Supplement to Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual

For Socata Models TB20 and TB21

Serial No: _____

Registration No: _____

Section 1

General

This supplement must be included in the Pilot's Operating Handbook and/or FAA Approved Airplane Flight Manual, when TKS ice protection systems are approved in accordance with STC SA00156WI. The information contained herein supplements the information of the basic Pilot's Operating handbook and Airplane Flight Manual.

FAA Approved: _____

For: Everett Pittman

Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas

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Log Of Revisions - Effective Pages

Date	Page	Description of Revision	FAA Approval*
5/3/94	-----	Original	
9/10/04	2,31	Update business address, combined 2 vertical TKS panels to 1.	

* for Manager, Wichita Aircraft Certification Office

Section 2

Limitations

1. There is no change to the airplane limitations when the TKS ice protection system is installed; **INTENTIONAL FLIGHT INTO KNOWN ICING IS PROHIBITED.**

2. De-icing Fluid.

Caution

Under no circumstances are fluids other than those listed below to be used in the TKS System. Some fluids currently used for ground de-icing purposes contain thickening agents which may block the porous panels. If it is known or suspected that such a fluid has been placed in the tank, do no operate the system.

De-icing fluids must meet one of the following specifications:

(i) TKS 80
(ii) AL-5 (DTD 406B)
(iii) TKS R328

Fluids conforming to these specifications may be mixed in the aircraft tank in any proportions.

3. Placard specifying fluid to be attached to the outside of the tank filler door.

T.K.S. ICE PROTECTION TANK
USE ONLY THE FOLLOWING FLUIDS
TKS 80 ; AL-5 (DTD 406B) ; TKS R328

4. Placard to be attached to the upper skin surface at the root end of each mainplane and stabilator (total 4 places).

T.K.S. ICE PROTECTION
CAUTION
POROUS DE-ICING PANELS MAY BE DAMAGED BY CERTAIN SOLVENTS. REFER TO SECTION 8 OF T.K.S. SUPPLEMENT TO PILOT'S OPERATING HANDBOOK

5. Placard prohibiting flight into known icing conditions fitted on control panel as shown in the appropriate drawing.

FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED

Warning

No determination has been made as to the capability of this system to remove or prevent ice accumulation.

Section 3.

Emergency Procedures

In Flight

(TB20 Only) Check that alternate air is selected whenever ice protection is on.

If unexpected icing conditions are encountered, the following procedure is recommended:

1. **Exit the icing condition.**

   If exiting the icing condition is unavoidable, then proceed with the following:

2. Anti-icing

   Pilot workload and loss of aircraft performance due to icing, are both minimized if the ice protection equipment is operated continuously during unexpected icing encounters. For this mode of operation:

   Select airframe/propeller switch to ANTI-ICE when icing condition encountered – OFF when icing conditions cease.

3. De-icing

   Economy of fluid usage may be achieved by using the ANTI-ICE position of the airframe/propeller switch. To remove ice which has been accreted, select airframe/propeller switch to DE-ICE until accreted ice is cleared, then select OFF or ANTI-ICE as required.

> ***Caution***
> *If ice accretions are permitted to form with the ice protection system off, the surface fluid anti-ice system may not remove significant accumulations of ice. The system must be turned on immediately upon detecting ice.*

4. Use windscreen de-ice as required.

   Note: Maximum economy of fluid usage will be achieved if

windshield de-ice is applied in bursts with sufficient interval allowed between each operation for the airflow to spread the fluid across the windshield. Poor visibility caused by spray from the propeller may be improved with the use of windshield de-ice.

5. Alternate Air (TB 20 only)

ON if OAT below +4 Degrees Centigrade and visible moisture present. Otherwise OFF.

6. Ice Protection Light

ON as required.

Descent/Landing

Caution

If it is known or suspected that ice is present on the horizontal stabilizer, do not extend the flaps beyond the takeoff position.

1. Select ice protection as required.

2. Minimize the period during which flaps are extended beyond the Takeoff position.

3. Windscreen

Accumulation of fluid mist from the propeller may obstruct vision through the center of the windshield. Use a burst of windshield de-ice fluid and allow at least 1 minute for the airflow to spread the fluid and clear the mist.

