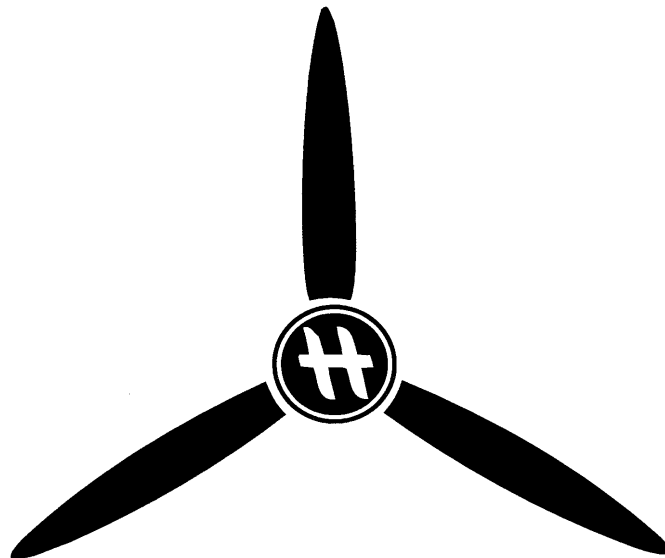


OPERATION AND MAINTENANCE MANUAL

No. E 540A

HO-V 352 () ()
Constant Speed Propeller

HO-V 352 () - S1
Constant Speed Propeller
with mechanical feathering



HOFFMANN GmbH & Co. KG

Küpfelingstraße 9
83022 Rosenheim

Tel.: ++49/(0)8031/1878-0

Fax: ++49/(0)8031/1878-78

Record of Revisions to this Manual

Rev. No.	Issue Date	Date Inserted	Inserted by	Ref. No.	Issue Date	Date Inserted	Inserted by

<u>Chapter</u>		Page
1	General	1-1
2	Designation	2-1
3	Design data	3-1
4	Construction	4-1
5	Operation	5-1
6	Installation and Operation	6-1
7	Inspection	7-1
8	Propeller Adjustment and Trouble Shooting	8-1
9	Maintenance and Repair	9-1
10	Shipping and Storage	10-1

List of Illustrations

Fig. 2-1	Decal	Chapter 2	Page 2-1
Fig. 4-1	HOFFMANN ITP tipping (Type B or C)	Chapter 4	Page 4-2
Fig. 5-1	HO-V352 - Normal operating range	Chapter 5	Page 5-3
Fig. 5-2	HO-V352 in feathered position	Chapter 5	Page 5-3
Fig. 5-3	Governor function "Oil pressure to increase pitch"	Chapter 5	Page 5-4
Fig. 5-4	Governor function "Oil pressure to decrease pitch"	Chapter 5	Page 5-5
Fig. 7-1	Normal erosion, no matter of concern	Chapter 7	Page 7-2
Fig. 7-2	Blade root No cracks in the silicone	Chapter 7	Page 7-2
Fig. 7-3	Erosion tipping Type B and C	Chapter 7	Page 7-3
Fig. 7-4	Parallel cracks in the paint	Chapter 7	Page 7-4
Fig. 7-5	Fine cracks in the paint	Chapter 7	Page 7-4
Fig. 8-1	Low- and high pitch stop	Chapter 8	Page 8-2
Fig. 9-1	Rework leading edge	Chapter 9	Page 9-2
Fig. 9-2	Damage of the paint	Chapter 9	Page 9-2
Fig. 10-1	HO-V352F	Chapter 10	Page 10-2
Fig. 10-2	HO-V352F-1	Chapter 11	Page 10-3

1 General

The propeller HO-V 352 () is a two bladed single acting fully hydraulically controlled constant speed propeller.

The pre-selected propeller RPM will be kept constant in the normal operating range by a propeller governor. This propeller uses oil pressure to increase pitch. The travel of the propeller blades is limited by mechanical stops.

In the event of an oil pressure failure the propeller blades automatically return to the low pitch stop and the propeller can be used as a fixed pitch unit. The propeller RPM has to be adjusted and controlled by the throttle only but the flight may be continued.

