated on this Plan the agency(s) and/or the location of the specimen collection site(s). The collection site(s) indicated meet or exceed the requirements as set forth in 49 CFR Part 40, and collection site procedures will follow the guidelines listed below. The collection site(s) will:

1. have or be an enclosure where private urination can occur
2. have toilet for completion of urination
3. have a clean suitable writing surface for the completion of required forms
4. have a separate monitored source of water for washing hands
5. have a water bluing agent added to the toilet water supply and holding tank
6. be thoroughly inspected by the collection site person prior to the commencement of specimen collection
7. if possible, be secured by the collection site person between specimen collections so as to be inaccessible to others
8. if a public rest room is utilized, have a sign posted on the entrance restricting access to anyone other than persons being tested
9. provide a means of securing all specimens until such time as they are ready for shipment to the testing laboratory in accordance with the laboratory procedures for sealing and shipping the specimen.

COLLECTION PERSON

In accordance with the FAR's the collection person:

1. will thoroughly inspect the collection site for the possibility of altering, exchanging, or diluting specimens
2. will control access to the specimen collection site
3. will monitor and control access to any source of water at the collection site which cannot have a bluing agent added to it
4. will ensure that specimens are properly secured, sealed and labeled for shipment
5. will collect only one specimen at any given time
6. will allow privacy during specimen collection unless there is reason to believe that a particular individual may alter or substitute the specimen to be provided, with this reasonable belief substantiated by the collection person's supervisor, based on one or more of the following circumstances:
    a. the individual provides a urine specimen outside the normal temperature range and refuses to allow his/her oral temperature to be taken, or the oral temperature does not exceed the specimen temperature; or
    b. the last urine specimen provided by the individual did not meet the specified creatinine and/or specific gravity levels; or
    c. the collection site person observes an attempt to substitute or alter a specimen
7. will complete all required forms, documents, and records as may be required by the Company, MRO, laboratory, or the FAR's;
8. will verify the identification of the individual being tested, either by photo ID or by identification by the Company's representative;
9. will check the temperature of the specimen immediately after collection;
10. will note on the urine custody and control form any unusual behavior of the individual being tested or any unusual findings with regard to the specimen itself; and
11. may, if there is reason to believe that the individual being tested may attempt to alter or substitute a specimen due to the individual having previously failed a drug test and is being tested under Return To Duty Testing, having a collection site person of the same gender as the individual being tested physically observe the specimen collection.

INDIVIDUAL TO BE TESTED

The individual being tested will:

1. present him/herself at the designated collection site at the specific date and time;
2. remove any outer garments such as coats, hats, sweaters, handbags, etc. prior to entering the collection site;
3. present to the collection site person positive identification (photo ID) or be identified by a Company representative;
4. wash his/her hands prior to urination;
5. not tamper with, dilute, substitute, alter, or in any way change or attempt to cause a change to a specimen;
6. not distract or attempt to distract the collection site person from the performance of his/her duties;
7. not permit anyone other than him/her and the collection site person to handle his/her specimen until the container is properly sealed by the collection site person;
8. keep his/her specimen in sight at all times until the container has been properly labeled by the collection site person;
9. allow his/her oral temperature to be taken with a sterile thermometer if his/her specimen is outside the normal temperature range; and
10. will report on the urine custody and control form any medications taken or administered in the past 30 days.

EMPLOYEE ASSISTANCE PROGRAM (EAP)

The Company will provide for employee education and training in accordance with the following provisions:

Employee education and training and/or training materials on the effects of drug use will be provided by:

Martinaire Aviation, L.L.C.
4553 Glenn Curtiss Drive
Addison, Texas 75001
Alan Rusinowitz, ADPM
(972) 349-5700

All covered employees will receive annual training on the following subjects and receipt of the training will be documented by the ADPM.

1. Effects and consequences of drug abuse on personal health and safety;
2. Effects and consequences of drug abuse in the work place;
3. Manifestations and behavioral cues of drug abuse;
4. Regulations mandating drug testing and training;
5. The companies commitment to a drug free work place;
    a. Policy
    b. Penalties
    c. Employee Assistance (to include notification to each employee of an area drug help hot line phone number)
    d. Training and Education
6. The provisions of this Plan; and
7. Employee rights of privacy and disclosure of testing results.

This training will be of a formal classroom nature, and will be supplemented through the year with informational posters, flyers, and pamphlets on the hazards and effects of drug abuse.

IMPLEMENTATION

In keeping with this commitment for a drug free work place, the Company will implement the provisions of this Plan and its Anti-Drug Program on or before February 15, 1990.

Martinaire Aviation, L.L.C.

(Hereafter referred to as employer)

POLICY
FOR
THE ALCOHOL MISUSE PREVENTION PROGRAM

(AS REQUIRED BY DEPARTMENT OF TRANSPORTATION AND FEDERAL AVIATION ADMINISTRATION REGULATIONS)

SUMMARY

The Federal Aviation Administration (FAA) Alcohol Misuse Prevention Program (AMPP) prohibits certain conduct by, and requires alcohol testing of, persons who perform specified safety-sensitive functions. Alcohol tests must be conducted by qualified technicians on evidential breath testing devices (EBT). Persons who violate this regulation will be subject to consequences, including removal from safety-sensitive functions. In addition, the company has established its own policies with respect to employees who misuse alcohol.

A copy of this policy will be distributed to each covered employee.

Written notice of the availability of this information will be provided to representatives of employee organizations.

1. CONTACT PERSON KNOWLEDGEABLE OF THE AMPP:

AMPP Program Manager

Alan S. Rusinowitz
972-349-5700

2. CATEGORIES OF EMPLOYEES SUBJECT TO TESTING (COVERED EMPLOYEES):

All persons performing any of the following safety sensitive functions for the company are subject to Department of Transportation (DOT)/FAA alcohol testing:

Flight Crewmember
Flight Attendants
Flight Instruction
Aircraft Dispatch
Aircraft Maintenance/Preventive Maintenance
Ground Security Coordinator
Aviation Screening
Air Traffic Control

3. FUNCTIONS AND PERIOD OF THE WORK DAY COVERED BY THE AMPP:

- Any employees performing the above listed safety-sensitive functions are subject to alcohol testing and must refrain from consuming any alcohol (not just alcoholic beverages) whenever they are performing, ready to perform, or immediately available to perform these functions.

- For example, our ground security coordinator is on call to perform ground security coordinator functions at any time during his or her work day. Even though these functions might not be performed during his or her regular work day, he or she would be subject to testing the entire work day because he or she is immediately available to perform the functions of the ground security coordinator.

- Employees will only be tested for alcohol while they are at the work site (this could include airports other than our home base). Therefore, a pilot on-call for duty while at home has not violated the regulations if he or she has an alcoholic beverage unless he or she reports for duty within 8 hours of consuming such alcohol. He or she is not subject to alcohol testing until he or she reports for work. Therefore, if he or she is called to work and has consumed alcohol within the 12 hour timeframe, he or she would have to decline to report until 12 hours has passed with no alcohol consumption. However, a pilot waiting to fly an aircraft in the employee's lounge is subject to testing as he or she is immediately available to fly the aircraft.

- A secretary who is available to perform aviation screening duties from 8 a.m. to 12 noon in order to cover for an absent employee would be subject to testing during those hours even if no covered functions were actually performed.

4. PROHIBITED CONDUCT:

ALCOHOL AND ALCOHOL USE

- ALCOHOL IS DEFINED AS THE INTOXICATING AGENT IN BEVERAGE ALCOHOL, ETHYL ALCOHOL, OR OTHER LOW MOLECULAR WEIGHT ALCOHOLS, INCLUDING METHYL OR ISOPROPYL ALCOHOL.

- ALCOHOL USE IS DEFINED AS THE CONSUMPTION OF ANY BEVERAGE, MIXTURE, OR PREPARATION, INCLUDING ANY MEDICATION (PRESCRIBED OR OVER-THE-COUNTER, INTENTIONAL OR UNINTENTIONAL), CONTAINING ALCOHOL.

Alcohol Concentration

- Covered employees may not report for duty or remain on duty in a position requiring the performance of safety-sensitive functions while having an alcohol concentration of 0.04 or greater.

Pre-Duty Use

- Employees may not perform flight crewmember, flight attendant, or air traffic controller duties within 8 hours after consuming alcohol.

- Employees may not perform flight instruction, aircraft dispatcher, aircraft maintenance or preventive maintenance, ground security coordinator, or aviation screening duties within 4 hours after consuming alcohol.

- On-call employees who are not at work, but could be called to perform safety-sensitive functions, are subject to the pre-duty alcohol prohibition (i.e., they would have to decline a call to work if acceptance would result in performing safety-sensitive duties within the 8 or 4 hours, whichever is applicable).

On-Duty Use

- Covered employees may not consume alcohol in any form while performing safety-sensitive functions.

- This prohibition also applies to covered employees who are at work and immediately available to perform safety-sensitive functions.

Use After an Accident

- Covered employees with knowledge of an accident involving an aircraft for which they performed a safety-sensitive function at or near the time of the accident may not use alcohol for 8 hours after the accident unless they have been given a post-accident test, or the company name has determined that their performance could not have contributed to the accident.

- Accident is defined as an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention

of flight and the time that all such persons have disembarked, and in which any person suffers death or serious injury or in which the aircraft receives substantial damage.

Refusal to Submit to Testing

- Covered employees may not refuse to submit to a post-accident, random, reasonable suspicion, or follow-up alcohol test. The company will not permit an employee who refuses to submit to such a test to perform or continue to perform safety-sensitive functions.

- Refusal to submit to a pre-employment or return to duty test is not a violation of the FAA AMPP rule, but a refusal will preclude any person from performing safety-sensitive functions.

5. CIRCUMSTANCES THAT REQUIRE TESTING:

Covered employees are subject to the following federally mandated alcohol tests:

Post-Accident

- As soon as practicable after an accident, each covered employee must be alcohol tested if that employee's performance either contributed to the accident or cannot be discounted as a contributing factor to the accident.

- A covered employee who is subject to post-accident alcohol testing will remain readily available for testing or may be deemed by the company to have refused to submit to testing.

- Attempts to conduct post-accident alcohol testing will cease 8 hours after the accident, even if no alcohol test has been conducted.

Random

- Covered employees will be selected for random alcohol testing through a scientifically valid method. We will use a random number generator to select employees.

- Random tests will be spaced throughout the year and will be unannounced.

- Employees notified of selection for random testing must proceed immediately to the testing site.

- Random tests will be conducted while the employee is performing safety-sensitive functions, just before the employee is to perform safety-sensitive functions, or just after the employee has ceased performing safety-sensitive functions.

Reasonable Suspicion

- A covered employee must submit to an alcohol test if the company has determined that reasonable suspicion exists that the employee has violated the alcohol misuse prohibitions.

- This determination must be based on a trained supervisor's specific, contemporaneous, articulable observations concerning the appearance, behavior, speech or body odors of the employee.

- Even if an alcohol test cannot be administered, no employee who is under the influence of or impaired by alcohol, as shown by behavioral, speech, or performance indicators of alcohol misuse, should report for duty or remain on duty requiring the performance of safety-sensitive functions until a test can be administered and the result is below 0.02 or until the commencement of the employee's next duty period if at least 12 hours has elapsed.

