SUPPLEMENT S03
TO THE AIRPLANE FLIGHT MANUAL DA 42

ICE PROTECTION SYSTEM

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0.1 RECORD OF REVISIONS

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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. This may best be achieved by climbing to warmer air above the freezing rain or drizzle. Maximum climb power with flaps retracted should be used.

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 µm to 500 µm, 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).

(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, landing and maneuvers.
I maximum airspeed for continuous operation in icing conditions	160 KIAS	

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

Caution alerts (amber)	Meaning / Cause
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 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 liters (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 liters (7.9 US gal). The maximum tank capacity is 31.5 liters (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. If the minimum airspeed for continuous operation in icing conditions (see Section 2.2 AIRSPEEDS) cannot be maintained, set the DE-ICE switch to 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
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, HIGH or MAX, 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.

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. Flap extension is limited to the APP position.

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.

4. Approach speed with residual ice . . . . . 82 KIAS
5. Increase landing distance from Section 5.3.11 by a factor of 1.4.

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
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.

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.

CONTINUED

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 10 liters (2.6 US gal))
i) DEIC PRES LO . . . . . check, ILLUMINATED (refer to NOTE)
j) DE-ICE . . . . . HIGH
k) DEIC PRES LO . . . . . verify NOT ILLUMINATED

NOTE

In HIGH mode the system pressure may not get high enough to disable the DEIC PRES LO warning if the ambient temperature is above 10 °C (50 °F). Disabling the DEIC PRES LO warning may take up to 20 seconds in HIGH- mode.

l) ICE LIGHT . . . . . ON
m) Ice lights . . . . . visual inspection, check

n) DEICE PRES HI . . . . . verify NOT ILLUMINATED
o) DEIC PRES LO . . . . . verify NOT ILLUMINATED

NOTE

In HIGH mode the system pressure may not get high enough to disable the DEIC PRES LO warning if the ambient temperature is above 10 °C (50 °F).

p) DE-ICE . . . . . OFF
q) ICE LIGHT . . . . . OFF
r) ANNUN-TEST . . . . . OFF
s) ANNUN-TEST . . . . . OFF
t) 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
e)	Porous panels on horizontal and vertical tail	visually check no damage and no holes blocked, evidence of de-icing fluid
f)	Slinger rings and/or nozzle at propeller	visually check no damage and no holes blocked, evidence of de-icing fluid
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.6.5 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

NOTE

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

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
2.	MAX	press push button if no shedding in HIGH mode. Repeat as required.

NOTE

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

CAUTION

If ice fails to shed, proceed with Section 3.10.2 FAILURE OF THE ICE PROTECTION SYSTEM.

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
2.	MAX	press push button if no shedding in HIGH mode. Repeat as required.

NOTE

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

WARNING

If ice fails to shed, proceed with Section 3.10.2 FAILURE OF THE ICE PROTECTION SYSTEM.

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.

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
2. MAX . . . . . press push button if no shedding in HIGH mode.
   Repeat as required.

NOTE

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

CAUTION

If ice fails to shed, proceed with Section 3.10.2 FAILURE OF THE ICE PROTECTION SYSTEM.

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.

4A.6.13 AFTER LANDING

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

4A.6.15 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.

4A.6.16 EXIT AIRPLANE

CAUTION

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

4B. ABNORMAL OPERATING PROCEDURES

4B.4 CAUTION-ALERTS ON THE G1000

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

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 liters (7.9 US gal) per hour
6. Ice Protection System . . . . . monitor operation
7. De-icing fluid level . . . . . check periodically

CAUTION

At temperatures above 10 °C (50 °F) the DEIC PRES LO caution will not extinguish at HIGH mode. Upon switching to MAX mode the caution should extinguish.

END OF CHECKLIST

4B.4.15 DE-ICE PRESSURE HIGH

DEIC PRES HI	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.

4B.4.16 DE-ICE LEVEL LOW

DEICE LVL LO	De-icing fluid level is low.

Maximum remaining system operating times after first annunciation of the DEICE LVL LO caution message:

NORM mode . . . . . 45 min.
HIGH mode . . . . . 22 min.

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.

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.

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 - FLAPS "UP" OR "APP"

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

5.3.8 MAXIMUM RATE OF CLIMB - FLAPS "UP"

Residual ice on unprotected airplane surfaces can cause a loss in rate of climb of up to approximately 150 fpm.

