

HARTZELL PROPELLER INC.

SERVICE BULLETIN

Propellers

Propellers - Assembly and Installation of HC-D2MV20-3

1. Planning Information

A. Effectivity

Hartzell Model HC-D2MV20-3 propellers installed on Republic (Stol Amphibian) RC-3 Seabee aircraft.

B. Concurrent Requirements

None.

C. Reason

- (1) Affected propellers have experienced instances of the blade clamp assembly contacting the B-93-D valve assembly, during reverse operation. Unapproved field changes to the assembly and/or installation procedures, in an effort to resolve the interference, can result in propeller overspeeds or uncommanded reverse (beta) operation.
- (2) Performance of this Service Bulletin will ensure that the blade clamp assembly will not contact the B-93-D valve assembly while ensuring adequate high pitch blade angle to avoid overspeeds and proper valve set-up to avoid uncommanded reverse (beta) operation.
- (3) Propellers assembled and installed in accordance with this Service Bulletin will not meet the Aircraft Type Certificate Data Sheet (TCDS) specification for reverse blade angle. As such, an FAA Form 337 will be required in order to return the propeller/aircraft to service.

D. Description

This Service Bulletin provides alternate assembly and installation instructions.

E. Compliance

- (1) It is recommended that the assembly and installation procedures specified in this bulletin be followed during assembly or installation of any affected propeller.
- (2) For those propellers already installed and in service it is recommended that this Service Bulletin be accomplished within 10 hours of operation from the effective date of this bulletin.

F. Approval

FAA approval has been obtained on technical data in this publication that affects propeller type design.

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G. Manpower

No additional manpower is required to perform this Service Bulletin

H. Weight and Balance

No change.

I. Electrical Load Data

Not affected.

J. References

Hartzell Manual 100E, (ATA 61-10-00) Hydro-Selective Propeller Overhaul Manual.

NOTE: Item references in this Service Bulletin refer to the item numbers detailed in Figure 1005, 1006 and 1007 in Hartzell Manual 100E (ATA 61-10-00). The item numbers appear in parenthesis directly following the part name to which they apply. For example, a bolt that which is item 20 will appear as bolt (20).

Hartzell Manual 202A, (ATA 61-01-02) Standard Practices.

K. Publications Affected

Hartzell Manual 100E, (ATA 61-10-00) Hydro-Selective Propeller Overhaul Manual.

2. Material Information

A. Material necessary for each propeller assembly.

<u>New Part Number</u>	<u>Keyword</u>	<u>Old Part Number</u>	<u>Fig/Item No.</u>	<u>Qty.</u>
A-186	Spacer, Rear Cone	A-186	210	A/R
A-165-6	Spacer Ring	A-165-3	320	1
A-165-5	Spacer Ring	N/A	320	A/R
A-165-4	Spacer Ring	N/A	320	A/R

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3. Accomplishment Instructions

A. Inspection

- (1) Measure the installed spacer ring (320) to ensure the hub was assembled with an A-165-6 spacer. Height of spacer should be 0.478 ± 0.010 inch (12.14 ± 0.25 mm).
- (2) If spacer height is incorrect proceed as follows to replace spacer and reset blade angles.
 - (a) Use a brass drift or suitable puller to remove spacer ring (320) from the hub (10).
 - (b) Press A-165-6 spacer ring (320) onto hub (10). Ensure spacer ring is fully seated against shoulder of hub.
 - (c) Make an aluminum or steel setup spacer with an inside diameter of 3.25 inch (82.55 cm) and an outside diameter of 3.50 inch (88.9 cm). The height of the spacer is to be 1.060 ± 0.010 inch (26.92 ± 0.25 mm) (See Figure 1).

NOTE 1: To facilitate installing the spacer on the hub, cut the spacer into two equal pieces.

NOTE 2: The setup spacer is used only for set up. The setup spacer is not used when installing the propeller on the aircraft.

