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

For the Hawker Beechcraft Bonanza G36 Aircraft
Equipped for Flight Into Known Icing
Conditions with TKS® Ice Protection

Serial Number: _____

Registration Number: _____

Section 1

General

This is a sample supplement and not intended for use. For the most accurate information, consult your POH Supplement.

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Log of Revisions – Effective Pages

Date	Page	Description of Revision	FAA Approval*
04 Apr 2011	All	Initial Release	Sample

* For Manager, Wichita Aircraft Certification Office

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Section 2
Limitations

2.1 Preflight Checks

Checks and inspections specified under Normal Operating Procedures – Preflight Inspection, Before Taxi and Before Takeoff Check in this supplement must be satisfactorily completed prior to flight into known or forecast icing conditions.

Takeoff is prohibited with any frost, ice, snow, or slush adhering to the wings, horizontal stabilizer, control surfaces, propeller blades, or engine inlets.

Warning

Even small amounts of frost, ice, snow, or slush on the wing may adversely change lift and drag characteristics of the aircraft. Failure to remove these contaminants will degrade airplane performance and may prevent a safe takeoff and climb out.

2.2 Minimum Dispatch Fluid Quantity

Minimum ice protection fluid required for Flight Into Known Icing conditions prior to takeoff:

5.5 U.S. Gallons (Indicated on Ground)

This minimum, as indicated on the TKS Control Panel, allows for 90 minutes of ice protection with NORM selected, however, the pilot must ensure adequate fluid quantity before each flight.

2.3 Approved Ice Protection Fluid

The TKS Ice Protection System tank must be serviced with the following fluids:

a) Specification DTD-406B

Trade names for DTD-406B include “TKS-406B” (Killfrost), “AL-5” / “TKS Fluid (D.W. Davies), “AVL” (Aviation Laboratories), and Aeroshell Compound 07 (Shell).

Warning

Under no circumstances are fluids other than those listed above 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 not operate the system.

2.4 Porous Panel Cleaning

Only the following are authorized for cleaning the leading edge panels:

Water (with soap/detergent)
Approved Ice Protection Fluid (See Section 2.4)
Aviation Gasoline
Aviation Turbine Fuel
Isopropyl Alcohol
Ethyl Alcohol
Industrial Methylated Spirit

2.5 Use of Pitot / Stall Heat on Ground

The operation of the Pitot / Stall Heat switch must be kept to a minimum while the aircraft is taxiing or stopped. Prolonged use of pitot heat on the ground may damage the lift detector heating elements.

2.6 Minimum Speed in Icing Conditions

Minimum airspeed for operation in icing conditions (except for takeoff and landing):

110 KIAS

2.7 Flap Settings in Icing Conditions

Maximum deflection is the approach setting when the TKS-Equipped aircraft has encountered 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 of +5°C or below.

2.8 Speed Brake Operation in Icing Conditions (If Installed)

Speed brakes are not to be operated during or after flight in icing conditions.

2.9 Windshield Pump

Do not operate the windshield pump continuously longer than 10 seconds. Allow at least 10 seconds between operations.

Caution

The windshield pump is intermittently rated. Continuous operation may damage the pump.

2.10 Required Equipment

The following equipment must be installed and operational for flight in icing conditions:

a. TKS Ice Protection System, including porous panels on the leading edges of the wings, horizontal and vertical stabilizers, fluid slinger assembly on the propeller, pumps, windshield spraybar, and heated lift detector / stall warning vane.
b. Alternate static source
c. Pitot tube heat system
d. Wing ice inspection light
e. Dual Alternators
f. Heater and Defroster
g. The following Hartzell Propellers:
   P/N: PHC-C3YF-1RF/F8468A(K)-6R
   STC: SA00719LA

2.11 Center of Gravity Limits in Icing Conditions

For Flight Into Known Icing conditions, the forward center of gravity is limited to 78.0 inches at 3414 pounds with straight line variation to 81.0 inches at 3650 pounds.

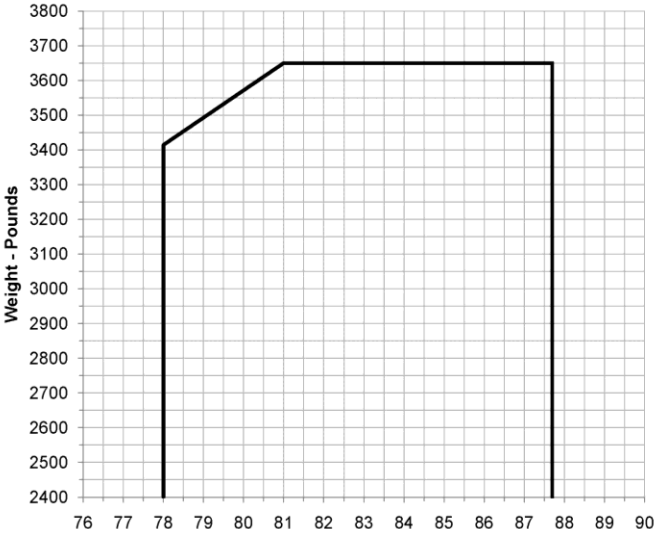


Figure 2-1 Bonanza G36 Center of Gravity Limits for Flight into Known Icing Conditions

2.12 Environmental Conditions

Known icing conditions are defined by 14 CFR 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 conditions, or conditions defined as severe).

