6. Power Management System *(See Figures 4 and 5)*

The major components of the power management system are the engine fuel control assembly, the propeller governor assembly and the propeller pitch control, plus the interconnecting mechanical linkage that coordinates the control functions. These interrelated power management controls are rigged to provide two basic modes of operation: the beta mode and the propeller-governing mode.

Beta-mode operation provides for operator control of propeller blade angle and selection of engine speed. The fuel control automatically meters fuel flow to supply engine power required by propeller load. Beta-mode operation is normally utilized at reduced aircraft speeds for reverse pitch braking on the runway and for ground operation.

Propeller-governing mode operation provides for operator control of engine power and selection of the engine speed-governing point. The propeller governor controls the propeller blade angle position to absorb the operator-selected power setting while maintaining constant engine speed. Propeller-governing mode operation is utilized for all airborne operations.

A beta light is furnished in the cockpit to indicate when illuminated that the propeller has moved into the ground operating (beta) range after landing in response to power lever movement. Therefore operation of the beta light between 65 and 85 percent engine rpm is not essential since the engine is not operated in this speed range during takeoff, flight or landing, and safety of flight is not involved.

A. Fuel Control and Pump Assembly

(1) General

The fuel control and pump assembly is composed of a fuel high pressure and boost pump assembly and fuel control unit. These components are stacked together as a single assembly on a four-stud drive pad, located in the upper right-hand position at the rear of the reduction gear section. The fuel control unit meters the fuel, supplied by the boost and high pressure fuel pumps, to the engine combustion chamber. The fuel control unit is composed of three major fuel devices: an underspeed governor, an overspeed governor and manual fuel valve (main metering valve).

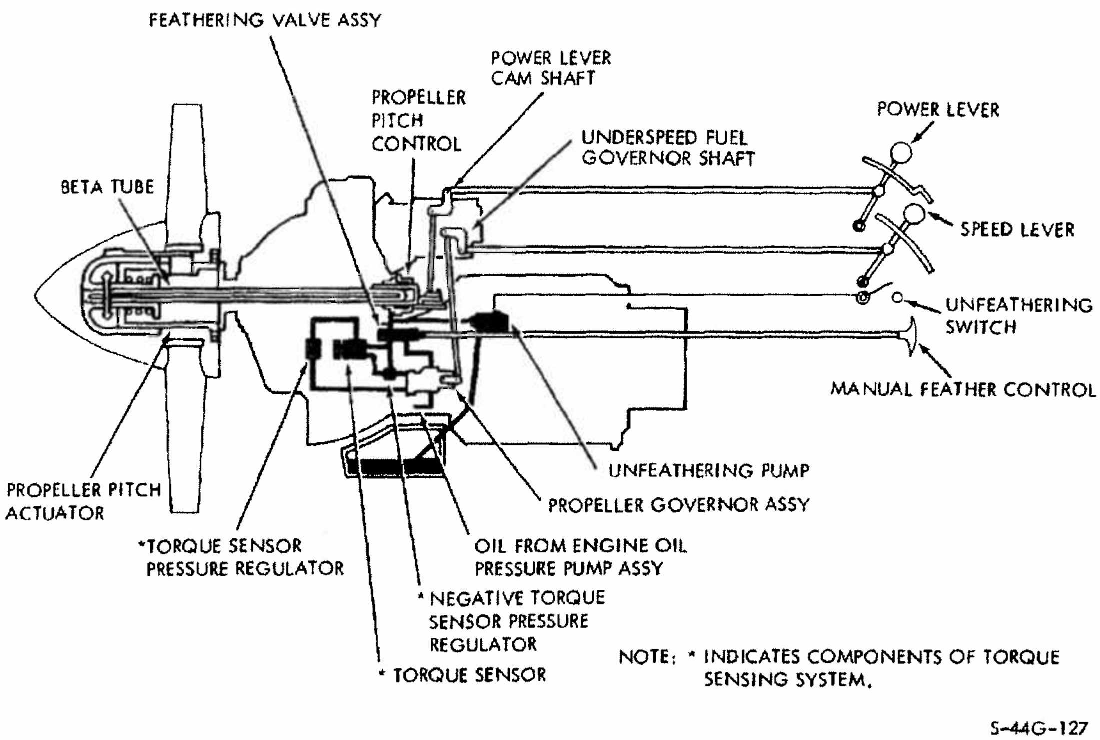
Fuel-flow range is established by two basic limiting devices:

(a) A maximum fuel flow schedule functionally controlled by mechanical means and compressor discharge pressure and compensated for compressor inlet temperature and pressure variance.