- (d) Put the jack plate unit (770) over and around the rotatable fixture on the build table. Rest the unit on the table.
- (e) Mount the hub spider unit on the rotatable fixture of the assembly table.
- (f) Install the hub nut (180) and the puller ring (160).
- (g) Install the snap ring (170) inside the groove in the hub (10) and encircling the hub nut (180).
- (h) Tighten the hub nut (180).
- (i) Lift the jack plate unit (770) into position.
- (j) Line up the push rods (800) with the holes in the guide lugs (60) that are welded to the hub.

CAUTION: MAKE SURE THE BLOCK (220) HAS A SLIDE FIT IN THE FORK. BEVEL THE BLOCK TO ALLOW HUB CLEARANCE.

- (k) Rotate the blades until the forks (810) slide onto the blocks (220) and the push rods (800) enter the guide lugs (60).

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- (l) Move the jack plate unit (770) away from the table until the jack plate (770) contacts the spacer ring (320) that was previously pressed onto the hub shoulder. This is the reverse pitch position for the blade clamps.
- (m) Loosen the outboard clamp nuts (470) and rotate the blades in the clamps to achieve -11.5 ± 0.5 degrees. This is the new reverse blade angle for the propeller.

NOTE 1: Use of a rubber mallet to rotate the blade in the clamp is acceptable.

NOTE 2: Propellers assembled in accordance with this procedure will not meet the Aircraft Type Certificate Data Sheet (TCDS) specification for reverse blade angle. As such, an FAA form 337 will be required in order to return the propeller/aircraft to service.

- (n) Torque the outboard clamp nuts (470) to 35 ft/lbs (47 N•m).
- (o) Check reverse pitch blade angle of both blades to confirm they are within a tolerance of ± 0.1 degree or a maximum of 0.2 degree variance from each other. If blades do not meet tolerance, reset the blades in the clamps.
- (p) Check blade tightness in clamp by applying a torque of 165 Ft-Lb to the blade near the blade root, as specified in Harzell Manual 100E (ATA 61-10-00) (Figure 707).
- (q) Recheck blade angles to ensure no slippage has occurred.
- (r) Move jack plate (770) toward table to allow clearance to place the set-up spacer between the jack plate and the spacer ring (320).
- (s) Move the jack plate unit (770) away from the table until the jack plate pinches the set-up spacer against the spacer ring (320) that was previously pressed onto the hub shoulder. This is the high pitch position for the blade clamps.
- (t) Measure high pitch blade angle to confirm it is a minimum of 19.5 degrees.

CAUTION: HIGH PITCH BLADE ANGLE OF BOTH BLADES MUST BE WITHIN A TOLERANCE OF ± 0.1 DEGREE OR A MAXIMUM OF 0.2 DEGREE VARIANCE FROM EACH OTHER.

- (u) Check high pitch blade angle of both blades to confirm they are within a tolerance of ± 0.1 degree or a maximum of 0.2 degree variance from each other. If blades do not meet tolerance, reset the blades in the clamps.

NOTE: It is acceptable to have greater than 0.2 degree variance at reverse if required to maintain a maximum of 0.2 degree variance at high pitch.

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CAUTION: DO NOT ETCH, SCRIBE, PUNCH MARK, OR SIMILARLY IDENTIFY PARTS IN ANY MANNER THAT MAY BE HARMFUL TO THE STRENGTH OR FUNCTION OF THE PROPELLER.

- (v) Mark position of the jack plate unit (770) with relation to the hub using a crayon or a soft, non-graphite pencil.

NOTE: Marking the jack plate-to-hub position will make sure that the correct orientation is maintained when assembling on the aircraft and engine.

- (w) Pull the jack plate unit (770) toward the table. Rotate the jack plate unit (770) and disengage the forks (810) from the blocks (220).

- (x) Identify block (220) location and orientation for installation of propeller on engine.

- (y) Remove the jack plate unit (770) and the setup spacer from the propeller.

NOTE: The setup spacer is used only during set up. The setup spacer is not used when installing the propeller on the aircraft.

- (z) Remove the propeller from the build bench.