Warning

Flight in conditions outside of 14 CFR Part 25, Appendix C is prohibited.

The airplane must not depart or be flown into an airport where freezing rain or drizzle conditions are being reported.

Some icing conditions not defined in 14 CFR Part 25, Appendix C have the potential of producing hazardous ice accumulations, which:

a. Exceed the capabilities of the airplane's ice protection equipment, and/or

b. Create unacceptable airplane performance and stall speed increase.

Pilots must be prepared to divert the flight promptly if hazardous ice accumulations occur. Inadvertent operation in these conditions may be detected by:

a. Unusually extensive ice is accreted on the airframe in areas not normally observed to collect ice.

b. Accumulation of ice on the upper or lower surface of the wings aft of the protected area.

c. Heavy ice accumulations on the windshield, or when ice forms aft of the curved sections on the windshield.

If these conditions are encountered, the pilot must take immediate actions to exit the conditions, regardless of speed. For further information, refer to the Emergency Procedures (Section 3) of this supplement.

Exit strategies must be determined during pre-flight planning.

2.13 Autopilot Operation in Icing Conditions

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

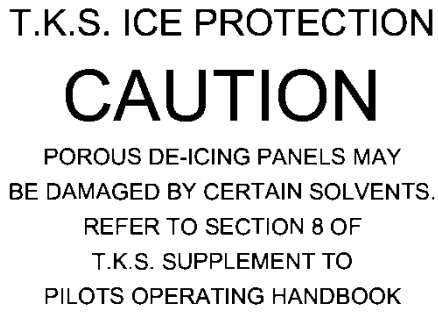
2.14 Placards

The following placards are required:

a. Above the Garmin G1000 PFD:

b. Adjacent to the ice protection fluid tank filler:

c. Adjacent to the porous panels:



d. Adjacent to the pitot / stall heat annunciator:

e. Operating Limitations Placard:

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Section 3
Emergency Procedures

Note

"Monitor Operation" is used commonly throughout the following section. In these cases, the pilot should be attentive to system annunciations, as well as visual cues, such as the accretion of ice on the TKS porous panels.

3.1 Flashing red low pressure lights illuminated (TKS fluid low pressure)

Note

During initial system startup, it is typical for the system to indicate a low pressure annunciation as the system primes itself. If low pressure is indicated after approximately 1 minute of system operation, the following procedures should be followed.

1. Other Pump - Select
2. Flow Rate - MAXIMUM if required

If normal operation is achieved with the other pump:

3. Continue Flight
4. TKS Ice Protection System - Monitor Operation

If the light does not extinguish:

5. TKS Control Panel - Off
6. TKS Backup Switch - On

If normal operation is achieved with the backup switch:

7. Continue Flight

8. TKS Ice Protection System - Monitor Operation

If the light does not extinguish:

9. Icing Condition - Exit immediately

3.2 Amber high pressure light illuminated (TKS fluid high pressure)

1. Reset Button - Press using ballpoint pen or pencil point.

If the light extinguishes:

2. Continue Flight

3. TKS Ice Protection System - Monitor Operation

If the light does not extinguish or unable to reset:

4. Icing Condition - Exit immediately

5. TKS Ice Protection System - Monitor Operation

3.3 Failure of ice protection system, or excessive ice accumulation (observed or suspected) on protected airplane surfaces

1. Autopilot - Disconnect

2. TKS Circuit Breaker - Check and reset as applicable

3.	Icing Condition	- Exit immediately. Asking for priority to leave the area is fully justified under these conditions.

Warning

Pilots must be prepared to divert the flight promptly if hazardous ice accumulations occur. Inadvertent operation in these conditions may be detected by:

a. Unusually extensive ice is accreted on the airframe in areas not normally observed to collect ice.

b. Accumulation of ice on the upper or lower surface of the wings aft of the protected area.

c. Heavy ice accumulations on the windshield, or when ice forms aft of the curved sections on the windshield.

If encountering severe icing, the pilot should minimize the use of flaps unless needed to maintain minimum speed in the icing condition. If flaps are used, avoid extending for long periods while operating 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.

Stall speeds will increase with ice accumulation on the wing and tail leading edges. Expect higher than normal sink rates with power reduction.

4.	Flaps	- Approach (If required to maintain 110 KIAS – Maximum Setting)
5.	Windshield Spraybar	- Operate to verify pumps are primed as evidenced by fluid on windshield.

Perform Steps 6 – 8 if TKS Ice Protection System is functional:

Warning

The operation of both pumps increases the flow rate of the TKS System to 4 times that of NORMAL mode, allowing for a maximum endurance of 38 minutes when the TKS fluid tank is full. Fluid usage must be monitored while in the icing condition to prevent the depletion of fluid prior to exiting the icing condition.

6.	Main Pump Select	- Pump 1
7.	Ice Protection Mode	- MAXIMUM
8.	TKS Backup Switch	- ON

Note

Reduce angle of attack by increasing speed as much as the airplane configuration and weather permit without exceeding design maneuvering speed.

Avoid abrupt and excessive maneuvering that may exacerbate control difficulties.

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.

Report these weather conditions to Air Traffic Control.

