



**SUPPLEMENT S03**  
**TO THE AIRPLANE FLIGHT MANUAL DA 42**  
**ICE PROTECTION SYSTEM**

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## 0.1 RECORD OF REVISIONS

Rev. No.	Reason	Chapter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature
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## 1. GENERAL

### 1.1 INTRODUCTION

This Supplement to the Airplane Flight Manual contains all necessary information to operate the ice protection system of the DA 42 in known icing conditions.

The DA 42 can be equipped with an optional ice protection system in accordance with the Optional Design Change Advisory OÄM 42-054. It distributes a thin film of de-icing fluid on the wings, vertical stabilizer, horizontal stabilizer, propellers and canopy. This prevents the formation and accumulation of ice.

#### **NOTE**

The ice protection system is not a "de-icing" system in the usual sense. It can remove only small accumulations of ice. Its main purpose is to *prevent* the accretion of ice.

**WARNING**

Known icing conditions are defined by CS 25 / FAR Part 25, Appendix C. These conditions do not include, nor were tests conducted in, all icing conditions that may be encountered (e.g., freezing rain, freezing drizzle, mixed phase icing conditions or conditions defined as severe). Flight in these conditions must be avoided. Some icing conditions not defined in CS 25 / FAR part 25 have the potential of producing hazardous ice accumulations, which (1) exceed the capabilities of the airplane's ice protections equipment, and/or (2) create unacceptable airplane performance. Inadvertent operation in these conditions may be detected by heavy ice accumulation on the windshield, or when ice forms on the side areas of the canopy. Another indication are the rapid formation and shedding of bars of ice (6 mm or 1/4 inch thickness or larger) from the porous panels. If these conditions are encountered, the pilot should take immediate action to select HIGH/MAX flow rate and leave these conditions by changing altitude or turning back or even continuing on the same course if clear air is known to be immediately ahead.



## **1.5 DEFINITIONS AND ABBREVIATIONS**

### (b) Meteorological Terms

**De-Ice or De-Icing:** The periodic shedding or removal of ice accumulations from a surface, by destroying the bond between the ice and the protection surface.

**Freezing Drizzle:** Drizzle is precipitation on the ground or aloft in the form of liquid water drops that have diameters less than 0.5 mm and greater than 0.05 mm (50  $\mu$ m to 500  $\mu$ m, 0.002 to 0.02 in). Freezing drizzle is drizzle that exists at air temperatures less than 0 °C or 32 °F (supercooled water), remains in liquid form, and freezes upon contact with objects on the surface or airborne.

**Freezing Rain:** Rain is precipitation on the ground or aloft in the form of liquid water drops which have diameters greater than 0.5 mm (0.02 in). Freezing rain is rain that exists at air temperatures less than zero degrees C (supercooled water), remains in liquid form, and freezes upon contact with objects on the surface or airborne.

**Ice Crystals:** Any one of a number of macroscopic, crystalline forms in which ice appears. Examples are hail and snow.

**Icing Conditions:** An icing condition is defined as visually detected ice, or the presence of visible moisture in any form at an indicated outside air temperature (OAT) of +3 °C (37.4 °F) or below.

**LWC:** Liquid water content. The total mass of water contained in liquid drops within a unit volume or mass of air.

**Mixed Phase Icing Conditions:**

A homogeneous mixture of supercooled water drops and ice crystals existing within the same cloud environment.

**Supercooled Water:** Liquid water at a temperature below the freezing point of 0 °C (32 °F).

**(c) Flight Performance and Flight Planning****Continuous Operation:**

Typical continuous operations in icing conditions are holding and cruise.

**(i) Miscellaneous****CS 25 / FAR Part 25, Appendix C:**

Certification icing condition standard for approving ice protection provisions on airplanes. The conditions are specified in terms of altitude, temperature, LWC, representative droplet size, and cloud horizontal extent.

**ICTS:** Ice contaminated tailplane stall.

**Protected Surface:** A surface containing ice protection, typically located at the surface's leading edge.

**Residual Ice:** Ice that remains on a protected surface immediately following the actuation of a deicing system.

## **2. OPERATING LIMITATIONS**

### **2.1 INTRODUCTION**

#### **2.1.1 METEOROLOGICAL CONDITIONS**

Flight in meteorological conditions described as freezing rain or freezing drizzle, as determined by the following visual cues, is prohibited:

- (1) Unusually extensive ice accreted on the airframe in areas not normally observed to collect ice.
- (2) Accumulation of ice on the upper surface of the wing aft of the protected area.
- (3) Accumulation of ice on the propeller spinner further back than normally observed.

If the airplane encounters conditions that are determined to contain freezing rain or freezing drizzle, the pilot must immediately exit the freezing rain or freezing drizzle conditions by changing altitude or turning back or even continuing on the same course if clear air is known to be immediately ahead.

#### **NOTE**

The prohibition on flight in freezing rain or freezing drizzle is not intended to prohibit purely inadvertent encounters with the specified meteorological conditions; however, pilots should make all reasonable efforts to avoid such encounters and must immediately exit the conditions if they are encountered.

**2.1.2 USE OF THE AUTOPILOT**

Use of the autopilot is prohibited when any ice is observed forming aft of the protected surfaces of the wing, or when unusual lateral trim requirements or autopilot trim warnings are encountered.

**NOTE**

The autopilot may mask tactile cues that indicate adverse changes in handling characteristics; therefore, the pilot should consider not using the autopilot when any ice is visible on the airplane.

## 2.2 AIRSPEED

Airspeed	IAS	Remarks
Minimum control speed, airborne, with ice accumulation on unprotected areas	72 KIAS	The minimum control speed is valid for ice accumulation on unprotected airplane surfaces in the maximum continuous icing conditions defined by CS 25 / FAR Part 25 Appendix C.
Minimum airspeed for continuous operation in icing conditions	121 KIAS	These limitations do not apply for take-off and landing.
Maximum airspeed for continuous operation in icing conditions	160 KIAS	
Minimum airspeed for continuous climb in icing conditions	121 KIAS	Flaps UP.
Minimum airspeed during approach in icing conditions	82 KIAS	

### NOTE

Typical continuous operations in icing conditions are holding and cruise.

### WARNING

If 121 KIAS cannot be maintained, Paragraph 2.1.1 applies.

## 2.6 WARNING, CAUTION AND ADVISORY ALERTS

### 2.6.1 WARNING, CAUTION AND ADVISORY ALERTS ON THE G1000

#### **NOTE**

The alerts described in the following are displayed on the Garmin G1000. Section 7.10 includes a detailed description of the alerts.

The following table shows the color and significance of the warning, caution and advisory alert lights on the G1000.

