

THE PROPELLER

The function of the propeller is to convert the torque, or turning movement, of the crankshaft into thrust, or forward, speed.

Designed so that, as it rotates, it moves forward along a corkscrew or helical path.

It pushes air backward with the objective of causing a reaction, or thrust, in the forward direction.

The jet engine moves a small mass of air backward at a relatively high speed.

The propeller, on the other hand, moves a large mass of air backward at a relatively slow speed.

The propeller blade is an airfoil section, similar to the airfoil section of a wing.

It meets the air at an angle of attack as it rotates.

It produces lift and drag.

In the case of the propeller, the forces are designated as **thrust** and **torque**.

Those attached forward of the engine and pull are called **tractors**.

Those which are attached aft of the engine and push from behind are called **pushers**.

PITCH

- The distance in feet a propeller travels forward in one revolution.
- The angle at which the blade is set governs the pitch.
- There is a **Coarse Pitch** meaning the blade is set at a larger angle.
 - There is a **Fine Pitch** meaning the blade is set at a small angle.

COARSE PITCH

- Travels forward a greater distance with each revolution.
- The airplane will move forward at greater speed for a given RPM.
- Like high gear in a car.
- Best suited for high-speed cruise and for high altitude flight.

FINE PITCH

- Less torque, or drag.
- Revolves at a higher speed around its own axis.
- Enables the engine to develop greater power.
- Like low gear in a car.
- Gives best performance during take-off and climb.

TYPES OF PROPELLERS

1. ***Fixed Pitch:***

Constant blade angle.

Blades are at an angle in between fine and course pitch to give the best overall performance possible for all flight conditions.

2. ***Adjustable Pitch:***

Blade angle may be adjusted on the ground.

3. ***Controllable Pitch:***

Blade angle can be adjusted by the pilot to various angles during flight.

4. ***Constant Speed:***

Blades automatically adjust themselves to maintain a constant RPM as set by the pilot.

PROPELLER CONTROL SYSTEMS

The mechanism for varying the pitch of the propeller may be:

1. ***Mechanical:***

Hand controlled by linkages.

2. ***Hydraulic:***

A fluid under pressure pushes or pulls on a cam that uses gears to turn the blades of the propellers.

3. ***Electrical:***

Operated by an electric motor

FEATHERING

- Turning the propeller blades to an extreme coarse pitch.
- Used in the event of an engine failure to stop the propeller from “wind milling”. It will reduce drag of the failed engine or propeller.

THRUST REVERSING

- Changing the pitch below the idle position (full fine pitch) into the reverse range or negative pitch,
- Thrust now works in the reverse direction.
- Used to slow down the aircraft after it has landed and to manoeuvre the aircraft on the ground.

BASIC ENGINE INSTRUMENTS

Although the aircraft has many basic instruments, the basic engine instruments are perhaps the most important.

- These gauges monitor essential components of the engine.
- Can indicate early warning signs of potential problems and possible engine failure.

COLOUR CODING

Colour code ranges from green, to yellow to red, indicating normal, caution and danger operating settings respectively.

OIL PRESSURE GAUGE

- Monitors oil pressure supplied by oil pump.
- High pressure can force oil into the combustion chamber where it will burn.
- Low pressure leads to poor lubrication.

OIL TEMPERATURE GAUGE

- Monitors temperature of oil.

CARBURETOR AIR TEMPERATURE GAUGE

- Enables pilot to monitor the temperature of intake air or air/fuel mixture into the carburetor.
- If icing exists, the carburetor heat control unit can be activated by the pilot.

TACHOMETER (RPM INDICATOR)

- Monitors the number of revolutions per minute the engine crankshaft is turning.
- On aircraft with fixed or controlled pitch propellers, RPM is controlled by the throttle.

CYLINDER HEAD TEMPERATURE GAUGE

- Records the temperature of one or more of the engines cylinder heads.
- Extremely high cylinder head temperatures are immediate signs of engine overloading.

MANIFOLD PRESSURE GAUGE

- Usually located beside the tachometer because both indicate engine power output.
- A drop in manifold pressure usually indicates carburetor icing.

ENG 407-05