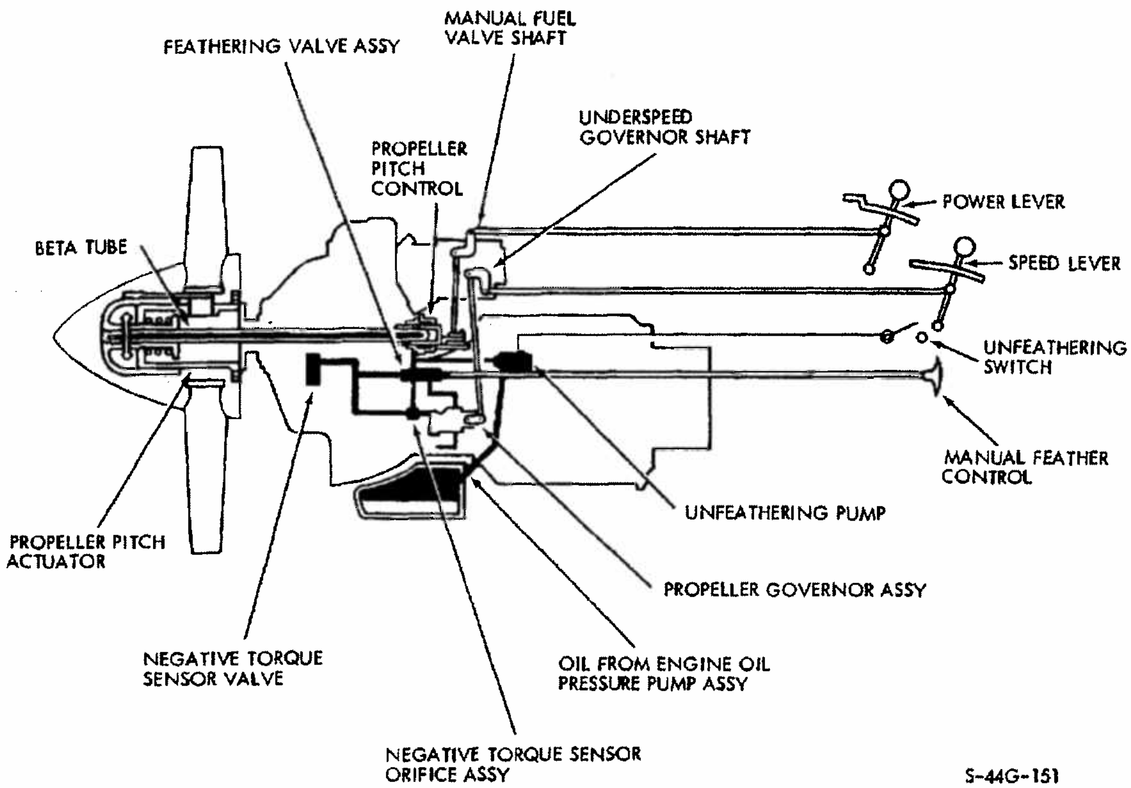
(b) A minimum fuel flow schedule functionally controlled by mechanical means and compressor discharge pressure.

A fuel trim manual adjustment is externally located on the fuel control unit to provide compensation for different fuel types.

Figures 6, 7, and 8 illustrate typical fuel system installations.



(Codes AA-AD) Simplified Power Management and Torque Sensing Diagram (Typical)
Figure 4



(Codes BA-BD) Simplified Power Management and Torque Sensing Diagram (Typical)
Figure 5

6. A. (2) Underspeed fuel governor.

The underspeed fuel governor, a droop-type speed control, is functional in a beta-mode operation. The engine speed selection is operator-controlled within limits specified in Testing Section, *Table 704*. Should engine speed decrease under the propeller blade angle load, the underspeed fuel governor increases fuel flow to oppose any decrease in engine speed to support the load.

The minimum speed setting provides a minimum engine speed during ground operation for reduced noise level. The maximum speed setting provides greater power during reverse-pitch braking operation.

The flyweight-type underspeed fuel governor, gear-driven by the fuel control unit drive shaft, positions the fuel main metering valve through mechanical linkage to control fuel flow. Variable-speed selection is accomplished by controlling the speeder-spring loading that opposes the speed-sensing flyweight action. The underspeed fuel governor shaft, which positions the speeder-spring loading mechanism, protrudes from the fuel control unit. Mechanical linkage connects the underspeed fuel governor shaft to the propeller governor assembly speed-control shaft and, coordinated into a single cockpit control, provides for operator control of the underspeed fuel governor speed-setting during beta mode and control of the propeller governor assembly speed-governing point during propeller-governing mode. The underspeed fuel governor is set at least 3 percent below the propeller governor assembly setting to prevent interference between the two speed-control governors.

The linkage from the underspeed fuel governor to the cockpit control is airframe-furnished.

