

EMT *focus*

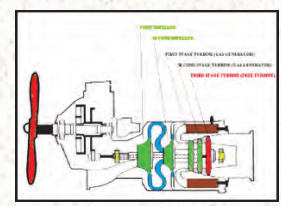
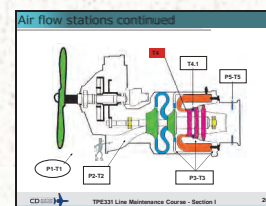
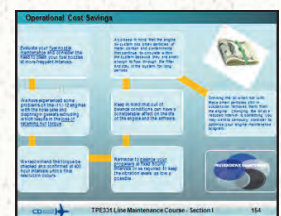
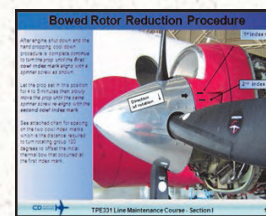
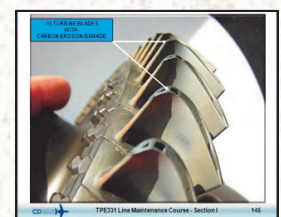
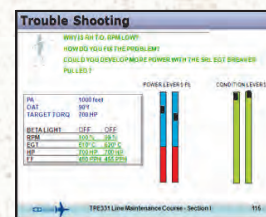
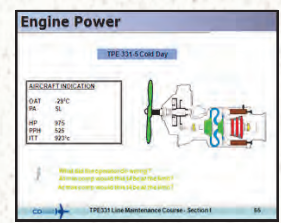
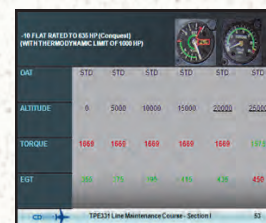
June 2011

The CD Aviation 5 day training class consists of over 550 colored slides via a power point presentation and each student will get their own personal colored training manual to take home. The material covered expands upon the subject material listed in the table of contents shown below.

- CD overview
- TPE History
- Airflows
- Horsepower
- Free turbine design
- Fixed shaft design
- Fuel consumption
- Cost comparison
- Engine power
- EGT / ITT systems
- Power runs
- Beta and PG modes
- Start procedures
- Cockpit trouble shooting
- Fuel nozzle maintenance
- Carbon erosion
- Cost savings
- Engine description
- Prop control sys
- Negative torque sys
- Neg torque strain gauge
- Torque indicating system
- EPA system
- Engine oil system
- Engine anti ice system
- Fuel system
- Bendix fuel system
- Static engine rigging
- Woodward rig engine to AC
- Woodward run and rig
- Bendix static rig
- Bendix rig engine to AC
- Bendix run and rig
- Conquest prop gov
- Conquest fuel control sys
- Conquest rigging
- Questions

The training material includes many student questions and the class participation during the open forum class structure results in an enhanced learning experience for those in attendance.

At the completion the students will be awarded a certificate of completion. The material is FAA approved and CD Aviation is a Honeywell authorized service center.



Constant Speed Operation continued

Reducing the fuel will do just the opposite. If you pull the Power lever aft you lower the fuel to the turbine which results in a RPM decline.

The propeller governor flyweights sense the RPM decline and increase the PG oil flow and pressure to the prop which decreases the prop pitch to again balance the engine on speed.



EMT focus

June 2011

PROPELLER CONTROL SYSTEM

Engine is in the PG mode.

1. What position are flyweights in?
2. Is the PPC controlling the prop?
3. What pitch change is needed?
4. What cockpit control changes the force on speeder spring?
5. Where is the PL.7?
6. What happened to PG system pressure?

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PROPELLER CONTROL SYSTEM

The flight idle power that results in the correct descent rate during approach for landing is accomplished by properly adjusting the flight idle fuel flow.

Note in flight the PG is controlling the blade angle (to keep the engine at 100% speed). The PPC and its FI blade angle setting is not controlling unless you observe an RPM drop below 100% and the beta light flashing on in flight which could occur if the FI blade angle is set too high or FI fuel flow is too low.

All FI governor is on speed and controlling the pitch and RPM at 100%.

It is possible for the FI fuel flow to be set too low and in fact it may be low enough that the resulting PG blade angle is low enough that it actually tries to adjust the blade angle down into the FI blade angle setting of the PPC. If this were to occur a result would be an RPM drop and possibly a flickering beta light in flight along with a rapid rate of descent.