5.3.9 ONE ENGINE INOPERATIVE CLIMB PERFORMANCE

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

NOTE

A positive rate of climb may not be achieved above 2000 ft pressure altitude.

5.3.10 CRUISE PERFORMANCE

The cruise performance can be reduced by 15 %.

5.3.12 RATE OF CLIMB ON GO-AROUND - FLAPS "APP"

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 liters by 1.1 to obtain kilograms (kg), or

multiply the fluid quantity in US gallons by 9.2 to obtain pounds (lb).

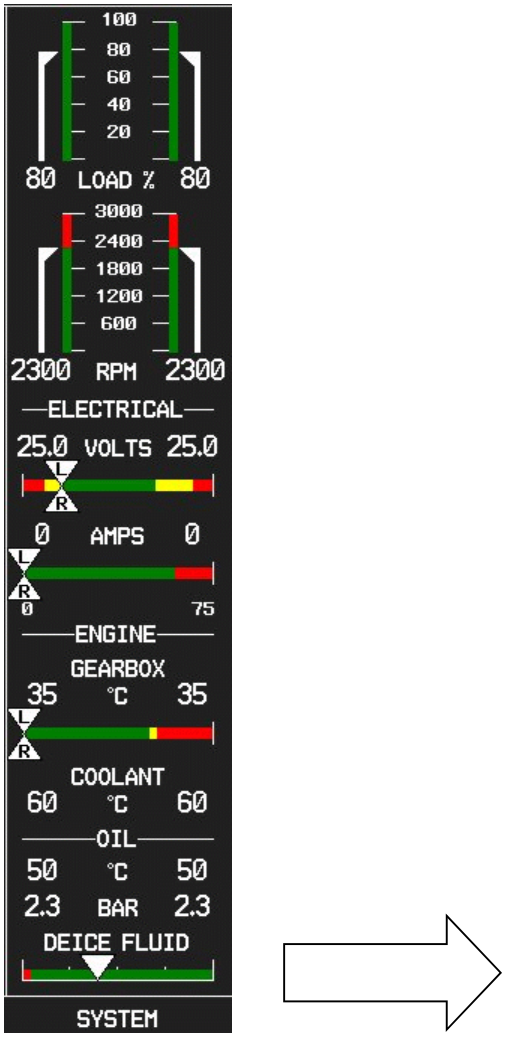
7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

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 liters 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