If the windscreen is obscured by ice, de-ice in advance of final approach and landing in order to allow sufficient time for ice

removal and fluid dispersion.

4. Alternate Air (TB 20 only)

ON if OAT below +4 Degrees Centigrade and visible moisture present. Otherwise OFF.

After landing

1. All ice protection switches – OFF.

2. Alternate air – OFF.

Note: Loss of flow to the airframe and propeller may occur due to air entering the pump in turbulent conditions with low tank contents. In this event, the airframe/propeller pump may be reprimed by operating the windshield pump until a steady fluid flow is obtained from the windshield spraybar.

In the event of loss of flow

to the airframe and propeller with ANTI-ICE selected, normal flow may be restored by selecting DE-ICE. This procedure will not be effective if the failure is due to the de-icing pump motor or due to failure of the electrical supply to the pump.

Note: During examination of this supplement, the pilot is advised to identify the ice protection panel and controls.

Section 4.

Normal Procedures

Pre-Flight Inspection

1. Battery Switch – ON

2. DE-ICE - ON

3. Airframe Inspection

Fluid Tank	– Check Quantity (Minimum Indicated Quantity 1.7 U.S. Gallons)
	– Check Filler Cap Secure and Fill Door Closed
	– Check Drain Closed and Not Leaking
Porous Panels	– Check Condition and security
	– Check evidence of fluid flow from all panels and propeller

4. All switches – OFF

Before Starting Engine

1. Fluid Quantity Indicator

– Check quantity sufficient for intended flight and prevailing conditions. (Minimum 1.7 U.S. Gallons Indicated if system is to be considered operational. (See Sections 6 and 7 for weight and balance limitations and calibration of contents indicator).

2. System Operation and Indicator Lights

- Select ANTI-ICE
- Check that both indicator lights flash red initially, then cancel as pressure rises, with green ANTI-ICE ON remaining illuminated.
- Select DE-ICE. Check that green DE-ICE ON is illuminated.

Note: If a delay occurs between the selection of ANTI-ICE and DE-ICE the indicator lamps may flash red for a short period until normal operating pressure is restored. This is acceptable provided that the flashing red indication is replaced by a steady green light within 30 seconds.

3. Pump Switches – OFF

4. Wing Inspection Light

- ON
- Check that light illuminates
- Switch OFF

5. Windshield de-ice pump

- Check Operation

In Flight

FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED.

Section 5.

Performance

No Change

Section 6.

Weight and Balance

The fluid density is 9.2 pounds per U.S. gallon. (1.1 kilogram/liter)

There are no changes in weight and balance limits with the system fitted.

The contents indicator will underestimate the quantity of fluid on board except when the tank is full. For the purposes of weight and balance either determine the true weight of fluid from the table below, or add 0.9 U.S. Gallon to the

indicator reading. (For system endurance purposes either the uncorrected display value is to be taken, or the correction table below may be used. Correction data is also shown, in graphical form in Section 7, Description).

Table 6-1 Weight and Balance Table, Ice Protection Fluid
Aircraft in Level attitude on ground.

Indicator Reading (gal)	True Contents (gal)	Weight (lb)	Arm (in)	Moment (in-lb)
0.0	0.7 or less	6.4	109	698
0.5	1.2	11.0	109	1199
1	1.7	15.6	109	1700
2	2.8	25.7	109	2801
3	3.8	35.0	109	3815
4	4.7	43.2	109	4709
5	5.5	50.6	109	5515
6	6.3	58.0	109	6322
7	7.0	64.4	109	7020
7.7	7.5 to 7.8	69.0 to 71.8	109	7521 to 7826

Section 7

System Description

Note: All volumes referred to in this supplement are U.S. Gallons .

This aircraft is equipped with fluid (liquid) ice protection systems for the wings, stabilizers, propeller and windshield. These systems are supplied with de−icing fluid from a single tank located below the floor of the baggage compartment.

Maximum Fluid Consumption:

Anti−ice Mode −2.40
U.S. gallons per hour

De−ice Mode −4.80
U.S. gallons per hour

Note: The system is intended to be operated continuously in icing conditions at the ANTI-ICE flow rate. With DE-ICE selected the rate of fluid consumption is

doubled.