#### Color and Significance of the Caution Alerts on the G1000

<b>Caution alerts (amber)</b>	<b>Meaning / Cause</b>
DEIC PRES LO	De-icing pressure is low.
DEIC PRES HI	De-icing pressure is high.
DEICE LVL LO	De-icing fluid level is low.

## **2.13 KINDS OF OPERATION**

### **2.13.1 OPERATION IN ICING CONDITIONS**

#### General

The DA 42 is approved for flight into known or forecast icing conditions as defined by CS 25 / FAR Part 25, Appendix C "Continuous Maximum and Intermittent Icing Envelope" only if the ice protection system is installed and serviceable.

#### Temperature Limitation

Minimum operation temperature for the Ice Protection System is -30°C (-22°F).

#### Take-off

Take-off with ice or snow accumulation or any frost on the airplane is prohibited.

#### **NOTE**

The airplane must be completely cleared of ice, snow and similar accumulations. For approved de-icing fluids refer to the main part of the AFM, Section 8.6 - DE-ICING.

#### Flight into Known or Forecast Icing Conditions

#### **NOTE**

The flaps and landing gear should only be extended and retracted for take-off and landing

**NOTE**

The flaps may not be set to the LDG position during flights in icing conditions and/or with residual ice on protected or unprotected surfaces.

**NOTE**

Intentional single-engine operation during flights under known or forecast icing conditions is not permitted.

Minimum Operational Equipment (Serviceable)

Flight into known or forecast icing condition requires the following equipment to be installed and serviceable:

- \* Ice Protection System installed in accordance with the Optional Design Advisory OÄM 42-054.

**NOTE**

Both wing ice inspection lights must be operative prior to flight into known or forecast icing conditions at night. This supersedes any relief provided by the table given in the main part of the AFM in Section 2.13.



## 2.15 LIMITATION PLACARDS

On the door of the RH nose baggage compartment

### **DE-ICING FLUID**

Refer to AFM for approved fluids.

Next to the filler cap

### **DE-ICING FLUID**

Max. 31.5 liters (8.3 US gal).

Usable 30 liters (7.9 US gal).

Refer to AFM for approved fluids.

**2.17 DE-ICING FLUIDS FOR SYSTEM OPERATION**

**2.17.1 MINIMUM DE-ICING FLUID QUANTITY FOR DISPATCH**

The minimum de-icing fluid quantity for dispatch is 22 liter (5.8 US gal). This amount corresponds to an indication of 3/4 full on the G1000.

**NOTE**

This minimum allows at least 90 minutes of ice protection with NORM selected. The pilot must ensure adequate fluid quantity before each flight.

**NOTE**

The maximum usable tank capacity is 30 liter (7.9 US gal). The maximum tank capacity is 31.5 liter (8.3 US gal). Maximum system operating times with maximum usable quantity of de-icing fluid:

- NORM mode . . . . . 2 hrs. 30 min.
- HIGH mode . . . . . 1 hr.
- MAX mode . . . . . 30 min.

### 2.17.2 DE-ICING FLUIDS

Approved de-icing fluids for use in the Ice Protection System are:

- AL-5 (DTD 406B)
- Aeroshell Compound 07

#### **WARNING**

The approved de-icing fluids are harmful. They are Glycol based with different additives. Refer to the Material Safety Data Sheets for proper handling which are available from the supplier of the de-icing fluid.

#### **CAUTION**

The use of other fluids will provide a correspondingly lower standard of ice protection or may cause damage to the ice protection system.

**3. EMERGENCY PROCEDURES**

**3.4 G1000 FAILURES**

**3.4.6 ERRONEOUS OR LOSS OF DE-ICING FLUID DISPLAY**

If the de-icing fluid quantity is known, the remaining system operating time can be estimated based on the durations given in Section 2.17.2 - DE-ICING FLUIDS.

- 1. Icing conditions . . . . . leave the icing area as soon as practicable

**3.5 ONE ENGINE INOPERATIVE PROCEDURES**

**3.5.6 ENGINE FAILURES IN FLIGHT**

- 1. Leave the icing area (by changing altitude or turning back or even continuing on the same course if clear air is known to be immediately ahead).
- 2. DE-ICE . . . . . HIGH
- 3. Proceed in accordance with the procedure given in Section 3.5.6 - ENGINE FAILURES IN FLIGHT in the main part of the AFM.

**3.7 FAILURES IN THE ELECTRICAL SYSTEM**

**3.7.1 COMPLETE FAILURE OF THE ELECTRICAL SYSTEM**

- 1. Leave the icing area (by changing altitude or turning back or even continuing on the same course if clear air is known to be immediately ahead).
- 2. Proceed in accordance with the procedure given in Section 3.7.1 - COMPLETE FAILURE OF THE ELECTRICAL SYSTEM in the main part of the AFM.

### **3.10 ICE PROTECTION SYSTEM EMERGENCIES**

#### **3.10.1 INADVERTENT ICING ENCOUNTER & EXCESSIVE ICE ACCUMULATION**

1. DE-ICE ..... HIGH
2. MAX ..... press push button, to dissipate  
ice build-up

#### **NOTE**

The MAX push button activates the maximum possible system flow rate for 120 seconds.

3. Pitot heating ..... check ON
4. ICE LIGHT ..... ON, as required
5. Cabin heat & defrost ..... ON
6. WINDSHIELD ..... press push button, as required

*If the system does not work properly:*

Continue with Section 3.10.2 - FAILURE OF THE ICE PROTECTION SYSTEM.

*If the system works properly, proceed as follows:*

7. De-icing fluid level ..... check periodically
8. DE-ICE ..... NORM or HIGH, as  
required. Monitor ice build-up

**END OF CHECKLIST**

**3.10.2 FAILURE OF THE ICE PROTECTION SYSTEM**

A "failure" of the ice protection system is any condition in which the system fails to remove ice from protected surfaces including the propellers and any system malfunction not covered in the abnormal operating procedures given in Chapter 4B of this Supplement.

1. Leave the icing area (by changing altitude or turning back or even continuing on the same course if clear air is known to be immediately ahead).
2. Maintain airspeed above 121 KIAS until final approach and landing.
3. FLAPS ..... UP
4. Slip ..... minimize

**WARNING**

With an inoperative ice protection system, set both POWER levers to MAX and leave icing conditions as soon as possible. In heavy icing conditions, it may not be possible to maintain altitude or proper glide path on approach; in this case, it is imperative that a safe airspeed be maintained, the stall warning system may not function and there may be little or no pre-stall buffet with heavy ice loads on the wing leading edges.

