

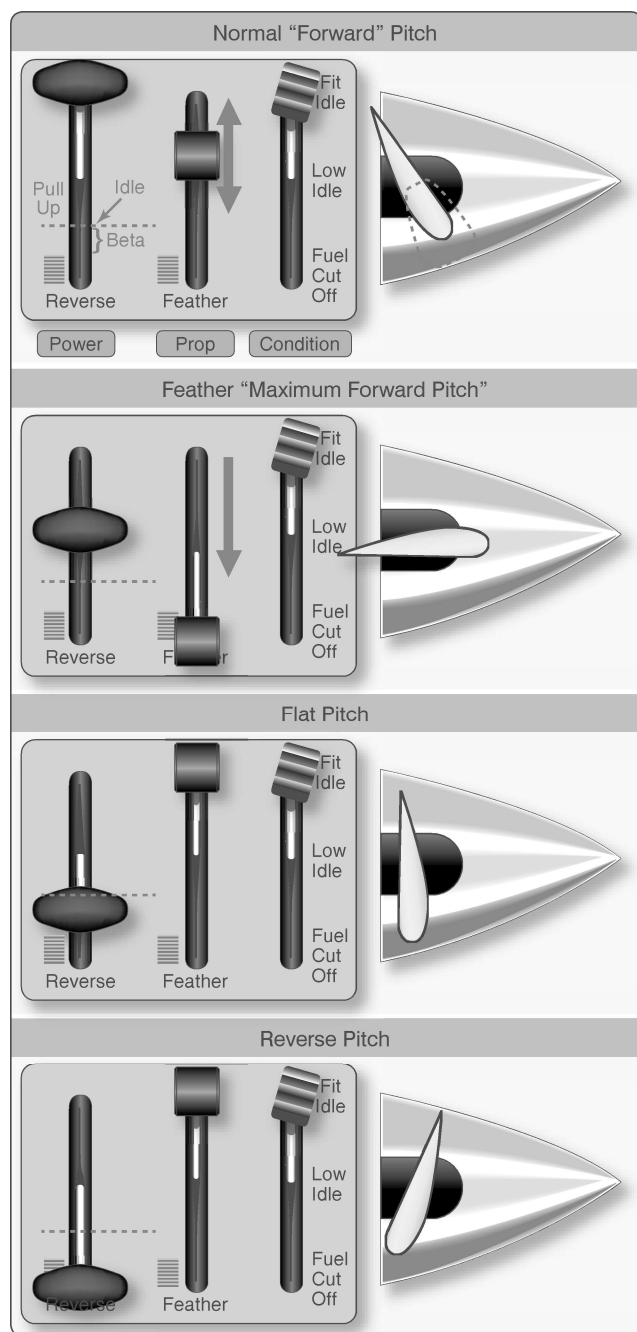


Figure 14-8. *Propeller pitch angle characteristics.*

With a turboprop engine, in order to obtain enough power for flight, the power lever is placed somewhere between flight idle (in some engines referred to as “high idle”) and maximum. The power lever directs signals to a fuel control unit to manually select fuel. The propeller governor selects the propeller pitch needed to keep the propeller/engine on speed. This is referred to as the propeller governing or “alpha” mode of operation. When positioned aft of flight idle, however, the power lever directly controls propeller blade angle. This is known as the “beta” range of operation.

The beta range of operation consists of power lever positions from flight idle to maximum reverse. Beginning at power lever positions just aft of flight idle, propeller blade pitch angles become progressively flatter with aft movement of the power lever until they go beyond maximum flat pitch and into negative pitch, resulting in reverse thrust. While in a fixed shaft/constant-speed engine, the engine speed remains largely unchanged as the propeller blade angles achieve their negative values. On the split shaft PT-6 engine, as the negative 5° position is reached, further aft movement of the power lever also results in a progressive increase in engine (N_1) rpm until a maximum value of about negative 11° of blade angle and 85 percent N_1 are achieved.

Operating in the beta range and/or with reverse thrust requires specific techniques and procedures depending on the particular airplane make and model. There are also specific engine parameters and limitations for operations within this area that must be adhered to. It is essential that a pilot transitioning to turboprop airplanes become knowledgeable and proficient in these areas, which are unique to turbine-engine powered airplanes.

Turboprop Airplane Electrical Systems

The typical turboprop airplane electrical system is a 28-volt direct current (DC) system, which receives power from one or more batteries and a starter/generator for each engine. The batteries may either be of the lead-acid type commonly used on piston-powered airplanes, or they may be of the nickel-cadmium (NiCad) type. The NiCad battery differs from the lead-acid type in that its output remains at relatively high power levels for longer periods of time. When the NiCad battery is depleted, however, its voltage drops off very suddenly. When this occurs, its ability to turn the compressor for engine start is greatly diminished, and the possibility of engine damage due to a hot start increases. Therefore, it is essential to check the battery’s condition before every engine start. Compared to lead-acid batteries, high-performance NiCad batteries can be recharged very quickly. But the faster the battery is recharged, the more heat it produces. Therefore, NiCad battery-equipped airplanes are fitted with battery overheat annunciator lights signifying maximum safe and critical temperature thresholds.

The DC generators used in turboprop airplanes double as starter motors and are called “starter/generators.” The starter/generator uses electrical power to produce mechanical torque to start the engine and then uses the engine’s mechanical torque to produce electrical power after the engine is running. Some of the DC power produced is changed to 28 volt 400 cycle alternating current (AC) power for certain avionic, lighting, and indicator synchronization functions. This is accomplished by an electrical component called an inverter.