6. A. (3) Power lever cam shaft.

The power lever cam shaft position meters fuel flow to control engine power at all engine speeds during propeller-governing mode.

At a fuel flow sufficient to drive the engine speed above the propeller governor setting, the propeller governor assembly establishes a constant-engine-speed operation by automatically increasing propeller-blade pitch angle. Additional fuel flow provides additional power at a constant engine speed (propeller-governing mode). Propeller-governor mode for speed setting can be established by operator control of the power lever.

The power lever shaft that controls the main metering valve position protrudes from the fuel control unit. Mechanical linkage connects the power lever shaft to the propeller pitch control cam shaft and, coordinated into a single cockpit control, provides for operator control of the propeller-blade pitch angle during beta-mode of operation. The power lever position relationship to fuel flow and propeller blade angle (on a typical installation) is shown in *Figure 6*.

The linkage from the propeller pitch control to the cockpit control is airframe-furnished.

(4) Overspeed fuel governor.

The flyweight-type overspeed fuel governor is a safety device to control engine speed at approximately 103.5 to 104.5 percent. Excess engine speed produces overspeed governor flyweight action, which reduces fuel flow to oppose any engine speed increase.

B. Propeller Governor Assembly

The propeller governor assembly is mounted in the lower left-hand position at the rear of the reduction gear section. The propeller governor assembly provides a constant engine speed during the propeller-governing mode of operation. The gear driven propeller governor assembly is composed of an integral gear type pump, metering valve, and flyweight governor. Engine lubricating oil is internally directed to the propeller governor assembly oil pump inlet. The pressure pump boosts the oil pressure sufficiently to position the propeller blade angle in propeller-governing mode. The oil flow is metered by the metering valve, controlled by flyweight governor action in response to engine speed change. The oil flow is metered to maintain pressure in the pitch control and propeller to set the blade angle required to maintain the speed setting.

The propeller governor assembly speed setting shaft is connected to the underspeed governor shaft on the fuel control unit by mechanical linkage. The propeller governor assembly provides for propeller-governing mode of operation at a choice of engine speed settings.

Operator control of the cockpit speed lever determines the amount of preload on the governor speed spring, which loads the flyweights.

During the beta-mode of engine operation the propeller governor assembly is not governing and supplies high-pressure oil via the propeller pitch control to the engine propeller control components.

6. C. Propeller Pitch Control

The propeller pitch control is mounted at the rear of the reduction gear section on the propeller shaft centerline. The propeller pitch control is composed of a ported sleeve, which is positioned by a cam. The control end of the beta tube (which also has oil-supply ports) rides inside the ported sleeve.

The positioning cam-control shaft is connected to the main metering valve power-lever shaft by mechanical linkage. During propeller-governing mode, the propeller pitch control serves no basic function other than oil passage and housing for the beta tube. In beta-mode (under-speed governing) the propeller pitch control provides for operator control of propeller blade pitch angle. Operator control is accomplished by manually positioning the propeller pitch control cam. The beta tube oil supply holes are then aligned with the ported sleeve so that the pressure supplied to the propeller balances the propeller piston spring.

D. Beta Tube

The propeller oil-transfer (beta) tube extends aft from a threaded adjustable connection in the propeller dome, through the engine propeller shaft, and into the propeller pitch control. The tube portion, housed within the propeller pitch control ported sleeve has oil supply ports through which propeller governor discharge oil is supplied to the propeller dome. During beta-mode, the beta tube and the propeller pitch control jointly control the oil pressure to the propeller dome to position the blade pitch angle. During propeller-governing mode, the beta tube performs no control function (due to the ported sleeve position) and serves only as an oil passage.

E. Torque/Temperature Limiter

The torque limiter is essentially a valve with one side connected between the fuel control and fuel shutoff valve and bypasses metered fuel to reduce fuel supply to the engine. The torque limiter consists of a torque motor with two coils wound in parallel. If an overtorque/overtemp condition arises, the torque motor receives an electrical signal from the torque and temperature limiter controller which is an electronic assembly remotely located in the airframe. The overtorque signal to the torque motor will position a plate valve in the torque limiter, permitting fuel to bypass directly back to the inlet of the fuel pump assembly thus reducing fuel flow to the engine.

(Codes AA, AB, BA, BB) The torque motor is also actuated by the torque and temperature limiter controller to limit engine interstage turbine temperature (ITT)/exhaust gas temperature (EGT).

F. **(Codes BA-BD)** Torque Signal Conditioner

The torque signal conditioner is remotely located in the airframe. It provides an excitation voltage to the strain gage bridge and amplifies the millivolt signal from the strain gage bridge to a usable level. This signal is sent to the cockpit torque readout gage and to the torque/temperature limiter controller.