5. Approach speed with residual ice ..... 91 KIAS
6. Increase landing distance from Section 5.3.11 by a factor of 1.4

**END OF CHECKLIST**

## **4A. NORMAL OPERATING PROCEDURES**

### **CAUTION**

Do not delay activation of the Ice Protection System if icing conditions are encountered. For best operation, the system should be activated prior to accumulation of ice on protected surfaces.

### **WARNING**

If ice is observed forming aft of the protected surfaces of the wing, or if unusual lateral trim requirements or autopilot trim warnings are encountered, accomplish the following:

- \* The flight crew should reduce the angle of attack by increasing speed as much as the airplane configuration and weather allow, without exceeding design maneuvering speed.
- \* If the autopilot is engaged, hold the control stick firmly and disengage the autopilot. Do not re-engage the autopilot until the airframe is clear of ice.
- \* Leave the icing area immediately by changing altitude or turning back or even continuing on the same course if clear air is known to be immediately ahead; and
- \* Report these weather conditions to air traffic control.

## CAUTION

Flight in freezing rain, freezing drizzle, or mixed phase icing conditions (supercooled water and ice crystals) may result in hazardous 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 it may seriously degrade the performance and controllability of the airplane.

### Identification of Freezing Rain/Freezing Drizzle Icing Conditions

The following shall be used to identify freezing rain/freezing drizzle icing conditions:

- (1) Unusually extensive ice accreted on the airframe in areas not normally observed to collect ice.
- (2) Accumulation of ice on the upper surface of the wing aft of the protected area.
- (3) Accumulation of ice on the propeller spinner farther back than normally observed.

### Identification of Possible Freezing Rain/Freezing Drizzle Conditions

The following may be used to identify possible freezing rain/freezing drizzle conditions:

- (1) Visible rain at temperatures below +5 °C (41 °F) outside air temperature (OAT).
- (2) Droplets that splash or splatter on impact at temperatures below +5 °C (41 °F) OAT.
- (3) Performance losses larger than normally encountered in icing conditions. It is possible to experience severe ice accretions not visible to the flight crew, such as wing lower surface accretion or propeller blade accretion.



### Procedures for Exiting the Freezing Rain/Freezing Drizzle Environment

These procedures are applicable to all flight phases from take-off to landing. Monitor the outside air temperature. While ice may form in freezing drizzle or freezing rain at temperatures as cold as -18 °C (0 °F), increased vigilance is warranted at temperatures around freezing with visible moisture present. If the visual cues specified above for identifying possible freezing rain or freezing drizzle conditions are observed, accomplish the following:

- (1) Exit the freezing rain or freezing drizzle icing conditions immediately to avoid extended exposure to flight conditions outside of those for which the airplane has been certificated for operation. Asking for priority to leave the area is fully justified under these conditions.
- (2) Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.
- (3) Do not engage the autopilot. The autopilot may mask unusual control system forces.
- (4) If the autopilot is engaged, hold the control stick firmly and disengage the autopilot.
- (5) If an unusual roll response or uncommanded control movement is observed, reduce the angle of attack by increasing airspeed or rolling wings level (if in a turn), and apply additional power, if needed.
- (6) Avoid extending flaps during extended operation in icing conditions. Operation with flaps extended can result in a reduced wing angle of attack, with ice forming on the upper surface further aft on the wing than normal, possibly aft of the protected area.
- (7) If the flaps are extended, do not retract them until the airframe is clear of ice.
- (8) Report these weather conditions to ATC.

**4A.6 CHECKLISTS FOR NORMAL OPERATING PROCEDURES**

**4A.6.1 PRE-FLIGHT INSPECTION**

I. Cabin check

*Ice Protection System*

- a) ELECT MASTER ..... ON
- b) DEICE FLUID ..... check quantity
- c) Canopy ..... closed

**WARNING**

De-icing fluids are harmful. Do not press the WINDSHIELD push button when the canopy is open. Otherwise the de-icing fluid may be sprayed into the cabin. For proper handling refer to the Material Safety Data Sheets which are available from the supplier of the de-icing fluid.

- d) WINDSHIELD ..... press push button
- e) Spraybar ..... evidence of de-icing fluid

**NOTE**

If the system has been inoperative for a while, has been drained or has run dry, trapped air - suspected in the feeder lines to the main pumps - can be removed from the feeder lines to the main pumps by activating the windshield pumps several times.

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**NOTE**

Do not operate the main pumps with an empty de-icing fluid tank. Operating the main system pumps with an empty de-icing fluid tank can cause a future system malfunction. To re-establish full system function special maintenance action is required.

- f) ANNUN-TEST ..... ON

**NOTE**

The ANNUN-TEST mode activates the DEICE LVL LO caution immediately if the de-ice fluid quantity is low and the DEIC PRES LO caution after 120 seconds.

- g) DEICE PRES HI ..... verify NOT ILLUMINATED
- h) DEICE LVL LO ..... check (must be annunciated if de-icing fluid quantity is below 6.0 liter (1.59 US gal))
- i) DEIC PRES LO ..... check, ILLUMINATED (refer to NOTE)
- j) ANNUN-TEST ..... OFF
- k) PUMP 1 ..... select
- l) DE-ICE ..... HIGH
- m) DEIC PRES LO ..... verify NOT ILLUMINATED

**CONTINUED****NOTE**

If at ambient temperature above 10°C (50°F) and below 20°C (68°F) DEIC PRES LO warning appears in HIGH mode switch to max mode to cancel the warning. Above 20°C (68°F) ambient temperature warning cancellation may not be possible.

- n) PUMP 2 ..... select
- o) ICE LIGHT ..... ON
- p) Ice lights ..... visual inspection, check
- q) DEICE PRES HI ..... verify NOT ILLUMINATED
- r) DEIC PRES LO ..... verify NOT ILLUMINATED
- s) DE-ICE ..... OFF
- t) ICE LIGHT ..... OFF
- u) ELECT MASTER ..... OFF

**END OF CHECKLIST**

II. Walk-around check, visual inspection

*Ice Protection System*

- a) De-icing fluid tank . . . . . visually check quantity through transparent tank (in RH baggage compartment);  
remove carpet if necessary
- b) Filler cap . . . . . check secure
- c) Deflector and spraybar . . . . . visually check, free from dirt
- d) Porous panels on wings . . . . . visually check no damage and no holes blocked,  
evidence of de-icing fluid along entire panel

**NOTE**

If required, activate DEICE on MAX until fluid is evident along entire panel.

