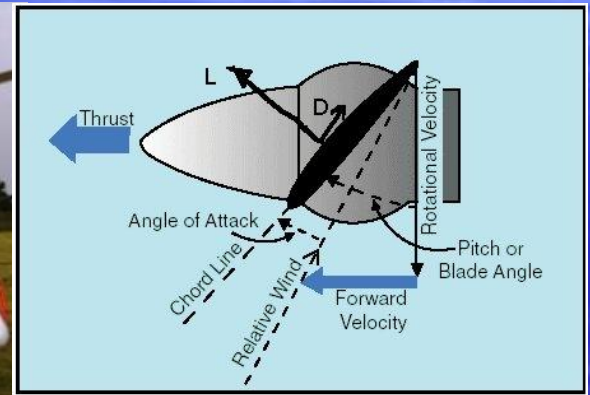


# Variable Pitch / Constant Speed propellers



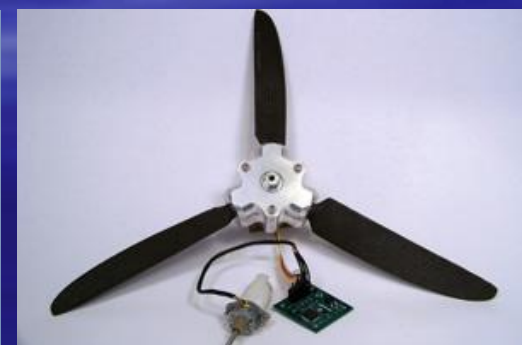
Len Klopper

# Not SAGPA approved

- The following is my attempt to assemble information from all sources and to combine it into a useful document.
- Please feel free to comment, change, fix, repudiate, teach by adding value to the document for everyone's benefit.
- Mail me to have the base document changed – [lenk@ehr.co.za](mailto:lenk@ehr.co.za)

# Variable Pitch Propellers

- Four common types of propeller
  - Fixed pitch
  - Ground adjustable
  - In flight adjustable
  - Constant speed
    - The last two are both examples of variable pitch propellers.





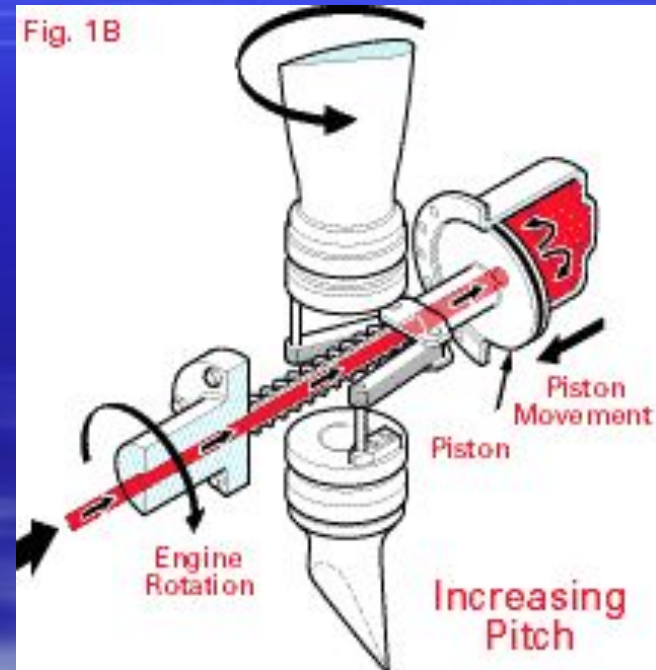
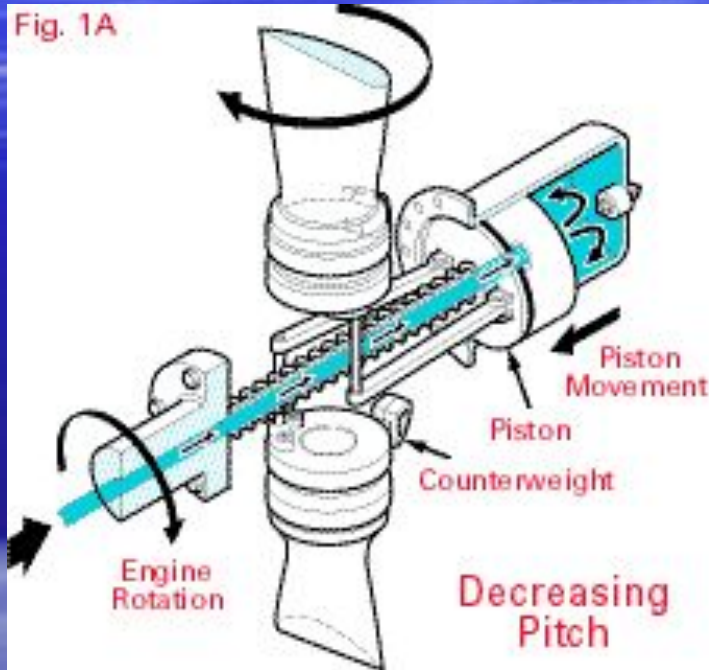
# History of Variable Pitch Propeller