Upon exiting the icing condition:

9.	TKS Backup Switch	- OFF
10.	TKS System	- Operate as necessary to shed residual ice.
11.	Airspeed	- Maintain 110 KIAS or greater until final approach and landing
12.	Landing Distance (Approach Flaps)	- Multiply AFM distances by a factor of 1.6 for approach flaps
13.	Final Approach Flaps)	- Maintain 100 KIAS or (Approach greater until over runway

3.4 Uncommanded elevator oscillation with landing flap deflection

1.	Autopilot	- Disconnect
2.	Flaps	- Return flaps to approach setting
3.	Airspeed	- Increase posted full flaps landing speed by 4 KIAS
4.	Landing Distance	- Increase full flap landing distance by a factor of 1.2

3.5 Pitot Heat annunciator illuminates with Pitot / Stall Heat turned on

1.	Autopilot	- Disconnect
2.	Pitot Heat CB	- Check and reset as applicable
3.	Icing Condition	- Exit immediately

Warning

Airspeed indications may be unreliable with the failure of pitot heat. Rely on pitch, attitude, power settings, rate of climb, and stall warning to safely fly the aircraft.

3.6 Stall Heat annunciator illuminates with Pitot / Stall Heat turned on

1.	Autopilot	- Disconnect
2.	Stall Heat CB	- Check and reset as applicable
3.	Icing Condition	- Exit immediately

Warning

Stall speeds will increase with ice accumulation on the wing and tail leading edges. Expect higher than normal sink rates with power reduction.

Stall warning indications may be unreliable with the failure of stall vane heat.

4.	Airspeed	- Maintain 110 KIAS or greater until final approach and landing
5.	Landing Distance (Approach Flaps)	- Multiply AFM distances by a factor of 1.6 for approach flaps
6.	Final Approach (Approach Flaps)	- Maintain 100 KIAS or greater until over runway

3.7 Alternator 1 Failure

In the event of an alternator 1 failure, refer to EMERGENCY PROCEDURES in the AFM for load shedding procedures. Additionally, the following steps must be adhered to:

1. Icing Condition - Exit immediately

After exiting the icing condition:

Warning

Airspeed indications may be unreliable with the failure of pitot heat. Rely on pitch, attitude, power settings, rate of climb, and stall warning to safely fly the aircraft.

Stall warning indications may be unreliable with the failure of stall vane heat.

2. Pitot / Stall Heat - As required. May be turned off only if clear of icing conditions and additional load shedding is desired.

3. Land as soon as possible

Warning

Delay in landing the aircraft beyond 30 minutes of flight while operating on battery power may result in a complete loss of aircraft power. Prudence must be exercised to land the aircraft as soon as possible following the failure of the alternator. Refer to EMERGENCY PROCEDURES in the AFM for additional information.

3.8 Alternator 2 Failure

In the event of an alternator 2 failure, bus 2 will be powered by alternator 1 and battery 1. Load shedding in this case is not required. Refer to EMERGENCY PROCEDURES in the AFM for additional information.

3.9 Alternator 1 and 2 Failure

In the event of a dual alternator failure, the following procedures should be followed in addition to those found in the EMERGENCY PROCEDURES section of the AFM:

1. Icing Condition - Exit immediately

Upon exiting the icing condition:

2. TKS System - OFF

Warning

Airspeed indications may be unreliable with the failure of pitot heat. Rely on pitch, attitude, power settings, rate of climb, and stall warning to safely fly the aircraft.

Stall warning indications may be unreliable with the failure of stall vane heat.

3. Pitot / Stall Heat - OFF

Warning

Delay in landing the aircraft beyond 30 minutes of flight while operating on battery power may result in a complete loss of aircraft power. Prudence must be exercised to land the aircraft as soon as possible following the failure of the alternator. Refer to EMERGENCY PROCEDURES in the AFM for additional information.

3.10 Alternator 2 Failure and Bus Tie Failure

The following procedures should be followed in addition to those found in the EMERGENCY PROCEDURES section of the AFM:

1. Icing Condition - Exit immediately
2. TKS System - OFF
3. TKS Backup - ON

Warning

The TKS Backup mode operates Pump 2 in Maximum mode. Fluid usage must be monitored while in the icing condition to prevent the depletion of fluid prior to exiting the icing condition.

After exiting the icing condition:

4. TKS Backup - Operate as necessary to shed residual ice, then OFF

Warning

Airspeed indications may be unreliable with the failure of pitot heat. Rely on pitch, attitude, power settings, rate of climb, and stall warning to safely fly the aircraft.

Stall warning indications may be unreliable with the failure of stall vane heat.

5.	Pitot / Stall Heat	- As required. May be turned off only if clear of icing conditions and additional load shedding is desired.

3.11 Complete Electrical Failure

In the event of a complete electrical failure, refer to the EMERGENCY PROCEDURES section of the AFM.

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Section 4

Normal Procedures

The following procedures in this section are provided as a supplement to the procedures outlined in the Bonanza G36 AFM, and should be followed if icing conditions are anticipated during the course of the flight.

Warning

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

In order to minimize ice accumulations on unprotected lower surfaces, maintain a minimum speed of 110 KIAS during operations in icing conditions. This will provide an angle of attack that reduces exposure (frontal area) of the lower surfaces to ice accumulation. If one is unable to maintain 110 KIAS at maximum continuous power, a change of altitude and / or course may be necessary to maintain minimum airspeed and / or exit the icing condition.

