(1) 620 SHP and 695°C is recommended for increased engine life.

(2) Maximum acceleration time from Lo Idle (Starting Control Lever "S" at RUN - Starting Idle) to 95% Take-off power should not exceed 5 seconds.

(3) Increase Ng if required to keep within ITT limit.

(4) ITT limit shown is time-limited to two seconds. Starting temperatures above 850°C should be investigated for cause.

(5) These values are time-limited to 2 seconds.

(6) If maximum torque is used, Np must be set so as not to exceed power limitations. Reverse power operation is limited to 1 minute.

(7) Normal oil pressure is 80 to 100 psig at Ng speeds of 72% or more with oil temperature between 60°C and 71°C. Oil pressures below 80 psig are undesirable and should be tolerated only for the completion of the flight, at reduced power setting. Oil pressure below 40 psig is unsafe and a landing should be made as soon as possible, using minimum power required to sustain flight.

(8) For increased oil service life, an oil temperature between 74°C and 80°C is recommended. A minimum oil temperature of 55°C is recommended for fuel heater operation at take-off power.

(9) Normal oil pressure is 85 to 105 psig at Ng speeds of 72% or more with oil temperature between 60°C and 71°C. Oil pressures below 85 psig are undesirable and should be tolerated only for the completion of the flight, at reduced power setting. Oil pressure below 40 psig is unsafe and a landing should be made as soon as possible, using minimum power required to sustain flight.

(10) 620 SHP and 740°C is recommended for increased engine life.

c. STARTER - Thermally limited to three (3) starts per hour.

d. FUEL - ASTM D1655-70, JET A, JET A1 (NATO Code F34, F35)
JET B (NATO Code F40)
MIL-T-5624, JP-4 (NATO Code F40), JP-5 (NATO Code F42, F44)
No. 3 Jet Fuel (GB6537-94) (People's Republic of China)

Automotive Diesel fuel, VV-F-800, DF-1 and DF-2 may be used. DF-1 should not be used below 25°F (-4°C), and DF-2 should not be used below 40°F (4.5°C).

If jet fuel or the above Automotive diesel fuels are not available, Aviation gasoline MIL-G-5572, all grades, may be used for maximum of 150 hours between overhauls.

WARNING: When using aviation gasoline, the electric fuel boost pump must be turned on and remain on for the duration of the flight.

KINDS OF OPERATION (Continued):

f. The following equipment must be installed:
(1) Stall warning system
(2) 24-volt electrical system
(3) Slip Indicator

g. The following equipment is optional:
(1) Nav/Com Radio (Or Com only)
(2) Light package of Strobe, Instrument, Dome, Flap Lights, Landing Lights
(3) Attitude Gyro
(4) Dust Spreader
(5) Standard Spray System
(6) Micronair Spray System
(7) Crew Seat or Buddy Seat
(8) Fire bomber dump gate and vent system
(9) Fuel flowmeter
(10) Air Conditioning
(11) Hopper Rinse System
(12) Turn Coordinator
(13) ADF
(14) Transponder
(15) Directional Gyro
(16) Cockpit Heater

FUEL LIMITATIONS:

One 63 Gallon (238 liters) Capacity Tank in each wing (optional)
One 85 Gallon (322 liters) Capacity Tank in each wing (standard)
One 108 Gallon (409 liters) Capacity Tank in each wing (optional)
One 117 Gallon (443 liters) Capacity Tank in each wing (optional)

Maximum Capacity (standard) -	170 U.S. Gallons (643 liters) (+33.0 in.)(+83.8 cm.), 164 Gallons (621 liters) Usable.
Maximum Capacity (optional) -	126 U.S. Gallons (477 liters) (+33.0 in.)(+83.8 cm.), 120 Gallons (454 liters) Usable.
	216 U.S. Gallons (818 liters) (+33.0 in.)(+83.8 cm.), 210 Gallons (795 liters) Usable.
	234 U.S. Gallons (886 liters) (+33.0 in.)(+83.8 cm.), 228 Gallons (863 liters) Usable.

See Section 2 for recommended use of Fuel System Icing Inhibitors (FSII).
See also Service Letter #315.