On 7 February 1922 Wallace Rupert Turnbull patented the Variable Pitch Propeller. Considered one of the most important developments in the history of aviation, this mechanism allowed for change in blade pitch to suit flying conditions and airplane weight. When Turnbull was posthumously inducted into the Canadian Aviation Hall of Fame in 1977, his citation read: "The patient application of his aeronautical theses to a number of problems unique to flight, and more especially his invention of the successful variable pitch propeller, have been of outstanding benefit to aviation."

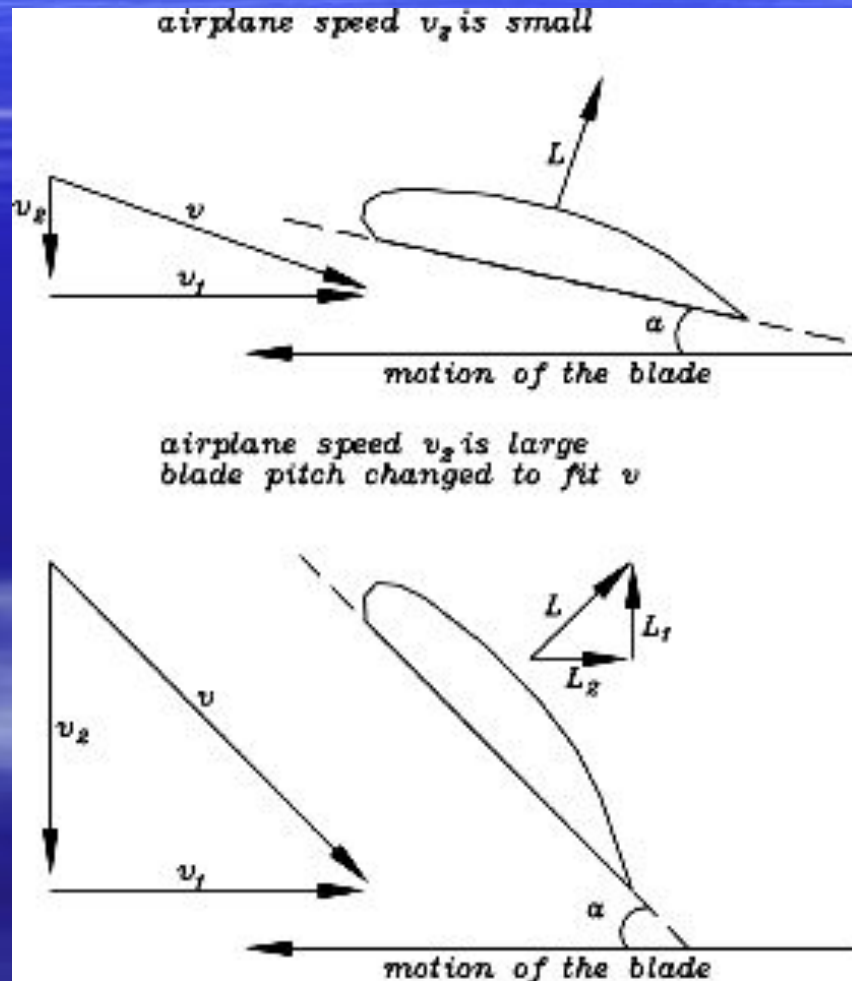
# Variable Pitch // Constant Speed Propeller