- Similarly, even if an alcohol test cannot be administered, the company will not permit any employee who is under the influence of or impaired by alcohol, as shown by behavioral, speech, or performance indicators of alcohol misuse, to report for duty or remain on duty requiring the performance of safety-sensitive functions until a test can be administered and the result is below 0.02 or until the commencement of the employee's next duty period if at least 12 hours has elapsed.

- A supervisor who identifies an employee for a reasonable suspicion test cannot conduct the alcohol test as the breath alcohol technician for that employee.

Return to Duty

- Before a covered employee returns to duty in a safety-sensitive function after engaging in prohibited conduct, he or she will undergo a return to duty test.

- The employee cannot perform a safety-sensitive function until a result indicating an alcohol concentration of less than 0.02 is obtained.

- **49 CFR Part 40, Subpart O is attached for further reference:**

Follow-Up

- Each covered employee, who has been identified by a substance abuse professional (SAP) as needing assistance in resolving a problem with alcohol misuse and who

has returned to duty performing a safety-sensitive function, will be subject to follow-up testing.

- Follow-up tests will be unannounced and at least 6 tests must be conducted in the first 12 months after the employee is back on the job. Follow-up testing may continue for up to 60 months.

- The schedule for follow-up alcohol testing is established by the SAP.

Retests

- If the company desires to permit an employee to perform a safety-sensitive function within 8 hours following administration of an FAA-mandated alcohol test indicating an alcohol concentration of 0.02 or greater but less than 0.04, the company will first retest the employee.

- The employee may return to the safety-sensitive function if the retest result indicates an alcohol concentration of less than 0.02.

6. PROCEDURES FOR ALCOHOL TESTING; PROTECTING THE EMPLOYEE AND THE INTEGRITY OF THE BREATH TESTING PROCESS; SAFEGUARDING THE VALIDITY OF THE TEST RESULTS; AND ENSURING THAT THOSE RESULTS ARE ATTRIBUTED TO THE CORRECT EMPLOYEE:

All tests will use the following procedures:

Preparation for Breath Alcohol Testing

- Upon entering the alcohol testing location, the breath alcohol technician (BAT) will require the employee to provide positive identification (photo I.D. or identification by a company representative). On request, the BAT will provide positive identification to the employee. The BAT will explain the testing procedure to the employee.

Screening Tests

The BAT will complete Step 1 on the breath alcohol testing form, and the employee will then complete Step 2 on the form, reading and signing the certification. Refusal by the employee to sign this certification will be regarded as a refusal to take the test.

An individually sealed mouthpiece will be opened in view of the employee and BAT and attached to the evidential breath testing device (EBT) in accordance with the manufacturer's instructions.

- The BAT will instruct the employee to blow forcefully into the mouthpiece for at least 6 seconds or until the EBT indicates that an adequate amount of breath has been obtained.

- If the EBT does not have a printer capable of generating a printed result, a sequential test number, the manufacturer's name for the device, the device's serial number, and the time and date of the test; the BAT will show the employee the result displayed on the EBT. The BAT will record the displayed result, test number, testing device, serial number of the testing device, date, time, and qualified result in Step 3 of the form; record the test number, date of the test, name of the BAT, location, and quantified test result in a log book. The employee will initial the log book entry.

- If the EBT provides a printed result, but does not print the results directly onto the form, the BAT will show the employee the result displayed on the EBT. The BAT will then affix the test result printout to the breath alcohol test form in the designated space, using a method that will provide clear evidence of removal (e.g., tamper evident tape).

- If the EBT prints the test results directly onto the form, the BAT will show the employee the result displayed on the EBT.

- In any case in which the result of the screening test is a breath alcohol concentration of less than 0.02, the BAT will date the form and sign the certification in Step 3 of the form. The employee will sign the certification and fill in the date in Step 4 of the form.

- If the employee does not sign the certification in Step 4 of the form or does not initial the log book entry for a test, it will not be considered a refusal to be tested. In this event, the BAT will note the failure to sign or initial in the "Remarks" section of the form.

- If a test result printed by the EBT does not match the displayed result, the BAT will note the disparity in the remarks section. Both the employee and the BAT will initial or sign the notation. The test is then invalid and the company and the employee will be so advised.

No further testing is authorized. The BAT will transmit the result of less than 0.02 to the company in a confidential manner and the company will receive and store the information so as to ensure that confidentiality is maintained as required.

Confirmation Tests

If the result of the screening test is an alcohol concentration of 0.02 or greater, a confirmation test will be performed. If the confirmation test will be conducted by a different BAT, the BAT who conducts the screening test will complete and sign the form and log book entry. The BAT will provide the employee with copy 2 of the form.

The BAT will conduct an "air blank" to ensure that the device is working correctly. The air blank result must be 0.00. If the reading is greater than 0.00, the BAT will conduct one more air blank. If the reading is greater than 0.00, testing will not proceed using that instrument. However, testing may proceed on another instrument.

The BAT will instruct the employee not to eat drink, put any object or substance in his or her mouth, and, to the extent possible, not belch during a waiting period before the confirmation test. This time period begins with the completion of the screening test, and will not be less than 15 minutes. The BAT will explain to the employee the reason for this requirement (i.e., to prevent any accumulation of mouth alcohol leading to an artificially high reading) and the fact that it is for the employee's benefit. The BAT will also explain that the test will be conducted at the end of the waiting period, even if the employee has disregarded the instruction. If the BAT becomes aware that the employee has not complied with this instruction, the BAT will so note in the "Remarks" section of the form.

If a BAT other than the one who conducted the screening test is conducting the confirmation test, the new BAT will initiate a new Breath Alcohol Testing Form. The BAT will complete Step 1 on the form. The employee will then complete Step 2 on the form, reading and signing the certification. Refusal by the employee to sign this certification will be regarded as a refusal to take the test. The BAT will note in the "Remarks" section of the form that a different BAT conducted the screening test.

A breath alcohol test is invalid under the following circumstances:

The EBT does not pass its next external calibration check (invalidates all test results of 0.02 or greater on tests conducted since the last valid external calibration test; does not invalidate negative tests).

The breath alcohol technician does not observe the minimum 15-minute waiting period prior to the confirmation test.

The breath alcohol technician does not perform an air blank of the EBT before a confirmation test, or such an air blank does not result in a reading of 0.00.

The breath alcohol technician does not sign the form.

The breath alcohol technician fails to note in the remarks section of the form that the employee has failed or refused to sign the form after the test has been conducted.

An EBT fails to print a confirmation test result.

The sequential test number or alcohol concentration displayed on the EBT is not the same as the sequential test number or alcohol concentration on the printed result.

- Employee records pertaining to alcohol testing will be maintained in a secure location with controlled access.

- These records will be promptly released to the employee, or a person identified by the employee (including subsequent employers), upon written request of the employee. This release of information will not be contingent upon payment for records other than those specifically requested.

- These records will be released to the Secretary of Transportation upon request of DOT or FAA.

- These records will be released to the National Transportation Safety Board when requested as part of an accident investigation.

- These records will be released to the employee or a decision maker in a lawsuit, grievance, or other proceeding initiated by or on behalf of the individual and arising out of a determination that the employee engaged in prohibited conduct.

7. CONSEQUENCES FOR VIOLATING THE RULES OF THE AMPP:

Removal From Safety-Sensitive Functions

- Covered employees are prohibited from performing safety-sensitive functions if they have engaged in prohibited conduct under the FAA rule or another DOT agency's alcohol misuse rule (including refusal to submit to random, reasonable suspicion, post-accident, or follow-up testing).

Permanent Prohibition on Service

- If a covered employee is determined to have violated the on-duty use of alcohol prohibition, he or she is permanently precluded from performing the safety-sensitive duties he or she performed before such a violation.

- If a covered employee is determined to have violated the prohibited alcohol-related conduct provisions, other than on-duty use, two times after the employee becomes subject to the prohibitions, he or she is permanently precluded from performing the safety-sensitive duties he or she performed before such a violation.

- The bar on two-time violators will apply both to persons who go through rehabilitation and to those who, after evaluation by a SAP, are determined not to need treatment.

Notice to the Federal Air Surgeon

- Any covered employee who holds an airman medical certificate issued under 14 CFR Part 67 and violates the provisions of the rule will be reported to the Federal Air Surgeon.

- No covered employee who holds a Part 67 airman medical certificate will perform a safety-sensitive function after a violation unless and until, in addition to other required return to duty steps, the Federal Air Surgeon has recommended that the employee be permitted to perform such duties.

Notice of Refusals

Any covered employee who holds an airman certificate issued under 14 CFR Part 61, Part 63, or Part 65 and refuses to submit to required random, post-accident, reasonable suspicion, or follow-up alcohol testing will be reported to the FAA.

Required Evaluations an Testing.

- No covered employee who has violated the rules on alcohol misuse or refusal to submit to testing can perform any safety-sensitive function unless and until that employee has:

1. Been evaluated by a SAP to determine whether the employee is in need of assistance in resolving problems related to alcohol use.

2. Completed any treatment recommended by the SAP;

3. Been evaluated by an SAP to ensure that the employee has properly followed the treatment program; and

4. Undergone required return to duty testing.

(Note: Federal Air Surgeon action may also be required for certain employees.)

- A SAP is a:
  a. licensed physician (medical doctor or doctor of osteopathy)
  b. licensed or certified psychologist
  c. licensed or certified social worker
  d. licensed or certified employee assistance professional
  e. drug and alcohol counselor certified by the National Association of Alcoholism and drug abuse Counselors Certification Commission (NAADAC) or by the International Certification Reciprocity Consortium/Alcohol and other Drug Abuse (ICRC)

  49 CFR Part 40, Subpart O is attached for further reference:

8. CONSEQUENCES FOR HAVING AN ALCOHOL CONCENTRATION OF 0.02 OR GREATER BUT LESS THAN 0.04

- If a covered employee is found to have an alcohol concentration of 0.02 or greater but less than 0.04, that employee will be immediately removed from performing safety-sensitive functions, until the employee is retested with a result below 0.02, or until the start of the employee's next regularly scheduled duty period, if it occurs at least 8 hours following administration of the test.

9. INTERVENING WHEN AN ALCOHOL PROBLEM IS SUSPECTED, INCLUDING CONFRONTATION, REFERRAL PROGRAM, AND/OR REFERRAL TO MANAGEMENT:

Why You Should Get Involved:

- Although the company has no history of substance abuse problems, we recognize that alcoholism and alcohol misuse are problems throughout America.

- There are three good reasons why you should be concerned if any of your coworkers is using drugs or alcohol on the job:

1. Your health and safety may be at risk

2. Alcohol misuse costs you money.

3. Alcohol creates a negative work environment.

- The U.S. Department of Labor has determined that drug and alcohol use on the job cost society an estimated $102 billion a year. Since most of this cost is passed on to you in the form of higher health insurance rates or in the prices you pay for things, drug and alcohol use on the job costs you and your fellow workers.

- The U.S. Department of Labor has also determined that absenteeism among problem drinkers or alcoholics is 3.8 to 8.3 times greater than normal. If your fellow workers don't come to work, you may have to do their jobs in addition to your own.

- Workers who misuse alcohol don't function at their full potential. Not only is absenteeism a problem, when they are at work these employees may have reduced capabilities and productivity. since our product is the safe transportation of the public, alcohol misuse is an especially serious issue.

- No matter what your position is in the organization, there is something you can do to ensure that drug and alcohol use on the job never becomes a problem at the company. Acceptance of any misuse puts you, this company, and the public at risk.