OPERATING LIMITATIONS:

a. Outside Air Temperatures for Airplane Operation
(1) Maximum: +110°F (43.3°C)
(2) Minimum: +5°F (-15°C)[40°F(4.4°C) in visible moisture]
b. Do not operate engine above 800 Ft-Lbs torque on ground run-up or tail will come up.
c. Maximum crosswind velocity during landing 15 MPH.
d. Do not move power lever into reverse position with the engine stopped or controls will be damaged.
e. Maximum operating altitude: 12,500 feet MSL
f. Maximum safe speed for Hopper Load jettisoning: 90 to 125 MPH IAS.
g. Noise abatement: This airplane has not been shown to comply with noise limits in FAR Part 36 and must be operated in accordance with the noise operating limitation prescribed under FAR §91.815

PLACARDS AND MARKINGS:

The following information on placards pertaining to flight and operating limitations must be displayed:

(a) On All Canopy Doors: RESTRICTED

DO NOT OPEN DOORS IN FLIGHT

IF DOORS WILL NOT OPEN AFTER OVERTURN,
KICK OUT WINDOWS WITH KNEES OR FEET.

(b) Attached to outside of aircraft:

(1) Next to fuel filler caps:
FUEL 63* GAL. [238 Liters] JET A. FUEL TANKS ARE INTERCONNECTED. ALLOW SUFFICIENT TIME FOR FUEL LEVEL TO EQUALIZE BEFORE TOP-OFF OF TANK.
*85 GAL. [322 Liters] (When standard 85 gallon tanks are installed)
*108 GAL. [409 Liters] (When optional 108 gallon tanks are installed)
*117 GAL. [443 Liters] (When optional 117 gallon tanks are installed)

(2) Next to Oil Filler Cap: OIL TANK 9.2 QUARTS [8.7 Liters] CAP.

(3) Next to pitot static buttons: STATIC AIR – KEEP CLEAN

(4) On hopper lid: FOR AGRICULTURAL PURPOSES:
MAX HOPPER LOAD 4,100 LBS. [1860 KG.]
MAX AIRCRAFT GROSS WT. 9,400 LBS. [4264 KG.]

(5) On side of engine air scoop: LEVELING POINT.
Planes with nose-mounted ram air engine inlet have placard above left hand gear leg that reads LEVELING POINT IS TOP OF GEAR LEG 5° TAIL DOWN.

(6) On baggage door: 60 POUNDS [27.2 KG.] MAXIMUM BAGGAGE.

(7) Below Hopper Rinse Fill: HOPPER RINSE TANK FILL

(8) Below Windshield Washer Fill: WINDSHIELD WASHER FILL

(9) On Canopy Doors: EMERGENCY EXIT OPEN

(10) In loader seat compartment (if installed): OCCUPANT MUST ATTACH SEATBELT AND SHOULDER HARNESS AND WEAR A D.O.T. APPROVED OR MIL-SPEC CRASH HELMET.

(11) On Canopy Doors: RESCUE

(c) In full view of pilot:

(1) THIS AIRPLANE MUST BE OPERATED IN RESTRICTED CATEGORY IN ACCORDANCE WITH PLACARDS AND MARKINGS DISPLAYED IN THE COCKPIT. NO ACROBATIC MANEUVERS, INCLUDING SPINS. DESIGN MANEUVERING SPEED 140 MPH [122 KNOTS] (225 km/h). MAX FLAP DOWN SPEED 115 MPH [100 KNOTS] (185 km/h). MAX CROSSWIND VELOCITY DURING LANDING 15 MPH [13 KNOTS] (24 km/h). ALT. LOSS FROM STALL 220 FT (67 m).

(2) THE OPERATION OF THIS AIRPLANE IS LIMITED TO DAY AND NIGHT* VFR CONDITIONS. FLIGHT INTO KNOWN ICING CONDITIONS IS PROHIBITED.
*Delete the words AND NIGHT unless aircraft is equipped with operable lighting package. (see page 6)

(3) PUSH STICK FORWARD TO UNLOCK TAILWHEEL. **(NOTE 1)**

(4) PARK BRAKE OPERATION: ON: DEPRESS PEDALS AND PULL LEVER
OFF: DEPRESS PEDALS.

PLACARDS AND MARKINGS (Continued):

(5) DO NOT OPERATE ENGINE ABOVE 800 FT-LBS TORQUE ON GROUND RUN-UP OR TAIL WILL COME UP.
FLIGHT IN VICINITY OF THUNDERSTORMS PROHIBITED.
FLIGHT IN VISIBLE MOISTURE BELOW 40°F PROHIBITED.
FLIGHT BELOW -5°F [-15°C] PROHIBITED.
USE FSII WHEN OPERATING BELOW 40°F [+4.4°C].
MAXIMUM OPERATIONAL ALTITUDE 12,500 FT [380 m] MSL.

(6) WARNING DO NOT MOVE POWER LEVER INTO REVERSE POSITION WITH ENGINE STOPPED OR CONTROLS WILL BE DAMAGED.