The propeller HO-V 352 () - S1 works exactly as the propeller HO-V 352 () in the normal operating range but has an additional mechanical feathering device to feather the propeller. To actuate the feathering mechanism the engine has to be shut down but the propeller may be still windmilling.

For special applications the propeller uses oil pressure to decrease pitch. In this case counterweights have to be used to turn the propeller blades towards coarse pitch. In the event of oil pressure failure the propeller blades automatically go to the high pitch stop.

2 Designation

2.1 Designation of the hub

Designation, Serial-No. and year of construction are stamped into the hub.

HO- V 35 2 F Q -Q -Q / Blade Model
 1 2 3 4 5 6 7 8

- 1: Hoffmann GmbH & Co. KG
- 2: Variable pitch propeller
- 3: Number of basic model
- 4: Number of blades
- 5: Flange type:
 - F: ARP 502 Type 1
 - K: AS 127D (SAE 2 Mod) "3/4" bushings
"1/2"-20 UNF bolts
 - L: AS 127D (SAE 2 Mod) "5/8" bushings
"7/16"-20 UNF bolts
- 6: Number for hub extension from blade axis to flange,
if required blank: 177 mm (7 inch)
- 7: Blank: Oil pressure to increase pitch, no counter-
weights
 - F: Oil pressure to increase pitch, small
counterweights
 - V: Oil pressure to decrease pitch
counterweights to increase pitch
 - S: Oil pressure to decrease pitch, counter
weights to increase pitch till feathering
 - S1: Oil pressure to increase pitch, mechanical
feathering device
- 8: Minor changes, not affecting interchangeability

2.2 Designation of the blades

Q Q 170 FQ Q Q Q ± (Q)
 9 10 11 12 13 14 15 16

- 9: Sense of rotation:
 Blank: right-hand, tractor
 D: right-hand, pusher
 L: left-hand, tractor
 LD: left-hand, pusher
 V: changed position of the pitch change pin for oil pressure to decrease pitch
 S: pitch change pin for feathering
- 10: Minor modification
- 11: Basic diameter in cm
- 12: Designation of blade design
- 13: Designation of blade twist
- 14: B: electrical de-icing (not yet certified)
- 15: Material of blade:
 blank: compreg scarfed with lighter wood
 P: compreg
- 16: Decrease (-) or increase (+) of basic diameter in cm

The model designation, the serial-no., the date and number of the inspection of the propeller are written on a decal on each blade shank. The serial-no. of the blade is also stamped into the blade butt face (not visible from outside) and the blade retention ring.

The complete designation of a variable pitch propeller is a combination of the designation of the hub assembly and the blade assembly. Both designations are separated by a slash mark.

The serial-no. of the hub is considered to be the serial-no. of the propeller assembly.

Example 1: HO-V 352 F / 170FQ

1. Hoffmann Propeller GmbH & Co KG
2. Variable pitch propeller
3. Basic model no. 35
4. No. of blades: 2
5. F-flange
6. blank - no flange extension
7. blank – oilpressure to increase pitch, no counterweights
8. blank - no minor modification
9. Sense of rotation – blank – righthand tractor
10. blank – no minor modification
11. Basic diameter = 170cm
12. Blade design “FQ”
13. blank – basic blade twist as specified in the basic blade design “FQ”
14. blank – no electrical deicing
15. blank – material compreg scarfed with lightwood
16. blank - no diameter variation

Example 2: HO-V 352 F-V-C /LD A 170FQa P-5

1. Hoffmann Propeller GmbH & Co KG
2. Variable pitch propeller
3. Basic model no. 35
4. No. of blades: 2
5. F-flange
6. blank - no flange extension
7. V – oilpressure to decrease pitch, counterweights to increase pitch
8. C - minor hub-modification C
9. Sense of rotation – LD – lefthand pusher
10. A – minor blade-modification A
11. Basic diameter = 170cm
12. Blade design “FQ”
13. a – basic blade twist “a” - modified
14. blank – no electrical deicing
15. P – material compreg not scarfed with lightwood
16. -5 - diameter reduction –5 cm