10. EFFECTS OF ALCOHOL MISUSE ON AN INDIVIDUAL'S HEALTH, WORK, AND PERSONAL LIFE:

- Alcohol is a central nervous system depressant. Taken in large quantities it causes not only the euphoria associated with "being drunk" but also adversely affects your judgment, your ability to think, and your motor functions. Drink enough alcohol fast enough and it can kill you.

- Long term overuse of alcohol can cause liver damage, heart problems, sexual dysfunction, and other serious medical problems.

- In some cases, alcohol use can lead to physical and psychological dependence on alcohol. Alcoholism is a serious chronic disease, left untreated it will inevitably get worse.

- Workers who use alcohol (and other drugs) affect everyone. Studies show that compared to alcohol and drug-free workers, substance abusers are far less productive, miss more workdays, are more likely to injure themselves or someone else, and file more workers' compensation claims.

- The measurable dollar costs of workplace substance abuse from absenteeism, overtime pay, tardiness, sick leave, insurance claims, and workers' compensation can be substantial. However, the hidden costs resulting from diverted supervisory and managerial time, friction among workers, damage to equipment, and damage to the company's public image mean that workplace substance abuse can further cut profits and competitiveness.

- Alcohol can also destroy relationships, lead to serious problems with the law (e.g., drunk driving), and even cause harm to the people you love.

- If drinking affects your work life, it could lead to job loss and all of the financial problems that would follow.

11. SIGNS AND SYMPTOMS OF ALCOHOL MISUSE

Any one or more of the following signs may indicate a drinking problem:

- Family or social problems caused by drinking.

- Job or financial difficulties related to drinking.

- Loss of a consistent ability to control drinking.

- "Blackouts" or the inability to remember what happened while drinking.

- Distressing physical and/or psychological reactions if you try to stop drinking.
- A need to drink increasing amounts of alcohol to get the desired effect.
- Marked changes in behavior or personality when drinking.
- Getting drunk frequently.
- Injuring yourself--or someone else--while intoxicated.
- Breaking the law while intoxicated.
- Starting the day with a drink.

12. AVAILABLE METHODS OF EVALUATING AND RESOLVING PROBLEMS ASSOCIATED WITH THE MISUSE OF ALCOHOL

Outpatient programs exist in a variety of settings:

1. Community mental health centers.

2. Family service agencies.

3. Private physicians' and therapists' offices.

4. Occupational settings.

5. Specialized alcoholism treatment facilities.

- Inpatient services, designed for those with more serious alcohol problems, can be found in hospitals, residential care facilities, community halfway houses, and some alcoholism clinics.

- Your local phone directory will list helpful referral organizations such as:

1. Local council on alcoholism.

2. Alcoholics Anonymous.

3. Community alcoholism or mental health clinic.

4.Social services or human resources department.

5. County medical society.

The policy of this company as it relates to alcohol misuse by employees performing safety-sensitive functions is as follows: (These policies are not governed by DOT/FAA regulations, but are developed and enforced solely by the company.)

1. Any employee who registers an alcohol concentration of 0.04 on any test administered by or for the company or who engages in other alcohol misuse will be subject to all appropriate disciplinary procedures and may be required to be evaluated and treated as a condition to further employment.

2. Employees self referring for an alcohol problem prior to being selected for testing will not be terminated and may be sent to a substance abuse professional for evaluation at the company's expense.

3. Any employee who refuses a FAA-mandated alcohol test will be subject to all appropriate disciplinary procedures, including termination.

4. Any employee who registers an alcohol concentration of 0.02-0.039 on an FAA-mandated test will be sent home for the day in a unpaid status the first, time such a test result is obtained in addition to all appropriate disciplinary procedures and may be required to be evaluated and treated as a condition to further employment. Any employee who twice registers an alcohol concentration of 0.02-0.039 on FAA-mandated tests will be subject to termination or evaluation and treatment at the company's option. In extraordinary circumstances, this company may exercise the right to retest an employee rather than send the employee home.

5. Any employee who will be terminated, or who the company has directed, will be advised to obtain an evaluation from a SAP, to determine if the employee is in need of assistance. Depending on the circumstances, the company may pay for this evaluation and, if the company pays, it will receive the SAP report.

49 CFR Part 40
Subpart O - Substance Abuse Professionals and the Return-to-Duty Process
§40.281 Who is qualified to act as a SAP?

To be permitted to act as a SAP in the DOT drug testing program, you must meet each of the requirements of this section:

(a) Credentials. You must have one of the following credentials:

(1) You are a licensed physician ((Doctor of Medicine or Osteopathy);

(2) You are a licensed or certified social worker;

(3) You are a licensed or certified psychologist;

(4) You are a licensed or certified employee assistance professional; or

(5) You are a drug and alcohol counselor certified by the National Association of Alcoholism and Drug Abuse Counselors Certification Commission (NAADAC) or by the International Certification Reciprocity Consortium/Alcohol and Other Drug Abuse (ICRC)

(b) Basic knowledge. You must be knowledgeable in the following areas:

(1) You must be knowledgeable about and have clinical experience in the diagnosis and treatment of alcohol and controlled substances-related disorders.

(2) You must be knowledgeable about the SAP function as it relates to employer interests in safety-sensitive duties.

(3) You must be knowledgeable about this part, the DOT agency regulations applicable to the employers for whom you evaluate employees, and the DOT SAP Guidelines, and you keep current on any changes to these materials. These documents are available from ODAPC (Department of Transportation, 400 7th Street, S.W., Room 10403, Washington DC, 20590 (202-366-3784), or on the ODAPC web site (http://www.dot.gov/ost/dapc).

(c) Qualification training. You must receive qualification training meeting the requirements of this paragraph (c).

(1) Qualification training must provide instruction on the following subjects:

(i) Background, rationale, and coverage of the Department's drug and alcohol testing program;

(ii) 49 CFR Part 40 and DOT agency drug and alcohol testing rules;

(iii) Key DOT drug testing requirements, including collections, laboratory testing, MRO review, and problems in drug testing;

(iv) Key DOT alcohol testing requirements, including the testing process, the role of BATs and STTs, and problems in alcohol tests;

(v) SAP qualifications and prohibitions;

(vi) The role of the SAP in the return-to-duty process, including the initial employee evaluation, referrals for education and/or treatment, the follow-up evaluation, continuing treatment recommendations, and the follow-up testing plan;

(vii) SAP consultation and communication with employers, MROs, and treatment providers;

(viii) Reporting and recordkeeping requirements;

(ix) Issues that SAPs confront in carrying out their duties under the program.

(2) Following your completion of qualification training under paragraph (c)(1) of this section, you must satisfactorily complete an examination administered by a nationally-recognized professional or training organization. The examination must comprehensively cover all the elements of qualification training listed in paragraph (c)(1) of this section.

(3) The following is the schedule for qualification training you must meet:

(i) If you became a SAP before August 1, 2001, you must meet the qualification training requirement no later than December 31, 2003.

(ii) If you become a SAP between August 1, 2001, and December 31, 2003, you must meet the qualification training requirement no later than December 31, 2003

(iii) If you become a SAP on or after January 1, 2004, you must meet the qualification training requirement before you begin to perform SAP functions.

(d) Continuing education. During each three-year period from the date on which you satisfactorily complete the examination under paragraph (c)(2) of this section, you must complete continuing education consisting of at least 12 professional development hours (e.g., CEUs) relevant to performing SAP functions.

(1) This continuing education must include material concerning new technologies, interpretations, recent guidance, rule changes, and other information about developments in SAP practice, pertaining to the DOT program, since the time you met the qualification training requirements of this section.

(2) Your continuing education activities must include documentable assessment tools to assist you in determining whether you have adequately learned the material.

(e) Documentation. You must maintain documentation showing that you currently meet all requirements of this section. You must provide this documentation on request to DOT agency representatives and to employers and C/TPAs who are using or contemplating using your services.

§40.283 How does a certification organization obtain recognition for its members as SAPs?

(a) If you represent a certification organization that wants DOT to authorize its certified drug and alcohol counselors to be added to §40.281(a)(5) , you may submit a written petition to DOT requesting a review of your petition for inclusion.

(b) You must obtain the National Commission for Certifying Agencies (NCCA) accreditation before DOT will act on your petition.

(c) You must also meet the minimum requirements of Appendix E to this part before DOT will act on your petition.

§40.285 When is a SAP evaluation required?

(a) As an employee, when you have violated DOT drug and alcohol regulations, you cannot again perform any DOT safety-sensitive duties for any employer until and unless you complete the SAP evaluation, referral, and education/treatment process set forth in this subpart and in applicable DOT agency regulations. The first step in this process is a SAP evaluation.

(b) For purposes of this subpart, a verified positive DOT drug test result, a DOT alcohol test with a result indicating an alcohol concentration of 0.04 or greater, a refusal to test (including by adulterating or substituting a urine specimen) or any other violation of the prohibition on the use of alcohol or drugs under a DOT agency regulation constitutes a DOT drug and alcohol regulation violation.

§40.287 What information is an employer required to provide concerning SAP services to an employee who has a DOT drug and alcohol regulation violation?

As an employer, you must provide to each employee (including an applicant or new employee) who violates a DOT drug and alcohol regulation a listing of SAPs readily available to the employee and acceptable to you, with names, addresses, and telephone numbers. You cannot charge the employee any fee for compiling or providing this list. You may provide this list yourself or through a C/TPA or other service agent.

§40.289 Are employers required to provide SAP and treatment services to employees?

(a) As an employer, you are not required to provide a SAP evaluation or any subsequent recommended education or treatment for an employee who has violated a DOT drug and alcohol regulation.

(b) However, if you offer that employee an opportunity to return to a DOT safety-sensitive duty following a violation, you must, before the employee again performs that duty, ensure that the employee receives an evaluation by a SAP meeting the requirements of §40.281 and that the employee successfully complies with the SAP's evaluation recommendations.

(c) Payment for SAP evaluations and services is left for employers and employees to decide and may be governed by existing management-labor agreements and health care benefits.

§40.291 What is the role of the SAP in the evaluation, referral, and treatment process of an employee who has violated DOT agency drug and alcohol testing regulations?

(a) As a SAP, you are charged with:

(1) Making a face-to-face clinical assessment and evaluation to determine what assistance is needed by the employee to resolve problems associated with alcohol and/or drug use;

(2) Referring the employee to an appropriate education and/or treatment program;

(3) Conducting a face-to-face follow-up evaluation to determine if the employee has actively participated in the education and/or treatment program and has demonstrated successful compliance with the initial assessment and evaluation recommendations;

(4) Providing the DER with a follow-up drug and/or alcohol testing plan for the employee; and

(5) Providing the employee and employer with recommendations for continuing education and/or treatment.

(b) As a SAP, you are not an advocate for the employer or employee. Your function is to protect the public interest in safety by professionally evaluating the employee and recommending appropriate education/treatment, follow-up tests, and aftercare.

§40.293 What is the SAP's function in conducting the initial evaluation of an employee?

As a SAP, for every employee who comes to you following a DOT drug and alcohol regulation violation, you must accomplish the following:

(a) Provide a comprehensive face-to-face assessment and clinical evaluation.

(b) Recommend a course of education and/or treatment with which the employee must demonstrate successful compliance prior to returning to DOT safety-sensitive duty.

(1) You must make such a recommendation for every individual who has violated a DOT drug and alcohol regulation.

