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CANADA	
DEPARTMENT OF TRANSPORT	
AIRCRAFT CERTIFICATION	
BRANCH	
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**Transport Canada Approved**  
**Airplane Flight Manual Supplement**  
**(For Aircraft Applicability List, see Master**  
**Eligibility List of STC SA03-35)**

**I. Limitations:**

The Graphic Engine Monitor instrument may replace any existing aircraft cylinder head temperature (CHT) indicator, exhaust gas temperature (EGT) indicator or turbine inlet temperature TIT indicator. Single engine airplanes will utilize the GEM-610 while twin engine airplanes may use two GEM-610 instruments or one GEM-1200 instrument.

**II. Procedures:**

- a. **Description:** The Graphic Engine Monitor (GEM) Model 610 & 1200 displays electronic bar graph readings of exhaust gas temperature. All temperature information is presented as vertical columns (one per cylinder) while CHT is indicated by a non-illuminated or black bar in the field of orange bars. (One bar represents 25°F.) Actual CHT values are determined by comparing the black bar to the scale along the right edge of the gauge. Any EGT, CHT, or TIT temperature may be selected for display on the numeric display by pushing the select button. (See Fig 1). Temperatures are displayed to one degree resolution in either Fahrenheit or Celsius as indicated by the scale annunciator.

The Graphic Engine Monitor has two modes of operation.

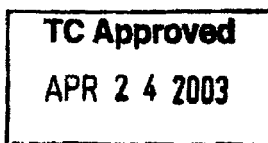
- (a) Lean Mode
- (b) Monitor Mode

The Lean Mode is identified by the EGT annunciator blinking. It may be entered at any time by holding the Reset Button for two seconds until the EGT annunciator blinks. Lean Mode is used to adjust the mixture for cruise and identify the leanest cylinder. The instrument then enters the Monitor Mode.

**b. Normal Procedure:**

**Cruise Leaning Procedure Using Insight GEM**

1. Establish cruise power setting. If EGT annunciator is not blinking, hold reset switch until it does blink.
2. Lean mixture slowly until one column blinks. Stop leaning when column starts blinking. The blinking identifies that cylinder as the leanest and that it has just gone past peak EGT. Push the reset switch briefly to stop the blinking. The instrument then enters the monitor mode.



3. Enrichen until the leanest cylinders EGT drops one bar (25°F). This sets the mixture to peak EGT for best economy setting. To select the best power setting, the mixture should be enriched further to drop the ECT 3 to 4 bars (75°-100°F). If best power is selected, the reset switch should be pushed briefly to trigger the storage of normal temperature for monitor mode.

### **Cylinder Head Temperature Limits**

Aircraft engine manufactures decide on a maximum cylinder head operating temperature and define it as the CHT redline. This temperature will be documented in the operating limitations section of the Pilot Operating Handbook. This temperature is not recommended for continuous operation. It is instead the absolute maximum operating temperature that may be encountered under adverse conditions like steep climbs on a hot day. The pilot should avoid engine operation near the CHT redline for safe operations and long engine life.

**Note:** The CHT limit temperature is shown on a placard displayed in proximity of GEM/GEMINI instrument.

### **The Cause of High Temperatures**

High cylinder head temperatures may result from poor pilot technique during adverse conditions or from a fault or abnormality of some kind.

The cause might be inadequate cooling air, inadequate lubrication, improper combustion, or increased cylinder heat generation from an engine component failure. Regardless of the cause the pilot should take steps to reduce the temperature to within safe limits. If the cause is determined to be from a fault or abnormality then a precautionary landing should be considered.

### **Reducing high temperatures**

The pilot may use any of the following procedures to reduce cylinder head temperatures.

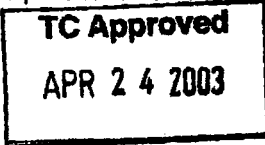
- 1) open cowl flaps (if equipped)
- 2) reduce climb angle to increase cooling airflow (if climbing)
- 3) increase airspeed to increase cooling airflow
- 4) enrich mixture
- 5) reduce power setting
- 6) shutdown engine (multi-engine only)

### **EGT & TIT redlines**

Engine manufactures do not specify a maximum Exhaust Gas Temperature. All references to EGT are relative to peak temperature.

However in a turbo-charged airplane EGT is measured collectively just prior to entering the turbo-charger and is called Turbine Inlet Temperature (TIT). The turbo has a definite temperature limit often near 1650° Fahrenheit. The limit will be specified in your POH. For long turbo life pilots often operate 100° below the specified limit.

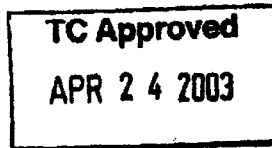
The flow of exhaust gas through the turbo is controlled by a valve called a waste gate. The term waste gate is used because the valve opens to bypass or waste exhaust gas past the turbo. The waste gate may be fixed, manually controlled, linked to throttle motion, or controlled automatically depending on the airplane. If the waste gate is a manual style, a second throttle like knob is used as the primary control of turbo performance and temperature. With the other waste gate systems the pilot controls Turbo temperature primarily by mixture



setting and to a lesser extent by power setting. Turbo aircraft are often leaned to control turbine inlet temperature only, rather than by reference to peak EGT. Failure of the waste gate control system or inability to control temperatures with normal limits may necessitate a precautionary landing.

Keep in mind that pressurized piston powered aircraft depend on the turbo to pressurize the cabin so the loss of turbo performance will result in a loss of cabin pressure as well.

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