INSIGHT

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FLIGHT MANUAL SUPPLEMENT

FOR

INSIGHT INSTRUMENT GEM 610C
GRAPHIC ENGINE MONITOR
(G1, G2 and G3 Configurations)
Document No. 610C-FMS
Issue 3

APPROVAL NUMBER: STC SA09-30

This document serves as the TCCA-approved Flight Manual Supplement when the aircraft is equipped with Insight Instrument Graphic Engine Monitor GEM 610C.
This document must be carried in the aircraft at all times when the GEM 610C instruments are installed in accordance with Supplemental Type Certificate SA09-30.
The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed herein. For limitations, procedures and performance information not contained in this document, consult the basic Airplane Flight Manual.

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DEPARTMENT OF TRANSPORT
AIRCRAFT CERTIFICATION
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BY Madan
CERTIFICATE NO. SA09-30
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RECORD OF REVISIONS

Issue	Date	Comment
1	April 14, 2009	First Issue
2	May 10, 2010	Change STC Holder's Name
3	January 19, 2012	G1,G2 Configurations Added

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SECTION I

GENERAL

The Insight GEM 610C Graphic Engine Monitor (GEM) is capable of displaying an airplane engine's Exhaust Gas Temperature (EGT), Cylinder Head Temperature (CHT) and Turbine Inlet Temperature (TIT), Carburetor Temperature (CARB), Manifold Pressure (MAP), Tachometer (RPM), Oil Pressure (OIL), Fuel Flow (GPH), Bus Voltage (VDC) and Outside Air Temperature (OAT) on a Liquid Crystal Display (LCD).

There are three configurations of the GEM 610C, G1, G2 and G3. All configurations of the GEM 610C indicate temperatures that are displayed to one degree resolution in Fahrenheit or Celsius degrees. The temperature unit is displayed in the lower right corner of the display. The LCD dims automatically with the intensity of ambient light.

The white, green and red colour-coded bar graph and digital values in the central and lower part of the display may be used as primary indicators for EGT, CHT, and TIT. The cyan colour-coded values at the top of the display are supplementary, for reference only.

The EGT values are displayed as vertical white bar graphs (one per cylinder). Digital EGT values for each cylinder are indicated by white four-digit numeric displays below the bar graph. CHT is indicated by a vertical green bar graph (one per cylinder) while the CHT value is within normal CHT operating range, or by a red vertical bar graph if the CHT value exceeds the maximum CHT limit. A horizontal red line indicates the maximum allowable CHT. Digital CHT values are indicated by three-digit numeric displays below the bar graphs. The digital CHT values are show in green while within normal operating range or red if the CHT limit is exceeded. Turbine Inlet Temperature (of a turbocharger-equipped engine) is displayed by a green vertical bar graph and digital value on the right-hand side of the display while the TIT value is within normal operating range, or by a red bar graph and digital display if the TIT value exceeds the maximum TIT limit. A red horizontal line displays the maximum allowable TIT.

The GEM 610C instrument senses temperatures through thermocouple-type probes. The instrument is powered typically from the avionics bus and protected by a dedicated, trip-free, re-settable 1A circuit breaker. GEM instruments automatically accommodate both 14 and 28 VDC electrical systems.

Descriptions of the different configurations of the GEM 610C are included on pages 6 and 7 of this Flight Manual Supplement.

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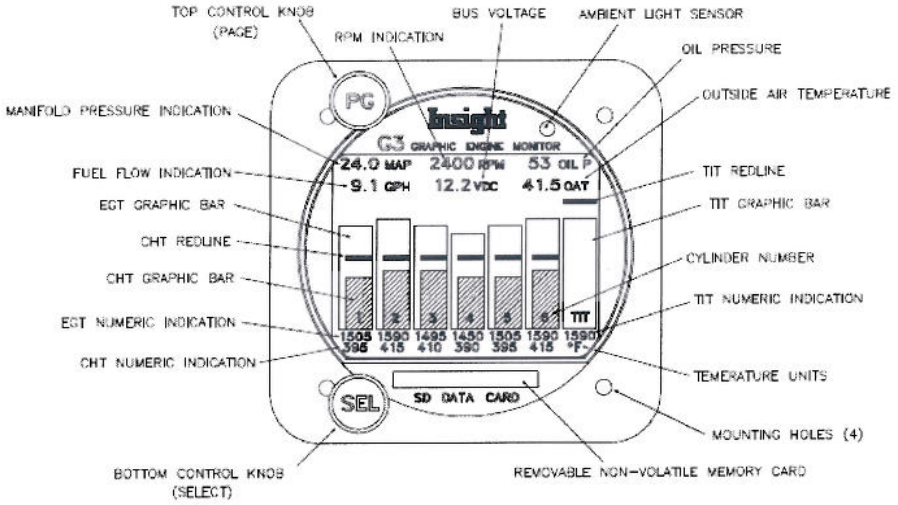
G3 CONFIGURATION