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NEGATIVE TORQUE SYSTEM

Torque sensor assembly

Pilot valve negative position (forward on helical gear)

Pilot valve positive (aft on helical gear)

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NEGATIVE TORQUE SYSTEM

Play used between the HSP internal splines and the coupler (inner) large OD splines. The torque sensor negative tip pressure becomes adequate within the spline play to tip the feather valve and cause an NTS event.

With the quit shaft installed and properly pre-loaded the negative input from the prop has to reach the required level to overcome the quit shaft preload before any spline movement occurs and the negative pressure rise results.

During assembly the quit shaft is partially inserted into the coupler (bottom picture) then biased CCW (as viewed from front) and fully inserted into the spline play to tip the feather valve and cause an NTS event.

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NEGATIVE TORQUE SYSTEM

The NTS system allows some remaining negative torque to exist when the system is triggered and during activation. This allowed negative torque keeps the system from striking all the way to full feather automatically. The level of negative torque allowed to exist by design is necessary to provide the required negative input on an start to properly drive and start the engine in the air.

If the negative torque system calibration were to be the engine NTS activation on engine flame out would result in less yaw which would be beneficial however, it would not provide adequate negative torque input on an start to properly drive and start the engine in flight. The system needs to have some allowed negative torque to properly meet both the shut down and air start requirements in flight.

During any engine shut down planned or unplanned the PL should be advanced as soon as possible to the full forward position on the cheat engine to provide what is referred to as the beta follow up position. This results in a higher blade angle which helps in the unlikely event the NTS system is inoperative to provide the least amount of drag possible.

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Slow turn gear train & torque sensor

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NEGATIVE TORQUE SYSTEM

High power (high positive pressure)

Clear end of pilot valve all on HSP

Negative pressure port input

Main shaft

HSP drive gear train and prop

Coupler

Torsion shaft

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NEGATIVE TORQUE SYSTEM

When the quit shaft shaft becomes loose from the coupler it is able to apply a force much less than the HSP torque sensor tip pressure. This HSP torque sensor tip pressure can compress the tip gap in the coupler (when the tip attached, engine).

The damage can affect the torque sensor calibration. In addition when the tip or high tip pressure when the tip is not applied it causes the tip to compress the tip gap in the coupler and the system may no longer be in tolerance.

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NEGATIVE TORQUE SYSTEM strain gauge

The 3 wash-ner case mounted torque load arm assemblies that load the ring gear in the normal direction of rotation against the torque ring in lbs. torque each (300 in lbs total load).

When a negative load is input into the engine from the prop air loads and this input torque exceeds the above total of the 300 in lbs. load arm settings the ring gear moved slightly within the 3000 control ring gear to torque ring spline free play causing the NTS valve toward the pressure and lifting the feather valve.

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NEGATIVE TORQUE SYSTEM strain gauge

During this NTS movement it actuates the NTS valve mounted on the nose case with an arm that extends internally into a hole in the ring gear.

Movement of the NTS valve in the negative input direction reduces the oil flow thru the valve and causes a negative pressure rise that automatically trips the feather valve located on the GB acy pad and drains prop control system pressure allowing the spring in the prop and the blade counter weight forces to drive the prop pitch to a higher blade angle momentarily reducing its drag on the prop.

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NEGATIVE TORQUE SYSTEM strain gauge

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Torque indicating system types

The torque indicating systems for the TPE331 engines come in two types listed.

Hydraulic torque sensor system provides positive pressure to provide a cockpit power indication.

Strain gauge torque ring system provides a cockpit power indication.

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Hydraulic torque sensor system

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TORQUE INDICATING SYSTEMS

On torque sensor configured engines, the torque transducer receives a torque sensor positive torque pressure and a GB negative pressure signal. The torque sensor output of pressure is proportional to the pilot valve position, bias in the torsion shaft and the power developed. This oil pressure peak signal is then sent to and converted by the transducer into an output VDC signal that then sends to the cockpit indicator which either a HP lbs of torque or % of power indicator that operates on a 0 to 100 VDC range. Zero valve transducer output results in the red line valve on the cockpit meter and 5 VDC output reads zero reading on the cockpit indicator.

On aircraft with torque and torque and temp limiting systems the zero to 5 VDC output from the torque transducer is also sent to the limiter control box which then sends its output signal to the limiter bypass valve. The limiter box output line signal is a 100 millivolt signal driving the valve fully open and the valve opening is proportional to the millivolt signal input. The signal and the valve opening increases as necessary to bypass fuel going to the fuel nozzles to prevent the engine from exceeding max power.

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ENGINE OIL SYSTEM

CD Aviation Services TPE331 Line Maintenance Course - Section II 98

FUEL SYSTEM

CD Aviation Services TPE331 Line Maintenance Course - Section II 128