- e) Porous panels on horizontal and vertical tail visually check no damage and no holes blocked,  
evidence of de-icing fluid along entire panel
- f) Slinger rings and/or nozzle at propeller . . . . . visually check no damage and no holes blocked
- g) Wing, Tail, Propellers, Windshield . . . . . verify free from ice

**END OF CHECKLIST**

**4A.6.5 TAXIING**

**NOTE**

De-icing fluid will remain on the windshield for a while after operating windshield de-ice. For an unobstructed view, do not operate the windshield de-ice during taxiing.

**4A.6.6 BEFORE TAKE-OFF**

*If icing conditions are anticipated immediately after take-off:*

- 1. DE-ICE ..... NORM
- 2. Pitot heating ..... ON
- 3. ICE LIGHT ..... ON, as required
- 4. Cabin heat & defrost ..... ON

**END OF CHECKLIST**

**4A.6.8 CLIMB**

*If icing conditions do exist:*

- 1. DE-ICE ..... NORM, monitor ice build-up  
HIGH, if no shedding, or to  
prevent excessive ice build up

**NOTE**

NORM mode is cycled. Therefore temporary ice build-up and subsequent shedding will occur on protected surfaces.

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*If no shedding in HIGH mode:*

2. Proceed with Section 3.10.1 - INADVERTENT ICING ENCOUNTER & EXCESSIVE ICE ACCUMULATION

*Whilst in icing conditions:*

3. Pitot heating ..... check ON
4. ICE LIGHT ..... ON, as required
5. Cabin heat & defrost ..... check ON
6. WINDSHIELD ..... press push button, as required
7. De-icing fluid level ..... check periodically

*After leaving icing conditions:*

8. DE-ICE ..... OFF
9. Pitot heating ..... OFF, as required
10. ICE LIGHT ..... OFF, as required
11. Cabin heat & defrost ..... OFF, as required

**END OF CHECKLIST**

**4A.6.9 CRUISE***If icing conditions do exist:*

1. DE-ICE ..... NORM, monitor ice build-up  
HIGH, if no shedding, or to  
prevent excessive ice build up

*If no shedding in HIGH mode:*

2. Proceed with Section 3.10.1 - INADVERTENT ICING ENCOUNTER &  
EXCESSIVE ICE ACCUMULATION

*Whilst in icing conditions:*

3. Pitot heating ..... check ON
4. ICE LIGHT ..... ON, as required
5. Cabin heat & defrost ..... check ON
6. WINDSHIELD ..... press push button, as required
7. De-icing fluid level ..... check periodically
8. Airspeed ..... maintain 121 to 160 KIAS

**NOTE**

During prolonged icing encounters in cruise, increase engine power to maintain cruise speed as ice accumulates on the unprotected areas, and to preclude the ice build-up on the fuselage under surface.

**CONTINUED**



**NOTE**

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.

**WARNING**

When disconnecting the autopilot with ice accretions on the airplane, the pilot should be alert for out-of-trim forces. Pilot control stick input should be applied as required to prevent potential undesired flight path deviations.

*After leaving icing conditions:*

- 9. DE-ICE ..... OFF
- 10. Pitot heating ..... OFF, as required
- 11. ICE LIGHT ..... OFF, as required
- 12. Cabin heat & defrost ..... OFF, as required

**END OF CHECKLIST**

**4A.6.11 APPROACH AND LANDING***If icing conditions do exist:*

1. DE-ICE ..... HIGH

*If no shedding in HIGH mode:*

2. Proceed with section 3.10.1 - INADVERTENT ICING ENCOUNTER & EXCESSIVE ICE ACCUMULATION

*Whilst in icing conditions:*

3. ICE LIGHT ..... ON, as required
4. WINDSHIELD ..... press push button, as required

**NOTE**

De-icing fluid will remain on the windshield for a period after operating windshield de-ice. For an unobstructed view, do not operate the windshield de-ice within 30 seconds prior to landing.

5. Airspeed ..... maintain 121 to 160 KIAS  
until final approach and landing
6. FLAPS ..... UP or APP, as required

*Before landing:*

7. FLAPS ..... APP
8. Final approach speed ..... min. 82 KIAS

**CAUTION**

Do not set the flaps to the LDG position. Otherwise the climb performance may not be sufficient for go-around, and the safety margin with respect to ICTS will be reduced.

**END OF CHECKLIST**

**4A.6.13 AFTER LANDING**

1. DE-ICE ..... OFF
2. ICE LIGHT ..... OFF

**4A.6.15 EXIT AIRPLANE**

**CAUTION**

When the ice protection system has been enabled in flight, the walkways on the inner wings may be slippery.

**4A.6.17 PARKING**

**NOTE**

When the ice protection system has been enabled in flight, special care must be taken when touching the airframe structure or canopy as they may be partially contaminated with de-icing fluid.

Clean the de-icing fluid from the canopy and the porous panels. Refer to Chapter 8 for appropriate procedures.

**4B. ABNORMAL OPERATING PROCEDURES****4B.4 CAUTION-ALERTS ON THE G1000****4B.4.6 L/R ALTN FAIL**

L/R ALTN FAIL	Left/Right engine alternator has failed.
---------------	--

**(a) One Alternator Failed**

1. Icing conditions . . . . . leave the icing area as soon as practicable
2. Proceed in accordance with the procedure given in Section 4B.4.6 - L/R ALTN FAIL in the main part of the AFM.

**4B.4.14 DE-ICE PRESS LOW**

DEIC PRES LO	De-icing pressure is low.
--------------	---------------------------

1. DE-ICE . . . . . HIGH

*If DEIC PRES LO indication does not extinguish on the G1000:*

2. PUMP1 / PUMP2 . . . . . select other main pump

**NOTE**

Activate the WINDSHIELD pump to prime the alternate main pump if necessary.

*If DEIC PRES LO indication still does not extinguish on the G1000:*

3. ALTERNATE switch on de-ice panel . . . . . open guard, toggle switch

**CONTINUED**

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If DEIC PRES LO indication still does not extinguish on the G1000:

4. Proceed with Section 3.10.2 - FAILURE OF THE ICE PROTECTION SYSTEM.

If DEIC PRES LO indication extinguishes on the G1000 and normal operation is achieved:

5. Continue flight, allow for a de-icing fluid flow of 30 liter (7.9 US gal) per hour
6. Ice protection system . . . . . monitor operation
7. De-icing fluid level . . . . . check periodically

**CAUTION**

If at ambient temperature above 10°C (50°F) and below 20°C (68°F) DEIC PRES LO warning appears in HIGH mode switch to max mode to cancel the warning. Above 20°C (68°F) ambient temperature warning cancellation may not be possible.

**END OF CHECKLIST**

**4B.4.15 DE-ICE PRESSURE HIGH**

<b>DEIC PRES HI</b>	De-icing pressure is high.
---------------------	----------------------------

1. Icing conditions . . . . . leave the icing area as soon as practicable

**NOTE**

Reduced system performance may occur. Unscheduled maintenance is required.