Note

Conditions exist for icing when the indicated outside air temperature is +5°C or below and visible moisture in any form is present.

If icing conditions are inadvertently encountered, select MAXIMUM flow until the ice is removed, then select NORMAL or MAXIMUM flow as required to prevent ice accumulation.
A third and fourth mode of operation are available by selecting pump 1 to either NORMAL or MAXIMUM, and turning on the TKS Backup switch. This mode should only be used in the event of extreme icing conditions, where the system is unable to shed ice from the aircraft, or it is suspected that the aircraft has encountered an icing condition outside of the icing envelope as defined in 14 CFR Part 25, Appendix C.

Warning

These modes of operation are not certified for operation outside of 14 CFR Part 25, Appendix C, and if these conditions are suspected of being encountered, the pilot should exercise prudence in exiting the icing condition in as safe and expedient manner as possible.

Endurance times for all modes of operation are depicted in Figure 4-1.

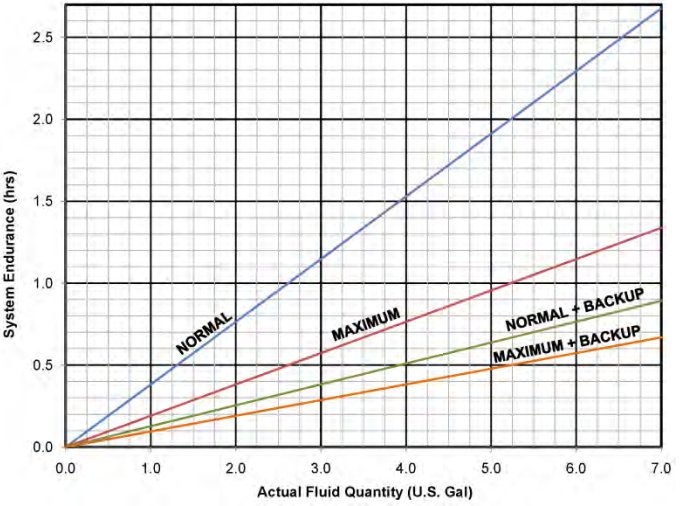

Figure 4-1 System Endurance

Note

The TKS liquid ice protection system should not normally be activated in dry, cold air. The ice protection fluid is designed to mix with water impinging on the aircraft surface in normal operation. If dispensed in dry, cold air, the fluid becomes a gel that takes considerable time to clear, particularly on the windshield.

Indicated fluid quantity does not directly correlate to actual fluid quantity in the TKS fluid reservoir. Figure 4-2 provides information, which correlates indicated fluid quantity to actual fluid quantity when in straight and level flight:

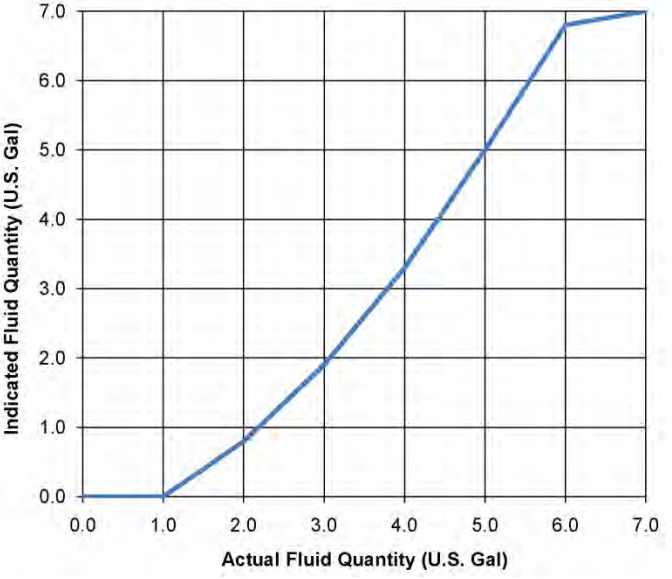

Figure 4-2 Fluid Quantity – Indicated vs. Actual

Note

The windshield pump cycles for approximately 4 seconds each time it is activated. The windshield will take approximately 30 seconds to clear after the spray cycle has ended. Ice should not be allowed to accumulate on the windshield. Activate the windshield pump as necessary to maintain clear forward vision.

Note

If the aircraft has encountered an icing condition, true airspeed and OAT values as indicated by the Garmin suite cannot be relied on for accurate information.

Note

The autopilot should be disconnected periodically to check for unusual control force or deflection, and to move the flight controls to check for evidence of ice accreting in control surface gaps or frozen actuators.

The autopilot may mask tactile cues that indicate adverse changes in handling characteristics.

4.1 Pre-Flight Inspection

Complete Pre-Flight Inspection as defined in the Bonanza G36 AFM prior to completing the following steps.

1. Airframe Inspection

Wings, Tail, Propeller Windshield	-	Verify free of ice
Fluid Tank	-	Check cap secured
Porous Panels	-	Check condition and security
Windshield Spraybar	-	Check condition and security

Complete the following items as a final part of the pre-flight inspection.