(7) DO NOT OPERATE PUMP ABOVE 140 MPH. [122 KNOTS] (225 km/h)

(8) WARNING: SULFUR DUSTING IS PROHIBITED UNLESS SPECIAL FIRE PREVENTION MEASURES ARE INCORPORATED IN AIRCRAFT.

(9) On engine Control Quadrant at respective HI and LO Idle positions:
FLIGHT IDLE and RUN.
On Start Control Lever: S.

(10) On aft end of Engine Control Quadrant next to Power Lever: REV.
At the stop detent: IDLE.
On Power Control Lever: POWER.

(11) On Prop Control Lever: P and on aft end of travel: F

(12) Below Caution Lights on Upper Panel: LOW FUEL, FUEL FILTER, CHIP DETECT, AIR FILTER, PROP IN BETA, RINSE PUMP, GENERATOR OUT

(13) Emergency Power Lever (If Installed):
On top of Lever:
CAUTION FCU OVERRIDE
UNLOCK - PUSH FOR POWER

(14) On instrument panel if loader seat is installed:
WHEN OPTIONAL LOADER SEAT IS OCCUPIED THE HOPPER RINSE TANK MUST BE FILLED WITH WATER AND/OR FUEL QUANTITY MUST BE ADJUSTED TO PREVENT EXCEEDING THE AFT C.G. LIMIT OR WEIGHT LIMIT. LOADER SEAT MUST NOT BE OCCUPIED DURING CHEMICAL APPLICATION

(15) On instrument panel: A STALL DURING SKIDDING TURNS WILL CAUSE THE NOSE TO PITCH DOWN SHARPLY AND RESULT IN SIGNIFICANT LOSS OF ALTITUDE. MAINTAIN COORDINATED FLIGHT AT ALL TIMES

(16) WARNING: TURN OFF STROBE LIGHTS WHEN TAXIING IN VICINITY OF OTHER AIRCRAFT, OR DURING FLIGHT THROUGH CLOUD, FOG, OR HAZE. STANDARD POSITION LIGHTS TO BE ON FOR ALL NIGHT OPERATIONS.

(17) On instrument panel: AVOID SKIDDING TURNS WHICH MAY RESULT IN FUEL MIGRATION FROM ONE TANK TO THE OTHER. THE ENGINE MAY QUIT WHEN EITHER TANK BECOMES EMPTY. MONITOR THE FUEL LEVEL IN EACH TANK FREQUENTLY WHEN FUEL LEVEL IS LESS THAN 1/2 TANK.

(18) On floor next to Emergency Engine Induction door cable (If Installed): TURN TO UNLOCK, PULL UP FOR EMERGENCY ENGINE INDUCTION SYSTEM

BEFORE TAKEOFF (Continued):

10. Re-check parking brake lever - Full Forward (OFF).
11. Hold brakes and set power at 600 Lb.-Ft. torque. (Stick full back).
12. Move Prop Lever "P" aft to check propeller RPM decrease. Return to flight position (Full forward).
13. Check that engine control quadrant friction knob is tight enough for proper control function without uncommanded creep of engine controls.

TAKEOFF: (NORMAL)

1. With power still approximately 600 Lb-Ft. torque, release brakes and as aircraft moves forward gradually advance power lever to provide a smooth and continuous acceleration of the engine.
2. As Power lever is advanced make sure temperature and torque limits are not exceeded.
3. Allow the tail to come up and make a conventional take-off.
4. Best rate of Climb speed at 8,000 lbs take-off weight is 111 mph. (96 kts.) (179 km/h) (IAS). The best Rate of Climb speed at heavier weights can be expected to increase.
5. Adjust trim lever for climb and check temperature and torque limits. If desired reduce propeller RPM to approx. 2100 RPM for climb.

CAUTION: Reduction of prop RPM will increase Torque and can cause torque limit to be exceeded when already operating at max. torque.

TAKEOFF (FULL HOPPER LOAD AND SHORT FIELD)

Use the same procedure as for normal take-off except as follows:

1. Lower flaps to 10° position (First Mark).
2. With a full hopper load, full power can be applied (within torque and temperature limits) before brakes are released.
3. After breaking ground do not retract the flaps until at least 105 mph (91 kts.) (169 km/h) (IAS) is reached for take-off weights of 8,000 lbs.

FUEL MANAGEMENT

Pay attention to the slip indicator in cruise. The ball in the slip indicator should be centered, otherwise fuel will transfer from one tank to another. Fuel migrates in the same direction that the ball indicates in the slip indicator. For instance, if the ball in the slip indicator is to the right of center that means the fuel is transferring to the right tank.