**END OF CHECKLIST**

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**4B.4.16 DE-ICE LEVEL LOW**

<b>DEICE LVL LO</b>	De-icing fluid level is low.
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Maximum remaining system operating times after first annunciation of the DEICE LVL LO caution message:

- I NORM mode ..... 30 min.
- I HIGH mode ..... 15 min.

**END OF CHECKLIST****4B.4.17 FAILURE OF INDICATION LIGHTS**

The indication lights (MAX, NORM, HIGH) on the de-ice panel are only used to indicate the selected operating mode. Failure to illuminate does not indicate a malfunction of the system.

1. Continue flight.
2. Unscheduled maintenance is required after flight.

**END OF CHECKLIST****4B.4.18 FAILURE OF THE WINDSHIELD DE-ICE**

A "failure" of the windshield de-ice is any condition in which the system fails to remove ice from the windshield.

1. Continue flight, viewing through the unobstructed areas on the side of the canopy. Open the emergency window if necessary.

**END OF CHECKLIST**

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## **5. PERFORMANCE**

### **5.1 INTRODUCTION**

Airplane performance and stall speeds in clear air are unchanged with the installation of the Ice Protection System.

Significant climb and cruise performance degradation, range reduction, as well as buffet and stalling speed increase must be expected if ice accumulates on the airframe.

Residual ice on the protected surfaces and ice accumulation on the unprotected areas of the airplane can cause noticeable performance losses, even with the Ice Protection System operating.

### **5.3 PERFORMANCE TABLES AND DIAGRAMS**

#### **NOTE**

The performance data is valid for ice accumulation on unprotected airplane surfaces in maximum continuous icing conditions defined by CS 25 / FAR Part 25 Appendix C. Greater accumulation of ice can result in further loss of flight performance.

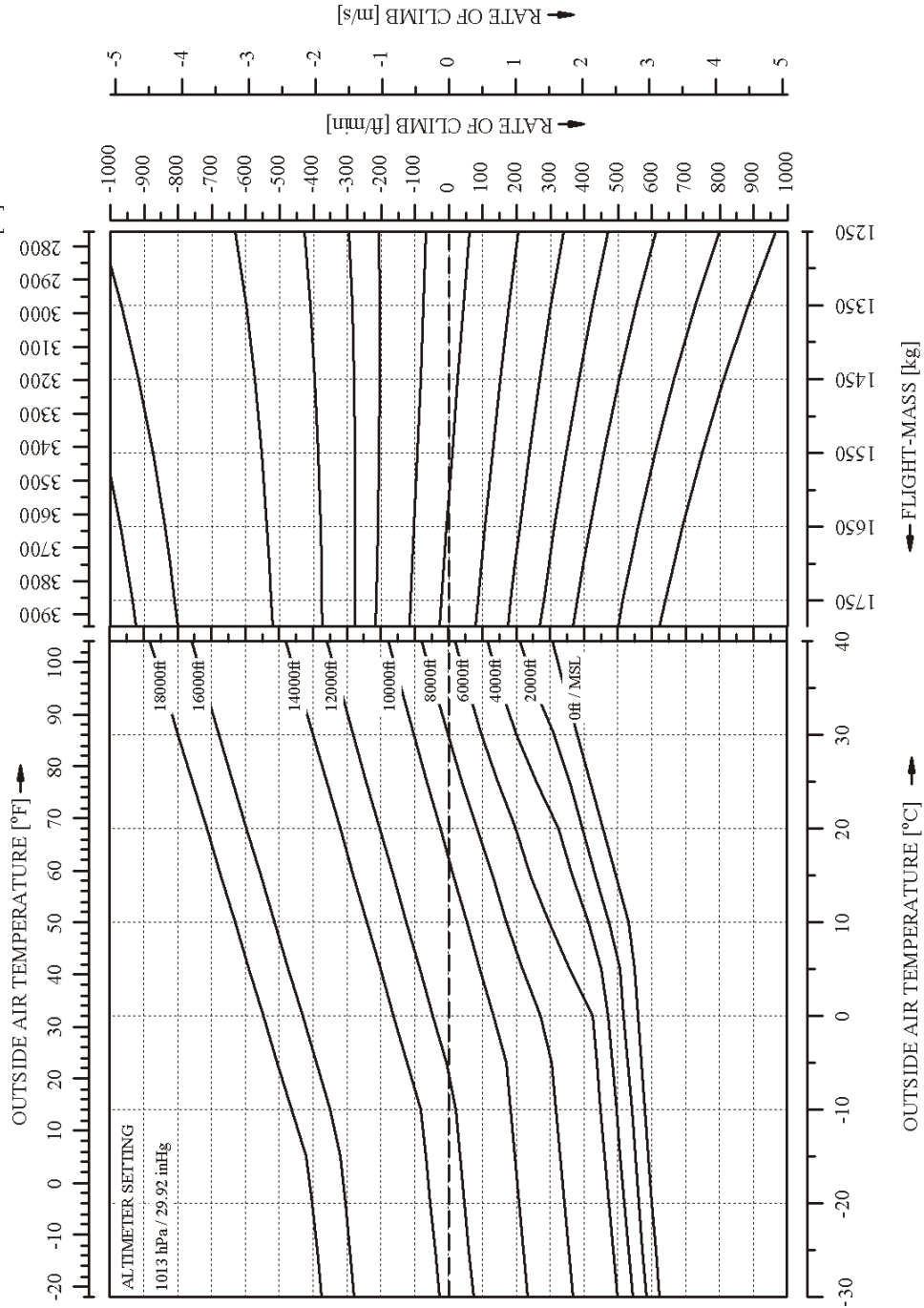
#### **5.3.4 STALLING SPEEDS**

The stalling speeds increase by up to 4 KIAS over those stalling speeds shown in the main part of the AFM.

**5.3.8 CLIMB PERFORMANCE - CRUISE CLIMB with 45 min. Ice Accretion**

**CLIMB PERFORMANCE @ 121 KIAS with 45 min. Ice**

*acc. FAR 25 Appendix "C" Icing Envelope*





### **5.3.9 ONE ENGINE INOPERATIVE CLIMB PERFORMANCE**

The one engine inoperative climb performance can be reduced by up to 150 ft/min.

#### **NOTE**

Due to ice build-up on unprotected areas and/or residual ice on the airplane, a positive rate of climb cannot be expected.

### **5.3.10 CRUISING (TRUE AIRSPEED TAS)**

The cruise performance can be reduced by 15 %.