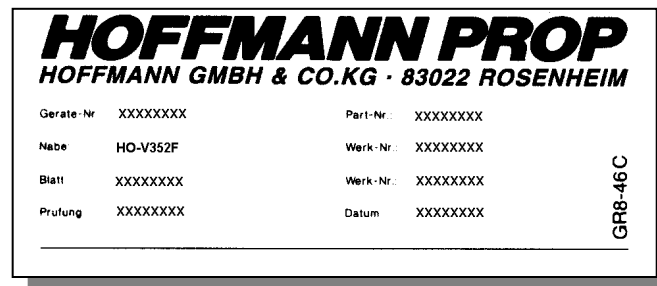


Fig. 2-1 Decal

Translation:

Geräte- Nr.:	TCDS- No.:	Part- Nr.:	Part- No.:
Nabe:	Hub:	Werk- Nr.:	Serial- No.:
Blatt:	Blade:	Werk- Nr.:	Serial- No.:
Prüfung:	Inspection:	Datum:	Date:

3 Design data

Following data are only standard values. For installation purposes only the data given in the applicable Type Certificate Data Sheet (TCDS) No. 32.130 / 88 of the German Luftfahrt-Bundesamt (LBA) are valid.

P_{\max}	90 kW
n_{\max}	2700 1/min
Number of blades:	2
Diameter max:	180 cm
Pitch change range:	about 75 deg
Weight:	about 9,3 kg (20.5 lbs)
Weight of the spinner:	about 1.2 kg (2.65 lbs)
Polar moment of inertia:	about 0.5 kgm ²
Governor:	Woodward 210xxx series, McCauley, Hartzell

4 Construction

The HOFFMANN variable pitch propeller consists of 4 sub assemblies:

- Hub assembly
- Blade assembly
- Spinner assembly
- Counterweight assembly if applicable

4.1 Hub assembly

The hub is made of aluminium alloy and mounted to the engine flange with bolts. The hub extension on the flange side is designed as a cylinder, in which the piston moves.

Axial movement of the piston is transferred to the pitch change pin by a fork and pitch change block, whereby the blade angle is changed. The pitch change range is limited by mechanical stops. The mechanical stops can be adjusted even if the propeller is installed on the aircraft.

4.2 Blade assembly

The HOFFMANN composite blade is a joint construction. The blade root is made of highly compressed hardwood and the blade part is made of light wood (spruce). Blades may also be manufactured of compressed wood only. Special lag screws connect the compressed wood of the blade to a metal ferrule.

For erosion protection of the blade leading edge three different types of Hoffmann proved leading edge protection can be used.

Type A is a brass metal strip soft soldered to a bronze fabric and glued to the blade FRP cover. This design will not be used with this propeller.

Blade tipping Type B is a special aluminium strip glued directly to the wooden core of the blade.

Blade tipping Type C is a special PU-strip (Polyurethane) blade tipping and also glued directly to the wooden core. Due to the material the leading edge is not painted.

To increase torsional stiffness the blade is covered with fibre reinforced epoxy (FRP). Fatigue failures due to vibration are unlikely with such blades because the internal damping of the material is considerably higher than that of duraluminium.

Several layers of special polyurethane paint (PU- paint) are sprayed onto the fibre reinforced epoxy covering and the erosion tipping (with the exception of the Type C erosion tipping), this assures a high resistance to atmospheric conditions. This polyurethane paint shows also high resistance against erosion and mechanical damage. Coloured paint is required to protect the wood against UV-rays. The thrust side is painted dull black to avoid reflection of sunlight. For safety reasons the tips are painted with a different colour to make the transparent propeller disc visible when the propeller is running.