(2) You must make a recommendation for education and/or treatment that will, to the greatest extent possible, protect public safety in the event that the employee returns to the performance of safety-sensitive functions.

(c) Appropriate education may include, but is not limited to, self-help groups (e.g., Alcoholics Anonymous) and community lectures, where attendance can be independently verified, and bona fide drug and alcohol education courses.

(d) Appropriate treatment may include, but is not limited to, in-patient hospitalization, partial in-patient treatment, out-patient counseling programs, and aftercare.

(e) You must provide a written report directly to the DER highlighting your specific recommendations for assistance (see §40.311(c)).

(f) For purposes of your role in the evaluation process, you must assume that a verified positive test result has conclusively established that the employee committed a DOT drug and alcohol regulation violation. You must not take into consideration in any way, as a factor in determining what your recommendation will be, any of the following:

(1) A claim by the employee that the test was unjustified or inaccurate;

(2) Statements by the employee that attempt to mitigate the seriousness of a violation of a DOT drug or alcohol regulation (e.g., related to assertions of use of hemp oil, "medical marijuana" use, "contact positives," poppy seed ingestion, job stress); or

(3) Personal opinions you may have about the justification or rationale for drug and alcohol testing.

(g) In the course of gathering information for purposes of your evaluation in the case of a drug-related violation, you may consult with the MRO. As the MRO, you are required to cooperate with the SAP and provide available information the SAP requests. It is not necessary to obtain the consent of the employee to provide this information.

§40.295 May employees or employers seek a second SAP evaluation if they disagree with the first SAP's recommendations?

(a) As an employee with a DOT drug and alcohol regulation violation, when you have been evaluated by a SAP, you must not seek a second SAP's evaluation in order to obtain another recommendation.

(b) As an employer, you must not seek a second SAP's evaluation if the employee has already been evaluated by a qualified SAP. If the employee, contrary to paragraph (a) of this section, has obtained a second SAP evaluation, as an employer you may not rely on it for any purpose under this part.

§40.297 Does anyone have the authority to change a SAP's initial evaluation?

(a) Except as provided in paragraph (b) of this section, no one (e.g., an employer, employee, a managed-care provider, any service agent) may change in any way the SAP's evaluation or recommendations for assistance. For example, a third party is not permitted to make more or less stringent a SAP's recommendation by changing the SAP's evaluation or seeking another SAP's evaluation.

(b) The SAP who made the initial evaluation may modify his or her initial evaluation and recommendations based on new or additional information (e.g., from an education or treatment program).

§40.299 What is the SAP's role and what are the limits on a SAP's discretion in referring employees for education and treatment?

(a) As a SAP, upon your determination of the best recommendation for assistance, you will serve as a referral source to assist the employee's entry into a education and/or treatment program.

(b) To prevent the appearance of a conflict of interest, you must not refer an employee requiring assistance to your private practice or to a person or organization from which you receive payment or to a person or organization in which you have a financial interest. You are precluded from making referrals to entities with which you are financially associated.

(c) There are four exceptions to the prohibitions contained in paragraph (b) of this section. You may refer an employee to any of the following providers of assistance, regardless of your relationship with them:

(1) A public agency (e.g., treatment facility) operated by a state, county, or municipality;

(2) The employer or a person or organization under contract to the employer to provide alcohol or drug treatment and/or education services (e.g., the employer's contracted treatment provider);

(3) The sole source of therapeutically appropriate treatment under the employee's health insurance program (e.g., the single substance abuse in-patient treatment program made available by the employee's insurance coverage plan); or

(4) The sole source of therapeutically appropriate treatment reasonably available to the employee (e.g., the only treatment facility or education program reasonably located within the general commuting area).

§40.301 What is the SAP's function in the follow-up evaluation of an employee?

(a) As a SAP, after you have prescribed assistance under §40.293 , you must re-evaluate the employee to determine if the employee has successfully carried out your education and/or treatment recommendations.

(1) This is your way to gauge for the employer the employee's ability to demonstrate successful compliance with the education and/or treatment plan.

(2) Your evaluation may serve as one of the reasons the employer decides to return the employee to safety-sensitive duty.

(b) As the SAP making the follow-up evaluation determination, you must:

(1) Confer with or obtain appropriate documentation from the appropriate education and/or treatment program professionals where the employee was referred; and

(2) Conduct a face-to-face clinical interview with the employee to determine if the employee demonstrates successful compliance with your initial evaluation recommendations.

(c) (1) If the employee has demonstrated successful compliance, you must provide a written report directly to the DER highlighting your clinical determination that the employee has done so with your initial evaluation recommendation (see §40.311(d)).

(2) You may determine that an employee has successfully demonstrated compliance even though the employee has not yet completed the full regimen of education and/or treatment you recommended or needs additional assistance. For example, if the employee has successfully completed the 30-day in-patient program you prescribed, you may make a "successful compliance" determination even though you conclude that the employee has not yet completed the out-patient counseling you recommended or should continue in an aftercare program.

(d)(1) As the SAP, if you believe, as a result of the follow-up evaluation, that the employee has not demonstrated successful compliance with your recommendations, you

must provide written notice directly to the DER (see §40.311(e)). (2) As an employer who receives the SAP's written notice that the employee has not successfully complied with the SAP's recommendations, you must not return the employee to the performance of safety-sensitive duties.

(3) As the SAP, you may conduct additional follow-up evaluation(s) if the employer determines that doing so is consistent with the employee's progress as you have reported it and with the employer's policy and/or labor-management agreements.

(4) As the employer, following a SAP report that the employee has not demonstrated successful compliance, you may take personnel action consistent with your policy and/or labor-management agreements.

§40.303 What happens if the SAP believes the employee needs additional treatment, aftercare, or support group services even after the employee returns to safety-sensitive duties?

(a) As a SAP, if you believe that ongoing services (in addition to follow-up tests) are needed to assist an employee to maintain sobriety or abstinence from drug use after the employee resumes the performance of safety-sensitive duties, you must provide recommendations for these services in your follow-up evaluation report (see §40.311(d)(10)).

(b) As an employer receiving a recommendation for these services from a SAP, you may, as part of a return-to-duty agreement with the employee, require the employee to participate in the recommended services. You may monitor and document the employee's participation in the recommended services. You may also make use of SAP and employee assistance program (EAP) services in assisting and monitoring employees' compliance with SAP recommendations. Nothing in this section permits an employer to fail to carry out its obligations with respect to follow-up testing (see §40.309).

(c) As an employee, you are obligated to comply with the SAP's recommendations for these services. If you fail or refuse to do so, you may be subject to disciplinary action by your employer.

§40.305 How does the return-to-duty process conclude?

(a) As the employer, if you decide that you want to permit the employee to return to the performance of safety-sensitive functions, you must ensure that the employee takes a return-to-duty test. This test cannot occur until after the SAP has determined that the employee has successfully complied with prescribed education and/or treatment. The employee must have a negative drug test result and/or an alcohol test with an alcohol concentration of less than 0.02 before resuming performance of safety-sensitive duties.

(b) As an employer, you must not return an employee to safety-sensitive duties until the employee meets the conditions of paragraph (a) of this section. However, you are not required to return an employee to safety-sensitive duties because the employee has met these conditions. That is a personnel decision that you have the discretion to make, subject to collective bargaining agreements or other legal requirements.

(c) As a SAP or MRO, you must not make a "fitness for duty" determination as part of this re-evaluation unless required to do so under an applicable DOT agency regulation.

It is the employer, rather than you, who must decide whether to put the employee back to work in a safety-sensitive position.

§40.307 What is the SAP's function in prescribing the employee's follow-up tests?

(a) As a SAP, for each employee who has committed a DOT drug or alcohol regulation violation, and who seeks to resume the performance of safety-sensitive functions, you must establish a written follow-up testing plan. You do not establish this plan until after you determine that the employee has successfully complied with your recommendations for education and/or treatment.

(b) You must present a copy of this plan directly to the DER (see §40.311(d)(9)).

(c) You are the sole determiner of the number and frequency of follow-up tests and whether these tests will be for drugs, alcohol, or both, unless otherwise directed by the appropriate DOT agency regulation. For example, if the employee had a positive drug test, but your evaluation or the treatment program professionals determined that the employee had an alcohol problem as well, you should require that the employee have follow-up tests for both drugs and alcohol.

(d) However, you must, at a minimum, direct that the employee be subject to six unannounced follow-up tests in the first 12 months of safety-sensitive duty following the employee's return to safety-sensitive functions.

(1) You may require a greater number of follow-up tests during the first 12-month period of safety-sensitive duty (e.g., you may require one test a month during the 12-month period; you may require two tests per month during the first 6-month period and one test per month during the final 6- month period).

(2) You may also require follow-up tests during the 48 months of safety-sensitive duty following this first 12-month period.

(3) You are not to establish the actual dates for the follow-up tests you prescribe. The decision on specific dates to test is the employer's.

(4) As the employer, you must not impose additional testing requirements (e.g., under company authority) on the employee that go beyond the SAP's follow-up testing plan.

(e) The requirements of the SAP's follow-up testing plan "follow the employee" to subsequent employers or through breaks in service.

Example 1 to Paragraph (e): The employee returns to duty with Employer A. Two months afterward, after completing the first two of six follow-up tests required by the SAP's plan, the employee quits his job with Employer A and begins to work in a similar position for Employer B. The employee remains obligated to complete the four additional tests during the next 10 months of safety-sensitive duty, and Employer B is responsible for ensuring that the employee does so. Employer B learns of this obligation through the inquiry it makes under §40.25.

Example 2 to Paragraph (e): The employee returns to duty with Employer A. Three months later, after the employee completes the first two of six follow-up tests required by the SAP's plan, Employer A lays the employee off for economic or seasonal employment reasons. Four months later, Employer A recalls the

employee. Employer A must ensure that the employee completes the remaining four follow-up tests during the next nine months.

(f) As the SAP, you may modify the determinations you have made concerning follow-up tests. For example, even if you recommended follow-up testing beyond the first 12-months, you can terminate the testing requirement at any time after the first year of testing. You must not, however, modify the requirement that the employee take at least six follow-up tests within the first 12 months after returning to the performance of safety-sensitive functions.

§40.309 What are the employer's responsibilities with respect to the SAP's directions for follow-up tests?

(a) As the employer, you must carry out the SAP's follow-up testing requirements. You may not allow the employee to continue to perform safety-sensitive functions unless follow-up testing is conducted as directed by the SAP.

(b) You should schedule follow-up tests on dates of your own choosing, but you must ensure that the tests are unannounced with no discernable pattern as to their timing, and that the employee is given no advance notice.

(c) You cannot substitute any other tests (e.g., those carried out under the random testing program) conducted on the employee for this follow-up testing requirement.

(d) You cannot count a follow-up test that has been cancelled as a completed test. A cancelled follow-up test must be recollected.

§40.311 What are the requirements concerning SAP reports?

(a) As the SAP conducting the required evaluations, you must send the written reports required by this section in writing directly to the DER and not to a third party or entity for forwarding to the DER (except as provided in §40.355(e)). You may, however, forward the document simultaneously to the DER and to a C/TPA.

(b) As an employer, you must ensure that you receive SAP written reports directly from the SAP performing the evaluation and that no third party or entity changed the SAP's report in any way.

