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

For Mooney Models
M20J, M20K, M20M, M20R, & M20S

Serial No:_____ Registration No:_____

Section 1

General

This supplement must be included in the Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, when TKS ice protection systems are installed in accordance with STC **SA2367CE**. The information contained herein supplements the information of the basic Pilot's Operating handbook and Airplane Flight Manual.

FAA Approved:

For:

Manager
Aircraft Certification Office
Federal Aviation Administration
Wichita, Kansas

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Aerospace Systems & Technologies Inc.
3213 Arnold Ave.
Salina, Kansas 67401
Phone: (785) 493-0946
Fax: (785) 493-0950

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Log Of Revisions - Effective Pages

Date	Page	Description of Revision	FAA Approval*
April 18, 1988	Title	Original	
April 18, 1988	2 thru 17	Original	
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Nov 1, 2001	All	Added M20R (Ovation II) and M20S Address Change	

* 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.

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

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

3. Placard specifying fluid to be fitted adjacent to de-icing fluid tank filler:

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

4. Placard to be fitted adjacent to porous panels:

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

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

1. **Exit the icing condition.**

If exiting the icing condition is not possible, then proceed with the following:

A. 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 ANTI-ICE position on airframe/propeller switch when icing conditions encountered. Select OFF when icing conditions cease.

B. 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 DE-ICE position on airframe/propeller switch until accreted ice is cleared, then select OFF or ANTI-ICE, as required.

See *Caution* next page.

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.

C. 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.

Loss of Flow

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.

Descent/Landing

1. Select system as required.

Note: 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.

After landing

1. All switches - 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.

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

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Section 4.

Normal Procedures

Pre-Flight Inspection

1.	Battery Switch	-	ON
2.	DE-ICE	-	ON
3.	Airframe Inspection		
	Fluid Tank	-	Check quantity
		-	Check cap secure
	Porous Panels	-	Check condition and security
		-	Check evidence of fluid from all panels and propeller
4.	All switches	-	OFF

Before Starting Engine

1.	Fluid Quantity Indicator	-	Check quantity (See **Limitations** for weight and balance)
2.	System Operation Lights	-	Check
3.	Windshield De-ice Pump	-	Check operation
4.	Wing Inspection Light	-	Check operation
		-	Check OFF if daylight operation
5.	All switches	-	OFF

In Flight

FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED.

See **Emergency Procedures**

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Section 5.

Performance

No Change

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Section 6.

Weight and Balance

The fluid density is 9.2 pounds per U.S. gallon.

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

Table 6-1 Weight and Balance Table Ice for Protection Fluid

Volume (gal)	**Weight** (lb)	**Arm** (in)	**Moment** (in-lb)
1	9.2	70.7	650
2	18.4	70.7	1301
3	27.6	70.7	1951
4	36.8	70.7	2602
5	46.0	70.7	3252
6	55.2	70.7	3903

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Section 7

System Description

The tank is serviced through a single filler located on the right fuselage aft of the baggage compartment, and has a total capacity of 6.1 gallons. The unusable volume is 0.10 gallon. It is the pilot's responsibility to ensure that an adequate quantity of fluid is carried. A minimum of 1.00 gallon is required in the tank before takeoff, if the system is to be considered operational. Fluid quantity is measured by a float operated sensor which transmits an electrical signal to the indicator located on the ice protection control panel.