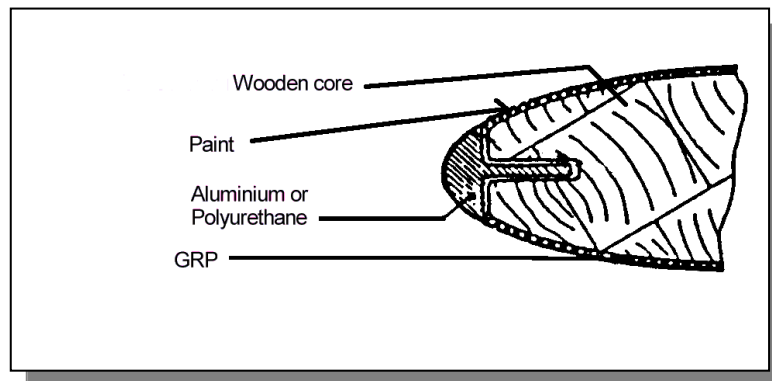


Fig. 4-1 Bade Tipping type B or C

4.3 Blade bearing

An axial needle bearing absorbs the centrifugal force of the blade. The bearing races are made of steel. The needle cage is split into two halves to allow exchange of the cage without removing the blade ferrule.

The blade ferrules are made of aluminium alloy which is shot-peened to prevent fatigue cracks. The blades are installed into the hub by a retention ring (blade nut), made of aluminium alloy. The necessary pre-load of the blade bearing is adjusted by the torque of the retention ring. The blade retention rings are sealed with silicone rubber to prevent penetration of moisture into the blade bearings. The blade shaft is sealed with a lip seal.

4.4 Spinner assembly

The spinner dome is one piece and made of aluminium alloy. It is screwed to the spinner bulkhead with Philips screws. The spinner bulkhead is made of an aluminium sheet and mounted to the hub. An additional front spinner support can be used to support the spinner dome.

4.5 Counterweights

Models with oil pressure to decrease pitch require counterweights. However, counterweights may also be used to reduce the pitch change forces of the blades on models with oil pressure to increase pitch. The counterweights are fixed to the blade ferrule by clamp screws.

5 Operation

- 5.1 The pitch change force of HOFFMANN composite blades is much lower than that of metal blades. That means a lower pitch change force is required to change the blade angles and the pitch changes much faster than with metal blades.

CAUTION

Move propeller and / or power lever slowly and smoothly. Do not operate the levers abruptly!

Rapid movement of the levers may cause over- speeding until the governor stabilises.

5.2 Governor

A gear type oil pump in the governor uses engine oil to produce the necessary oil pressure. The pilot valve in the governor will be operated by the rotating flyweights and a spring. According to the situation oil is directed to or from the propeller. The governor is single acting and produces oil pressure in only one direction (either increasing or decreasing pitch). Movement of the propeller blades in the opposite direction will be achieved in different ways.

5.2.1 Models HO-V 352(), (-F)

Uses oil pressure to increase pitch

To increase pitch the oil pressure works against the natural centrifugal moment of the blades and a compression spring. On -F models small counterweights are installed on the blade to reduce the natural centrifugal twisting moment of the blades. During idle or on ground with the propeller not rotating, the pitch change mechanism reaches the low pitch stop. The return spring holds the blades against the outside stop. The max. high pitch is limited by a hard stop on the hub.

5.2.2 Model HO-V 352()-V

Uses oil pressure to decrease pitch

To decrease pitch the oil pressure works in the same direction as the natural centrifugal twisting moment of the blades and a compression spring. Counterweights are mounted to the blades to overcompensate the natural centrifugal twisting moment of the blades, through which a centrifugal twisting moment towards high pitch will be achieved.