It's important to keep the fuel equalized in each tank especially when the quantity gets down to one-half and below. Fuel has a tendency to migrate to the right tank due to torque effects so if you want to transfer fuel back to the left tank to equalize the tanks, then use the rudder trim so that the ball in the slip indicator is to the left of the center position. Fuel should transfer from the right tank to the left tank.

Once you have the tanks equalized, then retrim the rudder such that the ball is centered. **If you run either tank completely dry the engine can flame out even if you have a substantial amount of fuel in the other tank.** This is because the header tank is out of fuel and the engine is starting to ingest air. For more information, read Service Letters 178 and 178A.

Instrument Responses (Continued):

3. Fuel remaining is displayed by moving the USED/REM. toggle switch to the REM. position; the information is shown on the right side of the display window as long as the switch is held in the REM. position and for three seconds after it is released.
4. Fuel used is displayed by moving the USED/REM. toggle switch to the USED position; the information is shown on the right side of the display window as long as the switch is held in the USED positon and for three seconds after the switch is released.
5. The display brightness is controlled by the BRIGHT/DIM toggle switch. Moving the BRIGHT/DIM toggle switch to BRIGHT repeatedly will make the display brighter and moving it to DIM repeatedly will dim the display. The default brightness after power up is full brightness.

FOR GREATER DETAIL, READ MICROFLO MANUAL

LOW FUEL WARNING LIGHT SYSTEM:

This aircraft incorporates a low fuel warning system that consists of two float switches, one in each tank, connected to a red warning light. Either float switch can activate the light independent of the other. The floats are positioned so that the light is activated with approximately 14 gallons usable quantity remaining (total in both wing tanks), if the aircraft is in level coordinated flight. An unbalanced fuel load (due to uncoordinated flight, flying all turns in one direction, or other cause), may result in fewer than 14 gallons usable at the time of warning light illumination. The fuel gauges are the primary instruments for fuel management, and the pilot should not use the warning light system as a means of determining the quantity of fuel remaining.

Corrective Action:

If the Low Fuel warning light illuminates, fly straight and level and monitor fuel gauges. Land as soon as practical. However, if fuel gauge monitoring indicates a fuel imbalance with adequate fuel remaining, flight may be continued after allowing fuel to transfer and equalize.

An intermittent (flickering) low fuel warning light should be treated the same as a steady warning light.

FERRY FUEL SYSTEM:

The ferry fuel system utilizes the hopper as a fuel tank and is not an FAA Certificated fuel system. However it may be installed in accordance with drawing 50280 providing a logbook entry is made for both the installation and the removal.

If the optional ferry fuel system is installed, hopper fuel may be used by turning the fuel selector handle 90° counter-clockwise to point towards the left*. All take-offs and landings are to be made on main tank fuel. A safe altitude should be attained before switching and it is advisable to operate the fuel boost pump for a few seconds prior to switching to hopper fuel. Turn boost pump OFF before switching to hopper fuel.

When switching back to wing fuel turn boost pump ON after valve handle is rotated clockwise to point straight forward for wing fuel. Lave pump ON for a few seconds and monitor fuel pressure until it is clear the fuel flow is established.

*For S/N 502B-0600 and subs. For S/N 502B-0001 thru 502B-0599 having the Aero Supply fuel valve, turn fuel selector handle 180° counter-clockwise to point aft.

Be sure to use the hopper fuel first. Keep in mind that if you run the wing tanks dry and then switch to hopper fuel, the fuel boost pump is not in the circuit between the hopper fuel and the engine. Therefore if you run the wing tanks dry, resulting in an airlock in the system, there is no way to clear the airlock and restart the engine.

SNOW ENGINEERING CO. WICHITA FALLS, TEXAS	ENGINEERING REPORT ☐ ORDER ☒	NUMBER # 178
TITLE SERVICE LETTER #178 (FAA APPROVED)	BY Jay Johnson CHK'D LS	MODEL ALL
	DATE 04-08-99	SERIAL ALL
		PAGE 1 OF 3

* Reissued 3/15/02
Reissued 3/23/09

SUBJECT

Imbalance of fuel in fuel tanks.

MODELS

All

SUMMARY

This Service Letter is to provide guidance to the Owner/Operator in preventing and/or minimizing the imbalance of the fuel level between the left and right main fuel tanks, which could lead to fuel starvation if one tank goes dry.

The fuel imbalance can result from migration of fuel from one tank to the other, or uneven fuel flow to the header tank. This can be caused by a number of different things. The following is a list of the potential sources:

1. Fueling one tank only and expecting the other tank to reach the same level prior to takeoff.

2. Rudder trim being off in either direction, causing a slight slip or skid during flight.

3. Flying the aircraft in a slip or skid condition.

4. Always turning in one direction during the spraying operation. This is sometimes referred to as "race tracking".

5. For planes having the single fuel receiver, operators are encouraged to frequently monitor the fuel quantity in each tank and to leave the selector switch on the low tank when the ½ tank fuel level is reached.