(c) The SAP's written report, following an initial evaluation that determines what level of assistance is needed to address the employee's drug and/or alcohol problems, must be on the SAP's own letterhead (and not the letterhead of another service agent) signed and dated by the SAP, and must contain the following delineated items:

(1) Employee's name and SSN;

(2) Employer's name and address;

(3) Reason for the assessment (specific violation of DOT regulations and violation date);

(4) Date(s) of the assessment;

(5) SAP's education and/or treatment recommendation; and

(6) SAP's telephone number.

(d) The SAP's written report concerning a follow-up evaluation that determines the employee has demonstrated successful compliance must be on the SAP's own letterhead (and not the letterhead of another service agent), signed by the SAP and dated, and must contain the following items:

(1) Employee's name and SSN;

(2) Employer's name and address;

(3) Reason for the initial assessment (specific violation of DOT regulations and violation date);

(4) Date(s) of the initial assessment and synopsis of the treatment plan;

(5) Name of practice(s) or service(s) providing the recommended education and/or treatment;

(6) Inclusive dates of employee's program participation;

(7) Clinical characterization of employee's program participation;

(8) SAP's clinical determination as to whether the employee has demonstrated successful compliance;

(9) Follow-up testing plan;

(10) Employee's continuing care needs with specific treatment, aftercare, and/or support group services recommendations; and

(11) SAP's telephone number.

(e) The SAP's written report concerning a follow-up evaluation that determines the employee has not demonstrated successful compliance must be on the SAP's own letterhead (and not the letterhead of another service agent), signed by the SAP and dated, and must contain the following items:

(1) Employee's name and SSN;

(2) Employer's name and address;

(3) Reason for the initial assessment (specific DOT violation and date);

(4) Date(s) of initial assessment and synopsis of treatment plan;

(5) Name of practice(s) or service(s) providing the recommended education and/or treatment;

(6) Inclusive dates of employee's program participation;

(7) Clinical characterization of employee's program participation;

(8) Date(s) of the first follow-up evaluation;

(9) Date(s) of any further follow-up evaluation the SAP has scheduled;

(10) SAP's clinical reasons for determining that the employee has not demonstrated successful compliance; and

(11) SAP's telephone number.

(f) As a SAP, you must also provide these written reports directly to the employee if the employee has no current employer and to the gaining DOT regulated employer in the event the employee obtains another transportation industry safety-sensitive position.

(g) As a SAP, you are to maintain copies of your reports to employers for 5 years, and your employee clinical records in accordance with Federal, state, and local laws regarding record maintenance, confidentiality, and release of information. You must make these records available, on request, to DOT agency representatives (e.g., inspectors conducting an audit or safety investigation) and representatives of the NTSB in an accident investigation.

(h) As an employer, you must maintain your reports from SAPs for 5 years from the date you received them.

§40.313 Where is other information on SAP functions and the return-to-duty process found in this regulation?

You can find other information on the role and functions of SAPs in the following sections of this part:

§40.3 – definition.

§40.347 - service agent assistance with SAP-required follow-up testing.

§40.355 - transmission of SAP reports.

§40.329(c) – making SAP reports available to employees on request.

Appendix E to Part 40 - SAP Equivalency Requirements for Certification Organizations.

THIS PAGE INTENTIONALLY LEFT BLANK

DOCUMENT CUSTODY FORM
OP-1

I agree to comply with the following:

1. I am responsible for keeping this Manual number _____ in usable and current condition, inserting revisions when received and recording revision dates and insertion instructions on the Revision Control Page.

2. I will immediately return this manual to Martinaire if I resign my position, am terminated, or take an extended leave of absence.

_____ _____
(Date) (Signature)

_____ _____
Position Typed or Printed Name

REVISION NOTICE

OP-2

Revision Number 39, dated 04-20-2022, becomes effective _____, issued to _____ for GOM Number _____.

The person indicated above will complete the revision by removing the outdated pages and inserting the new/revised pages according to the instructions listed below. He will sign and date the revision record sheet.

Place the upper portion of this form in the manual behind the revision record sheet and return the lower portion to the Chief Pilot.

Remove:	**Insert:**
Exterior Cover (Purple), Interior Cover/Preface	Exterior Cover (Blue) Interior Cover/Preface
Revision Pages xiii-xvi, xix	Revision Pages xiii-xvi, xix
Section A: A-1/A-2, A-9/A-10	Add Revision Pages xiia/xiib
Section P: Appendix G	Section A: A-1/A-2, A-9/A-10
Section U: U1/U2, U8/U9	Section P: Appendix G
	Section U: U1/U2, U8/U9 Add U14/U15
Ops Spec A004-1 to A004-7 A007-1 to A007-2 B050-1 to B050-2	Ops Spec A004-1 to A004-7 A007-1 to A007-2 B050-1 to B050-2

I hereby certify that I have received, read, and fully understand the contents of the General Operations Manual Revision 39. I further certify that I have revised the operations manual in my possession as per the revision instructions.

_____ _____ _____

Name Signature Date

MARTINAIRE FORM 01 C-2088
(sample copy of MRA Form 01 follows this page)

Martinaire Form 01 is used to perform the required weight and balance computations as required by Federal Aviation Regulations on all Martinaire aircraft in revenue operations.

1. This form will be completed as indicated in Section B of this GOM for the aircraft you are flying.

2. Weight and Balance will be certified by the PIC.

3. Form 01 will serve as the aircraft load manifest.

4. Form 01 will be sent to Flight Operations via US Mail once a week where it will be retained for thirty (30) days.

Martinaire

WEIGHT AND BALANCE - MRA FORM 01

GENERAL INFO

ROUTE: _____ N#: _____ PIC DUTY FROM: _____ TO: _____ DATE: _____

C-208B ONLY

WEIGHT AND BALANCE

LEG/CITY	1	2	3	4	5	6	ARM	1	2	3	4	5	6
EMPTY WT.													
CREW							135.5						
FUEL (2224)							206.4						
ZONE 1 (415)							172.0						
ZONE 2 (860)							217.8						
ZONE 3 (495)							264.4						
ZONE 4 (340)							294.5						
ZONE 5 (315)							319.5						
ZONE 6 (245)							344.0						
POD A (230)							132.4						
POD B (310)							182.1						
POD C (270)							233.4						
POD D (280)							287.6						
TOTALS													
C.G.							MAX. FWD						
MAX T.O. WT.							MAX. AFT						
CAPT. INITIALS							C.G. FROM 179.6		C.G. TO 204.35		MAX RAMP WT. 8785		

Pilot Notes:

This form must be sent to the chief pilot weekly

Martinaire / UPS Flight Crew Procedures and Responsibilities For Loading and Unloading Aircraft

Pilot Name:	Date:	Route:

These procedures are taken directly from the UPS Small Feeder Aircraft Operations Manual. It is the Pilot's responsibility to ensure they are followed. If for any reason they are not, ALL operations should be STOPPED and dispatch notified immediately! When performing ramp operations for UPS, specific guidelines are to be followed by UPS personnel to ensure the safety of flight crews and aircraft.

The movement of any vehicle inside the perimeter of the aircraft, with the pilot present, is the responsibility of the Pilot. Failure of Martinaire Pilots to follow the procedures listed below will result in disciplinary action. These procedures were established for the safety of the Martinaire Pilot, UPS Personnel, and the equipment we all use in our daily operations.

Checklist Directions: This Checklist is to be completed for each MRA/UPS loading event. For each leg, complete the checklist below by initialing the appropriate "Leg" box for each item. Checklists are to be returned to Martinaire Dispatch with your MRA Form 01.

Specific Pilot Duties: Confirm aircraft is properly set up for the operation by ensuring the following:	**Leg City**	1	2	3	4	5	6
Pilot is have the aircraft pre-flighted and serviced and is to be present at the aircraft 30 minutes prior to departure for loading.							
Check Aircraft is properly chocked.							
Check Aircraft tail stand is attached.							
Check that cargo doors and pod doors are opened.							
When truck arrives, check that the truck stops outside the perimeter of the aircraft wing and tail (at least 15 feet from aircraft). Pylons/cones are to always be used and properly placed by UPS personnel to establish a safety zone around the aircraft and loading door area. **Three feet from the closest point of aircraft.** IF PYLONS/CONES ARE NOT AVAILABLE, THE TRUCK IS NOT TO ENTER THE PERIMETER OF THE AIRCRAFT WING AND TAIL. THE DRIVER WILL HAVE TO HAND-CARRY THE CARGO TO THE AIRCRAFT FOR LOADING. THERE ARE NO EXCEPTIONS TO THIS RULE.							
If used, check that the belt loader is no closer than 2 inches from the aircraft. No part of the belt loader can break the plain of the aircraft door.							
Specific Pilot Duties: Guiding driver into safety zone							
Never stand between the aircraft and vehicle when guiding the driver.							
Check and ensure driver understands your guide signals.							
Driver will sound horn twice prior to backing.							
Check and ensure driver does not back closer than 3 feet from any part of the aircraft. AT NO TIME IS ANY VEHICLE TO BE CLOSER THAN THREE FEET TO THE AIRCRAFT. VEHICLES MUST REMAIN OUTSIDE OF THE SAFETY ZONE. THE PILOT HAS THE ULTIMATE RESPONSIBILITY FOR MARSHALLING THE TRUCK IN THE VICINITY OF THE AIRCRAFT.							
Check that Driver chocks left hand vehicle tire.							
Specific Pilot Duties: Exiting the safety zone							
Guide the driver out of the safety zone.							
Driver will sound horn once prior to forward movement.							
If used, guide belt loader operator out of safety zone.							
UPS personnel will remove pylons.							
All packages were unloaded at correct stops and aircraft was searched for left over freight after unloading at final destination together with UPS driver. Write UPS driver's name in box →							

These procedures are taken directly from the UPS Small Feeder Aircraft Operations Manual. It is your responsibility to ensure they are followed. If for any reason they are not, ALL operations should be STOPPED and dispatch notified immediately!

MRA Form 01A (rev 01-6-17-2010)

AIRCRAFT FLIGHT LOGBOOK (AFL)

Each Martinaire aircraft will have its own Aircraft Flight Logbook (AFL). This log contains flight information that must be recorded by the pilot for each Martinaire flight that is dispatched for operation. The AFL contains blocks for recording such things as OUT, OFF, ON, IN, times, customer delay codes, beginning and ending hobbs times, aircraft trend monitoring information and fuel uplift and invoicing information. EXTRA care must be taken to ensure that the correct information is inserted into each AND every block of the AFL.

The AFL also is where aircraft discrepancies will be written up and kept track of and where they will be signed off by the appropriate maintenance personnel once they have been corrected in accordance with Federal Aviation Regulations.