- A **variable pitch propeller (VPP)** or **controllable pitch propeller (CPP)** is a special type of propeller with blades that can be rotated around their long axis to change their pitch – manual transmission in a car.
- A **constant speed propeller (CSP)** is a type of propeller that can change its blade pitch automatically to take better advantage of the power supplied by an engine in much the same way that an automatic transmission in a car takes better advantage of its power source.

# Basic Mechanism



# Airspeed // Pitch





# Control





### AUTO /MANUAL SELECTOR

Selects between Automatic (Constant Speed governing) mode and Manual override mode.

### FINE INDICATION LIGHT

Indicates the status of the propeller movement towards feather.  
Orange = Travelling  
Green = reached pitch stop  
Red = Error condition

### COARSE INDICATION LIGHT

Indicates the status of the propeller movement towards feather.  
Orange = Travelling  
Green = reached pitch stop  
Red = Error condition

### TAKE OFF

When in 'Auto' the 'Take Off' selection will automatically control the pitch of the propeller to hold the preset take off RPM. This greatly improves take off performance by allowing maximum thrust to be achieved right from the start of the take off roll.

### FEATHER INDICATION LIGHT

Indicates the states of the propeller movement towards feather.  
Orange = Travelling  
Green = reached pitch stop  
Red = Error condition



### CLIMB

When in 'Auto' the Climb selection will automatically control the pitch of the propeller to hold the preset climb RPM. Not only will this increase performance but it also allows the pilot to concentrate on flying the plane during climb without having to worry about adjustments to the propeller system.

### MODE SELECTOR

Selects control Mode of AC200 controller.

### FEATHER

The Feather mode for the AC200 controller allows the propeller to be feathered in flight, and provides complete control of this process. In designing the controller Airmaster has eliminated the possibility of inadvertent feather by requiring a two step operation to feather.

When preparing to commence gliding flight, the motor-glider pilot readies the propeller by rotating the mode selector to the feather position. When the engine is shut down, the pilot initiates the automatic feather cycle by momentarily actuating the feather engage switch. The propeller blades will automatically travel to the feather position (approximately 90° blade angle).

When gliding flight is nearing an end, and the pilot is preparing to restart the engine, the propeller will automatically un-feather when any other position is selected on the mode selector.

### HOLD

When in auto the hold selection will allow any governed speed to be selected by the pilot, by using the manual Fine/Coarse selector.

### CRUISE

When in 'Auto' the 'Cruise' selection will automatically control the pitch of the propeller to hold the preset cruise RPM. This is true even for unexpected climbing and descending (as long as sufficient throttle has been applied).

# WARNING!

- Engine overspeed Danger!
  - If no governor or governor settings inop. Watch MAP & Engine RPM closely
- Always set CLIMB pitch on final approach in case of a go-round
- Keep Aircraft speed in mind when adjusting pitch

# TIPS!

- Excessive manifold pressure raises the cylinder compression pressure, resulting in high stresses within the engine. Excessive pressure also produces high engine temperatures. A combination of high manifold pressure and low r.p.m. can induce damaging detonation. In order to avoid these situations, the following sequence should be followed when making power changes.
- When increasing power, increase the r.p.m. first, and then the manifold pressure.
- When decreasing power, decrease the manifold pressure first, and then decrease the r.p.m.



# Final tip!

- All power changes should be made smoothly and slowly to avoid overboosting and/or overspeeding.