The G3 GEM 610C instrument configuration is shown below. The Insight G3 GEM 610C Graphic Engine Monitor (GEM) displays an airplane engine's Exhaust Gas Temperature (EGT), Cylinder Head Temperature (CHT) and Turbine Inlet Temperature (TIT), Carburetor Temperature (CARB), Manifold Pressure (MAP), Tachometer (RPM), Oil Pressure (OIL), Fuel Flow (GPH), Bus Voltage (VDC) and Outside Air Temperature (OAT) on a Liquid Crystal Display (LCD).



G2 CONFIGURATION

The G2 GEM 610C instrument configuration is shown below. The G2 configuration displays EGT, CHT, TIT, Carburetor Temperature, GPH, VDC and OAT on an LCD.

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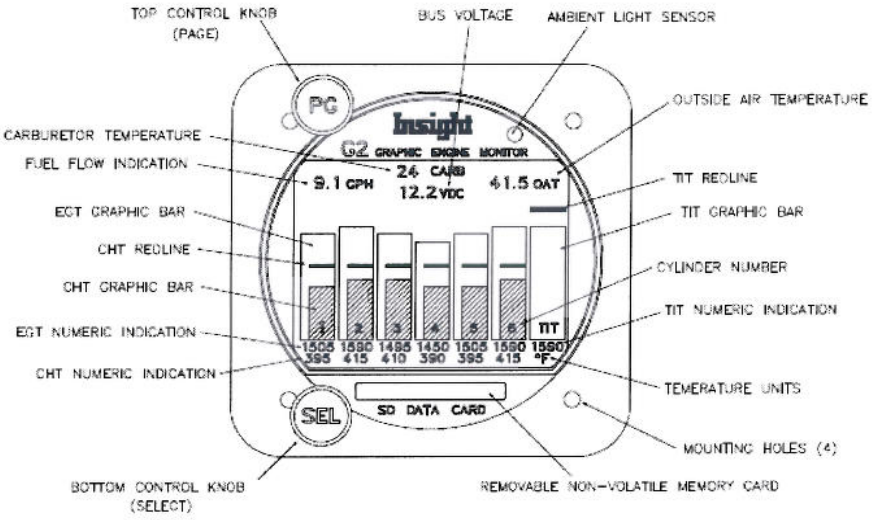
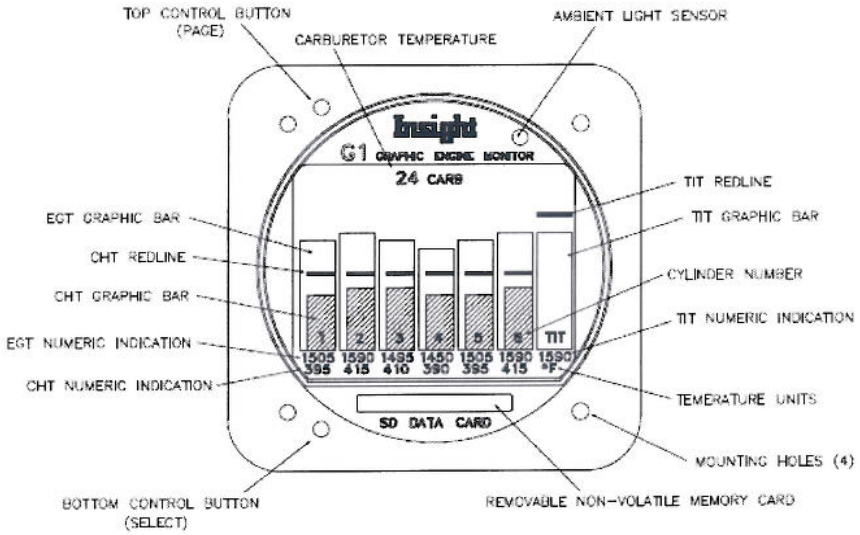


G1 CONFIGURATION

The G1 GEM 610C instrument configuration is shown below. The G1 configuration displays EGT, CHT, TIT and Carburetor Temperature (optional) on an LCD.