The following is a short explanation of each block of the AFL:

The following procedures must be used to complete the Aircraft Flight Log (AFL) (Form MRA-01)

1. Enter Registration Number of Aircraft.
2. Enter date.
3. Enter flight/route number.
4. Enter ID# of pilot in command (PIC).
5. If applicable, enter ID# of second in command (SIC).
6. If applicable, enter name of customer and flight number for Hot Charter enter name of Customer only.
7. Enter city or code of city of departure.
8. Enter city or code of city of arrival.
9. Enter schedule departure time. (Use CENTRAL Time). This is needed to determine delay codes and times.
10. Enter time aircraft departs gate (chocks), which is the beginning of pilot flight time. (Use ZULU Time).
11. Enter time when aircraft departs runway. This begins Flight Time. (Use CENTRAL Time).
12. Enter time aircraft touches down at destination. This ends Flight Time. (Use CENTRAL Time).
13. Enter time aircraft arrives at gate (chocks), which is the end of pilot flight time. (Use CENTRAL Time).
14. Enter schedule arrival time. (Use CENTRAL Time). This is needed to determine delay codes and times.
15. Enter total weight of all cargo. (Customer manifests weight or actual scale weighing.)
16. Enter estimated percent of volume in both cabin and pods, if applicable
17. See note. This section is for pilot training operations.
18. Enter applicable delay code and minutes. As derived from the difference between scheduled departure and actual departure times
19. Enter applicable delay code and minutes. As derived from the difference between scheduled arrival and actual arrival times.
20. Enter ending hobbs time (if hobbs meter is installed) otherwise leave blank.
21. Enter starting hobbs time (if hobbs meter is installed) otherwise leave blank.
22. In an aircraft equipped with a an operable hobbs meter, enter time flown by subtracting

AFL explanatory remarks continued:

starting hobbs from ending hobbs, otherwise leave blank.

23. If equipped with hobbs meter enter time flown from item 22. If aircraft is not equipped with operable hobbs meter then determine the flight time by the difference between boxes 11 and 12 which is the difference between OFF and ON time – convert this to a decimal time value and enter into box 23.
24. Enter the total from item 25 from the previous flight log.
25. Add aircraft total time for all legs, (converted to a decimal value if the aircraft does not have a hobbs meter). This total is what will be forwarded to the next log page and entered into box 24 ON THE NEXT LOG PAGE.
26. Enter number of landings. (Usually one landing per cycle).
27. Enter total landing from previous flight log.
28. Enter total number of landings for all legs.
29. Enter flight number. C/W means Complied With
30. Enter flight number. C/W means Complied With
31. Enter employee ID number.
32. Enter employee ID number.
33. Enter airport identifier where preflight was done. C/W means Complied With.
34. Enter airport identifier where post flight was done. C/W means Complied With.
35. Enter left engine oil level, (e.g. -1 cold, -1 hot) if oil is added make a log book entry below and sign off.
36. Enter left engine oil level, (e.g. -1 cold, -1 hot) if oil is added make a log book entry below and sign off.
37. Enter right engine oil level, (e.g. -1 cold, -1 hot) if oil is added make a log book entry below and sign off. (Leave blank for single engine aircraft.)
38. Enter right engine oil level, (e.g. -1 cold, -1 hot) if oil is added make a log book entry below and sign off. (Leave blank for single engine aircraft.)
39. Enter fuel off in (pounds).
40. Enter fuel on in (pounds).
41. Enter total fuel burned in (pounds).
42. Enter fuel up-lift in (gallons).
43. Enter invoice number for fuel lifted.
44. Enter outside air temperature (Celsius).
45. Enter altitude (altimeter to 29.92).
46. Enter airspeed (IAS).
47. Enter actual torque reading (Tq).
48. Enter actual propeller speed (Np).
49. Enter actual engine temperature (T5/ITT).
50. Enter actual engine speed (Ng).
51. Enter actual fuel flow in pounds (Wf).
52. Leave blank for single engine aircraft (if multi engine, do the same as item 47).
53. Leave blank for single engine aircraft (if multi engine, do the same as item 48).
54. Leave blank for single engine aircraft (if multi engine, do the same as item 49).
55. Leave blank for single engine aircraft (if multi engine, do the same as item 50).
56. Leave blank for single engine aircraft (if multi engine, do the same as item 51).
57. Enter the number of discrepancy.
58. Enter the flight number.

AFL explanatory remarks continued:

59. Enter the airport identifier.
60. Enter discrepancy noted by flight or ground personnel.
61. Enter the part number of the item removed of any.
62. Enter the serial number of that part if it has one.
63. Enter the number of discrepancy which was corrected.
64. Enter the corrective action of each discrepancy corrected. Deferred is a form of corrective action and the deferred date is entered in this block for procedures specified in the G.O.M.
65. Enter the date corrective action is taken.
66. Enter the airport identifier.
67. Enter signature and certificate number of the person taking corrective action. (Technician or Certified Repair Facility). (In the case of deferred, the pilot signature who transfers discrepancy to the deferred discrepancy sheet (DDS)).
68. Enter the part number of the replacement part.
69. Enter the serial number of the replacement part.

NOTE: **This column will be used during flight training. The training pilot will record all touch and go by entering the letter G followed by the number of landings. Also the training pilot will record each deployment of the flaps by entering the letter F followed by the number of time the flaps were cycled.**

DO NOT REMOVE THE YELLOW COPY FROM THE AFL LOG.

SEND IN THE WHITE AND BLUE COPIES OF EACH AFL FOR EACH FLIGHT WITH YOUR PAPERWORK TO FLIGHT OPERATIONS WEEKLY VIA U.S. MAIL

MARTINAIRE AIRCRAFT FLIGHT LOGBOOK

N 1 Date 2 LOGPAGE #

SCHEDULE AND PERFORMANCE

FLIGHT #	EMPLOYEE NUMBER			LEG			DEPARTURE TIMES			ARRIVAL TIMES			FREIGHT		A	DELAYS OF SCHEDULE	
	CAPT ID #	F/O ID #	JUMP SEAT		FROM	TO	SCHED	OUT	OFF	ON	IN	SCHED	WT	% BULK		CD-MIN	CD-MIN
3	4	5	6	1	7	8	9	10	11	12	13	14	15	16	17	18	19
				2												-	-
				3												-	-
				4												-	-
				5												-	-
				6												-	-

ENDING HOBBS	20	FLT HRS	23	LDGS	26	ITEM	FLT #	ID #	STA	#1 OIL ADD	#2 OIL ADD
STARTING HOBBS	21	HRS FWD	24	LDGS FWD	27	PRE FLT C/W	29	31	33	35	37
TOTAL HRS	22	TOTAL	25	TTL LDGS	28	POST FLT C/W	30	32	34	36	38

LEG	1	2	3	4	5	6	ENGINE TREND MONITORING		LEFT	RIGHT
FUEL OFF	39						OAT(C) 44	TORQ	47	52
FUEL ON	40						ALT(PA) 45	Np	48	53
FUEL BURN	41						KIAS 46	T5/ITT	49	54
FUEL UPLIFT	42							Ng	50	55
INVOICE	43							Wf	51	56

#	FLT #	STA	DISCREPANCY	#	CORRECTIVE ACTION	DATE	STA	SIGNATURE
57	58	59	60	63	64	65	66	67
P/N OFF: 61			S/N OFF: 62		P/N ON: 68		S/N ON: 69	
P/N OFF:			S/N OFF:		P/N ON:		S/N ON:	
P/N OFF:			S/N OFF:		P/N ON:		S/N ON:	
P/N OFF:			S/N OFF:		P/N ON:		S/N ON:	

DELAY CODES

11)	Late Arrival of Primary Carrier Aircraft	* 16)	Loading Delay	* 25)	Slower Aircraft on Route	52)	Storm Avoidance
12)	Late Arrival of Primary Carrier Vehicle	* 21)	Line Service Delay	33)	ATC Delay	* 55)	Other Weather Delays
		* 23)	Late Maintenance	* 44)	Mechanical Malfunction	65)	Delay Due To Previous Leg
		* 24)	Crew Late Reporting	51)	Headwinds	* 66)	All Other Delays

* Requires Explanation to Dispatch

DISTRIBUTION: WHITE - MAINTENANCE BLUE - FLIGHT OPS YELLOW - AIRCRAFT RECORDS (DO NOT REMOVE)

Original: 03/2004

MRA Form 100
BEAR A BULL FORMS ™

DEFERRED DISCREPANCY SHEET (DDS)

The Deferred Discrepancy Sheet is attached to the Aircraft Flight Log (AFL) on the inside back cover for each Martinaire aircraft. This sheet shall be used to Defer any mechanical items that are allowed to be deferred in accordance with the Martinaire Minimum Equipment List for the applicable aircraft in operation.

The following procedures must be used to complete the DDS:

1. As deferred items are placed on the DDS, enter the numerical sequence as items are entered. (Note: Do Not use the Logpage number system from the AFL).

2. Enter the control number assigned by the company computer system and which is provided to the pilot or person entering deferred items from company maintenance personnel.

3. Enter the discrepancy as written on the AFL.

4. Enter the number of the discrepancy which is corrected and noted in block #1. (Note: The first number used in column 4 may not be the #1).

5. Enter the corrective action.

6. Enter the name of the certificated person or repair facility which provided corrective action.

7. Enter the date of the corrective action.

8. Enter the certificate number of the technician or repair facility which provided corrective action. (Repairman certificate numbers should not be used in lieu of the Certified Repair Station number).

Note to Pilots <u>Only</u>: Do not write anything in columns 4, 5, 6, 7, or 8. This area is for Certificated Repairmen and/or the Certified Repair Station.

Deferred Discrepancy Sheet

NO.	Control	Discrepancy	No.	Corrective Action	Signature	Date	Cert.# and Type
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

MARTINAIRE FORM 06

Martinaire Form 06 is a generated form from Martinaire Dispatch's CALM dispatch program and compiles the flight and duty time for each pilot on active duty with the company. A pilot may request this report at any time.

Pilot Flight Summary

From: June 1, 2009 To: June 30, 2009

Pilot: 606 DURAN, HANSEL **Date: 02/10/2022**

Date	Route	PIC SIC	LEG	Cities	Aircraft	Out	In	Hours
06/01/2009	694	PIC	1	SAV / CAE	9762B	18:55	19:52	1.0
06/01/2009	694	PIC	2	CAE / SAV	9762B	05:27	06:15	0.8
06/02/2009	694	PIC	1	SAV / CAE	9762B	19:00	19:49	0.8
06/02/2009	694	PIC	2	CAE / SAV	9762B	05:20	06:09	0.8
06/03/2009	694	PIC	1	SAV / CAE	9762B	19:14	20:07	0.9
06/03/2009	694	PIC	2	CAE / SAV	9762B	05:11	06:04	0.9
06/04/2009	694	PIC	1	SAV / CAE	9762B	18:52	19:53	1.0
06/04/2009	694	PIC	2	CAE / SAV	9762B	05:47	06:50	1.1
06/05/2009	694	PIC	1	SAV / CAE	9762B	19:47	20:35	0.8
06/05/2009	694	PIC	2	CAE / SAV	9762B	06:25	08:08	1.7
06/08/2009	694	PIC	1	SAV / CAE	9762B	19:15	20:07	0.9
06/08/2009	694	PIC	2	CAE / SAV	9762B	05:20	06:14	0.9
06/10/2009	1.0	PIC	1	SAV / CAE	9762B	16:12	17:10	1.0
06/11/2009	8109	PIC	1	CAE / ARW	9762B	07:00	07:45	0.8
06/11/2009	8109	PIC	2	ARW / CAE	9762B	08:08	09:07	1.0
06/13/2009	694	PIC	1	CAE / SAV	9762B	06:58	07:48	0.8
06/15/2009	694	PIC	1	SAV / CAE	9762B	18:53	19:45	0.9
06/15/2009	694	PIC	2	CAE / SAV	9762B	05:13	06:00	0.8
06/16/2009	694	PIC	1	SAV / CAE	9762B	19:40	20:42	1.0
06/16/2009	694	PIC	2	CAE / SAV	9762B	05:42	06:47	1.1
06/17/2009	694	PIC	1	SAV / CAE	9762B	19:09	20:05	0.9
06/18/2009	694.2	PIC	1	CAE / SAV	4625B	06:10	07:03	0.9
06/18/2009	694	PIC	1	SAV / CAE	4625B	19:30	20:35	1.1
06/18/2009	694	PIC	2	CAE / SAV	4625B	05:05	06:00	0.9
06/19/2009	694	PIC	1	SAV / CAE	4625B	20:05	21:00	0.9
06/19/2009	694	PIC	2	CAE / SAV	4625B	06:35	07:24	0.8
06/23/2009	694	PIC	1	SAV / CAE	4625B	18:52	19:47	0.9
06/23/2009	694	PIC	2	CAE / SAV	4625B	05:10	06:02	0.9
06/24/2009	694	PIC	1	SAV / CAE	4625B	19:00	19:56	0.9
06/24/2009	694	PIC	2	CAE / SAV	4625B	04:53	05:40	0.8
06/25/2009	694	PIC	1	SAV / CAE	4625B	19:13	20:15	1.0
06/25/2009	694	PIC	2	CAE / ARW	4625B	06:48	07:40	0.9
06/25/2009	694	PIC	3	ARW / SAV	4625B	07:58	08:27	0.5
06/29/2009	694	PIC	1	SAV / CAE	4625B	19:05	19:58	0.9
06/29/2009	694	PIC	2	CAE / SAV	4625B	05:12	06:04	0.9
06/30/2009	694	PIC	1	SAV / CAE	4625B	19:14	20:07	0.9
06/30/2009	694	PIC	2	CAE / SAV	4625B	05:18	06:10	0.9
						Total		**34.0**

