TELEDYNE CONTINENTAL ® AIRCRAFT ENGINE

CATEGORY 4

SERVICE INFORMATION DIRECTIVE

Compliance Will Enhance Safety, Maintenance or Economy Of Operation

SID97-3E

Technical Portions
FAA APPROVED
SUPERSEDES M73-22, M89-10, M92-17, SID98-10A, SID97-3, SID97-3A, SID97-3B, SID97-3C and SID97-3D,

SUBJECT: PROCEDURES AND SPECIFICATIONS FOR ADJUSTMENT OF TELEDYNE CONTINENTAL MOTORS (TCM) CONTINUOUS FLOW FUEL INJECTION SYSTEMS.

PURPOSE: Provide procedures and specifications for the adjustment of Teledyne Continental Motors (TCM) fuel injection systems.

COMPLIANCE: At Engine Installation, 100 hour/Annual Inspection, fuel system component replacement or as required if operation is not within specifications.

MODELS AFFECTED: All TCM continuous flow fuel injected engine models except IO-240-B w/ Bypass Fuel System; L/TSIO-360-RB; TSIO-520-L, LB, WB; GTSIO-520-F, K, N and GIO-550-A Engine Models.

WARNING

THE PROCEDURES AND VALUES PROVIDED IN THIS SERVICE BULLETIN APPLY TO TCM FUEL INJECTED ENGINES THAT HAVE NOT BEEN MODIFIED FROM THEIR ORIGINAL TYPE DESIGN. REFER TO SUPPLEMENTAL TYPE CERTIFICATE (STC) HOLDER INFORMATION AND INSTRUCTIONS FOR AIRCRAFT AND ENGINES THAT HAVE BEEN MODIFIED FROM THEIR ORIGINAL TYPE DESIGN.

GENERAL INFORMATION

Fuel injection system components manufactured by TCM are adjusted and calibrated to meet engineering specifications. This insures operation within those specifications throughout the full range of operation. Fuel injection system components installed on factory new and rebuilt engines are further adjusted to meet design specifications during operation in the production engine test facility. These tests and adjustments are carried out in an environment of controlled fuel supply pressures and calibrated test equipment.

When engines are installed in aircraft, they are subjected to a different induction system, fuel supply system and operating environment. These differences require checking and adjusting the fuel injection system to meet operational specifications before flight.

Aircraft and engines that have been modified from their original type design must have the fuel injection system maintained in accordance with the Supplemental Type Certificate Holder's FAA approved instructions.

Operational verification of the engine fuel system is required any time one of the following circumstances occurs: (1) at engine installation, (2) during 100 hour and annual inspections, (3) whenever a fuel system component is replaced or adjusted, (4) when changes occur in the operating environment.

CAUTION: Engine performance, service life and reliability will be compromised if the engine's fuel injection system is neglected.

The following adjustment procedures are presented in a sequential format that must be followed to insure proper fuel system adjustment. Reference the applicable Aircraft Maintenance Manual for detailed fuel system adjustment and maintenance procedures.

mixture conditions that are too rich or too lean as follows:

a) Identify the type of throttle and control assembly that is to be adjusted. See Figures 6, 8 and 9.

b) Perform an IDLE fuel/air mixture check and observe RPM rise. If the RPM rise is not within specifications, advance the throttle control to 1500 - 1800 RPM for 15 seconds after each adjustment to clear the engine. Retard the throttle control to IDLE RPM and repeat mixture check. Make the necessary adjustment. Repeat this procedure until the specified RPM rise is achieved.

c) Recheck IDLE RPM unmetered pump pressure. If pressure in not within limits, repeat Steps 18, 19, 19-a and 19-b before continuing.

20. On all naturally aspirated engines, adjust the FULL POWER metered fuel pressure to the specified value by turning the adjustable orifice screw clockwise to increase fuel pressure and counterclockwise to decrease fuel pressure. See Figures 1, 2 and 3.

21. On turbocharged engines, adjust the full power metered fuel pressure to the specified value as follows:

NOTE: On turbocharged engines equipped with a fuel pressure regulator, the full power metered fuel pressure and fuel flow must be adjusted to five (5) percent higher than the maximum specified limit.

a. Loosen the aneroid adjustment screw lock nut. See Figures 4 and 5.

b. Turn the aneroid adjustment screw counterclockwise to increase metered fuel pressure and clockwise to decrease metered fuel pressure.

c. After final adjustment is accomplished, torque lock nut to 25-30 inch pounds. DO NOT EXCEED LOCK NUT TORQUE LIMITS. OVER-TORQUING OF LOCK NUT WILL RESULT IN DAMAGE TO ANEROID HOUSING THREADS AND SUBSEQUENT LOSS OF ADJUSTMENT.

22. For engines equipped with a fuel pressure regulator, the full power metered fuel pressure and fuel flow flow must now be set to the specified limit by adjustment of the regulator as follows. See Figure 10. Reconnect the regulator and torque all connections to the specified value. Loosen the lock nut on the regulator adjustment. Turn the regulator adjusting screw clockwise to increase metered fuel pressure and fuel flow and counterclockwise to decrease metered fuel pressure and fuel flow. After final adjustment is completed, torque the lock nut to the specified value.

