

GULFSTREAM G550

OPERATING MANUAL

ENGINE IGNITION

2A-74-10: Engine Ignition System

1. General:

A. Description:

Each engine has two ignitor plugs installed in the combustion chamber to ignite the fuel / air mixture injected into the chamber by the fuel nozzles and the high pressure compressor. Each ignitor plug provides a high voltage pulse of energy supplied by a dedicated ignition exciter. The exciters transform twenty-eight volt (28v) direct current from the aircraft electrical system to a three thousand volt (3,000v) energy pulse routed to the ignitors through shielded electrical leads. The exciters are mounted side by side at the twelve (12) o'clock position at the top of the engine. The igniter plugs protrude into the engine combustion chamber with the number one (1) ignitor located at the four (4) o'clock position and the number two (2) ignitor at the seven (7) o'clock position. When the ignitors are selected on, the exciters send the high voltage pulse to the plugs every one point one to two (1.1 - 2.0) seconds. When the engine reaches a stabilized normal rpm, ignition is no longer required since the combustion of the fuel / air mixture is self-sustaining.

Ignition is controlled by the engine FADEC in response to switch commands on the ENGINE START panel on the cockpit overhead (see Figure 1), commands from the FUEL CONTROL, L CONT IGN and R CONT IGN switches on the cockpit center console (see Figure 2), or automatically if the FADEC detects conditions that degrade engine performance.

B. Subsystems, Units And Components:

Each engine ignition system includes the following units and components:

- Two (2) Ignition Exciter Units
- Two (2) Ignition Leads and Plugs
- Two (2) Continuous Ignition (L/R CONT IGN) Switches

2. Description Of Subsystems, Units And Components:

A. Ignition Exciter Units:

The ignition exciter units provide a capacitive discharge high energy pulse of approximately three thousand volts (3000v) to the ignition leads and plugs. Ignition exciter one (1) is powered by the left essential DC bus through the L/R IGN #1 circuit breaker. Exciter number two (2) is powered from the right essential DC bus through the L/R IGN #2 circuit breaker. The exciters use inverters, transformers and capacitors to boost the twenty-eight volt (28v) power supply to three thousand volts (3,000v).

B. Ignition Leads and Plugs:

Each ignition exciter unit transmits the ignition energy pulse to the ignitor through a shielded lead that runs from the top of the engine to the ignitors on the lower section of the combustion chamber. The leads contain a twelve (12) gage multi-strand wire surrounded by flexible mesh insulation.

The ignitor leads connect to the inner electrode of the ignitor plugs. The inner electrode is surrounded by a ceramic insulator and encased within a

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surrounding outer electrode. When the capacitance of the energy pulse from the exciter reaches the required level, the pulse discharges from the inner electrode to the outer electrode providing ignition to the combustion chamber.

C. Continuous Ignition (L/R CONT IGN) Switches:

Although a single ignitor is normally powered only during the engine starting sequence to provide an ignition source until engine combustion is self-sustaining, the flight crew may select the continuous operation of both ignitors in each engine using the L CONT IGN and R CONT IGN switches on the center console aft of the power levers.

The use of continuous ignition is advisable when encountering unstable air and/or precipitation, even though the FADEC will automatically select continuous ignition if moisture is detected at the high pressure compressor inlet. The continuous ignition switches are also employed when using the alternate engine starting procedure and when performing abnormal engine operations as defined in Section 05-00-00: Expanded Abnormal / Emergency Procedures and in the Engines - EB section of the Quick Reference Handbook.

3. Ignition Operation:

A. Operation:

During a normal engine start, only one ignitor is energized to initiate combustion within the engine. The ignitor is powered when the fuel control switch is selected to RUN and continues to provide ignition pulses until reaching stabilized engine rpm, usually at approximately forty two percent (42%) HP.

To prolong ignition exciter / ignitor service life, the FADEC alternates control channels and ignitor selection during each normal engine start. Switching occurs each time that the FUEL CONTROL switch is selected OFF.

During flight, the FADEC will automatically activate continuous ignition using both ignitors if moisture is detected in the high pressure compressor inlet or during an auto relight of the engine if the FADEC detects an abnormality in LP, HP or TGT parameters.

4. Controls and Indications:

Whenever the engine ignitor(s) is energized a text indication is displayed on the Engine Start and Engine system 1/6 window displays. The Engine Start window will display a "L IGN and/or R IGN" in green near the top of the respective engine side of the window. On the Engine system window, green "IGN" indications are shown on the respective left and/or right lower corners of the display. Descriptions of the Engine and Engine Start system pages appear in Section 2B-07-00.