2.	Battery 1	-	ON
3.	Reset Button	-	Press using ballpoint pen or pencil point and verify high pressure annunciator illuminates. Verify annunciator extinguishes upon release.
4.	Windshield Pumps	-	Check operation 1 and 2
5.	TKS Backup	-	ON, verify audible hum from right landing gear well, then OFF. This verifies proper function of the TKS Backup circuit.

Note

At temperatures above +15°C, fluid viscosity is such that operating pressure may not extinguish flashing low pressure lights. Verify normal panel flow.

6.	TKS Operation	- Select MAXIMUM: Check main pump 2, then main pump 1 for an audible hum from the right landing gear well.
7.	TKS Backup	- ON, allow to run for approximately 1 minute with Main Pump 1 selected in MAXIMUM mode.
8.	TKS Operation / Backup	- Both OFF
9.	Wing Ice Light	- ON
10.	Fluid Quantity	- Check quantity – minimum 5.5 U.S. gallons for Flight Into Known Icing conditions.
11.	Pitot / Stall Heat	- ON, momentarily (no longer than approximately 5 seconds), then OFF.

Exit the aircraft for system walk around:

Caution

Any amount of TKS fluid on the ground constitutes a slippage hazard. Use care when walking around the aircraft after the system has been run.

12.	Pitot / Stall Vane	- Perform tactile check to verify pitot mast and stall vane are warm to the touch
13.	Wing Ice Light	- Verify ice light is illuminated.
14.	Porous Panels	- Check evidence of fluid from all panels. If needed, repeat Steps 7 & 8 to verify proper panel flow.
15.	Propeller	- Check evidence of fluid from propeller
16.	All Switches	- OFF

4.2 Before Taxi

1.	Main Pump 1	- MAXIMUM, verify steady green light - NORMAL, verify steady green light - OFF
2.	Main Pump 2	- MAXIMUM, verify steady green light - NORMAL, verify steady green light - OFF
3.	High Pressure Light	- Verify not illuminated (if light illuminates, push RESET with a ballpoint pen or pencil point and verify it remains extinguished)

Note

During initial system startup, it is typical for the system to indicate a low pressure annunciation as the system primes itself. If low pressure is indicated after approximately 1 minute of system operation, the following procedures should be followed to verify proper system operation:

- Main Pump - Select 1
- System Operation - MAXIMUM
- TKS Backup - ON
- Verify Low Pressure Annunciation extinguishes

Note

At temperatures above +15°C, fluid viscosity is such that operating pressure may not extinguish flashing low pressure lights. Verify normal panel flow.

4.3 Before Takeoff Check

1. TKS Ice Protection - Select pump 1 or 2, System NORMAL flow
2. Wing Ice Light - As required
3. Pitot / Stall Heat - ON, after cleared for takeoff

4.4 After Takeoff

1.	TKS Ice Protection System	- Select pump 1 or 2, NORMAL flow, MAXIMUM if required
2.	Windshield Ice Fluid	- Activate either pump as Pump required
3.	Pitot / Stall Heat	- ON
4.	Heater and Defroster	- ON
5.	Wing Ice Light	- As required
6.	Airspeed	- Maintain 110 KIAS or greater

4.5 Cruise Check

1.	TKS Ice Protection System	- Select pump 1 or 2, NORMAL flow, MAXIMUM if required
2.	Windshield Ice Fluid	- Activate either pump as Pump required
3.	Pitot / Stall Heat	- ON
4.	Heater and Defroster	- ON
5.	Wing Ice Light	- As required
6.	Airspeed	- Maintain 110 KIAS or greater

Note

Alternate air may activate in icing or snow conditions. This may be indicated by a manifold pressure drop. Refer to Bonanza G36 AFM for additional information.

4.6 Before Landing Check

1.	TKS Ice Protection System	- Select pump 1 or 2, NORMAL flow, MAXIMUM if required
2.	Windshield Ice Fluid	- Activate either pump as Pump required
3.	Pitot / Stall Heat	- ON
4.	Heater and Defroster	- ON
5.	Wing Ice Light	- As required
6.	Airspeed	- Maintain 110 KIAS or greater

4.7 Final Approach

1.	Flap Setting	- Approach (maximum)
2.	Windshield Ice Fluid	- OFF at least 30 seconds Pump prior to landing
3.	Landing Distance (Approach Flaps)	- Increase full flap landing landing distance by a factor of 1.2
4.	Airspeed (Approach Flaps)	- Increase posted full flaps approach speed by 4 KIAS

4.8 After Landing Check

1.	TKS Ice Protection System	- OFF
2.	Pitot / Stall Heat	- OFF
3.	Wing Ice Light	- OFF

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Section 5
Performance

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

Significant climb and cruise performance degradation, range reduction, as well as buffet and stall speed increase can be expected if ice accumulates on the airframe. Residual ice on the protected areas and ice accumulation on the unprotected areas of the airplane can cause noticeable performance losses, even with the TKS Ice Protection System operating.

5.1 Normal Rate of Climb

Residual ice on unprotected airplane surfaces can cause a loss in rate of climb. Additional accumulation of ice on the airplane can result in significant loss in normal rate of climb.

5.2 Balked Landing Climb

Residual ice on unprotected airplane surfaces can cause a loss in balked landing climb performance. Additional accumulation of ice on the airplane can result in a significant loss in balked landing climb performance.