23. When full power metered fuel pressure has been adjusted to the specified values, recheck: (a) IDLE RPM, (b) unmetered fuel pressure, (c) fuel/air mixture. If any values are not within specified limits, repeat the adjustment procedures.

24. With the fuel system set to the specified metered fuel pressure, set the IDLE RPM to the aircraft manufacturer's specified value by turning the Idle Speed Stop screw clockwise to increase RPM or counterclockwise to decrease RPM. See Figures 6, 8 and 9.

D. POST SETUP PROCEDURES

1. Insure that the master switch, ignition switch and fuel selector are in the OFF position.

2. Remove the engine cowling or cooling shroud in accordance with the aircraft manufacturer's instructions. (a) remove all test gauges, fittings and hoses that were installed for fuel system setup, (b) reconnect all fuel hoses and cap fittings to their original locations, (c) support and torque all fittings to the specified value, see TABLE 1.

3. ASSURE CAP ASSEMBLY 639494 IS CORRECTLY INSTALLED ON INLET TEE FITTING OF COMBINATION THROTTLE BODY/METERING UNITS. TORQUE TO

135-190 INCH POUNDS PER TABLE 1 SPECS. UNDER NO CIRCUMSTANCE ALLOW ANY CAP FITTING OTHER THAN 639494 TO BE INSTALLED DURING ENGINE OPERATION.

4. Perform a complete fuel system leak check in accordance with the aircraft manufacturer's instructions. Correct any discrepancies noted.
   - Turn aircraft master switch to ON position
   - Adjust mixture control to full rich
   - Adjust throttle control to 1/4 inch open
   - Activate the aircraft boost pump (ON)
   - Inspect entire fuel system for fuel leakage
   - Return mixture and throttle to idle/closed position
   - Turn aircraft boost pump OFF
   - Turn the aircraft master switch OFF
5. Install engine cowling in accordance with the aircraft manufacturer's instructions.
6. Perform a complete operational ground run-up and verify that all fuel system performance specifications are achieved.

E. FLIGHT TEST:
Except naturally aspirated engines with altitude compensating fuel pump

1. Refer to the aircraft manufacturer's or Supplemental Type Certificate (STC) holder's POH/AFM for specific operational information.
2. A flight test is required whenever an adjustment is made that may affect engine operational characteristics or performance.
3. If FULL POWER RPM was not obtained during fuel injection system setup and adjustment, a flight test is required to insure that the fuel injection system is performing within specified limits for the engine and aircraft.
4. Repeat the setup and adjustments as required until the fuel injection system is performing within the published specification for the aircraft and engine.

F. FLIGHT TEST:
Naturally Aspirated engines with altitude compensating fuel pumps (AUTO LEAN)

1. All naturally aspirated engines utilizing an altitude compensating fuel pump require a flight test at: (a) Initial installation, (b) Every 12 months (Scheduled to coincide with annual or 100 HR inspection), (c) each time adjustments are made due to a fuel system component replacement and (d) at any indication of improper auto-leaning feature operation.
2. Table 5 and Chart 1 provide fuel flow vs. pressure altitude specifications for the IO-240-B series engine with altitude compensating fuel pumps. Table 6 and Auto Leaning Chart 3 provide fuel flow vs. pressure altitude specifications for the IO-360-DB engine with altitude compensating fuel pump. Tables 7 & 8 and Auto Leaning Charts 4 & 5 provide fuel flow vs. pressure altitude specifications for the IO-360-ES engine with altitude compensating fuel pump. Tables 9 through 12 and Auto Leaning Charts 6 through 9 provide fuel flow vs. pressure altitude specifications for the IO-550- series engine with altitude compensating fuel pumps.
3. Insure the accuracy of aircraft fuel flow gauge and tachometer has been verified. These gauges must be accurate or the data recorded during flight test will not be valid.
4. Locate the correct table and auto leaning chart for the aircraft and engine. On the operational test form provided in this Service Information Directive, record all pressure altitudes and corresponding minimum and maximum fuel flows as specified.
5. In accordance with the aircraft manufacturer's instructions, perform a complete preflight inspection, engine start and ground runup.

8. After making any adjustments to the variable orifice, torque the lock nut to 25-30 inch pounds.

9. Perform a complete ground run-up and verify that unmetered and metered pressures and fuel flows are within the limits specified in the appropriate table for the pressure altitude. If these parameters are not within the limits specified make adjustments in accordance with PART C to achieve the specified values.

NOTE...

The adjustable orifice tapered needle may be damaged if forced against its seat. The adjustment should move freely. Do not continue adjustments if rotational resistance increases suddenly.