A. Circuit Breakers (CBs):

The following CBs power the engine ignition system:

Circuit Breaker Name:	CB Panel:	Location:	Power Source:
L/R IGN 1	POP	F-7	L Essential DC Bus
L/R IGN 2	CPOP	F-7	R Essential DC Bus

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5. Limitations:

A. Flight Manual Limitations:

(1) Continuous (Airstart) Ignition:

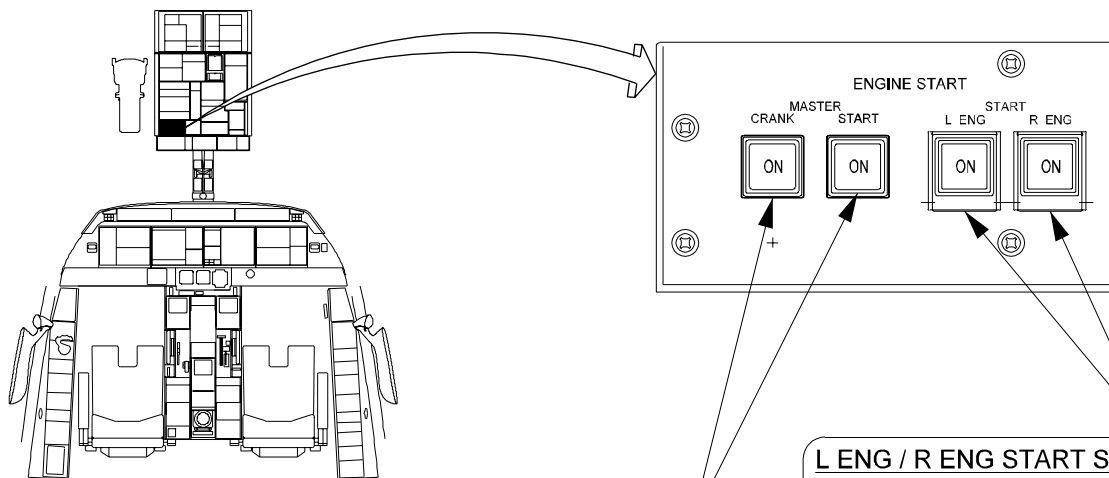
There is no duty cycle time limitation for continuous (airstart) ignition.

NOTE:

Although the use of continuous ignition is not time limited, prolonged operation will reduce exciter and ignitor service life.

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MASTER CRANK / START SWITCHES

Alternate action switches. Normal position is off. When MASTER CRANK switch is selected ON, alternate engine starting mode and wet / dry crank mode are enabled.

When MASTER START switch is selected ON, normal start mode is enabled.

After selection of either switch to ON:

- Respective ON legend illuminates blue.
- If APU is running, APU load control valve opens.
- If right ECS pack is operating, ECS pack is shut down.

When selected OFF:

- ON legend extinguishes.
- Associated mode is disabled.
- If right ECS pack was operating when either switch was selected ON, ECS pack operation resumes.

L ENG / R ENG START SWITCHES

Guarded momentary action switches. Normal position is off.

With selection of either ENG START switch to ON and MASTER CRANK switch ON, a crank sequence for selected engine is initiated.

With selection of either ENG START switch to ON and MASTER START switch ON, a start sequence for selected engine is initiated.

In either above case, the following also occurs when either ENG START switch is elected ON:

- Respective ON legend illuminates blue.
- If left ECS pack is operating, ECS pack is shut down.
- Starter Air Valve (SAV) opens to supply air to starter. SVO icon is displayed on Engine Instruments page on Display Unit.

Crank sequences are terminated manually. Start sequences can be terminated:

- Automatically under normal conditions by the EEC at approximately 42% HP RPM.
- Automatically under abnormal conditions at any time by the EEC.
- Manually by selection of the ENG START switch to OFF.

When the crank or start sequence is terminated:

- ON legend extinguishes.
- SAV closes. SVO icon extinguishes.
- If left ECS pack was operating when either ENG START switch was selected ON, ECS pack operation resumes.

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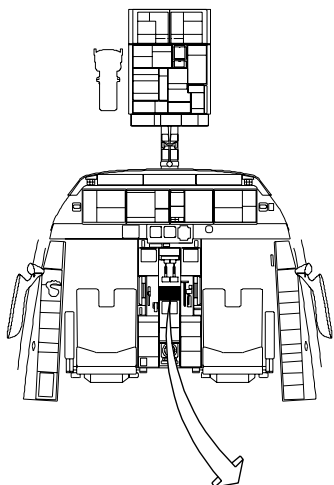
Engine Start Panel
Figure 1

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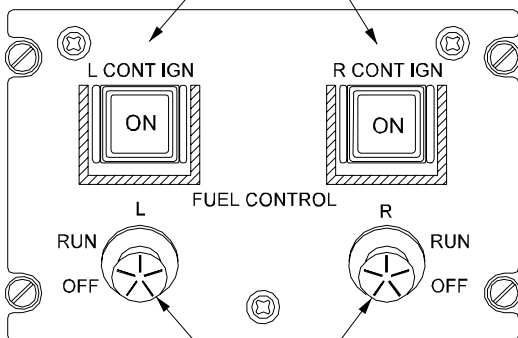
L/R CONT IGN

OFF:

- Continuous ignition is available only upon automatic command from EEC.
- Blue ON legend extinguishes.
- Normal operating mode.

ON:

- Blue ON legend illuminates.
- Continuous ignition operates on both ignitors.



L/R FUEL CONTROL

RUN:

Authority given to Electronic Engine Controller (EEC) to command all ignition functions automatically.

OFF:

- Ignition is inhibited.
- Engine is shut down.
- FADEC is reset.

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Engine Ignition System Controls
Figure 2

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