### **5.3.12 GRADIENT OF CLIMB ON GO-AROUND**

The DA 42 reaches a constant gradient of climb of 5.83 % or 529 ft/min under the following conditions:

- Mass ..... max. flight mass  
(1785 kg/3935 lb)
- Power lever ..... both MAX @ 2300 RPM
- Flaps ..... APP
- Landing gear ..... extended
- Airspeed ..... 82 KIAS
- ISA standard conditions at sea level

**6. MASS AND BALANCE****6.4 FLIGHT MASS AND CENTER OF GRAVITY****6.4.1 MOMENT ARMS**

Item	Lever Arm	
	[m]	[in]
De-icing fluid tank	1.00	39.4

The mass (weight) of the de-icing fluid is obtained as follows:

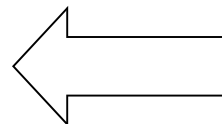
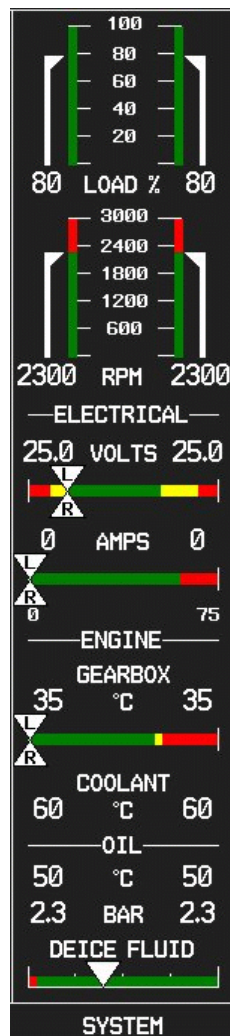
Multiply the fluid quantity in liter by 1.1 to obtain kilogram (kg), or  
multiply the fluid quantity in US gallon by 9.2 to obtain pound (lb).

## 7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

### 7.9 POWER PLANT

#### 7.9.4 ENGINE INSTRUMENTS

On the Garmin G1000 MFD the de-icing fluid level indication is displayed on the system page. Indication markings indicate (from left to right) 1/4, 2/4, 3/4 and 4/4 of the usable fluid quantity (30 liter or 7.9 US gal). Display when pushing the SYSTEM button:



**7.13 ELECTRICAL SYSTEM****7.10.3 WARNING, CAUTION AND ADVISORY ALERTS**CAUTION ALERTS

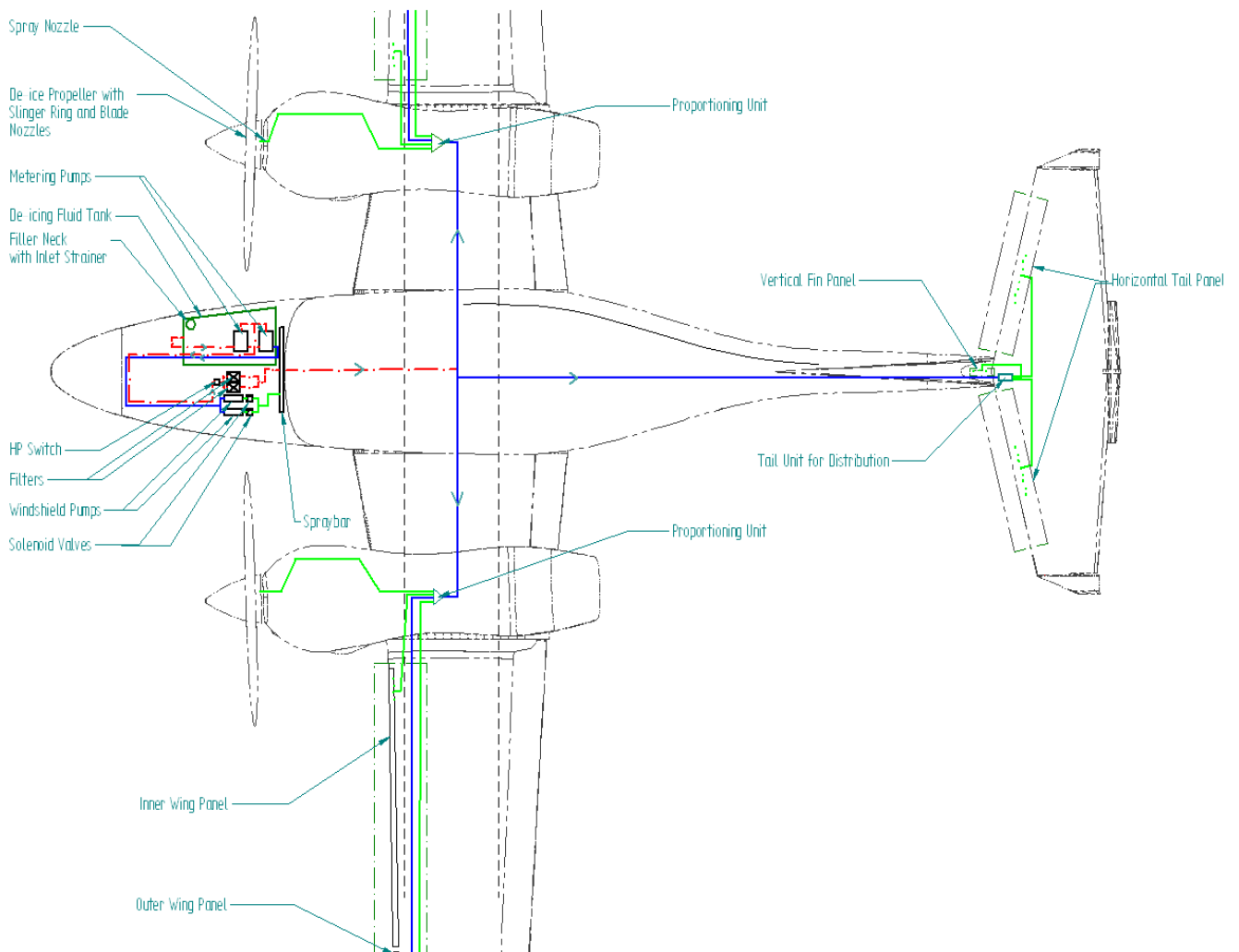
Caution alerts (amber)	Meaning / Cause
DEIC PRES LO	System pressure upstream of the porous panels on the horizontal or vertical tail is too low.
DEIC PRES HI	System pressure upstream of the de-icing fluid filter is too high.
I DEICE LVL LO	De-icing fluid level in the tank is below 6.0 liter (1.59 US gal).

