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Yorkton Aircraft Service Young Pilots Session February 2015

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Engine Operation Limits and Performance

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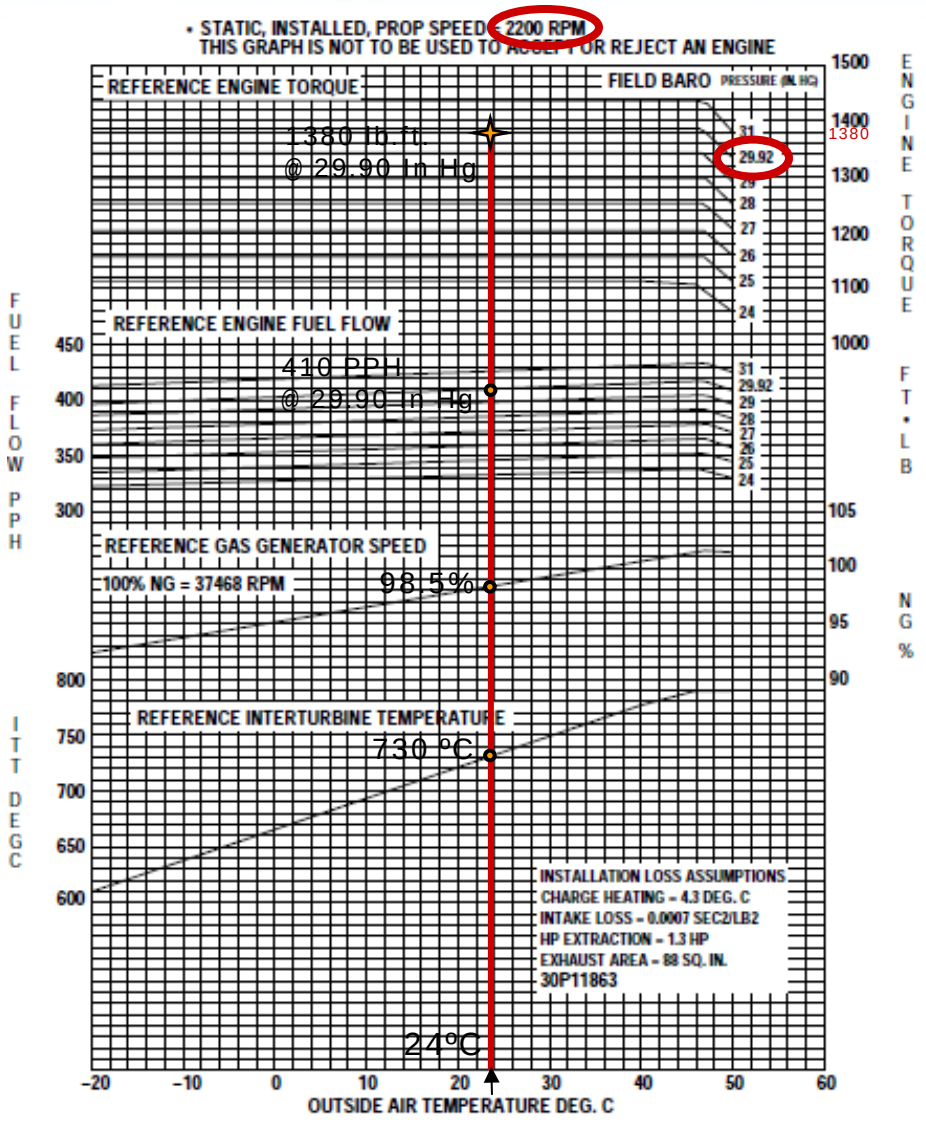
PT6A-34AG - Engine Performance Checking Curve EMM Chapter 71-00-00 Figure 513



Ground performance check

Record the OAT (°C)
Record Field Barometric Pressure
Close Air Bleeds
Start the engine per POH
Run at ground idle speed for 5 min
Set propeller speed (Np - RPM) per chart
Set Torque of the day per chart
Stabilize for few minutes