Maximum System Endurance:

Anti-ice Mode –
3 hours 20 minutes

De-ice Mode –
1 hour 40 minutes

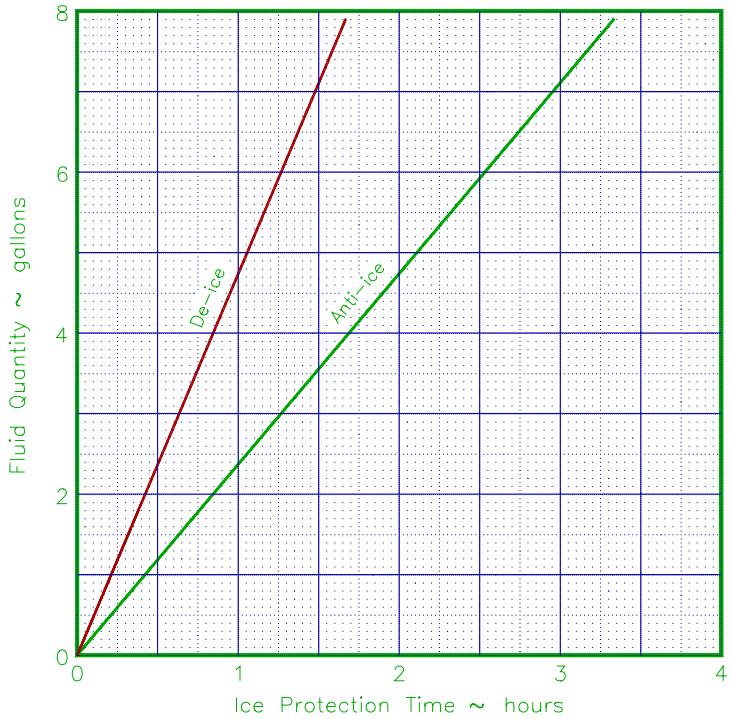

Figure 7-1 Fluid Quantity Chart

The tank is serviced through a filler located on the left hand side of the fuselage, to the rear of the baggage compartment door. The filler orifice is attached to the inside of a door and moves outward with the door as it is opened. Special containers are not required to accomplish filling.

The tank capacity is 7.8 U.S. gallons. The unusable volume is 0.1 U.S. gallons with the aircraft in the level attitude, increasing to 1.45 U.S. gallons in the climb attitude (measured at 10.5 degrees nose up). The usable quantities are 7.7 and 6.35 U.S. gallons respectively. Fluid quantity is measured by a float operated sensor which transmits an electrical signal to the indicator located on the ice protection control panel. Errors exist over most of the range between the true tank contents and the value indicated. A correction table is provided in Section 6 and the data is shown graphically in Figure 7-2.