## 7.14 DE-ICING SYSTEM

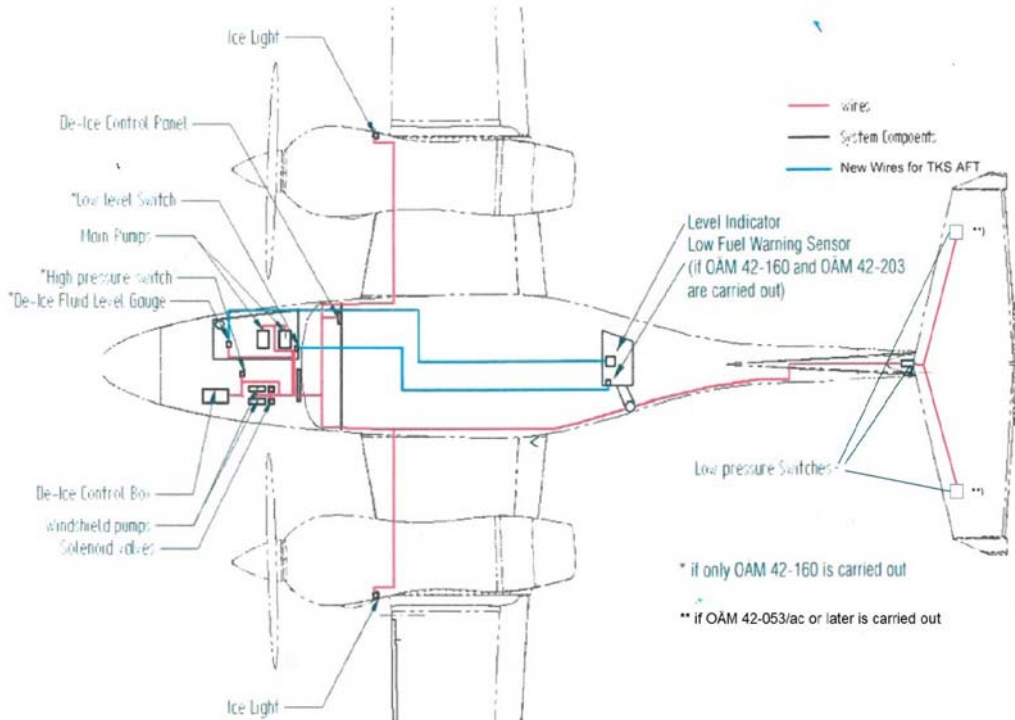
### Description

The ice protection system is electrically operated. It is supplied with power via the XFR PUMP/DE-ICE circuit breaker. The airframe and propellers are grouped and operate together. Windshield de-icing is a separate system and operates independently. All systems draw fluid from a common tank.

### Mechanical Overview



### Electrical Overview



The system consists of the following main components:

\* De-icing fluid tank with an integrated filler neck, which has an inlet strainer. The tank has a capacity of 30 liter (7.9 US gal) and is installed in the nose compartment of the airplane, on the RH side. The de-icing fluid is glycol-based. It has an approx. mass density of 1.1 kg/liter (9.2 lb/US gal).

■ A low level sensor in the tank provides indication of low de-icing fluid level.

A fluid level gauge provides data for de-icing fluid level indication on the G1000 System.

- \* Two main pumps, installed in the nose compartment of the airplane, under an inspection lid on the RH side.

The pumps take de-icing fluid from the tank and feed it to :

- the airframe ice protection system (see below), and
- the windshield de-icing system (see below).

In the NORM mode both main pumps run simultaneously and are cycled on and off by two time delay relays.

In the HIGH mode only the selected main pump runs continuously.

In the MAX mode both pumps run simultaneously and continuously.

A switch in the cockpit selects the modes NORM and HIGH. In the HIGH mode the MAX mode can be engaged by pressing a push button on the de-ice panel in the cockpit. This mode is activated for 2 minutes.

The information which mode is currently in use is indicated by three lights on the ice protection control unit on the instrument panel.

- \* The airframe/propeller ice protection system consists of the following components:
  - Two de-icing fluid filters, installed in the nose compartment of the airplane, under an inspection lid on the LH side. The active main pump feeds the de-icing fluid through the filters to the proportioning units. The filters prevent the proportioning units from fouling.

- Proportioning units in each nacelle (between the main spars) and in the upper vertical tail (forward of the front spar). The proportioning units regulate the flow of de-icing fluid to the porous panels and to the propeller slinger rings by means of capillaries.
- TKS porous panels are fitted to the leading edge of the outer wings, the vertical tail, and the horizontal tail. The porous panels weep the fluid at a low rate through fine holes.
- Nozzles and slinger rings on the propellers. The nozzle sprays fluid into the slinger ring which is mounted to the spinner backplate. The fluid is then distributed to the propeller blades by centrifugal force through notches in the slinger ring.
- Three low pressure sensors which detect malfunctions of the system. Refer to Section 7.10 in this Supplement.
- One high pressure sensor which activates an indication when the filter cartridges need to be replaced. Refer to Section 7.10 in this Supplement.

\* The windshield ice protection system consists of:

- Two windshield de-icing pumps with solenoid valves, installed in the nose compartment of the airplane, under an inspection lid on the LH side. The active windshield de-icing pump supplies the fluid to the spraybar.

Only one windshield de-icing pump is operative at a time. A switch in the cockpit selects the active pump (PUMP1/PUMP2). The second pump is installed for redundancy.

- One de-icing fluid spraybar for the canopy.

Unlike the airframe de-icing system, the windshield de-icing system does not spray fluid continuously, but is activated for 5 seconds by operating a push button, even when the main switch of the Ice Protection System is in the OFF position.



\* The electrical system consists of:

- An ice protection control box which is mounted under the LH baggage compartment floor. The ice protection control box contains all necessary relays to operate and cycle the pumps.
- A de-ice panel, mounted on the RH side of the instrument panel, enables the complete control of the whole de-icing system.
- Two ice lights, one for each wing, are installed for monitoring ice accretion on the wings in low lighting conditions.

### Replenishing

Refer to Section 2.17 in this Supplement for approved de-icing fluids.

### **NOTE**

The de-icing fluid must be considered for the mass and balance calculations. Refer to Chapter 6 in this Supplement.