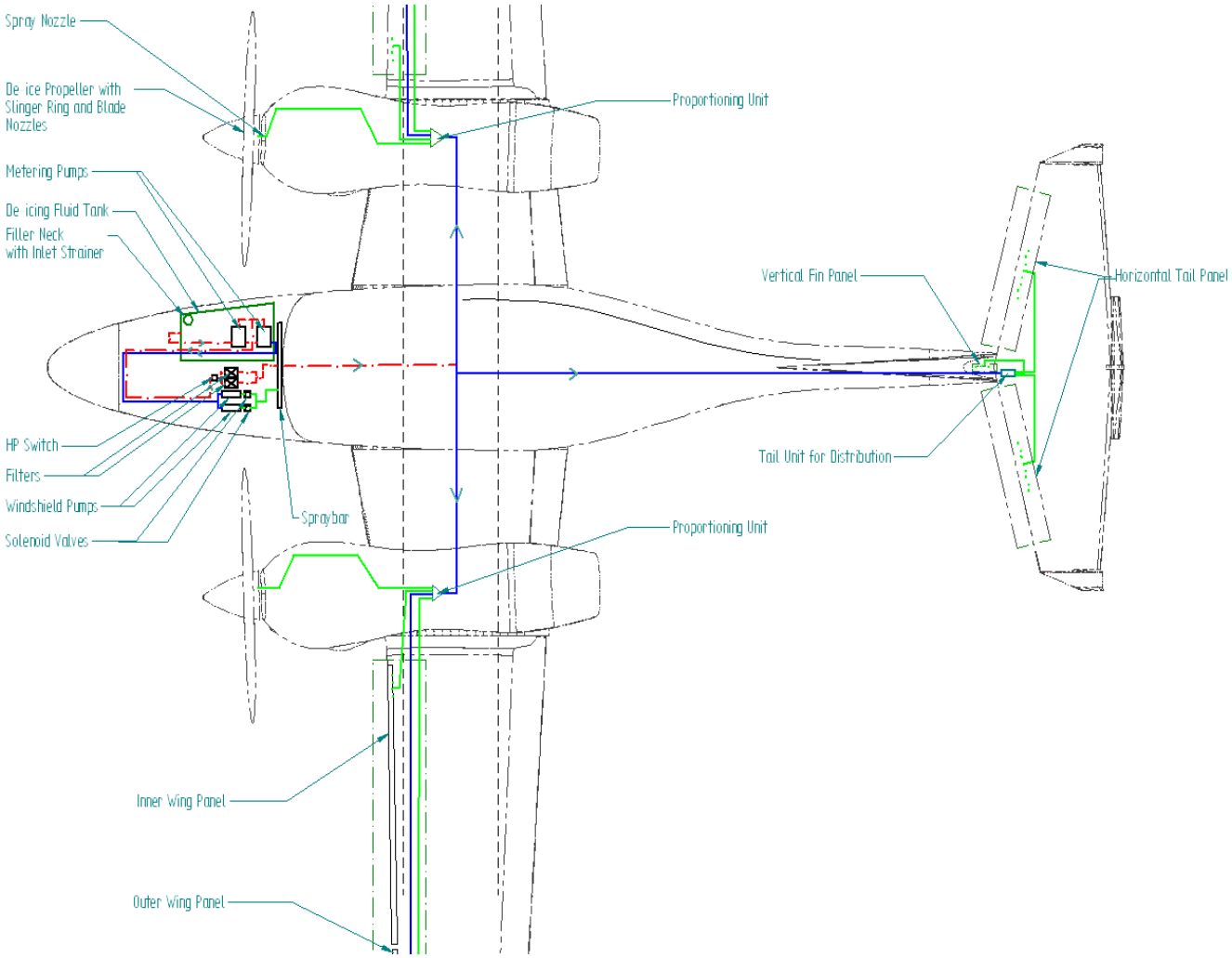
Caution alerts (amber)	Meaning / Cause
DEIC PRES LO	System pressure upstream of the porous panels on the horizontal or vertical tail is too low.
DEIC PRES HI	System pressure upstream of the de-icing fluid filter is too high.
DEICE LVL LO	De-icing fluid level in the tank is below 10 liters (2.6 US gal).