5.3 Stall Speeds

Stall speed is not affected by residual ice on unprotected airplane surfaces. Stall speeds increase significantly with even small accumulations on the wing leading edge.

The first ¼ inch of ice accumulation on the wing leading edges causes the most rapid increase in stall speed. Additional ice accumulation on the wing leading edges results in a continued increase in stall speed, although at a less rapid rate.

5.4 Landing

When the aircraft has encountered icing conditions, flap deflection is to be limited to the approach setting as a maximum. An icing condition is defined as visually observing ice accumulation or flight in temperatures at or below +5°C when any type of visible moisture is present.

Increase full flap landing speed by 4 KIAS when landing with approach flaps. Likewise, multiply full flap landing distance by a factor of 1.2 when approach flaps are used.

Multiply full flap landing distance by a factor of 1.6 with approach flaps in the event of an ice protection system failure or ice is observed or suspected on the aircraft.

Section 6
Weight and Balance

For flight into known icing conditions, the forward center of gravity is limited to 78.0 inches at 3414 pounds with a straight line variation to 81.0 inches at 3650 pounds.

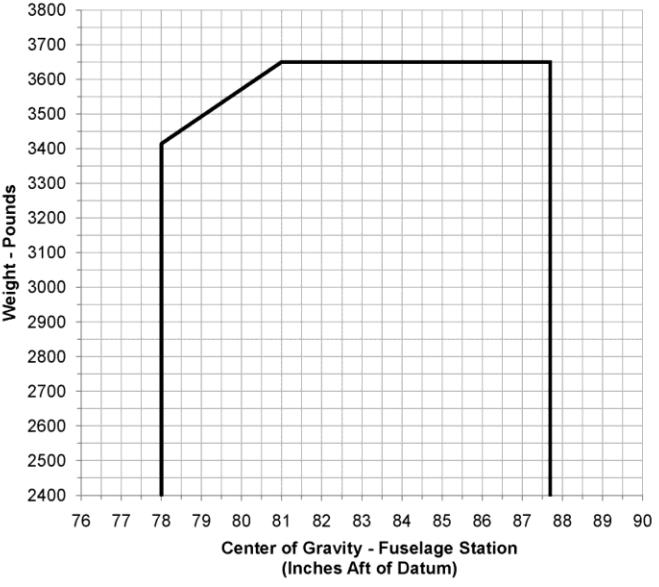

Figure 6-1 Bonanza G36 Weight and Balance Limits for Flight into Known Icing Conditions

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

Table 6-1 Weight and Balance Table
Ice Protection Fluid

Volume (gal)	Weight (lbs)	Arm (in)	Moment (in-lbs)
1.0	9.2	100	920
2.0	18.4	100	1840
3.0	27.6	100	2760
4.0	36.8	100	3680
5.0	46.0	100	4600
6.0	55.2	100	5520
7.0	64.4	100	6440

Section 7
Handling, Servicing and Maintenance

7.1 Prolonged out of Service Care

During Flyable Storage

Assure that the ice protection fluid tank contains at least the minimum takeoff quantity of fluid (refer to Section 2), and that all system components are filled with fluid. Monthly, operate pump(s) until all air is dispelled from components and pipelines (see system priming below). Recheck tank contents.

7.2 Servicing

1. Ice Protection Fluid Tank

See Limitations for specified ice protection fluids. The filler cap is located on the right wing behind the main spar. To preclude the possibility of contaminated fluid, always clean the top of the fluid containers before dispensing, and if required maintain a clean measuring vessel solely for ice protection fluid. Secure the filler cap immediately after filling. A tank vent line is provided at the right wing tip.

2. Ice Protection Fluid Strainer

The ice protection fluid strainer in the fluid tank outlet should not require cleaning unless there is a definite indication of foreign matter in the tank.

3. Ice Protection Fluid Filter

Illumination of the amber HIGH PRESSURE warning in flight (or during ground testing) may indicate the need for filter element replacement. [Warnings at abnormally low temperatures (below -30°C, -22°F) may be ignored.] The HIGH PRESSURE light may be illuminated by spurious electrical impulses. The first reaction should be to depress the recessed RESET switch. If the light remains illuminated, the filter element must be replaced.

4. System Priming

The airframe / propeller pumps may not be self priming, and are primed, when required, by operation of either 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 soap / detergent)
Approved Ice Protection Fluid – See Section 2.4
Aviation Gasoline
Isopropyl Alcohol
Ethyl Alcohol
Industrial Methylated Spirit

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

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Section 8
System Description

8.1 System Description

The TKS Ice Protection System, as depicted in Figure 8-1, consists of porous panels installed on the leading edges of the wings and tail surfaces, a slinger ring on the propeller, a spray bar for the pilot's windshield, pumps, fluid reservoir, and associated plumbing.