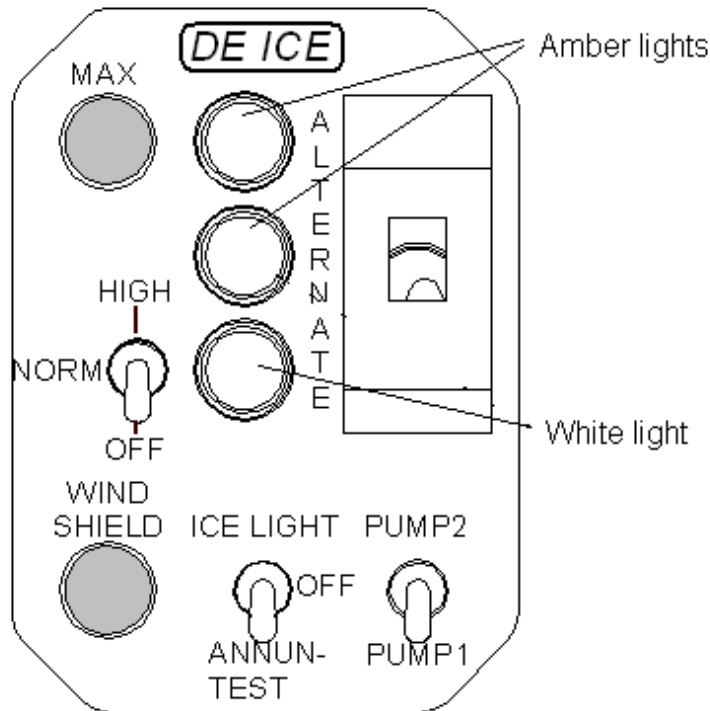
De-icing fluid is replenished through the filler which is located in the fuselage nose on the RH side, aft of the nose baggage door. The tank has a usable capacity of 30 liter (7.9 US gal).

### Operation

The system is operated through four toggle switches and two push buttons located on the ice protection control unit in the RH section of the instrument panel.

The current operating mode is indicated by the following indication lights:

- NORM : lower white light only
- HIGH : center amber light only
- MAX : both (top and center) amber lights



### OFF/NORM/HIGH Switch

The OFF/NORM/HIGH switch operates the selected main pump and thus activates the system. It has 3 positions:

Down position: OFF.

Center position: NORM (normal). The main pumps produce a cycled fluid flow: the main pumps provide fluid to the system for 30 seconds, followed by a 90 seconds break. This mode is designed to cover the more frequent but less severe known icing conditions as defined by CS 25/FAR Part 25, Appendix C, and is selected when icing conditions are encountered and prior to ice formation. Maximum system operating time is approximately 2 hours and 30 minutes.

Up position: HIGH. The active main pump produces a continuous fluid flow. This mode is designed to cover all known icing conditions as defined by CS 25/FAR Part 25, Appendix C, and is selected when icing conditions are more demanding or if ice has already accumulated. Maximum system operating time is approximately 1 hour.

#### *MAX Push Button*

The upper push button activates the MAX mode of the ice protection system when the system is presently in the HIGH mode. This mode is designed to provide maximum possible protection for conditions outside the icing envelope as defined by CS 25/FAR Part 25, Appendix C, and is only active for 2 minutes after each activation. In this mode both pumps are active simultaneously and provide fluid to the system. Maximum system operating time with continuous MAX mode activation is approximately 30 minutes.

#### *PUMP1/PUMP2 Switch*

The RH bottom switch selects one of the two main pumps and one of the two windshield pumps. It has 2 positions.

Down position: PUMP 1. Main pump no. 1 is selected as the active pump in HIGH mode. Pump no. 2 is standby. Also windshield pump no. 1 is selected in case the windshield switch is activated. Windshield pump no. 2 is inoperative.

Up position: PUMP 2. Main pump no. 2 is selected as the active pump in HIGH mode. Pump no. 1 is standby. Also windshield pump no. 2 is selected in case the windshield switch is activated. Windshield pump no. 1 is inoperative.

*WINDSHIELD Push Button*

The WINDSHIELD push button activates the selected windshield de-icing pump for a duration of 5 seconds. During this time it feeds de-icing fluid to the spraybar in front of the canopy.

The windshield de-icing works even when the OFF/NORM/HIGH switch of the ice protection system is set OFF. Purging air from the ice protection system is also provided from these pumps by continuously pressing the WINDSHIELD push button.

*ALTERNATE Switch*

The ALTERNATE switch connects the main pump no. 2 directly to the RH main bus. Thus, in case of a total loss of the LH main bus in icing conditions, operation of the ice protection system similar to the HIGH mode is possible.

*ANNUN-TEST/OFF/ICE LIGHT*

This switch activates either both ice-lights or the annunciation test procedure (refer to Section 4A.6.1).

## **8. AIRPLANE HANDLING, CARE AND MAINTENANCE**

The porous panels can be cleaned with soap and water using a clean, lint-free cloth. Isopropyl alcohol, ethyl alcohol or methylated spirit may be used to remove oil or grease. Furthermore approved de-icing fluids, AVGAS and jet fuel are permitted for use on the panels.

### **CAUTION**

Do not apply polish or wax to the panels. Certain solvents, particularly methyl ethyl ketone (MEK), acetone, lacquer thinner and other types of thinners and solvents damage the inner membrane of the panels. Mask active area of panels with a low tack tape when using solvents or painting the airplane in the proximity of the panels or when the airplane is stored in a dusty environment.

### **NOTE**

The ice protection system should be checked for excessive de-icing fluid leaks after each use. Due to the dihedral wing small amounts of de-icing fluid can evaporate from the inner wing panels over a period of several days. Contamination precautions must be done if the airplane is stored in a hangar.

#### **8.4.5 REPLENISHMENT OF THE DE-ICING FLUID TANK**

For approved de-icing fluids refer to Chapter 2 LIMITATIONS. The tank is located in the baggage compartment and the filler cap is on top of the filler neck of the tank, accessible via the open RH baggage door.

To preclude the possibility of contaminated fluid do not remove the inlet strainer, always clean the top of the fluid tank before replenishing. Secure the filler cap immediately after replenishment.

#### **8.6.6. PROLONGED OUT OF SERVICE OR DE-ICING SYSTEM RUN DRY**

To avoid the need to reprime the system and to provide a quick response when turned to service, maintain at least 2 liter (0.5 US gal) in the tank. To ensure that all system components are filled with fluid, operate the system at least once in a month. If necessary, operate the pumps until all air is purged from components and pipelines.

##### Priming of the Main Pumps

The main pumps may not be self priming and are primed, when required, by the operation of either windshield pump. Windshield pump 1 or 2 will prime main pump 1 or 2.

##### Priming of the Porous Panels

*In flight:*

### **WARNING**

Priming of the porous panels in icing conditions is not permitted.

Priming of the porous panels is best done during climb or descent, at ambient temperatures up to 4 °C (39 °F). To prime the porous panels, activate the MAX mode. Repeat the procedure in intervals of approximately 5 minutes until fluid dissipates from all porous panels.

*By special maintenance:*

At ambient temperatures above 4 °C (39 °F), special maintenance may be required to prime the porous panels.

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