7.14 DE-ICING SYSTEM

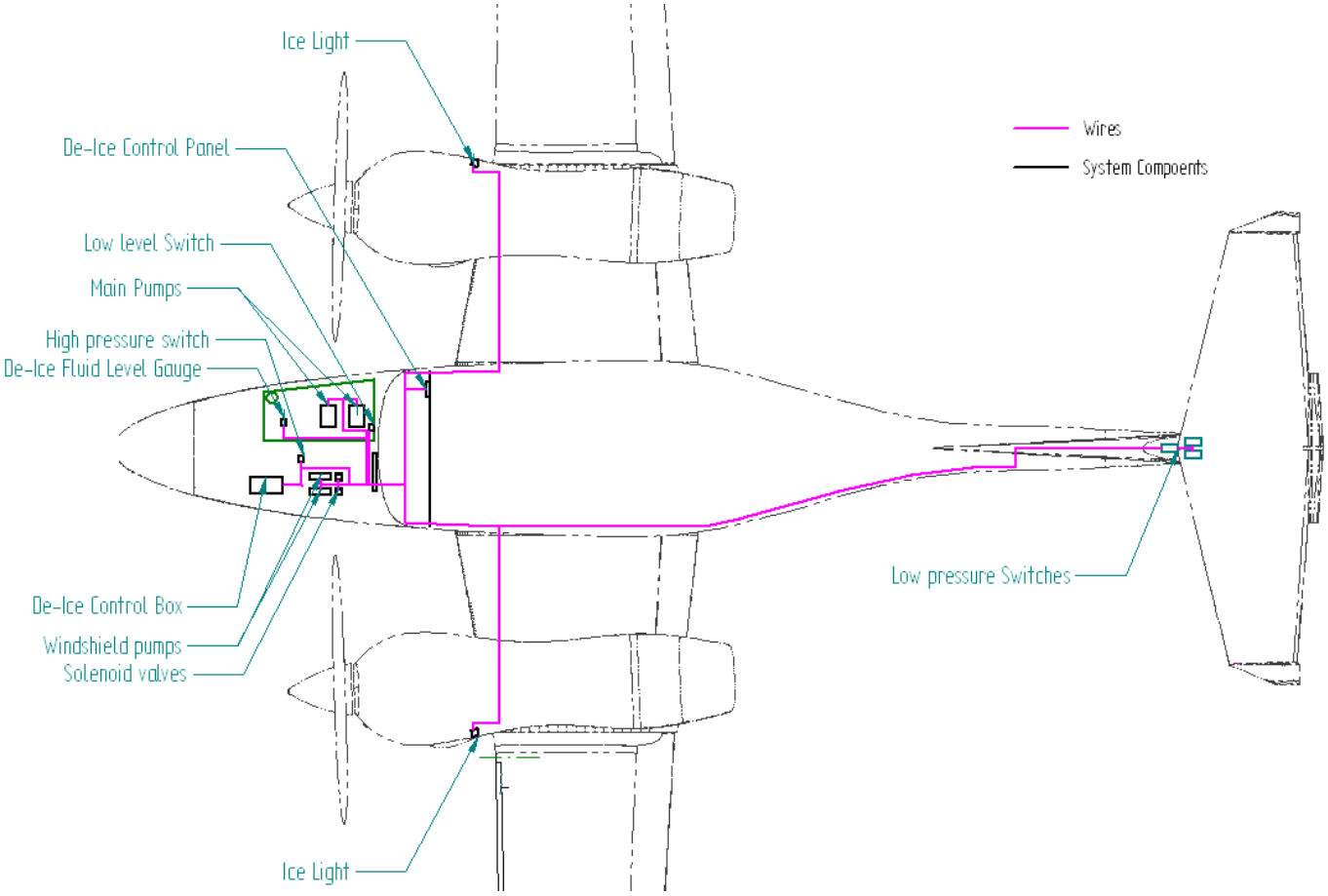
Description

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 liters (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 the minimum quantity for dispatch (45 minutes).

  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.

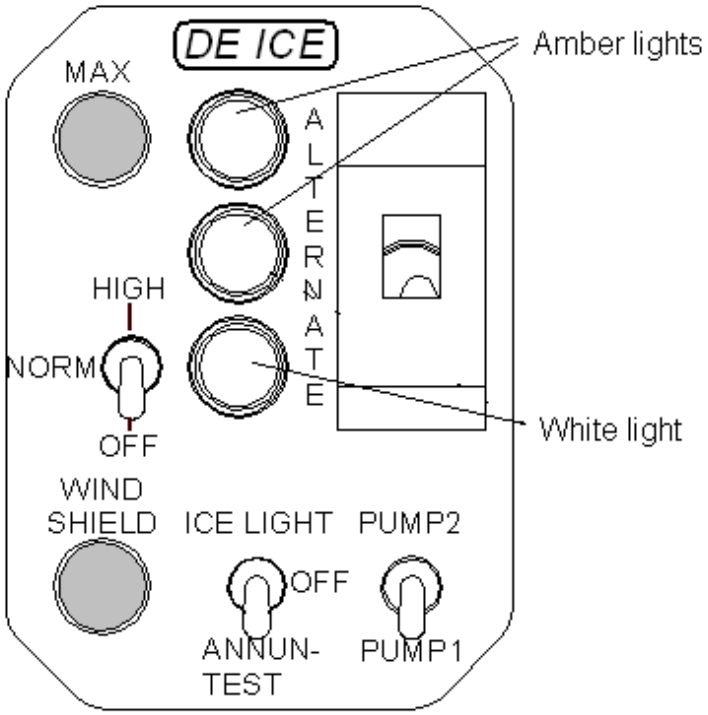
De-icing fluid is replenished through the filler which is located in the fuselage nose on the RH side, aft of the nose baggage door. The tank has a usable capacity of 30 liters (7.9 US gal).

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 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 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 only active for 2 minutes. In this mode both pumps are active simultaneously and provide fluid to the system. This mode is selected when icing conditions are severe or if significant ice has accumulated on the airplane. Maximum system operating time in the MAX mode 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.

8.1 REPLENISHMENT OF THE 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.

8.5 PROLONGED OUT OF SERVICE OR 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 liters (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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