B. Hydraulic Unit Installation

- (1) Use six elastic nuts (730) to attach the cylinder (540) to six studs protruding from the engine.
- (2) Check to make sure that the studs do not extend over 0.5 inch (12.7 mm) above the bottom inside surface of the cylinder.

NOTE 1: Piston travel may be limited if the studs extend over 0.5 inch (12.7 mm) above the bottom inside surface of the cylinder.

NOTE 2: If the hydraulic valve was not removed from the piston, position the valve body at either extreme of the valve stroke to allow air to escape from the cylinder.

CAUTION: MAKE SURE TO REINSTALL THE PISTON AND CYLINDER REMOVED AT DISASSEMBLY. FOR REASSEMBLY ORIENTATION REFER TO DISASSEMBLY MARKINGS.

- (3) Turn the piston (510) so the number stamped on the flange lines up with the number stamped on the front edge of the cylinder, and the pins (550) in the cylinder (540) line up with the appropriate holes in the piston.

NOTE: Cylinder-to-piston guide rods may bind in the piston if the cylinder and piston combination is changed

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CAUTION: DO NOT DAMAGE THE O-RINGS WHEN INSTALLING THE PISTON INTO THE CYLINDER.

- (4) Install the jack plate unit (770) and piston assembly (510) into the cylinder (540). Use a rubber mallet as necessary to bottom the piston in the cylinder.
- (5) Install the hydraulic valve assembly onto the piston with a gasket (1010) and two screws (1250). Safety the two screws.

C. Propeller Installation

- (1) Clean and oil the engine shaft.
- (2) Install one spacer (210) and the rear cone (200).
- (3) Place the propeller on the crankshaft and align the wide hub spline, if applicable, with the shaft blind spine.
- (4) Install a pitch change block (220) on each link screw (380).

CAUTION: USE MARKINGS MADE DURING BENCH ASSEMBLY TO MATCH THE FORKS (810) AND BLOCKS (220). MAINTAIN BLOCK ORIENTATION AND MATCH WITH THE SAME LINKSCREW AS ESTABLISHED DURING BENCH ASSEMBLY AND ADJUSTMENT.

- (5) Rotate the hub relative to the jack plate forks and rotate the blades on the hub.

NOTE: The rotation will make it easier to slide the forks (810) onto the blocks (220).

- (6) Confirm that a minimum of five (5) threads on the engine shaft are available for threading on the hub nut (180).
- (7) Turn the hub nut (180) onto the engine shaft. Make sure the threads have engaged properly.
- (8) Torque the hub nut on the engine shaft to 450 ft/lbs (610 N•m) and safety.

- D. Rotate the blades by hand toward low pitch until the jack plate (770) contacts the spacer ring (320). Confirm that there is a minimum of 0.020 inch (0.5 mm) clearance between the clamps (330) and the valve (1000).

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E. If there is insufficient clearance between the clamps (330) and the the valve (1000), measure the gap to determine how much clearance is needed, remove the propeller, and reassemble using the alternate spacer ring (320) that will provide adequate clearance, in accordance with steps (1) through (3) below.

(1) Remove propeller in accordance with paragraph 3.I.

WARNING: REFER TO TABLE 1 FOR REVERSE BLADE ANGLE CHANGES THAT WILL RESULT FROM THE INSTALLATION OF ALTERNATE SPACER RINGS. DO NOT RESET BLADES IN CLAMPS TO COMPENSATE FOR BLADE ANGLE CHANGE.

(2) Reassemble propeller in accordance with steps 3.A.(2)(a) through 3.A.(2)(z), using the correct dash number spacer ring (320)(see Table 1), to provide 0.020 inch (0.5 mm) minimum clearance between the clamps (330) and the valve (1000).

(3) Reinstall propeller in accordance with paragraph 3.C.

F. Confirm proper high pitch blade angle as follows:

CAUTION: VALVE MUST BE IN HIGH PITCH POSITION TO BLEED AIR INTO THE CYLINDER.

(1) Rotate the blades, by hand toward high pitch until travel is limited by the hydraulic unit (500).

