ENGINE CONTROLS - DESCRIPTION AND OPERATION

1. Scope

A. This chapter describes those controls which govern operation of the engine. These include the power control lever, fuel condition control lever, propeller speed control lever and emergency power control lever.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the topics incorporated in this chapter is as follows:

(1) Quadrant assembly provides description, operation and removal/installation procedures for the throttle quadrant.

(2) Engine control rigging provides instructions for rigging the airplane.

3. Description and Operation

A. Engine controls for the Model 208 airplane consist of a power control lever, fuel condition control lever, and propeller speed control lever. Power and fuel condition control levers are engine controls, while the third controls propeller speed. A fourth lever, emergency power control, is available for use in the event of primary power control system failure within the hydro-pneumatic metering and governing system.

(1) A power control lever, located in the cockpit, is connected through an airframe linkage to a cam-box assembly mounted on the front of the Fuel Control Unit (FCU) at the rear of the engine. The power control lever controls the engine power through full range from maximum takeoff power, back through idle, then to maximum reverse power. The power control lever schedules fuel in the forward power range, while directly controlling propeller blade angle and fuel in the reverse power range.

(a) Control of reverse blade angles is accomplished through and externally grooved back ring provided with the propeller. Feedback ring motion is proportional to propeller blade angle, and picked up by a carbon block running in the feedback ring. The relationship between the axial position to the feedback ring and propeller blade angle is used to maintain control of blade angle from idle to full reverse.

(2) A fuel condition control lever, located in the cockpit, is connected through an airframe linkage to a combined lever and stop mechanism at the top of the fuel control unit. The fuel condition control lever is then connected by an FCU linkage to a fuel shutoff lever on the side of the unit. Additionally, the control lever and stop function as an idle stop for the FCU control rod.

(a) The fuel condition control lever consists of three positions: high idle, low idle and cutoff. When the cockpit control lever is in high idle position, the FCU is at 65 percent gas generator speed (N_g). When in low idle position, the FCU is at 52 percent N_g.

(3) A propeller speed control lever, located in the cockpit, is connected through an airframe linkage to the propeller governor mounted on the top forward section of the engine. The cockpit propeller speed control lever regulates propeller blade angle from maximum RPM position (1900 RPM) to full feather. Propeller speed control is achieved through a propeller governor which controls blade angle.

(4) An Emergency Power Lever (EPL), located in the cockpit, is connected through an airframe linkage to a lever mechanism on the aft side of the FCU. The EPL schedules fuel in the event of primary control failure. A red warning light on the annunciator panel, EMERGENCY POWER LEVER, indicates the EPL is not in normal stowed position.

(5) The following airplanes incorporate frangible/shear wire, which is installed from the EPL to the pedestal cover:

- Airplanes 20800351 and On.
- Airplanes 208B0920 and On.
- Airplanes 20800001 thru 20800350 Incorporating SK208-142.
- Airplanes 208B0001 thru 208B0919 Incorporating SK208-142.

(6) Use of the EPL is indicated by breakage of this frangible/shear wire. After use of the EPL, appropriate engine maintenance actions must be accomplished in accordance with the Pratt & Whitney Maintenance Manual, Chapter 71-00.

B. Propeller control is provided by a standard governor, Beta control valve, and overspeed governor. The propeller governor performs two functions. Under normal flight conditions, the governor acts as a Constant Speed Unit (CSU), maintaining cockpit selected propeller speed by varying blade angle to match the load to the engine torque in response to changing flight conditions. During low airspeed operation, the propeller governor is used to select the required propeller blade angle. When the engine is operating in the Beta control range, engine power is adjusted by the FCU and power turbine governor to limit power turbine speed (N_1) at a speed approximately 4 percent lower than that set on the propeller governor.

C. During constant speed operation, desired propeller speed is set by the propeller speed control lever located in the cockpit. Lever movement is translated by an externally mounted control lever on the propeller governor, into a change in compression in the governor speeder spring. Increased compression results in increased propeller speed.

(1) Propeller underspeed condition is sensed by governor flyweights, allowing the pilot valve to move down under the influence of the speeder spring, thus permitting high pressure oil to flow to the propeller servo piston, decreasing propeller blade angle. If, during constant speed operations, the blade angle decreases below a specified positive blade angle, the propeller feedback ring moves forward, actuating the Beta control valve and preventing the flow of high pressure oil to the propeller servo piston.

(2) Constant speed operation allows the Beta control valve to act as a hydraulic fine pitch stop for the propeller, maintaining positive propeller blade angles during flight.

(3) Propeller overspeed condition results in flyweights forcing the pilot valve to move up against the speeder spring tension, allowing propeller oil to bleed to the reduction gearbox. Propeller feather spring and blade counterweights then cause the propeller pitch to coarsen, decreasing propeller speed.

D. Propeller low blade angles and reverse angles are scheduled by a cam-box and cable system connected to the power control lever and controlled from the cockpit. During low airspeed and low engine power, propeller blades are at hydraulic fine pitch stop. The propeller will exhibit an underspeed condition, relative to speed selection on propeller speed control lever. Movement of the power control lever, below idle position into the Beta control range, moves the cam arrangement in the cam-box. Through the Beta control linkage, the Beta control valve opens, permitting oil to flow to the servo piston, thus decreasing propeller blade angle.

(1) As the propeller blade angle approaches the control lever angle selection, the feedback ring causes the propeller reversing lever to close the Beta control valve. Oil flow is terminated to the propeller and further pitch change is prevented. Resulting blade angle is proportional to the selected power control lever position. Low blade angles and reverse may only be selected when the propeller is underspeeding, relative to the speed selected by the propeller speed control lever. When a high forward flight speed is achieved, low blade angles and reverse cannot be selected, as the propeller will windmill at selected speed, even when the gas generator is at IDLE.