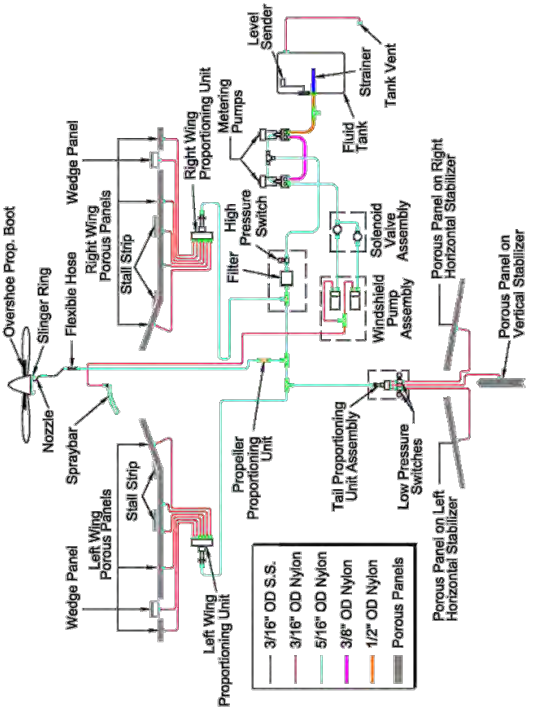

Figure 8-1 TKS System Fluid Schematic

The porous panels are attached to the aircraft leading edges. When the system is functioning, these panels exude ice protection fluid at a low steady flow rate. Protection for the propeller is provided by a tube 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 onto grooved rubber overshoes fitted to the root end of each propeller blade. A control panel, as depicted in Figure 8-2, provides control and monitoring functions.

Fluid pressure for airframe / propeller ice protection is provided by individually selectable, two-speed electrically driven pumps. The

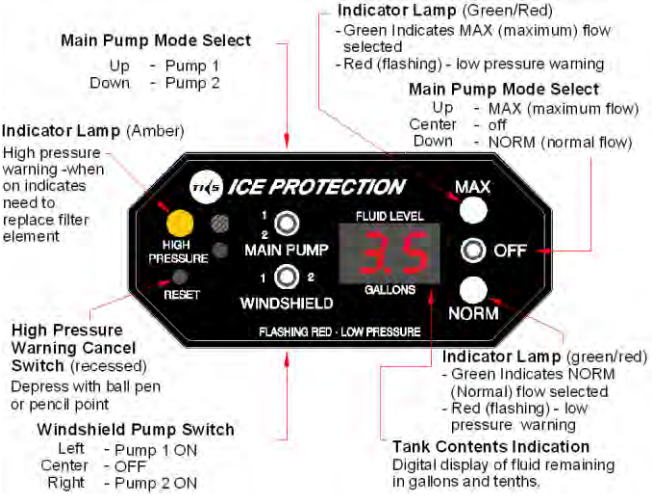

Figure 8-2 TKS Control Panel

low speed provides the required flow when NORMAL is selected, and the high speed provides the required flow when MAXIMUM is selected. In the event of a primary electrical failure of the TKS Electrical System, a TKS Backup Switch is provided, which provides power to Pump 2 for MAXIMUM mode only.

Two individually selectable pumps provide pressure for windshield de-icing. Operation of these pumps is controlled by a non-latching switch on the ice protection control panel, and applies a 4 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.

The operational state of the airframe / propeller system is displayed by two LED's which indicate when NORMAL or MAXIMUM flow is 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 flash green. The LED of the unselected option will flash red. From the selected pump, the ice protection fluid passes through a filter and then through a spring loaded check valve which prevents flow when the pump is not operating.

A network of nylon 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.

The tank is serviced through a single filler, located on the right wing behind the forward spar, and has a total capacity of 7.5 gallons. The unusable volume is 0.5 of a gallon. It is the pilot's responsibility to ensure that an adequate quantity of fluid is carried. 5.5 gallons of fluid as indicated on the TKS Control Panel is required before takeoff if the system is to be considered operational for icing conditions. Fluid quantity is measured by a float-operated sensor which transmits an electrical signal to the indicator located on the ice protection control panel.

The contents indicator display is a digital readout in gallons with a resolution of 0.1 of a gallon. This display automatically dims for night operation. Information in regards to indicated fluid quantity versus actual fluid quantity can be found in Section 4, Normal Procedures – Figure 4-2.

A dimming knob, located to the right of the TKS Control Panel, is provided for dimming of the fluid level display. Turning the knob counter-clockwise will dim the display for nighttime illumination.

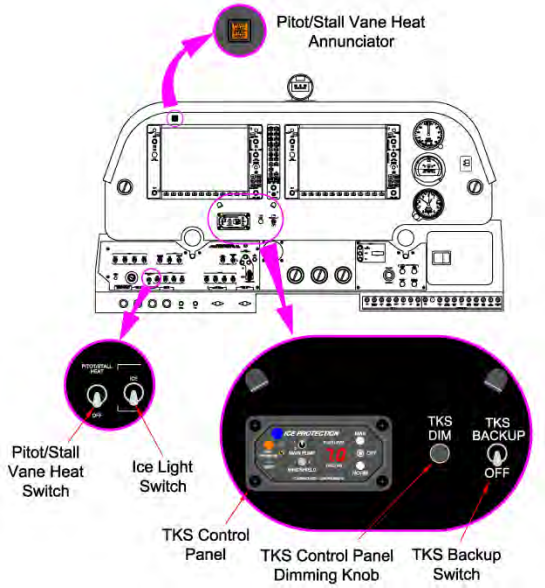

Figure 8-3 Bonanza G36 Instrument Panel With TKS System Installed

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

As depicted in Figure 8-3, the aircraft is equipped with both pitot and stall vane heaters for ice protection of each respective device. The two systems are activated by toggling the PITOT / STALL HEAT switch to the up position. The location of the switch is located in the pilot's left subpanel. Each device and circuit is protected by a circuit breaker, located on the left circuit breaker panel.