   Later Air Tractors incorporate two fuel receivers on the upper instrument panel so that the contents of each tank can be determined at a glance. Operators may order a retrofit kit to convert planes with the single fuel receiver to the dual receiver configuration.

6. The fuel tank vent system could have blockage due to buildup of contaminates by nature or the flight environment. Insects can be the source of this problem. Check the fuel vent system on a routine basis for uninterrupted air flow to the tank.

7. A stopped up or partially blocked wing finger strainer can cause a reduced flow. The finger strainer should be checked periodically for contaminates that enter the tank during refueling.

8. Parking the aircraft on an uneven or slanted surface for an extended period of time prior to takeoff.

9. The fuel cap o-rings can become degraded, which will lead to fuel venting or loss of fuel in flight. This is due to the fact that the fuel tank vent induces positive pressure to the tank, and the low pressure on the top of the wing in flight tends to draw the fuel out. The fuel cap can be tightened by adjustment of the castellated nut. If the venting persists, replace either the internal or external o-ring, or both. The external o-ring should be inspected periodically for cracking or "set" in the material.

10. On applicable turbine engine models, equipped with the FCU (Fuel Control Unit) air purge line, the line should be inspected for both condition and proper routing.

    Air Tractor Service Letter #128 provides additional information on the incorporation of a firewall restrictor orifice to reduce the flow rate of fuel discharged from the FCU. Service Letter #128 is reissued with this one.

The above listed sources of fuel imbalance are the most common that Owner/Operators have encountered. There may be others unique to that particular Operator that Air Tractor, Inc. is not aware of.

SNOW ENGINEERING CO. WICHITA FALLS, TEXAS	ENGINEERING REPORT ☐ ORDER ☒	NUMBER # 178
TITLE SERVICE LETTER #178 (FAA APPROVED)	BY Jay Johnson CHK'D LS	MODEL ALL
		SERIAL ALL
	DATE 04-08-99	PAGE 3 OF 3

Air Tractor has enlarged the header tank on later models of the AT-402 and AT-502 series, changing from a 3-inch diameter tube to a 4-inch diameter tube. The purpose of this change was to allow longer periods of uncoordinated flight or flight at extreme pitch angles during a low fuel condition. Operators with the smaller header tank may order a retrofit kit from the Factory if desired.

In addition, Air Tractor has developed a low fuel warning system for the turbine models. This incorporates a level float switch in each tank. When the fuel tank level reaches a minimum safe level, a red panel warning light will illuminate, warning the pilot to land as soon as practical. A retrofit kit is available from the Factory if desired.

Contact the Customer Service Department at Air Tractor for your specific question, or to obtain more detailed information on the operation of your airplane.

SNOW ENGINEERING CO. WICHITA FALLS. TEXAS	ENGINEERING REPORT ☐ ORDER ☒	NUMBER # 178A
TITLE SERVICE LETTER #178A	BY Leland Snow CHK'D DATE 6/18/99	MODEL ALL SERIAL ALL PAGE 1 OF 3

* Reissued 3/15/02
Reissued 12/14/04

SUBJECT:

Recommendations to prevent fuel imbalance in fuel tanks for all Air Tractor models.

MODELS:

All models

SUMMARY:

Service Letter #178 lists the causes of fuel migration from one tank to the other. This service letter lists recommendations to minimize fuel migration and provides a list of modifications that would be helpful to make on earlier Air Tractors.

Maintenance:

1. At least once a year drain the fuel, lift the tail to where the fuel tank bottom is level at the mid-span position, and check the "E" mark on the fuel receiver. Reset the "E" if necessary using the adjust screw on the lower face of the instrument.

Before adding any fuel remove the elbow fittings on the tank outlets and check the finger strainers for trash. Replace fittings.

With the airplane still in level flight position level the wingtips with the horizon and pump 1/2 tank of fuel into one side, take a reading on the gas pump, and pump that same quantity into the other tank. Wait about ten minutes for the tanks to equalize and compare readings from side to side for the 1/2 mark on the fuel receiver. This is to determine if the fuel senders have approximately the same Ohms resistance and are sending the same signal to the fuel receiver.

If there is more than about 1/8" difference in the needle position on the fuel receiver when comparing fuel quantity a placard could be installed such as this: "AT THE 1/2 FULL MARK THE L/H TANK READS .15" LOWER THAN THE R/H TANK".