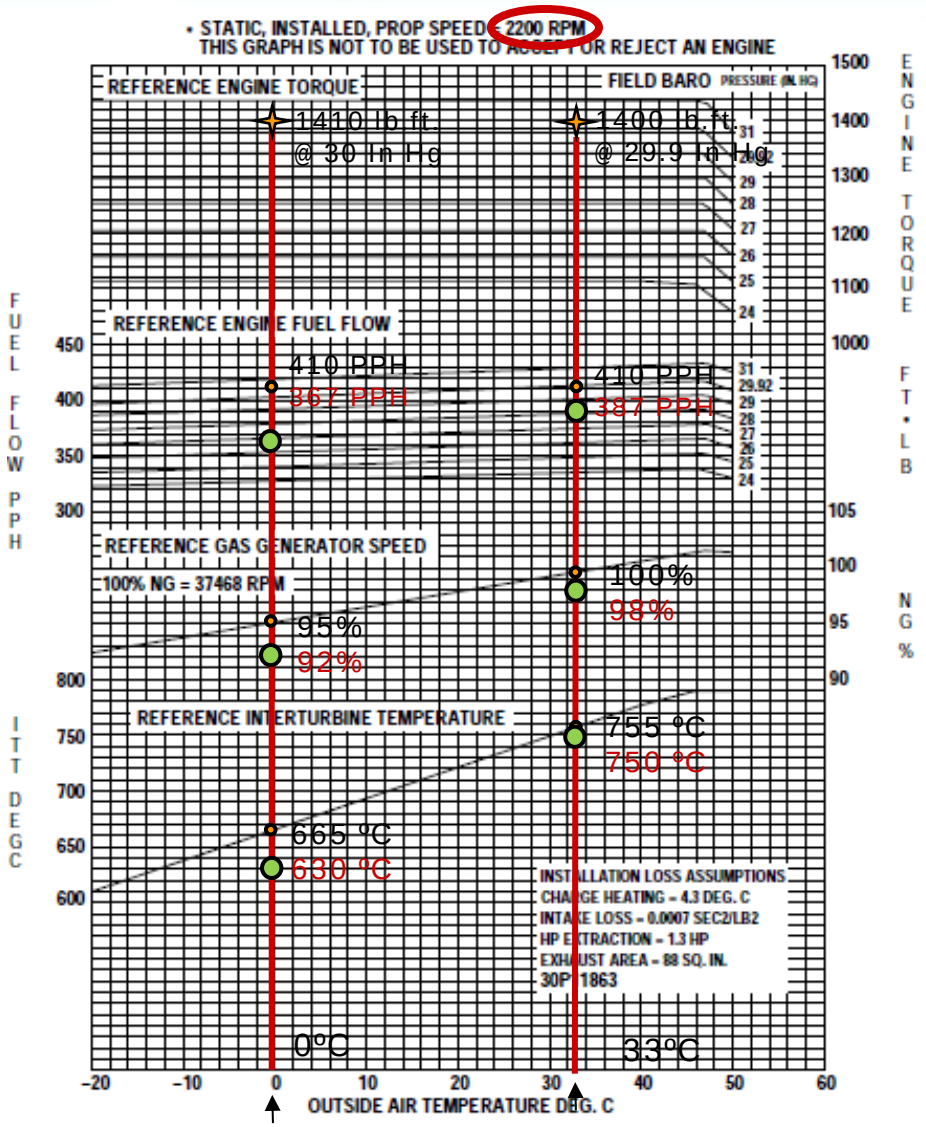
Keep records of engine performance;

- Gas Generator Speed (% Ng)
- Fuel Flow (Wf - lb/hr.)
- Inter Turbine Temperature (T5 -°C)

✓ *If Wf more than 75 lb/hr of margin check instrumentations*
✓ *If T5 more than 75 °C of margin check instrumentations*

Maintain and monitor results

PT6A-34AG - Engine Performance Checking Curve EMM Chapter 71-00-00 Figure 513



Case study

PT6A-34AG – Low ITT Margin

Limited load on hot summer day

Troubleshooting performed

- ✓ ITT System
- ✓ Bleed valve
- ✓ Compressor FOD
- ✓ Analysis of Performance Check and Test Cell data sheet shows good margin of Ng

Proposed workscope

Speed up Ng to increase T5 margin

- Increase PT Vane area

Cold and Hot Section

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PT6A Pilot Familiarization
Compressor Rotor Maintenance

What cause the observed damage?