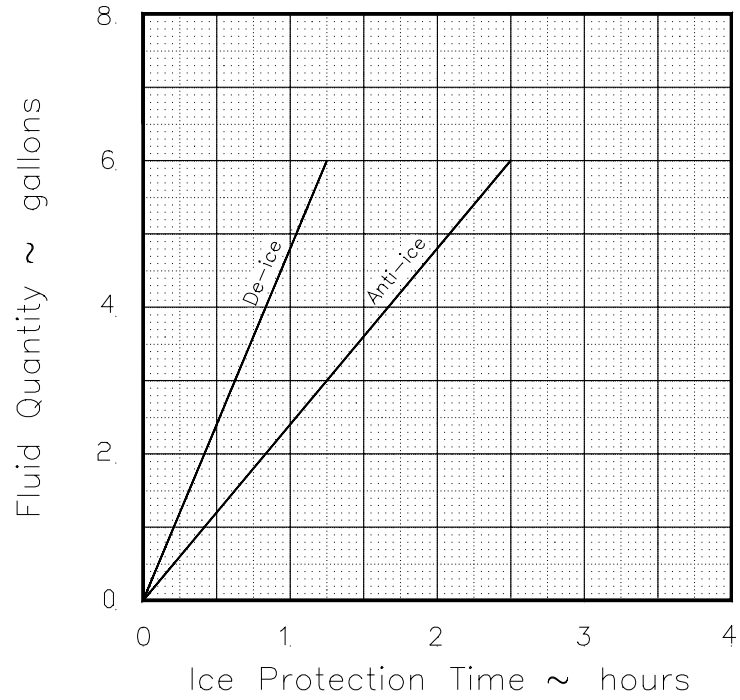

Figure 7-1 Fluid Quantity Chart

Maximum system endurance:

With ANTI-ICE selected... 2 hours 30 minutes

With DE-ICE selected ..... 1 hour 15 minutes

The above time includes an allowance of 5% for the use of windshield de-icing.

The contents indicator display is a digital readout in gallons and 1/10 of a gallon. This display automatically dims for night operation.

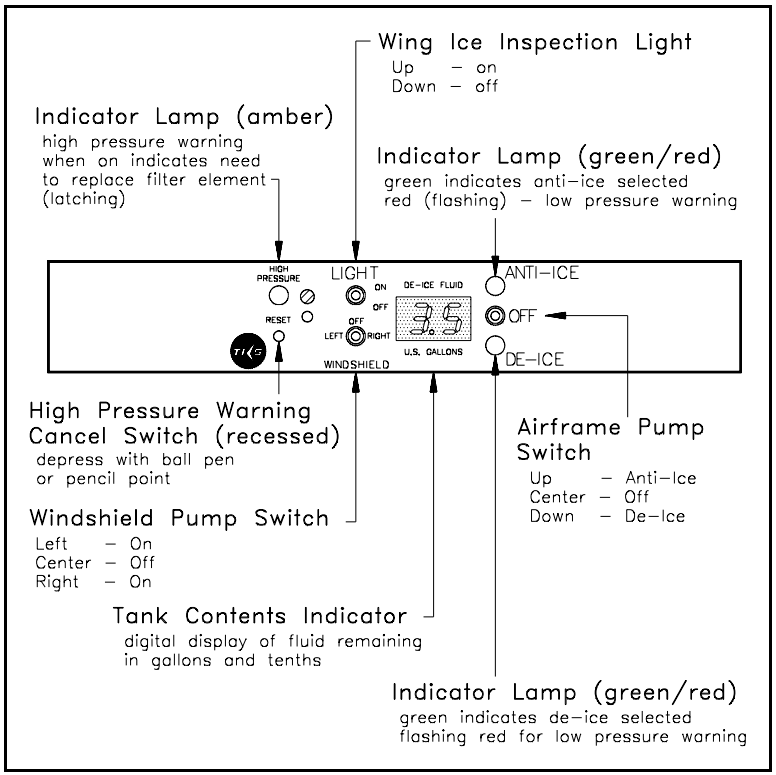

Figure 7-2 Ice Protection Control Panel

Fluid pressure for airframe/propeller ice protection is provided by a two- speed electrically driven pump. The low speed provides the required flow when ANTI-ICE is selected, and the high speed provides the required flow when DE-ICE is selected.