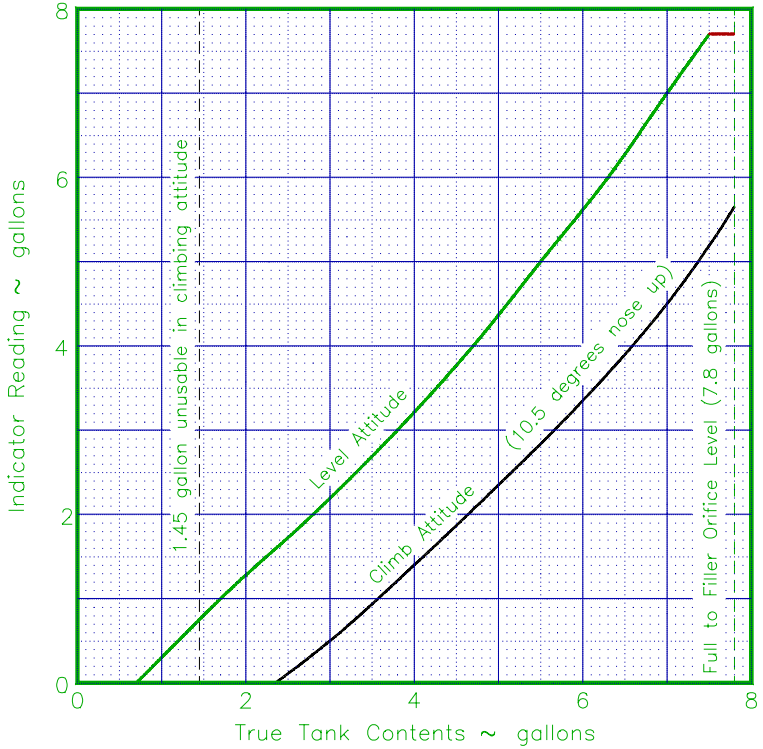

Figure 7-2 Fluid Quantity Indicator Calibration

If the system is to be considered operational, a minimum of 2.5 U.S. gallons should be present in the tank before takeoff. This is represented by an indicator reading of 1.7 U.S.Gallons. A drain is provided, this is located beneath the right fuselage slightly aft of the wing leading edge and is used for priming of the feed pipeline in addition to tank drainage.

The contents indicator display is shown in Figure 7-3 and reads the approximate fluid quantity in the tank in U.S. Gallons. True quantity can be obtained by correcting the value shown as described above. This display has automatic dimming for night operations.

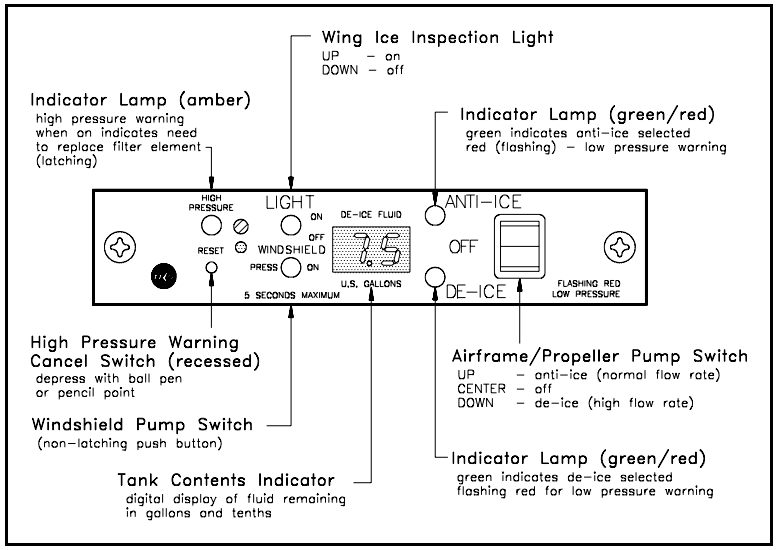

Figure 7-3 Ice Protection Control Panel

Three indicator lights are provided; two of these are dual colour and illuminate steady green to indicate the selected condition of the airframe/propeller ice protection system. In the event of low system pressure both lights flash red, with the light appropriate to the current pump selection alternating red/green in colour.

The third indicator light is amber in colour and light is illuminated when the pump delivery pressure exceeds normal limits. Illumination of this light indicates the possible need for filter element renewal. (Refer to Section 8. Paragraph 3 for further details).

Note: Once this light is illuminated it will remain on until the aircraft circuit is switched OFF, unless it is reset by depressing the recessed RESET switch using a probe such as

a pencil or ballpen.

The fluid supply to the porous panels and propeller is provided by a two speed electrically driven pump. Propeller and airfoil protection cannot be operated independently. The supply for the windshield is provided by a separate intermittently rated pump. Figure 7-4 presents the fluid system schematic, while Figure 7-5 presents the wiring schematic.