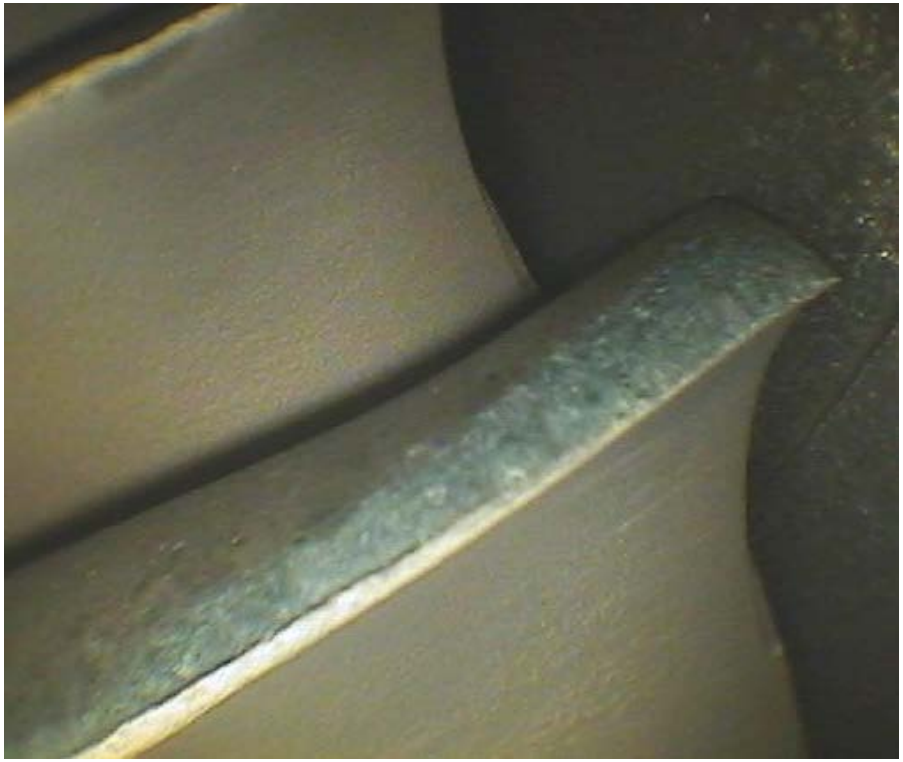
Erosion due to sand / dirt ingested

What can you do to improve your compressor performance?

- ✓ ***Inspect Air Inlet Filter per the OEM recommendations***
- ✓ ***Compressor recovery wash***
- ✓ ***Inspect the bleed valve closing point***
- ✓ ***Report unusual noise (humming, hooting)***

PT6A Pilot Familiarization
Combustion and Turbine Section

CT Blade Damage noticed during Borescope Inspection



- **CT Blade light erosion**
- **No performance deterioration**

- **CT Blade light erosion**
- **Carbon erosion**
- **No performance deterioration**

Hot starts main causes

Low Battery start

Adding Fuel too early

- 13% Ng Minimum

Quick Turns

- Motor down below 130°C ITT

Anything that loads the compressor, drives up the ITT

- AGB accessories
- Secondary air bleed system

PT6A Pilot Familiarization
Combustion and Turbine Section

Creep = to time, temperature and rotational stress.

- Tensile overload fracture can only occur after solutioning (excessive heat).
- Results of a visual examination revealed **necking** near the fracture surface
- Cross section along blade axis approximately revealed **microvoids** at grain boundaries.
- Higher magnification shows microvoids along with **coarsening and partial solutioning of the gamma prime precipitates**

Oil System

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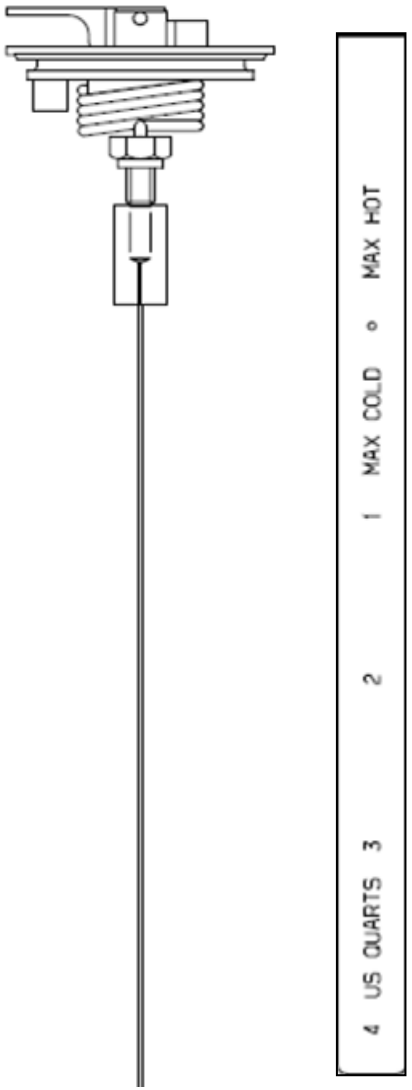
PT6A Pilot Familiarization
Oil System