Fill both tanks full and set the "F" position of the receiver needle. This is either on the circuit board behind the receiver or on a remote mounted trimmer on the upper panel near the receiver.

2. Lubricate the locking cam on the fuel caps with grease and compare the pressure it takes to lock the cap on each side. If one side is looser than the other adjust the castellated nut on the cap per Note 9 of S/L #178.

3. Measure the distance the fuel tank vent line protrudes below the lower wing skin and adjust to make each side equal. Check the vent system by blowing into it to see that it is clear.

4. Adjust the position of the rudder boost tab until the pilot assures that the airplane is in good directional trim at the normal spraying speed.

5. Assure that the wiring is correct from the L/H sender to the L/H receiver or R/H sender to the R/H receiver. This can be done by observing the receiver during fueling or defueling one side.

Pilot Briefing:

1. Have all pilots review Service Letter #178.

2. Communicate to the pilots that when one tank reaches the "E" mark on the fuel receiver the engine can flame out even if substantial fuel is shown in the other tank.

3. Advise the pilots to report any consistent fuel imbalance such as the R/H tank always having more fuel than the L/H so that the cause can be investigated and steps taken to prevent this condition.

4. Advise the pilots to correct any fuel imbalance when either tank is below 1/4 Full by turning in the opposite direction or by deliberately skidding the airplane. With wings level applying left rudder will transfer fuel to the right hand tank, and vice-versa. Due to fuel sender location on the inboard part of the tank, the application of left rudder will show the opposite effect on the fuel receiver, since the fuel will migrate to the outboard tank wall in the right tank, showing less fuel on that side. Remember that the fuel will go in the direction of the ball in the slip indicator.

5. The factory should be contacted at any time progress reaches a standstill in trying to remedy a continued fuel imbalance problem.

Modifications available from the factory:

1. Placard kit and flight manual additions warning of uncoordinated turns.
2. Dual fuel receivers to replace the single receiver with selector switch to provide instant reference to the amount of fuel remaining in each tank.
3. Low-fuel warning light system.

4. Larger header tank with lowered fuel outlet for AT-401/402/502 series to allow longer periods of uncoordinated flight. Later 802's have the same size tank but have a lowered outlet fitting.

5. For AT-602 and AT-802 aircraft and for smaller engines that have an FCU air purge line a kit is being developed that will route fuel that is passed by the FCU air purge line to both tanks instead of just the right tank or to the right side of the header tank. At the present time a restrictor fitting on the firewall greatly limits the amount of fuel from the FCU back to the tank, but splitting this discharge into both tanks will minimize any fuel imbalance from this source, however small.

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YEAR 20 21 DATE	RECORDING TACH TIME	TODAY'S FLIGHT	TOTAL TIME IN SERVICE	**Description of Inspections, Tests, Repairs and Alterations** Entries must be endorsed with Name, Rating and Certificate Number of Technician or Repair Facility. (*See* back pages for other specific entries.)
6-1-21	4648.1		4648.1	Inspected Turbin Conversion's LTD fuel system IAW service maqual Rev B Installed New BA409E air filter, Installed new brake pads. Overhauled Starter/Gen P/N 23048-028 P1063 I certify that this aircraft has been inspected in accordance with an annual inspection and was determined to be in airworthy condition. [redacted] FA [redacted]

06/26/20 Hobbs [redacted]
Inspection requirements of Section 72-00-00, Table 601
Reference Consolidated Turbine Specialist, [illegible] to
Inspection requirements of Section 72-00-00, Table 601 carbon dust
Clean the fuel control inlet screen; install a new outlet filter. Clean the
TIS. Check & clean the reduction gearbox chip detector, OK. Lube the cam box & engine repairs, the
from the start gen; check the brushes 60% life remaining. Reassemble the engine. Following completion of inspection & repairs, 35
engine performance was functionally checked. This engine has accrued 1258 starts & 7430 flights to date from pilot's records, the
starts & 215 flights for this computational period; compute Life Limited Parts Status Report I certify that this engine has been
inspected IAW a **Hot Section Inspection** and that the work specified above was carried out in accordance with Federal Aviation
Regulations and the current manufacturers' specifications. In respect to the work performed, the engine is approved for return to
service.