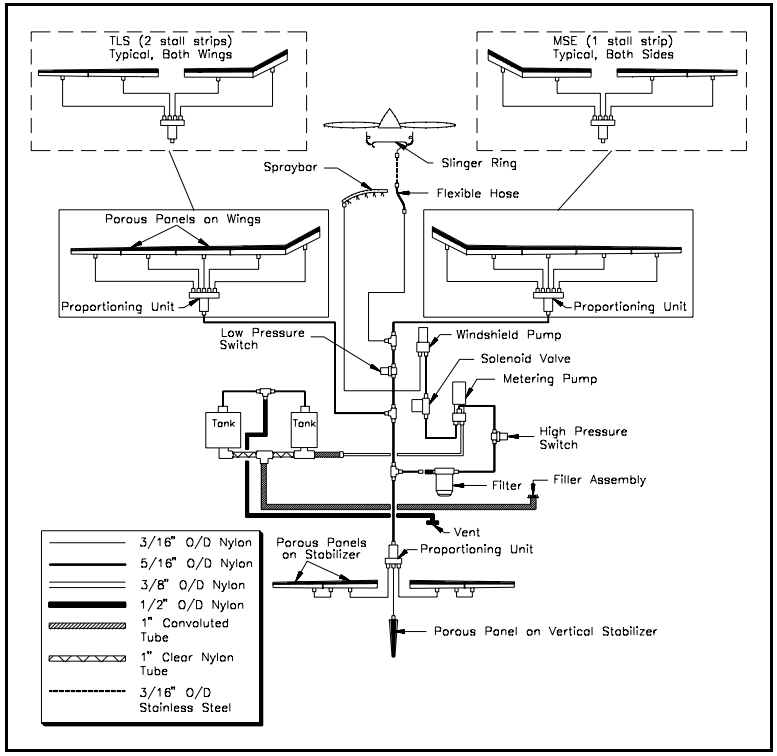

Figure 7-3 Fluid System Schematic

The operation state of the airframe/propeller system is displayed by two indicator LED's which indicate when anti-ice and de-ice are selected. The option selected will cause the corresponding LED to illuminate green. If a low pressure is experienced in the system, the option selected will alternately flash green and red. The LED of the unselected option will flash red. From the pump, the de-icing fluid 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 in the tail and in each wing. The proportioning units divide the flow into the requirements of the individual items fed from each proportioning unit outlet.

Porous panels are attached to the aircraft leading edges. When the system is functioning, these panels exude de-icing fluid at a low steady flow rate. Protection for the propeller is provided by a pipe which passes through the engine compartment and directs fluid into a slinger ring located on the spinner backplate. Centrifugal action throws the fluid from the slinger ring through tubes and on to grooved rubber overshoes fitted to the root end of each propeller blade.

A small electrically operated pump provides pressure for windshield de-icing. Operation of this pump is controlled by a non-latching switch on the ice protection control panel, and applies a 3 second timed burst of fluid from a multiple outlet spraybar onto the left hand side of the windshield. The windshield de-icing system is designed for intermittent operation to establish pilot's forward vision as required.

A wing inspection light, controlled by the ice light switch, is provided to illuminate the leading edge of the left wing during night operation.