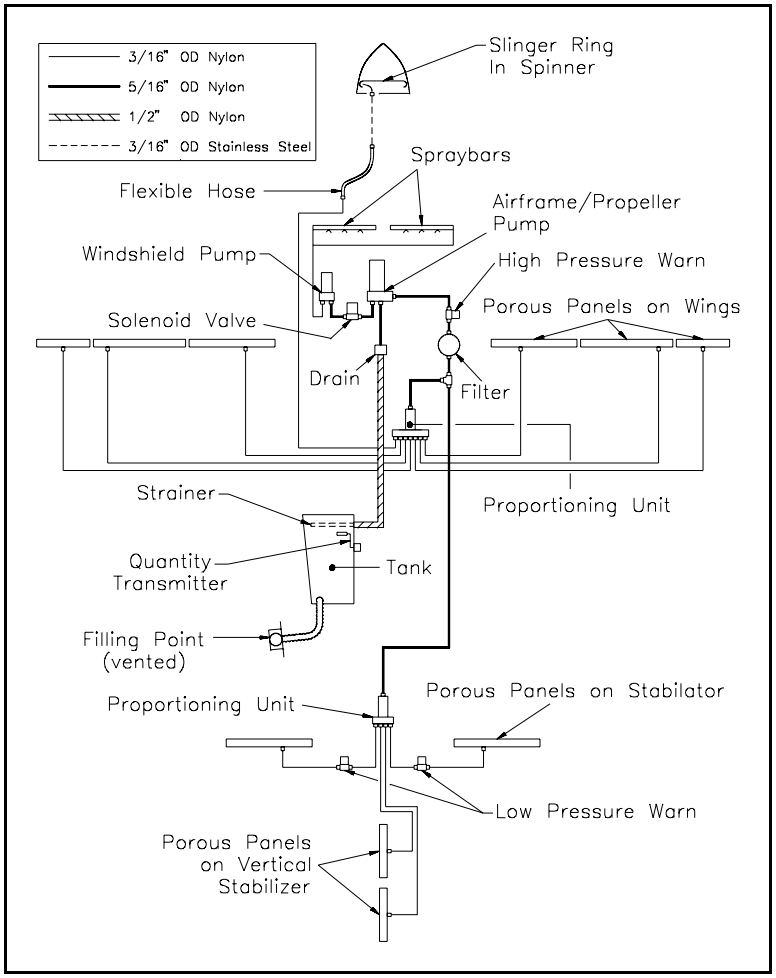

Figure 7-4 Fluid System Schematic

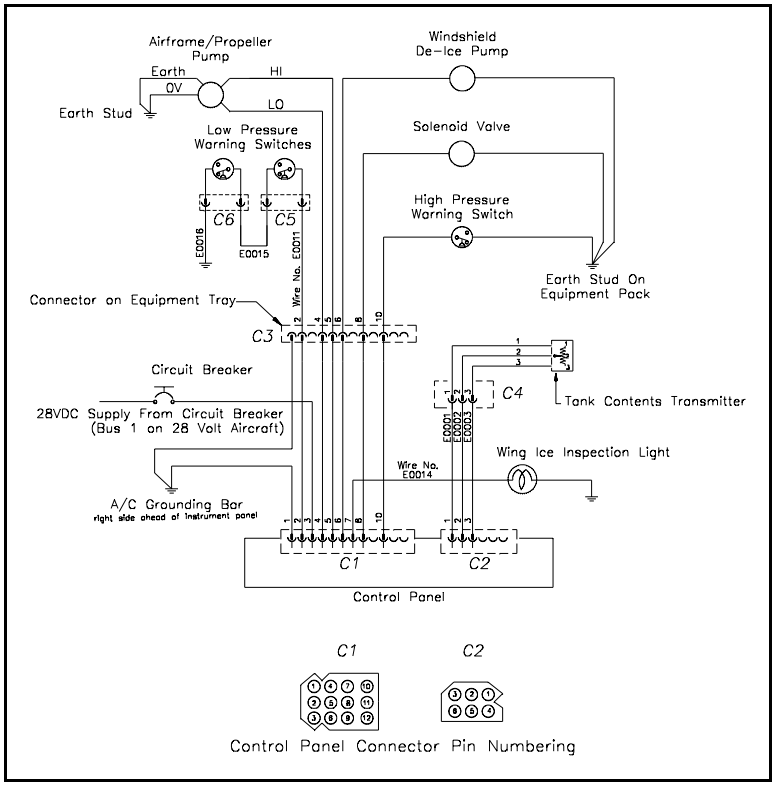

Figure 7-5 Wiring Schematic

De-icing fluid from the pump, passes through a filter and then through a spring loaded check valve which prevents flow when the pump is not operating.

A system of plastic tubing carries the

fluid to proportioning units located between the main undercarriage wheel wells and in the tail fairing. The proportioning units divide the flow into the requirements of the individual regions fed from each proportioning unit outlet.