[redacted]
Joe H. Vaughn
A&P [redacted] IA

6-1-21	4648.1	Overhauled starter/Generator P/N 23048-028 S/N [redacted] Installed exchanged fuel nozzles, Cleaned P3 filter, Cleaned & Checked chip detector, Installed New BA 409E Air filter cleaned oil filter Cleaned fuel control inlet screen, installed a new outlet fuel f 121 Starts and 472 flights for this period, [redacted] Complied with 100 hr/annual Inspection requirments of Section 72-00-00 I certify that this engine has been inspected in accordance with an annual inspection and was determined to be in airworthy conditions		

[redacted] IA [redacted]

HUB & BLADE INSPECTIONS, REPAIRS AND ALTERATIONS ☐

Year: 2021	Total Time in Service	**Description** Propeller inspection IAW an annual inspection
Date: 6-1-21	10,006.8	
Next Inspection Due:	Time Since Overhaul	Mech. Cert. # or Repair Station # [redacted] IA [redacted]

Year:	Total Time in Service	**Description**
Date:		
Next Inspection Due:	Time Since Overhaul	Mech. Cert. # or Repair Station #

Year:	Total Time in Service	**Description**
Date:		
Next Inspection Due:	Time Since Overhaul	Mech. Cert. # or Repair Station #

Australian Government
Civil Aviation Safety Authority

AIRWORTHINESS BULLETIN

Diesel Fuel

AWB 28-015 **Issue** : 1
Date : 26 May 2014

1. Effectivity

Australian registered aircraft fitted with turbine engine(s) conducting operations utilising diesel fuel.

*Note For the purpose of this bulletin the term **diesel fuel** includes commercially available automotive diesel fuels.*

2. Purpose

To provide a set of guiding principles and parameters which have been identified as having either a direct or indirect impact on the selection and use of diesel fuels.

3. Background

CASA requires the pilot in command of an aircraft to ensure that the aircraft is not flown unless the fuel complies with the specification and grade required or approved for the purpose by CASA, *(Civil Aviation Order 20.9, Para. 3 refers)*.

The use of any fuel is dependent on that fuel being listed, by specification and grade, for a particular purpose in a manual or manuals promulgated by the aircraft and/or aircraft engine manufacturer. It matters not that diesel fuel is simply identified as an approved fuel for certain aircraft or engines, if the diesel is not to the *specification* listed (e.g. ASTM D975), then it cannot be used.

The current Australian Standard for automotive diesel fuel does not have any legislative basis. It is essentially an industry guideline and its main purpose is to specify requirements that are consistent with commercial diesel engine development practice and reliable operation.

The use of diesel fuels in aircraft turbine engines is only acceptable when:

a) The fuel is listed as an approved fuel in the manufacturers approved data, and

b) The fuel conforms to a specification detailed in that approved data.

Note Approved data includes the Airplane Flight Manual (AFM), the Pilots Operating Handbook (POH), aircraft and engine manufacturers approved maintenance data (CAR 2A) and the aircraft and engine Type Certificate Data Sheet (TCDS).

4. Recommendations

a) To establish the actual suitability of a particular fuel and any associated limitations, all pertinent data sources for the aircraft/engine combination are to be consulted prior to making a final determination.

The following scenario illustrates an acceptable level of due-diligence that should be exercised during this process. The stated fuel requirements are a direct excerpt from each of the referenced documents.

Operator 'A' is considering the use of automotive diesel fuel in an Air Tractor AT-502 aircraft which is fitted with a Pratt & Whitney Canada PT6A-34AG turbine engine.

Document	Fuel Requirements
FAA TCDS A17SW Rev. 13, (Air Tractor, Inc. Model: AT-502)	Per specifications CPW 46, PWA 522, GB 6537-94 (Peoples' Republic of China RP-3 kerosene), or Automotive diesel fuels.
FAA TCDS E4EA Rev. 26 (Pratt & Whitney Canada Corp. PT6A-34AG)	FUEL (See NOTE 8) - Fuels conforming to P&WC Spec. CPW204 & CPW46. For PT6-AG engines CPW381 also. NOTE 8. Emergency use of MIL-G-5572, Grades 80/07, 91/98, 100/130 and 115/145 is permitted for a total time period not exceeding 150 hours during any overhaul period. It is not necessary to purge the unused fuel from the system when switching fuel type.
P&WC S.B. No. 1344R10 ENGINE FUELS & ADDITIVES - REQUIREMENTS AND APPROVED LISTING	TABLE 12, Alternate Fuels Approved Fuels Subject to Restrictions on Use. Low Sulphur Diesel Fuel (CP-43)(Arctic Grade), ASTM D975 No. 1D, Canadian CGSB CAN 3.6 Type A. Automotive Diesel Fuel (CPW46)(Arctic Grade), ASTM D975 No. 1D, Canadian CGSB CAN 3.6 Type A. Low Sulphur Diesel Fuel (CP-48)(Arctic Grade), Canadian CGSB CAN 3.6 Type A. Automotive Diesel Fuel (Winter Grade), Canadian CGSB CAN 3.6 Type A. Automotive Diesel Fuel (Regular Grade),ASTM D975 No. 2D, Canadian CGSB CAN 3.6 Type B. NOTE: 1. Unless otherwise specified intermittent or continued use of these fuels for up to 1000 hours is allowed provided satisfactory fuel nozzle inspection results are achieved at the approved intervals.

