Constant Speeding Variable Pitch Propeller System

Propeller Control Unit (PCU) Operation

How the PCU changes propeller pitch and maintains constant engine speeds
Basic Principal of Operation

The Pilot moves the throttle lever which, as well as changing fuel flow and therefore engine power, selects an RPM for the engine to run at.

(You will see later that the throttle is connected to both the Fuel Control Unit and the PCU)

The PCU maintains the selected speed by adjusting propeller pitch.

This eases pilot workload:-

Especially during combat as the engine is automatically prevented from over speeding and therefore potential destruction and the pilot can concentrate on defeating the enemy

And during civilian/transport duties giving the same engine safeguards as above allowing the pilot to concentrate on flying the aircraft, and therefore deliver the passengers and/or cargo safely to their destination
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle Positions: -
- Take Off
- Cruise
- Start & Idle

Pilot Input Signal

Engine Mounted
- Sliding Collar
- Spring
- Counter Balance Weights

Spinner

Propeller Hub
- Connecting Linkage
- Operation Piston

Hydraulic Connections

Hydraulic Return

Hydraulic Pressure Supply

PCU

Engine RPM Signal (Mechanical Drive)

Simplified System
Piston Engine driven propeller

PROPELLER SYSTEM – VARIABLE PITCH CONTROL
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Jet Engine driven propeller – Turbo-Prop

PROPELLER SYSTEM – VARIABLE PITCH CONTROL
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle Positions
- Take Off
- Cruise
- Start & Idle

Pilot Input Signal

Engine Mounted

Propeller Hub

Engine Stationary
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Start & Idle
Cruise
Take Off

Start Initiated – Engine Begins to Rotate
PROPeller system – variable pitch control

Throttle positions:
- Take Off
- Cruise
- Start & Idle

Engine mounted

Propeller hub

Engine at idle

PROPELLER SYSTEM – VARIABLE PITCH CONTROL
PROPELLER SYSTEM – VARIABLE PITCH CONTROL
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Start & Idle
Cruise
Take Off

Engine Accelerates to Take Off Speed
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Engine Mounted

Propeller Hub

Start & Idle

Cruise

Take Off

Throttle Positions

Engine Running at Take Off Speed
Look at how the PCU changes propeller pitch and maintains constant engine speeds during Dive commencement.

In all these manoeuvres, all the pilot is doing is flying (redirecting) the aircraft, the throttle is not touched.

PROPELLER SYSTEM – VARIABLE PITCH CONTROL
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle Positions
- Take Off
- Cruise
- Start & Idle

Aircraft Starts Dive
- Throttle (and Engine) at Cruise – Aircraft Starts Dive
Throttle Positions

- Start & Idle
- Cruise
- Take Off

PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle at Cruise – RPM Increases
Propeller Hub

Engine Mounted

Propeller Hub

Throttle Positions

Take Off

Cruise

Start & Idle

RPM Increases - Prop Goes to Coarser Pitch

PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle at Cruise –
RPM Increases - Prop Goes to Coarser Pitch
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle Positions
- Take Off
- Cruise
- Start & Idle

Engine Mounted

Propeller Hub

Throttle at Cruise – Aircraft in Dive – RPM Restored
Looked at how the PCU changes propeller pitch and maintains constant engine speeds during Dive commencement.

In all these manoeuvres, all the pilot is doing is flying (redirecting) the aircraft, the throttle is not touched.

PROPELLER SYSTEM – VARIABLE PITCH CONTROL
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle Positions
- Take Off
- Cruise
- Start & Idle

Engine Mounted

Propeller Hub

Throttle at Cruise – Aircraft Levels Out
PROPELLER SYSTEM – VARIABLE PITCH CONTROL

Throttle Positions
- Take Off
- Cruise
- Start & Idle

Engine Mounted

Propeller Hub

RPM Reduces Throttle at Cruise –
PROPELLER SYSTEM – VARIABLE PITCH CONTROL