Porous panels are attached to the wing and stabilizer leading edges. When the system is functioning these panels exude fluid at a low steady rate. At the same time a metered quantity of fluid is pumped via a slinger ring to the propeller blades.

The windshield pump has a second function which is to prime the airframe/propeller pump. When the windshield pump is operated the solenoid valve in series with this pump opens and fluid (and air if present) is drawn from the tank through the airframe/propeller pump.

Section 8

Handling, Servicing and Maintenance

Prolonged Out of Service Care

During Flyable Storage

Ensure that the de−icing fluid tank contains at least the minimum recommended quantity of fluid (Refer to Section 7) and that all system components are filled with fluid. Operate airframe/propeller pump for at least two minutes at DE-ICE speed, intervals between operations should not exceed two months, for the first two years from new. At the same time exercise the windshield pumps for several periods not exceeding five seconds each. The two month interval between operation may be increased to a period not exceeding six months, after the two year period unless any of the system plastic tubing has been renewed. (see also Pump Priming). Recheck tank contents.

Note: Complete system priming after prolonged out of service may take as long

as 15 to 20 minutes. Priming prior to each flight is recommended to maintain the system ready for immediate use and to facilitate insect removal from the leading edges.

Servicing and Maintenance

1. De-icing Fluid Tank

Caution

Under no circumstances are fluids other than those listed to be used in the TKS system. Some fluids currently used for ground de-icing purposes contain thickening agents which may block the porous panels. If it is known or suspected that such a fluid has been placed in the tank, do no operate the system.

See **Limitations** for approved de-icing fluids.

The de-icing tank filler is located on the left hand side of the fuselage just aft of the baggage compartment door. To preclude the

possibility of contamination, always clean the top of fluid containers before dispensing. If fluid is dispensed from bulk storage it is recommended that a clean vessel is maintained, solely for de-icing fluid. Secure the filler cap and filler door immediately after filling.

A drain point is provided beneath the fuselage, on the right side slightly aft of the wing leading edge. This is provided for the purpose of draining the tank and should also be used to remove air from the pipeline between the tank and pump when refilling the system from empty. In this case fill or partially fill the tank and open the drain valve until air free fluid is discharged.

2. De-icing Fluid Strainer

Remove and clean the de-icing fluid strainer in the tank outlet at 12 monthly intervals or sooner if

there are indications of foreign materials in the tank. The strainer is accessed either through the inspection panel situated on the lower fuselage skin below the forward end of the tank, or by tank removal. Flush the tank with clean water if foreign materials are evident in the bottom of the tank.

3. De-icing Fluid Filter

Illumination of the HIGH PRESSURE warning in flight (or during ground testing) indicates the need for filter element renewal, except that warnings arising from system operation in the DE-ICE mode and/or at abnormally low temperatures (below −30°C) may be ignored.

4. Pump Priming

The airframe/propeller pump may not be self priming and is ground primed by first opening the drain valve to remove any air in the

supply pipeline from the tank, (Reference paragraph 1 of this Section) then by operating windshield de−ice system to remove air from the remainder of the fluid feed pipelines and the body of the airframe/propeller pump. (In flight priming may be accomplished by operation of the windshield pump only, see Section 3).

5. Stabilator Balancing

In the event of changes requiring checking and/or rebalancing of the stabilator this is to be carried out in accordance with SOCATA Maintenance Manual Section IV.1, except that due allowance is to be made for the weight of de−icing fluid in the porous panels attached to the stabilator leading edge. The de−icing fluid contained in the stabilator panels represents a moment of −50 mm kg. The stabilator is to be balanced such that the moment is within the

permitted limits with the porous panels both dry and filled with fluid. In view of the difficulty of determining the quantity of fluid contained within the panels during the balancing operation, it is recommended that the stabilator is balanced within moments reduced by 50 mm kg at each limit. (i.e. SOCATA limits are −150 mm kg to +74 mm kg. It is recommended that the stabilator with TKS panels installed is balanced within the limits −100 mm kg to +24 mm kg)

6. Stall Warning Sensor

Maintenance functions relating to the stall warning sensor are to be made as detailed in SOCATA Maintenance Manual Section XI.1.9, except that for access to and/or removal of the unit it is first necessary to remove the left outer mainplane porous panel. This panel is secured with eight screws and may be withdrawn for access to

the stall warning sensor following removal of these screws. It is not necessary to disconnect the feed tube to the panel although care is to be taken not to damage or kink the tube during the operation.