The PITOT HEAT and STALL HEAT annunciators are warning devices designed to alert the pilot to the loss of power to each of these devices respectively. The amber annunciator will illuminate when no current is supplied to its respective component. When the pitot heat switch is in the OFF position, the annunciator will illuminate. Under normal conditions, the annunciator will be extinguished when the PITOT / STALL HEAT switch is turned on. If a failure occurs while the PITOT / STALL HEAT is on and it results in a loss of power to the pitot heater, the PITOT HEAT annunciator will illuminate. Similarly, if a failure occurs while the PITOT / STALL HEAT is on and it results in a loss of power to the stall heater, the STALL HEAT annunciator will illuminate. The annunciator can be dimmed for night time use by pushing the annunciator.

8.2 System Endurance

The maximum endurance for the TKS Ice Protection System is defined as follows:

With NORMAL Selected	-	2 hours 40 minutes
With MAXIMUM Selected	-	1 hour 20 minutes
With NORMAL + BACKUP	-	53 minutes Selected
With MAXIMUM + BACKUP	-	40 minutes Selected

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

A graphical depiction of System Endurance versus Tank Fluid Quantity can be found in Section 4, Normal Procedures – Figure 4-1.

Section 9
Supplemental Information

Not applicable.

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Section 10
Safety Information

10.1 Flight in Icing Conditions

This airplane has been approved for flight in icing conditions as defined in 14 CFR Part 25, Appendix C, in accordance with the criteria contained in Advisory Circular 23.1419-2, and the applicable requirements of CAR Part 3, and 14 CFR Part 23. These conditions do not include, nor were tests conducted in, all icing conditions that may be encountered (e.g. freezing rain, freezing drizzle, mixed conditions, or conditions defined as severe). Some icing conditions not defined in 14 CFR Part 25 have the potential of producing hazardous ice accumulations which:

1. Exceed the capabilities of the airplane's ice protection equipment, and / or

2. Create unacceptable airplane performance.

Safe operation in icing conditions is dependent upon pilot knowledge of atmospheric conditions conducive to ice formation, familiarity with the operation and limitations of the installed ice protection equipment, and the exercise of good judgment when planning a flight into areas where possible icing conditions exist. Flight into areas with known icing conditions should be avoided or limited to the minimum amount of time absolutely necessary. When possible, prolonged operations in icing conditions should be avoided. When icing conditions are encountered, the recommended procedure is to change to an altitude where icing conditions are not present, particularly if it is known that the icing conditions at the present altitude are widespread. Ice accumulations on the airplane increase aerodynamic drag, reduce airplane range, reduce climb performance, and increase stall speed.

To achieve the best visibility, a straight-in approach should be utilized whenever possible if ice has accumulated on the right windshield and unprotected areas of the left windshield. The windshield pump should be off at least 30 seconds prior to landing to allow adequate time for the windshield to clear.

Accumulation of ice on unprotected lower surfaces is minimized by maintaining a minimum airspeed of 110 KIAS, until a lower speed is required for final approach and landing. This speed provides an angle of attack that minimizes exposure (frontal area) of lower airframe surfaces to ice accumulation. The pilot should take appropriate actions to maintain this minimum speed, including increasing power (up to maximum available if necessary), change of altitude, descent, etc. Prolonged operation at lower speeds may result in substantially greater performance losses than specified in Section 4 of this supplement.

By definition, icing conditions are considered to exist when the indicated outside the air temperature is at or below +5°C and any kind of visible moisture is present. Outside air temperature should be closely monitored when flying in clouds or precipitation. The most significant icing, found in stratus type clouds, is generally located near the top of a well defined cloud formation. Severe icing conditions exceeding the capability of the ice protection system can be encountered in many different situations. Examples of these conditions include rapidly building cumulus tops, up slope environments, etc.

The prudent pilot must remain alert to the possibility that icing conditions may become so severe that the TKS Ice Protection System cannot cope with the situation. If such a condition is encountered, the pilot should immediately take the most safe and expeditious course of action to exit the condition.

Warning

Severe icing comprises environmental conditions outside of those for which the airplane is certified. Flight in freezing rain, freezing drizzle, or mixed icing conditions (supercooled liquid 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 system, and it may seriously degrade the performance and controllability of the airplane.

Some icing conditions not defined in 14 CFR Part 25, Appendix C (e.g. freezing rain, freezing drizzle, mixed conditions, or conditions defined as severe) have the potential of producing hazardous ice accumulations, which:

1. Exceed the capabilities of the airplane's ice protection equipment, and / or
2. Create unacceptable airplane performance and stall speed increase.

Pilots must be prepared to divert the flight promptly if hazardous ice accumulations occur. Inadvertent operation in these conditions may be detected by:

1. Unusually extensive ice is accreted on the airframe in areas not normally observed to collect ice.
2. Accumulation of ice on the upper or lower surface of the wings aft of the protected area.
3. Heavy ice accumulations on the windshield, or when ice forms aft of the curved sections on the windshield.