(2) Measure high pitch blade angle to confirm it is 19.5 degrees minimum.

(3) If high pitch blade angle is less than 19.5 degrees remove propeller and install additional spacer(s) (210) in order to achieve desired high pitch blade angle in accordance with steps (a) through (d) below.

(a) Remove propeller in accordance with paragraph 3.I.

(b) Remove rear cone (200) and spacer (210).

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WARNING: EACH ADDITIONAL SPACER WILL LIMIT REVERSE BLADE ANGLE BY APPROXIMATELY 1.5 DEGREE.

- (c) Reinstall rear cone (200) with additional spacer(s) (210) in order to achieve 19.5 degrees minimum.

NOTE 1: It is recommended to use the minimum number of spacers (210) needed to achieve the required blade angle.

NOTE 2: Do not attempt to reset the blades in the clamps in order to compensate for the reverse blade angle change.

- (d) Reinstall propeller in accordance with paragraph 3.C.

G. Hydraulic Unit Connections

CAUTION: HOSE MUST BE LONG ENOUGH TO ALLOW VALVE TO MOVE FREELY WITH THE PISTON.

- (1) Install 3/8 - 1/2 inch (9.5 - 12.7 mm) I.D. flexible hose from pressure side of the engine to the lever side of the valve.

CAUTION: LOCATE THE CRANKCASE DRAIN FITTING AS CLOSE TO THE VALVE AS POSSIBLE--NOT OVER 18 INCHES (45.7 CM) .

- (2) Install 3/8 - 1/2 inch (9.5 - 12.7 mm) I.D. flexible hose from the engine crankcase to the valve.
- (3) Position the cockpit reverse control line forward just off the locked position.
- (4) Attach the reverse control line at the propeller to the short end of the lever on the valve, making sure the clamping bolt is tight against the bracket on the cylinder.

NOTE: There should be an increase in line tension when moving the cockpit reverse control lever into the locked position.

- (5) Bottom piston in cylinder, pull out the cockpit propeller control handle approximately 2-1/4 inches (57.15 mm) from the instrument panel and position the valve spool midway between the cotter pin and the base of the guide pin.
- (6) Attach the propeller pitch control line to the valve lever.

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H. Set-Up

(1) Adjust propeller static RPM

(a) Determine the current static RPM.

NOTE: The limits for full throttle maximum static RPM are listed in the FAA Aircraft Specification.

- 1 Start and warm up engine and check for propeller action.
- 2 Determine what full throttle maximum static RPM is obtained with cockpit propeller control full forward for low pitch.

(b) Static RPM Set Too Low.

- 1 Stop engine.
- 2 Adjust cockpit lever throw to allow movement of the valve lever to a lower pitch.

(c) Static RPM Set Too High.

- 1 Pull back on the propeller control until the correct RPM is obtained.
- 2 Stop engine.
- 3 Adjust the cockpit lever throw to reduce the movement of the valve lever, resulting in a higher pitch.

(2) Setting Reverse Pitch

(a) Reverse pitch is adjusted with a stop screw against the valve link.

CAUTION: MAINTAIN A MINIMUM CLEARANCE OF 0.125 INCH (3.175 MM) BETWEEN THE JACK PLATE AND THE HUB SHOULDER TO PREVENT THE THRUST BEARINGS IN THE PROPELLER AND ENGINE FROM BEING LOADED UNNECESSARILY.

- (b) Check that there is a minimum 0.125 inch (3.175 mm) clearance between the jack plate and the hub shoulder when in full reverse.

(3) Check pitch control in flight for proper operating range.

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I. Propeller Removal (if required).

CAUTION: VALVE MUST BE IN HIGH PITCH POSITION TO BLEED AIR INTO THE CYLINDER.

- (1) Twist the counterweights (340) toward high pitch so the push rods back out of the hub lugs.

NOTE: Push rods will move toward the engine.