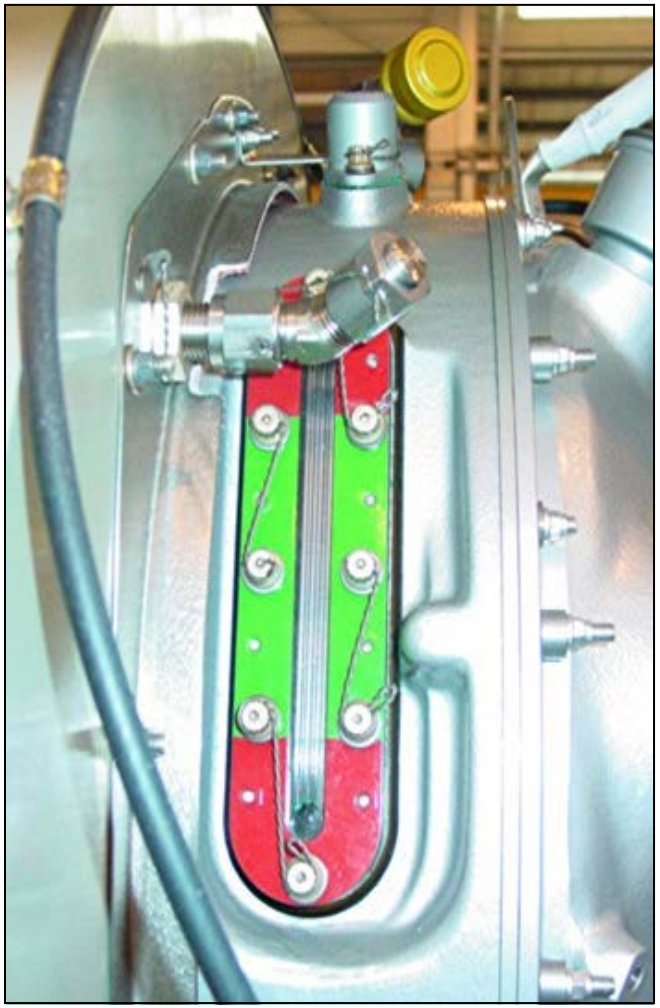


Oil Level Check and Servicing

- Within 30 minutes after engine shutdown to avoid overfilling of oil tank, and high oil consumption
  - Ideal interval is 15 to 20 minutes
  - If more than 30 minutes and oil is needed, start the engine and run at ground-idle for 5 minutes, and recheck oil level
  - Normal oil level is between MAX HOT and 1 US quart below MAX HOT
- Filling to Max level may result in high consumption rate, with the oil exiting through the AGB breather
- On some engines, this may also occur at 1 or 2 US quarts below Max level
  - In such cases, service the oil to the level that results in acceptable consumption, down to 3 quarts below the maximum, if necessary.

Caution:	**When filler cap is installed and locked – No movement is allowed**
Routine Insp.:	**Check condition and locking of oil filler cap**
Best practice:	**Propeller Governor in FEATHER for 15 seconds**

PT6A Pilot Familiarization
Oil System



Oil Consumption monitoring

- **Will vary** from one engine to another
  - Some operators are having a consumption of 1qt per 15 FH and sometimes up to 1 qt per 30 FH
- Small PT6A - Maximum Limit of 0.2 lb/hr to be calculated over a 10 hours period
  - 2lb total for 10 hours = 1 US Quart
- Large PT6A - Maximum Limit of 0.3 lb/hr to be calculated over a 10 hours period
  - 3lb total for 10 hours = 1.5 US Quarts
- Record your oil consumption
  - If you see a quick increase in your oil consumption it needs to be investigated