Cleaning

Caution

Porous panels contain a plastic membrane which may be damaged by certain solvents, particularly Methyl Ethyl Ketone (MEK): Acetone; Lacquer thinner and other types of thinners and solvents. Mask panels when painting aircraft or when using solvents for other purposes in the proximity of the porous panels.

The porous panels may be washed with soap (or detergent) and water using a brush or lint free cloth. Only the following solvents are permitted for use on porous panels (Refer also to the aircraft manufacturers recommendations and instructions for cleaning the aircraft exterior surfaces.):

Water (with soaps or detergents)

Approved de-icing fluids

Aviation gasoline

Aviation turbine fuel

Isopropyl alcohol

Ethyl alcohol

Cleaning of the porous panels will be greatly facilitated if the system is primed prior to each flight, especially if flight at low altitudes or in insect infested areas is anticipated.

Table 8-1 Overhaul or Replacement Guide

Component	Overhaul or Replace
Airframe/Propeller Pump	On Condition

Motor Brushes, Airframe/Propeller Pump	Every 2,000 Hours
Windshield Pump	On Condition
Solenoid Value (Windshield)	On Condition
Low Pressure Switch	On Condition
Filter (Subject to element replacement detailed in servicing)	On Condition
Fluid Tank	On Condition
Pipelines and Couplings	On Condition
Proportioning Units	On Condition

Table 8-1 Overhaul or Replacement Guide (continued)

Component	Overhaul or Replace
Porous Panels	On Condition
Propeller and Spinner Mounted Equipment	On Condition
Control Panel	On Condition

Section 10

Safety Information

Flight in Unexpected Icing Conditions

1. The airframe ice protection equipment is not intended to remove ice from aircraft on the ground. Do not attempt to take off with frost, ice or snow on flying surfaces.

2. No airplane or combination of de-icing and anti-icing equipment can be designed for the worst possible icing encounter – this condition cannot even be defined. As

competent pilots know, there appear to be no predictable limits for the most severe weather conditions. For essentially the same reasons that airplanes, however designed or equipped for IFR flight, cannot be flown safely into conditions such as severe thunderstorms, tornadoes, hurricanes or other phenomena likely to produce extreme turbulence, airplanes cannot be expected to cope with the worst icing conditions that nature can produce.

The prudent pilot must remain aware of and react in a timely manner to prevailing conditions. He must also be aware of the possibility that icing conditions may become so severe that his aircraft and equipment cannot cope with them. At the first indication that such conditions may have been encountered, or may be ahead,

he/she should react by deciding the most expeditious and safe course of action. The decision should be based on weather briefing, recent pilot reports and ATC observations. Alternatives could be course changes, altitude changes or even continuance on the same course.

3. The ice protection system is not designed to permit flight in icing conditions for an indefinite period of time. Its purpose is to provide some protection from the effects of ice, should an unexpected or inadvertent encounter with ice occur. At the first observation of airframe ice, the pilot should immediately take action to find a flight condition that will minimize the time in icing and provide a safe exit from the icing conditions. If the possibility of icing exits, the prudent pilot will always plan

the flight such that at least one alternative exists (altitude, course, or landing site) that will offer a safe exit from the icing conditions.

4. The pilot must remain aware that any ice on the aircraft will have some effect on the flight qualities, and be prepared to make the appropriate allowances.

Caution

If it is known or suspected that the protected regions of the horizontal stabilizer are not free of ice, caution must be exercised when lowering the flaps and the use of full flap should be avoided. At the first sign of a reduction of pitch control flap deployment should be halted or reversed.

Stall warning indications should not be relied upon during or following icing conditions, as the margin between operation of the wing mounted sensor and the aerodynamic stall may be affected by residual ice. Depending upon circumstances it may be advisable to increase approach and landing speeds, because even with the protected surfaces clear of ice a performance degradation may occur due to ice on the unprotected regions.