- (2) Unthread the hub nut (180) far enough to allow the jack assembly push rods (800) to completely slide out of the hub lugs.
- (3) Turn the jack plate unit (770) until the pitch change forks (810) disengage from the pitch change blocks (220).

CAUTION: DO NOT ETCH, SCRIBE, PUNCH MARK, OR SIMILARLY IDENTIFY PARTS IN ANY MANNER THAT MAY BE HARMFUL TO THE STRENGTH OR FUNCTION OF THE PROPELLER.

- (4) Reference the blocks (220), if reusable, to the forks (810) to insure reassembly with the same fork.
- (5) Remove the blocks (220) from the forks (810).
- (6) Remove the hub nut (180).
- (7) Pull the hub (10) with blades from the engine shaft.

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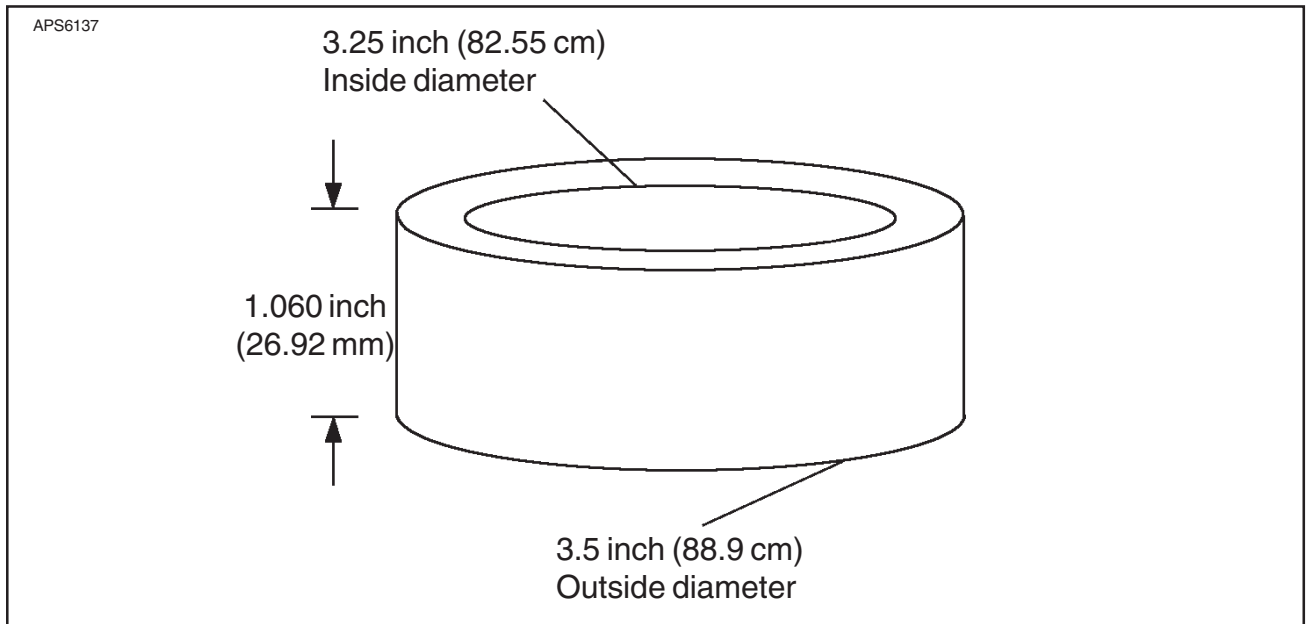
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<u>Part Number</u>	<u>Height</u>	<u>Effect on Reverse Blade Angle</u>
A-165-6	0.478 ± 0.010 (12.14 + 0.25 mm)	Set Up
A-165-5	0.543 ± 0.010 (13.79 + 0.25 mm)	~1.5 - 2.0 deg. less reverse than A-165-6.
A-165-4	0.513 ± 0.010 (13.03 + 0.25 mm)	~0.6 - 1.0 deg. less reverse than A-165-6.

**Spacer Selection
Table 1**



**Setup Spacer for HC-D2(V,MV)20-3
Figure 1**