	NOTE: 2. Unless otherwise specified continued use of these fuel for more than 1,000 hours is allowed provided periodic fuel nozzle inspection results are found acceptable by P&WC. NOTE: 3. After the use of diesel fuel containing dyes or Grade 80 aviation gasoline, the fuel system must be flushed.
FAA Approved AT-502 Airplane Flight Manual	FUEL – ASTM D1655-70, JET A, JET A1 (NATO Code F34, F35) JET B (NATO Code F40) MIL-T-5624, JP-4 (NATO Code F40), JP-5 (NATO Code F42, F44) Aeromatic Fuels prohibited. Automotive Diesel fuel, VV-F-800, DF-1 and DF-2 may be used. DF-1 should not be used below 25°F (-4°C), and DF-2 should not be used below 40°F (4,5°C).

In the above scenario, if the referenced documents were read in isolation an inaccurate conclusion may be reached regarding the approval of a particular fuel type. It is not until all the pertinent documents are viewed in their totality that an accurate judgement on the suitability and operational limitations of a fuel be made.

The correct determination in this scenario is that only specific grades of diesel may be used as an alternate fuel with its usage restricted and contingent on specific maintenance actions.

The use of any other fuel not specifically listed or conforming to the specifications detailed in the approved data would therefore not be acceptable.

b) The following items should also be considered when evaluating the acceptability of diesel fuel for use in an aircraft turbine engine.

1) Cloud Point

Cold flow performance is one of the most fundamental criteria for fuel quality in relation to engine performance. Diesel fuel can have a high content of paraffinic hydrocarbons which, if cooled sufficiently, will form as wax in the solution. As diesel fuel is cooled, there comes a point at which the waxes begin to separate and appear as a cloud or haze in the fuel. If cooling is continued, more of the waxes come out of solution until a point is reached where wax begins to cover the fuel filter thickly enough to impede the flow of fuel.

The cloud point detailed in the diesel fuel specification therefore becomes an important consideration when using diesel fuel in areas of low atmospheric temperatures.

2) Additives

Additives are generally used to influence properties such as the cold flow, lubricity, storage and combustion characteristics of diesel fuel, to differentiate products and to meet trademark specifications. The actual properties of automotive diesel depend on the refining practices employed and the nature of the crude oils from which the fuel is produced.

As Australian fuel quality standards are progressively tightened the need to use additives to manage certain diesel properties will increase.

The primary concern is that these additives have not been tested for use in aviation fuels and the potential effect on the continuing airworthiness of associated aeronautical products has not been ascertained.

3) Fuel Blends

Even though diesel or blended fuels may seem to be chemically similar to approved jet fuels, specific characteristics which are normally controlled during the refining process may not remain intact or continue to meet the prescribed fuel property limits. Any fuel or combination of fuel products must conform to the approved fuel specification(s).

4) Sulfur Content

The sulfur content of diesel fuel depends on both the source of the crude oil and the refining process. The sulphur content of diesel may result in sulphidation. This chemical/corrosive reaction primarily exists in the extremely high temperature, high pressure environment of the engines tubine, affecting turbine blade roots, shrouds and blade airfoils.

Sulfidation is a critical parameter that requires regular monitoring and strict adherence to Hot Section Inspection (HSI) procedures and the timely replacement of sulphidated turbine components is necessary to address potential airworthiness concerns.

5) Cleanliness

Diesel does not burn as cleanly as aviation turbine fuels, causing problems with fuel nozzles, combustion liners and hot section parts, primarily due to its carbon-forming tendencies.

It may also be necessary to purge the fuel system when changing fuels or using fuels containing certain additives.

6) Handling & Storage

As Australian fuel companies do not supply diesel fuel specifically for use in aircraft turbine engines, tanker and storage tank cleanliness is not a prime consideration. Adherence to appropriate fuel quality procedures is essential to ensure that the fuel is free from un-dissolved water, sediment, and suspended matter.

Operators utilising drum stocks or fuel distribution networks with low turnover rates need to remain particularly vigilant in this regard.

5. Enquiries

Enquiries with regard to the content of this Airworthiness Bulletin should be made via the direct link e-mail address:

[redacted]

or in writing, to:

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Civil Aviation Safety Authority
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