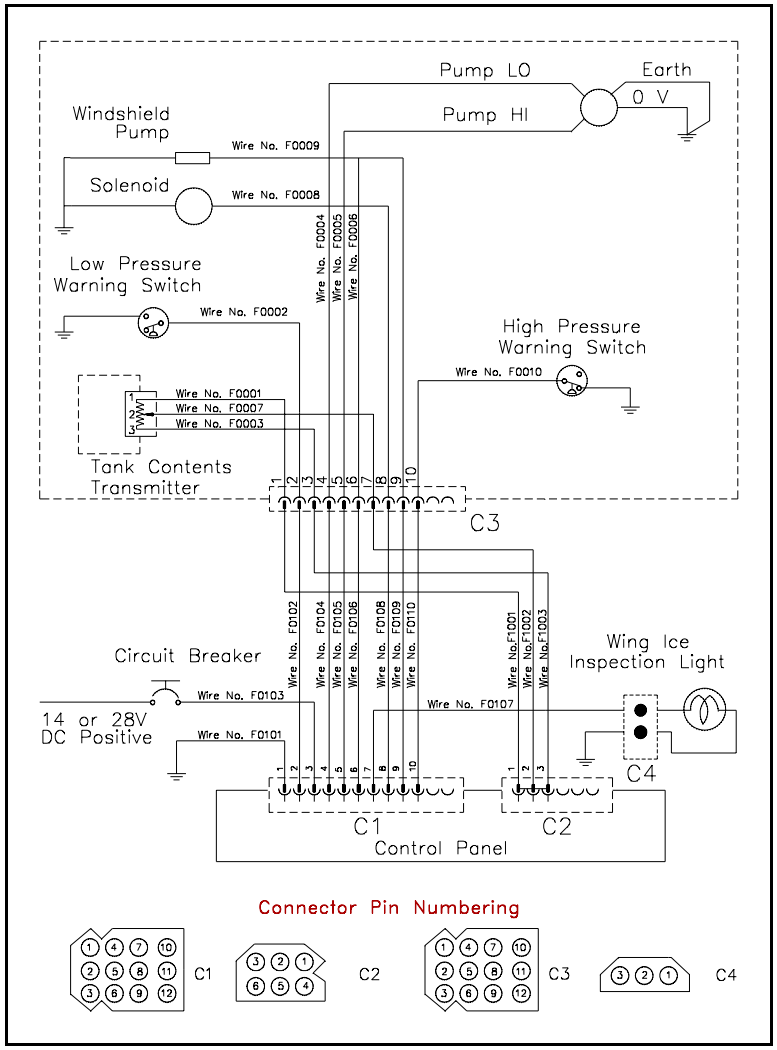

Figure 7-4 Wiring Schematic

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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 take off quantity of fluid (1 gallon), and that all system components are filled with fluid. If necessary operate pump(s) until all air is dispelled from components and pipelines (see Priming, below). Recheck tank contents.

Servicing

1. De-icing Fluid Tank

   See Limitations for specified de-icing fluids. The filler cap is located on the right fuselage aft of the baggage compartment. To preclude the possibility of contaminated fluid, always clean the top of fluid containers before dispensing, and if required maintain a clean measuring vessel solely for de-icing fluid. Secure the filler cap immediately after filling. The tank is vented through the filler cap and an additional vent line is provided.

2. De-icing Fluid Strainer

   Ordinarily, the de-icing fluid strainer in the fluid tank outlet should not require cleaning, unless there is a definite indication of foreign matter in the tank.

3. De-icing Fluid Filter

Normally, the de-icing fluid filter element should be changed at 1200 hours or 2 year intervals. However, the filter element may require changing at more frequent intervals, depending on service conditions and fluid handling equipment when operating in localities where there is an excessive amount of sand and dust.

4. Priming

The airframe/propeller pump may not be self priming, and is primed, when required, by operation of the windshield pump.

5. Porous Leading Edge Panels

Caution

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

Only the following solvents are permitted for use on porous panels, but refer to recommended procedures for cleaning exterior painted surfaces for aircraft.

Water (with soaps or detergents)
De-icing fluids (As specified in **Limitations**)
Aircraft fuels (Gasoline or Kerosene)
Isopropyl or Ethyl alcohol

The porous panels may be washed with mild soap and water using a brush or lint free cloth.

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

Table 8-1 Overhaul or Replacement Guide
(continued)

Component	Overhaul or Replace
Fluid Tank	On Condition
Pipelines and Couplings	On Condition
Proportioning Units	On Condition
Porous Panels	On Condition
Propeller and Spinner Mounted Equipment	On Condition
Control Panel	On Condition

Section 9

Supplements

Not applicable.

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Section 10

Safety Information

Flight in Unexpected Icing Conditions

1. The airframe ice protection system is not intended to remove ice from the 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 alert to the possibility that icing conditions may become so severe that his equipment cannot cope with them. At the first indication that such conditions may have been encountered, or may be ahead, he or 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. Stall warning indications should not be relied upon during, or following, icing conditions, as operation of the wing mounted sensors is likely to be impaired. Depending upon circumstances, it may be advisable to increase approach and landing speeds, because even with the protected regions totally clear of ice, a performance degradation will occur due to ice on the unprotected regions. The amount of the degradation cannot be accurately predicted. Therefore the pilot must use extreme caution during approach and landing, being alert to the first signs of pre-stall buffet and an impeding stall.