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SECTION II

LIMITATIONS

The GEM 610C Engine Monitor instruments **(G1, G2 and G3 configurations)** may replace any eligible aircraft Cylinder Head Temperature (CHT) indicator or Exhaust Gas Temperature (EGT) or Turbine Inlet Temperature (TIT) indicator. Single-engine airplanes utilize one GEM 610C instrument, while twin-engine airplanes need two.

The Manifold Pressure (MAP), Carburetor Temperature (CARB), Tachometer (RPM), Oil Pressure(OIL), Fuel flow (GPH), Bus Voltage (VDC) and Outside Air Temperature (OAT) indications at the top of the display are supplementary information, for reference only.

SECTION III

EMERGENCY PROCEDURES

None.

SECTION IV
NORMAL PROCEDURES

Normal Operation

The GEM 610C continuously measures and displays EGT, CHT and TIT temperatures, Carburetor Temperature, Manifold Pressure, RPM, Oil Pressure, Fuel Flow, Bus Voltage and Outside Air Temperature.**(See configuration examples on pages 6 and 7)** Normal operating temperatures for CHT and TIT are displayed with green bar graphs and digital values. EGT operating temperatures are shown with white bar graphs and digital values. CHTs and TITs at an above maximum (redline) are displayed in red. All other values are supplementary and shown in cyan.

Cruise Leaning Procedure for Rich-of-Peak (ROP) Operation Using GEM 610C

1. Establish cruise power setting and mixture according to the engine and airframe manufacturers' instructions.
2. Set the desired lean threshold by pushing the lower button and turning the knob. Push the lower button to exit.**(Not applicable to G1 configuration)**
3. Lean mixture slowly until each cylinder reaches peak EGT and display the temperature difference in a box above each column. Reverse mixture control motion to enrich the mixture to obtain the fuel flow rate or EGT drop recommended by the engine and airframe manufacturer. The EGT drop is continuously displayed above the EGT column. **Reaching the desired EGT drop is annunciated by the temperature box turning from hollow to solid.(Applicable to G2 and G3 configurations only)**
4. The user may retry the procedure by setting the mixture well on the rich side and then pushing the lower button for 3 seconds to erase the temperature difference boxes. Then start from the beginning.

Cruise Leaning Procedure for Lean-of-Peak (LOP) Operation Using GEM 610C
(For aircraft approved for LOP mixture operation)

1. Establish cruise power setting and mixture according to the engine and airframe manufacturers' instructions.
2. Set the desired lean threshold by pushing the lower button and turning the knob. Push the lower button to exit. **(Not applicable to G1 configuration)**
3. Lean mixture slowly until all cylinders display peak EGT difference boxes. Continue leaning until all the temperature difference boxes indicate the engine manufacturers' recommended LOP temperature drop. **This point is annunciated by the temperature from hollow to solid.(Applicable to G2 and G3 configurations only)**
4. The user may retry the procedure by setting the mixture well on the rich side and then pushing the lower button for 3 seconds to erase the temperature difference boxes. Then start from the beginning.

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CHT Limits

Aircraft engine manufacturers' specify 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 the GEM 610C instrument as a red line across the bar graphs. In the overheat conditions, the bar graph and digital value representing the overheating cylinder will change from green to red.

Causes of High Temperatures

High CHT values 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 CHT:

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)

TIT Limits

Engine manufacturers do not specify a maximum Exhaust Gas Temperature (EGT). All references to EGT are relative to peak temperature. However in a turbo-charged airplane the 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 °F. The limit will be specified in the airplane's POH/AFM. For long turbo life pilots often operate 100 °F below the specified limit.

The flow of exhaust gas through the turbo is controlled by a valve called a waste gate. The tem waste gate is used because the vale 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.

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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.

Manual Brightness Adjustment

The instrument adjusts its brightness automatically, according to ambient lighting condition.

The G2 and G3 configurations may have minimum brightness adjusted. See Installation Instruction, Document No. 070906, latest revision.

SECTION V

PERFORMANCE

No change to Aircraft Flight Manual

SECTION VI

WEIGHT AND BALANCE

See current weight and balance data.

Note: The GEM 610C weight is 0.22kg.

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