Fuel System

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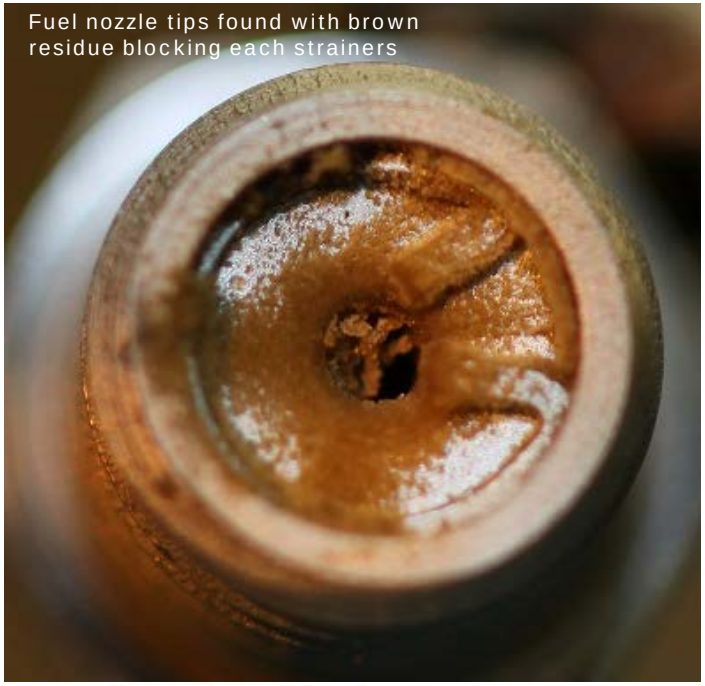
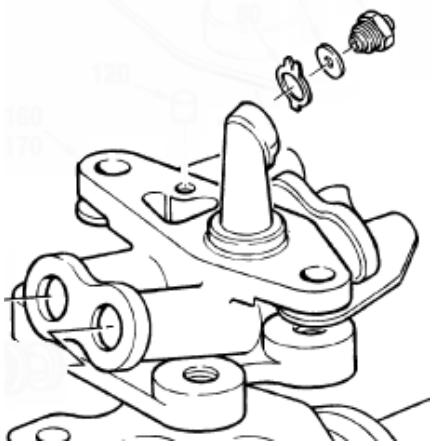
PT6A Pilot Familiarization
Fuel System





Symptoms / Issue
Fuel contamination
No throttle response
Engine <100 FH TSN

Troubleshooting
Engine did not make power performing the following actions
- Flow Divider valve jammed
- Fuel filters found cleaned
- FCU replaced

Investigation findings
Fuel nozzles found some brown residue blocking each strainers

Two of them did not flow at all on flow bench, the rest flowed badly, some streaking

Fuel sample analysed at P&WC Laboratory showed Potassium

PT6A Fuel System Case Study

PT6A-34AG
Operator landed, refueled and loaded fertilizer, during take-off the engine flamed out.

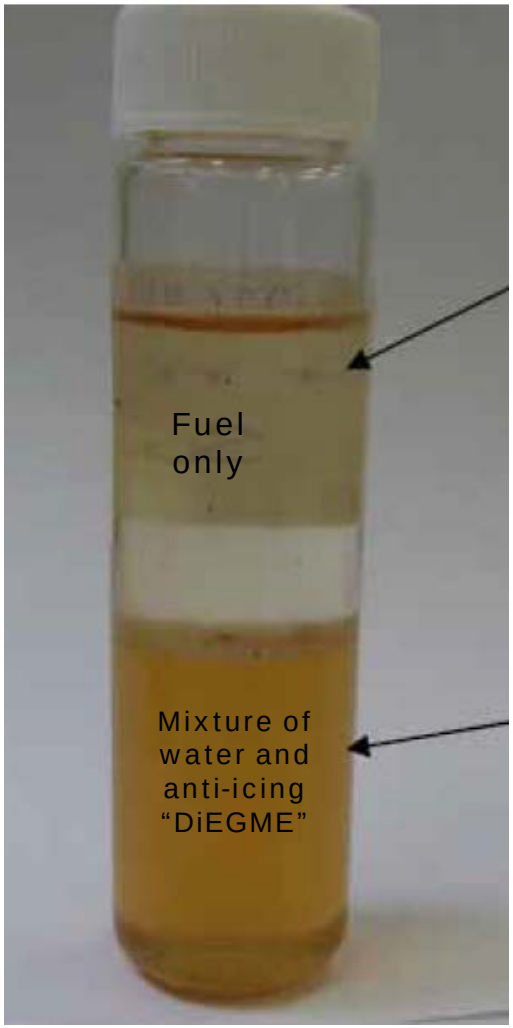
Subsequent inspection revealed 100% liquid fertilizer in the fuel system.

The fuel loading tanks had been inadvertently filled with fertilizer

PT6A-34AG
The aircraft lost power after takeoff. The pilot landed the aircraft in a cultivated paddock and the landing was very heavy.

Substantial amount of water was found in the fuel tank and the fuel filter

PT6A Pilot Familiarization
Fuel System



Fuel Control Unit contamination

Symptoms: TQ from 70 to 144% in few sec

DIEGME “Apple Jelly” found in FCU sample

- *Diethylene Glycol Monomethyl Ether*

Important to follow the pre-flight walk around inspection to ensure fuel free of water and contaminants

Question period

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