10. Once the adjustments are completed, remove the test equipment in accordance with part D (Post Setup Procedures).

11. Perform a flight test in accordance with part F (Flight Test: Naturally Aspirated engines with Auto Lean).

12. Repeat these procedures until the engine's fuel injection system meets all published specifications.

TABLE 1

Torque Specifications for Hose End and Cap Fittings

BRASS or ALUMINUM END FITTINGS/CAPS

Hose Size	Fitting Material	Torque (inch lbs.)
#2 (.31x24)	Hose end fitting Brass/Aluminum	50 – 80
#3 (.38x24)	Hose end fitting Brass/Aluminum	70 – 105
#4 (.4375x20)	Hose end fitting Brass/Aluminum	100 – 140
#5 (.500x20)	Hose end fitting Brass/Aluminum	130 – 180
#6 (.5625x18)	Hose end fitting Brass/Aluminum	150 – 195
#8 (.750x16)	Hose end fitting Brass/Aluminum	270 – 350
#10 (.875x14)	Hose end fitting Brass/Aluminum	360 – 430
#12 (1.063x12)	Hose end fitting Brass/Aluminum	460 – 550

STEEL HOSE END FITTINGS/CAPS

Hose Size	Fitting Material	Torque (inch lbs.)
#2 (.31x24)	Steel End Fitting	75 – 120
#3 (.38x24)	Steel End Fitting	95 – 140
#4 (.4375x20)	Steel End Fitting	135 – 190
#5 (.500x20)	Steel End Fitting	170 – 240
#6 (.5625x18)	Steel End Fitting	215 – 280
#8 (.750x16)	Steel End Fitting	470 – 550
#10 (.875x14)	Steel End Fitting	620 – 745
#12 (1.063x12)	Steel End Fitting	855 – 1055

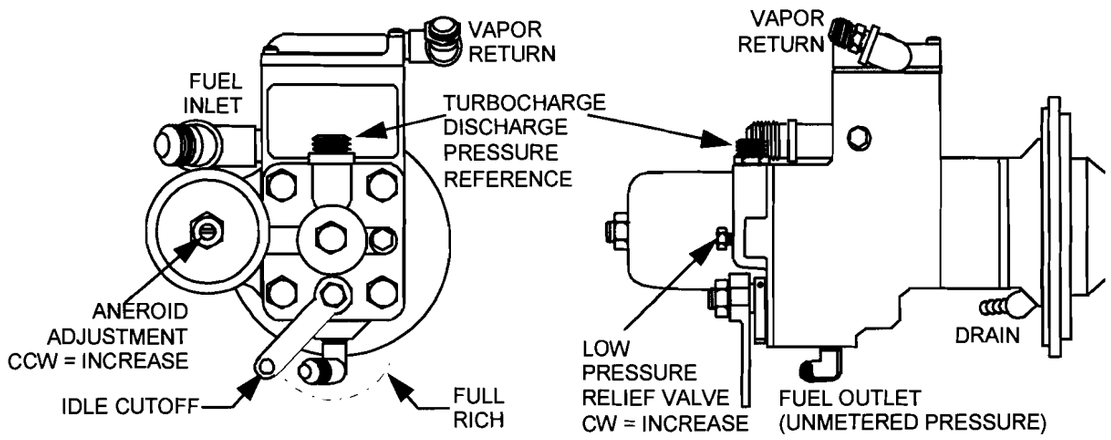

FIGURE 5 - ANEROID & MIXTURE CONTROL EQUIPPED FUEL PUMP TURBOCHARGED ENGINE

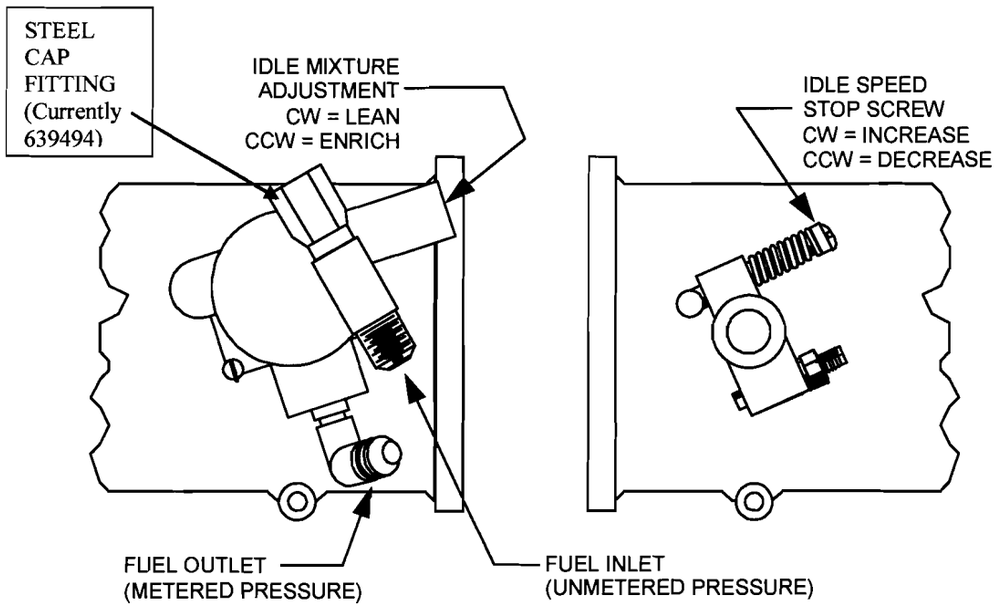

FIGURE 6 - THROTTLE & METERING ASSEMBLY