MARTINAIRE FORM 8410

This form is used during annual and 6 month flight proficiency checks to record a satisfactory or unsatisfactory performance during the administration of these checks. This serves as the PIC's and company's record that the required flight check has been performed.

AIRMAN COMPETENCY/PROFICIENCY CHECK
FAR 135

NAME OF AIRMAN *(last, first, middle initial)*: SMITH, DANE	LOCATION: SLR, 2F7, GVT, ADS — DATE OF CHECK: 01/10/2022
PILOT CERT. INFORMATION — GRADE: ATP; NUMBER: 3499797	TYPE OF CHECK — FAR 135.293 [X] FAR 135.297 [X] FAR 135.299 [X]
EMPLOYED BY: MT9A828W Martinaire — BASED AT *(City, State)*: ADDISON, TX	MEDICAL INFORMATION — Date of Exam: 11/02/2021; Date of Birth: 07/05/1958; Class: II
NAME OF CHECK AIRMAN: ROYDON J. WELLS — SIG. OF CHECK AIRMAN: R Wells	TYPE OF AIRPLANE *(Make/Model)*: C208
	Simulator/Training Device *(Make/Model)*: n/a
	FLIGHT TIME: 1.5 hrs — TAIL NUMBER: N4591B

FLIGHT MANEUVERS GRADE *(S - Satisfactory U - Unsatisfactory)*

PILOT	Air-craft	Simu-lator	Trng. Dev.
PREFLIGHT			
1. Equipment Examination *(Oral or Written)*	S		
2. Preflight Inspection	S		
3. Taxiing	S		
4. Powerplant Checks	S		
TAKEOFFS			
5. Normal	S		
6. Instrument 1800 Feet RVR	S		
7. Crosswind	S		
8. With Simulated Powerplant Failure	S		
9. Rejected Takeoff	S		
IN-FLIGHT MANEUVERS			
10. Steep Turns	S		
11. Approaches to Stalls	S		
12. Unusual Attitudes	S		
13. Powerplant Failure	S		
LANDINGS			
14. Normal	S		
15. From and ILS	S		
16. Crosswind	S		
17. With Simulated Powerplant Failure	S		
18. Rejected Landing	S		
19. From Circling Approach	S		
EMERGENCIES			
20. Normal and Abnormal Procedures	S		
21. Emergency Procedures	S		
INSTRUMENT PROCEDURES			
22. Area Departure	S		
23. Holding	S		
24. Area Arrival	S		
25. ILS Approaches ILS 17Z GVT, ILS 33 ADS	S		
26. Other Instrument Approaches	S		
Approaches; NDB	S		
VOR VOR-A 2F7	S		
GPS RNAV 01 SLR	S		
Other *(Specify)*	S		
27. Circling Approaches	S		
28. Missed Approaches	S		
29. Comm./Nav. Procedures	S		
30. Use of Auto-Pilot	S		
GENERAL			
31. Judgement	S		
32. Crew Coordination	- -		

MARTINAIRE Aviation LLC
4553 GLENN CURTISS DRIVE
ADDISON, TX 75001

AIRMAN COMPETENCY INFORMATION

Demonstrated Current Knowledge FAR 135.293(a) Make/Model Expires (12 months)	DEC 2022
Demonstrated Current Knowledge FAR 135.293(b) Make/Model Expires (12 months)	DEC 2022
Satisfactorily Demonstrated Line Checks FAR 135.299 Expires (12 months)	DEC 2022
Satisfactorily Demonstrated IFR Proficiency FAR 135.297 Expires (6 months)	JUN 2022
Use of Autopilot (is) (is not) Authorized Expires (12 months)	DEC 2022

REMARKS ***LOWER THAN STANDARD MINIMUMS APPROVED***
Base Month for 135.293 = DEC 2015
Base Month for 135.297 = DEC 2015
Basis for this Check = RECURRENT

RESULT OF CHECK: [X] Approved [ ] Disapproved
CHECK AIRMAN'S PERFORMANCE *(FAA Only)*: [ ] Satisfactory [ ] Unsatisfactory

REGION	DISTRICT OFFICE	FAA INSPECTOR's SIGNATURE
SOUTHWEST	*NTX-FSDO / SW-19*	

ACCESS AIRMAN COMPETENCY.PDF 06/22/18

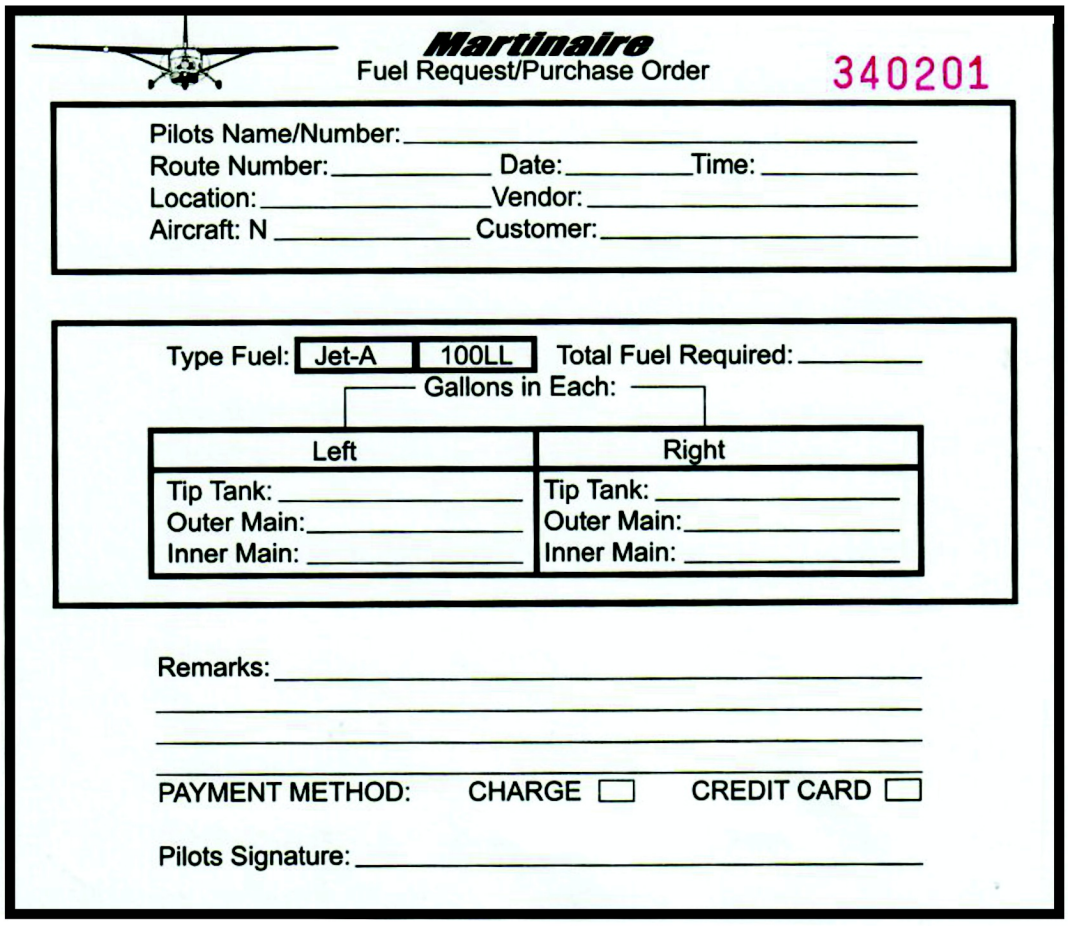
MARTINAIRE FUEL REQUISITION FORM

This form is used to place an order for fuel for Martinaire's aircraft ANY TIME FUEL IS NEEDED. This is a two part form.

A. The top portion or the white copy should be handed to the ground servicing personnel.

B. The blue copy should be retained and turned in with monthly paperwork to Martinaire's Flight Operations.

C. Ensure that all blanks are filled out including the amount of fuel, type and whether PRIST will be needed.



Martinaire
Fuel Request/Purchase Order 340201

Pilots Name/Number: _____
Route Number: _____ Date: _____ Time: _____
Location: _____ Vendor: _____
Aircraft: N _____ Customer: _____

Type Fuel: Jet-A | 100LL Total Fuel Required: _____

Gallons in Each:

Left	Right
Tip Tank: _____	Tip Tank: _____
Outer Main: _____	Outer Main: _____
Inner Main: _____	Inner Main: _____

Remarks: _____

PAYMENT METHOD: CHARGE ☐ CREDIT CARD ☐

Pilots Signature: _____

NOPC INFORMATION FORM

This form is used by Martinaire Dispatch to record information that the PIC, in compliance with 49 CFR 175.33, will give to Martinaire Dispatch so that a written record will be maintained and made readily available and accessible to the appropriate federal and/or local authorities, if requested, for all HAZMAT material carried aboard Martinaire aircraft.

