HARTZELL HC-A3V SERIES PROPELLERS WITH BETA VALVE HYDRAULIC LOW PITCH STOP

(Ed note: The following was reproduced from a procedure by Aerotech Services' Seabee Service Notes. It explains how to set up the Beta (Reversing) valve linkage and adjustments. It has been re-typed for clarity and accuracy can not be guaranteed.)

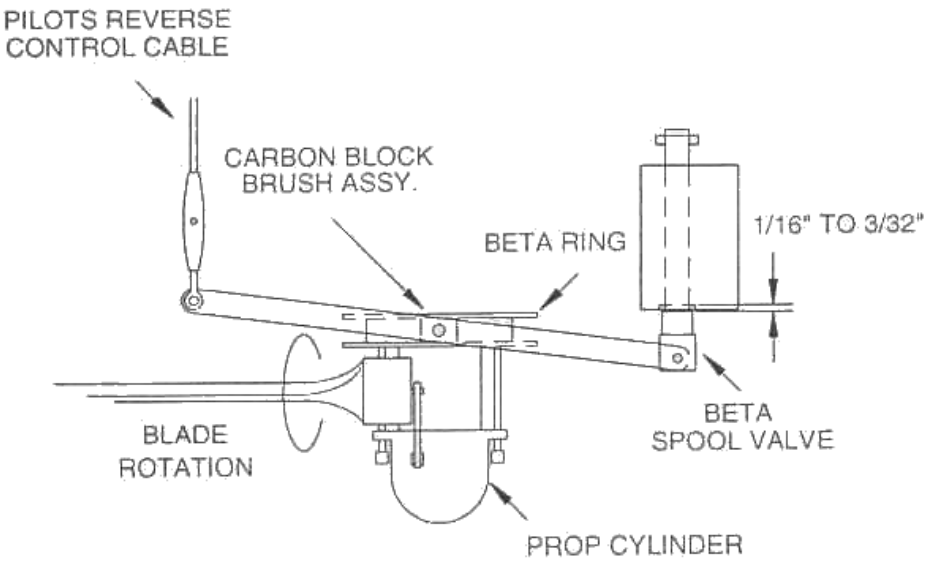
The most common propeller utilized on Lycoming powered Seabees is the Hartzell HC-A3(M)V(X)-(X)(X). The (X)'s denote subtle differences between various models in the series. This propeller utilizes a hydraulic low pitch stop which can be controlled by the pilot's reverse control lever to allow the propeller blades to rotate from low pitch, through flat pitch and on into reverse.

The propeller uses oil pressure from the governor to move the blades from high pitch (this is the static / start-up position of the blades) to a low pitch position required to achieve the RPM called for by the positioning of the pilot's prop control. This action is opposed by a combination of springs and counterweights acting to twist the blades to a high pitch position. If sufficient manifold pressure (power) exists to achieve the requested RPM at a low pitch setting, a hydraulic low pitch stop is activated to keep the propeller blades from turning completely flat in an attempt to achieve the requested RPM.

The hydraulic low pitch stop system consists of a beta spool valve, a beta ring, a carbon block brush assembly and the pilot's reverse control cable. The beta spool valve, located under the governor, controls the oil flow from the governor to the propeller. Upon engine start-up, with the reverse control in full forward position, the carbon block / beta ring assembly positions the beta spool valve to direct all of the oil from the governor to the prop cylinder. The expanding cylinder rotates the blades into low pitch. When the engine RPM is below that called for by the governor, the blades will continue toward the flat position until the beta ring is pulled forward (aft on the aircraft for a pusher., i.e. Seabee). This action repositions the spool in the reverse valve, cutting off further oil to the prop. This servo action is the hydraulic low pitch stop.

Reverse pitch is achieved by changing the relationship of the beta ring, beta spool valve and reverse control to set the hydraulic low pitch stop at a point beyond a flat pitch blade setting and on into reverse pitch. When the pilot applies pressure to the reverse control, the beta spool valve again directs oil to the prop cylinder. As the beta ring travels forward, the spool valve position is maintained by continued pressure applied to the reverse control by the pilot. This situation continues until the pilot's control runs out of travel or the pilot stops applying pressure to the control. When the pilot returns the reverse control to the forward position, the spool valve is positioned to drain oil from the prop cylinder. As the beta ring travels back to a low forward pitch position the spool valve cuts off the oil flow draining the prop cylinder and propeller blades maintain a low forward pitch setting.

Correct adjustment of the beta spool valve and associated control linkage is critical to the operation of the propeller.



The most common indication of incorrect rigging of the beta spool valve is the inability of the propeller blades to come out of high pitch at start up. Excessive manifold pressure will be required to achieve run-up RPM and the prop pitch control will be ineffective.

Prior to adjusting the control system, inspect for excessive wear of the carbon brush block. Maximum clearance between the carbon block and the beta ring is .010”. Also inspect for wear in the linkage between the reverse control and the beta spool valve. Repair or replace worn components as necessary.

With the pilot’s prop reverse control locked in the forward position, adjust the reverse control cable to position the beta spool 1/16” to 3/32” off the recessed shoulder in the valve body. Bump the spool a bit by hand to eliminate sticking of the internal o-rings effecting the setting. Secure the linkage adjustment and perform an operational check of the system.

A properly rigged control will be consistently responsive to the prop pitch control at run up RPM. Operate the reverse control with the engine idling at 1,000 RPM. Transition to and from reverse pitch should be smooth and consistent.

Always return the prop reverse control to the forward position prior to engine shut down. Damage to the reverse control cable and linkage can occur if the reverse control is restrained in any position other than forward (and locked) at engine shut down.

Refer to the appropriate Hartzell propeller manual and reverse control valve documentation for more specific setup and adjustment procedures.