Dangerous Goods / HAZMAT Notification of Pilot in Command **NOPC**

Martinaire	Date (1)	Flight No. (2)	Dest. Apt. (3)	A/C Tail # (4)	PIC EMPL # (5)

Proper Shipping Name (*do not abbreviate*): (6)

UN ID#: (7)

Hazard Class: (8) **Subsidiary Risk:** (8a)
(e.g. Oxygen is a 2.2 & 5.1. (5.1 is subsidiary))

Packing Group: (9)
(I, II, or III if applicable)

Quantity / Weight: (10)
(enter quantity)

qt. liters gallons g oz lbs kg (11)
(check applicable unit)

Emergency Contact # From Shipping Papers:
[***not required for dry ice or consumer commodity shipments. 49 CFR 172.604 (d)(2)***] (13)

☐ Passenger Aircraft (14) ☐ Cargo Aircraft
(check / mark applicable box)

Location On-Board Aircraft
CARGO ZONE (15) CARGO POD

1	2	3	4	5	6	■	A	B	C	D

(mark applicable location)

SP / CA Required: ☐ YES ☐ NO (12)
(check applicable box)

Special Permit #: (12a)

UPS Tracking #: (16)

Date:

Proper Shipping Name (*do not abbreviate*):

UN ID#:

Hazard Class: **Subsidiary Risk:**
(e.g. Oxygen is a 2.2 & 5.1. (5.1 is subsidiary))

Packing Group:
(I, II, or III if applicable)

Quantity / Weight:
(enter quantity)

qt. liters gallons g oz lbs kg
(check applicable unit)

Emergency Contact # From Shipping Papers:
[***not required for dry ice or consumer commodity shipments. 49 CFR 172.604 (d)(2)***]

☐ Passenger Aircraft ☐ Cargo Aircraft
(check / mark applicable box)

Location On-Board Aircraft
CARGO ZONE CARGO POD

1	2	3	4	5	6	■	A	B	C	D

(mark applicable location)

SP / CA Required: ☐ YES ☐ NO
(check applicable box)

Special Permit #:

UPS Tracking #:

Printed Name:

RAM TI & LOCATION (if applicable): (no more than 50 TI allowed on MRA aircraft) (17)	NOPC page _____ of _____ (enter number of NOPC forms used. 5 DG/HM packages require 3 NOPC forms) (18)
For information regarding this form, contact Martinaire Flight Operations at 972-349-5700.	Total # of DG/HM packages on board: _____ (if you have 5 DG/HM packages, enter '5' on each page) (19)
Damaged or Leaking Packages are not Permitted on Martinaire Aircraft.	Captain's or Dispatchers printed name: (20)

Auditor's Signature:

Martinaire Form MRA-HAZ02 Rev6. 08-28-20

NOPC INFORMATION FORM

The following is a short explanation of each data block of the Notice of Pilot In Command (NOPC) form. Procedures indicated must be used to complete the NOPC form. [Form MRA-HAZ02].

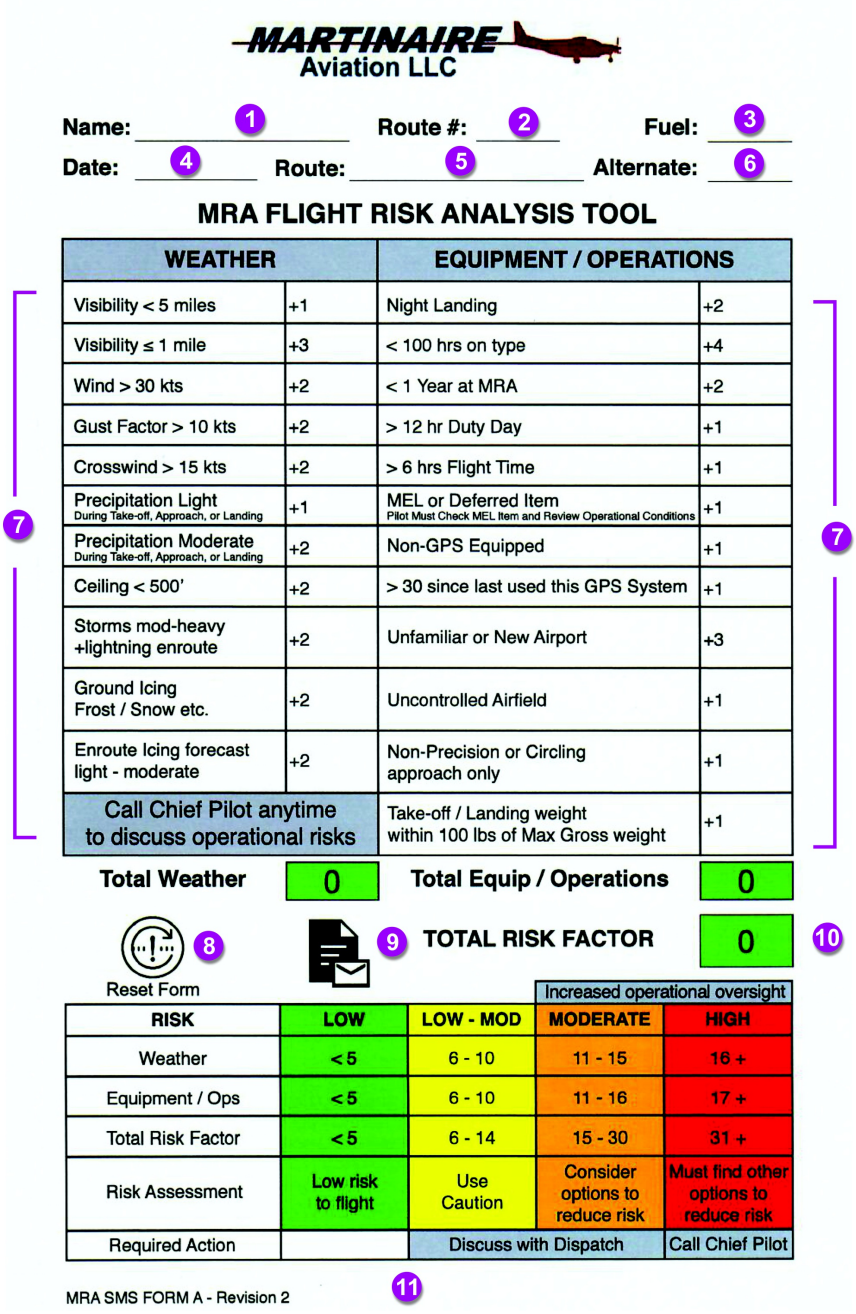
1. Enter date.
2. Enter Flight/Route Number.
3. Enter the Destination Airport for the Hazardous Material / Dangerous Good (HM/DG). If there is more than one (1) destination for HM/DG's carried, the destination may be placed in the border alongside the respective HM/DG.
4. Enter Aircraft Registration Number.
5. Enter Pilot-In-Command's Employee Number.
6. Enter Proper Shipping Name of HM/DG. *[DO NOT ABBREVIATE]*
7. Enter the UN Identification Number of the HM/DG.
8. Enter the Hazard Class of the HM/DG.
   8a. Enter the Subsidiary Risk of the HM/DG. *[e.g., Oxygen is a 2.2 and 5.1 (5.1 is the subsidiary)]*
9. Enter the Packing Group I, II, or III, if applicable. *[Not every HM/DG has a packing group]*
10. Enter the Quantity/Weight of the HM/DG.
11. Circle the applicable Quantity/Weight unit of measure.
12. Check the applicable box regarding 'Special Permits' (SP). *[Not every HM/DG has an SP. If a HM/DG's Shipping Papers are accompanied by an SP, check the appropriate box and record the SP number.]*

12a. Enter the Special Permit Number if applicable.

13. Enter the Emergency Contact Number if applicable. *[Not every HM/DG has an Emergency Contact Number. The Emergency Contact Number is not required for dry ice or consumer commodity shipments.]*
14. Check mode of transport. Passenger Aircraft or Cargo Aircraft as indicated on shipping papers.
15. Mark the location of the HM/DG on board the aircraft.
16. Record the UPS Tracking Number. *[All UPS Tracking numbers begin with '1Z'.]*
17. Record RAM Transportation Index (TI) and the location on board the aircraft if applicable.
18. Record number of NOPC pages utilized. *[e.g. 5 HM/DG packages require 3 NOPC forms (page 1 of 3, 2 of 3, and 3 of 3)]*
19. Record Total Number of HM/DG packages on board. *[If you have 5 HM/DG packages, enter 5]*
20. Print your name.

FLIGHT RISK ANALYSIS TOOL

The Flight Risk Analysis Tool (FRAT) is a pre-flight and enroute tool meant to analyze flight risk elements based upon existing weather conditions, aircraft equipment, and flight operation parameters. It assesses flight risk levels from nil or low risk to levels of high risk. Based upon the risk assessment, pilots realizing a moderate to high risk for a particular flight, shall contact Martinaire Dispatch, the Chief Pilot, and/or the Assistant Chief Pilot for a more detailed analysis of flight conditions and to formulate a plan-of-action to mitigate risk elements.



MARTINAIRE Aviation LLC

Name: (1) Route #: (2) Fuel: (3)

Date: (4) Route: (5) Alternate: (6)

MRA FLIGHT RISK ANALYSIS TOOL

WEATHER		EQUIPMENT / OPERATIONS	
Visibility < 5 miles	+1	Night Landing	+2
Visibility ≤ 1 mile	+3	< 100 hrs on type	+4
Wind > 30 kts	+2	< 1 Year at MRA	+2
Gust Factor > 10 kts	+2	> 12 hr Duty Day	+1
Crosswind > 15 kts	+2	> 6 hrs Flight Time	+1
Precipitation Light During Take-off, Approach, or Landing	+1	MEL or Deferred Item Pilot Must Check MEL Item and Review Operational Conditions	+1
Precipitation Moderate During Take-off, Approach, or Landing	+2	Non-GPS Equipped	+1
Ceiling < 500'	+2	> 30 since last used this GPS System	+1
Storms mod-heavy +lightning enroute	+2	Unfamiliar or New Airport	+3
Ground Icing Frost / Snow etc.	+2	Uncontrolled Airfield	+1
Enroute Icing forecast light - moderate	+2	Non-Precision or Circling approach only	+1
Call Chief Pilot anytime to discuss operational risks		Take-off / Landing weight within 100 lbs of Max Gross weight	+1

(7) (7)

Total Weather 0 **Total Equip / Operations** 0

(8) Reset Form (9) **TOTAL RISK FACTOR** 0 (10)

			Increased operational oversight	
RISK	**LOW**	**LOW - MOD**	**MODERATE**	**HIGH**
Weather	< 5	6 - 10	11 - 15	16 +
Equipment / Ops	< 5	6 - 10	11 - 16	17 +
Total Risk Factor	< 5	6 - 14	15 - 30	31 +
Risk Assessment	Low risk to flight	Use Caution	Consider options to reduce risk	Must find other options to reduce risk
Required Action		Discuss with Dispatch		Call Chief Pilot

MRA SMS FORM A - Revision 2 (11)

FRAT INFORMATION FORM

The following is a short explanation of each data block of the Flight Risk Analysis Tool (FRAT). Procedures indicated must be used to complete the FRAT form . MRA SMS Form A - Revision 2.

1. Enter name of Pilot-In-Command.
2. Enter Martinaire Route Number.
3. Enter Fuel On-Board.
4. Enter Date of the flight.
5. Enter Route of Flight.
6. Enter Alternate airport, if applicable.
7. Check existing parameters for Weather, Aircraft Equipment, and Operational Elements. *Each checked parameter will automatically **total** existing numerical values in the 'Total Weather' and 'Total Equip/Operations' columns.*
8. This is a 'Form Reset Control' button that will clear existing form entries.
9. This is an 'Email Send' button that will transmit the form to frat@martinaire.com.
10. This is a 'Total Risk Factor' box that will automatically sum the values of 'Total Weather' and 'Total Equip/Operations' values to create the Total Risk Factor.
11. This is the 'Required Action' table that recommends pilot actions with respect to the Total Risk Factor. Risk Factor values greater than 6 require the pilot to discuss specific flight risk concerns with Martinaire Dispatch, the Chief Pilot, and/or the Assistant Chief Pilot.