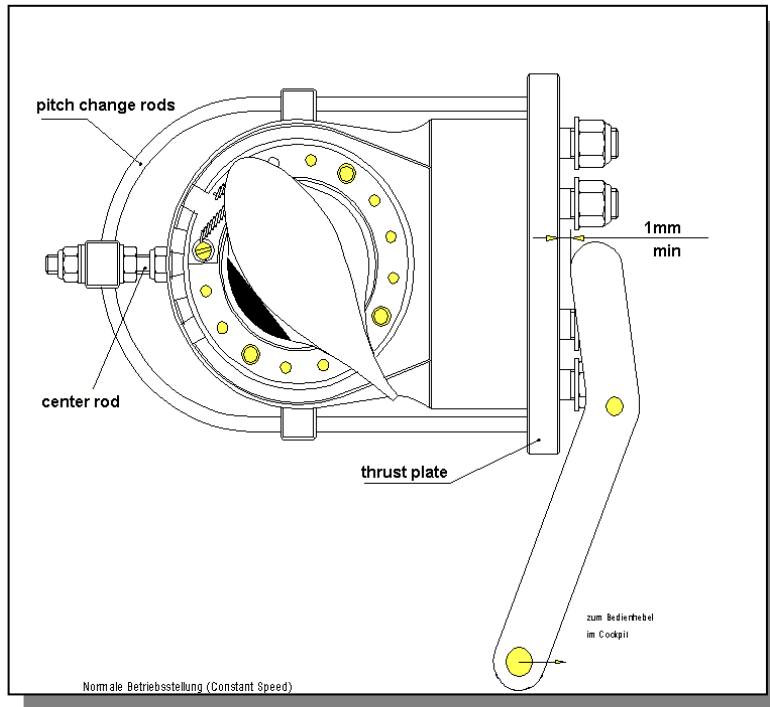


Fig. 5-1 HO-V352()() normal operating range

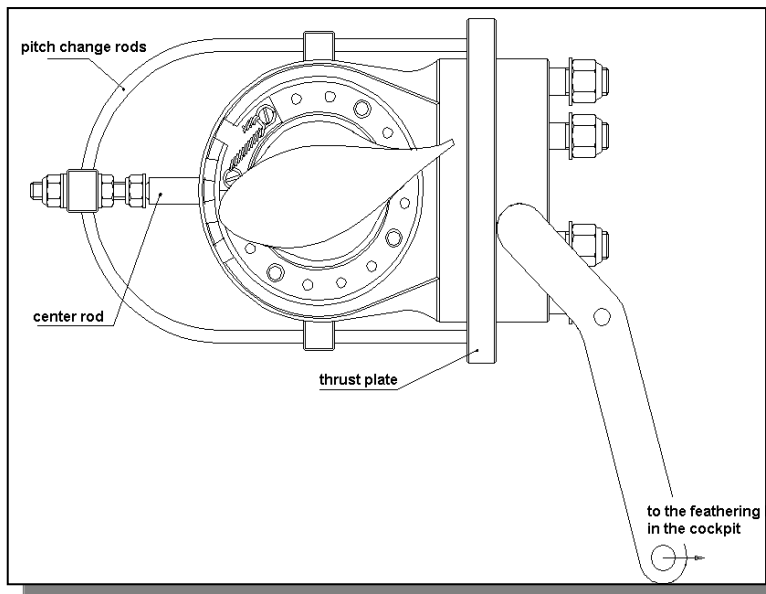


Fig. 5-2 HO-V352()() in feathering position

5.2.3 Model HO-V 352 ()-S1

Uses oil pressure to increase pitch

The behaviour of this propeller in the normal operating range (constant speed range) is described in para. 5.2.1.

The maximum attainable pitch is the feathering position of the propeller blades. The feathering position will be attained by a mechanical device. (Fig. 5.1).

CAUTION

The change to the feathering position can be done only with the engine stopped or windmilling.

In order to change the propeller pitch to the feathering position an actuating system with two ball bearings has to be installed on the engine. When operating the feathering lever in the cockpit the two ball bearings contact the thrust plate of the propeller. The force of the lever acts against the force of a return spring. The centre rod is connected with the pitch change rods to the thrust plate. The blade angle for feathering is determined by the length of the connecting cable. The feathering lever in the cockpit will be locked. This keeps the propeller in the feathering position.

To return the propeller blade to the low pitch position the feathering lever has to be released. Through that a "windmillstart" of the engine is possible. The "windmillstart" is repeatable.

The gap between the ball bearings and the thrust plate with the propeller blades at the low pitch stop must be at least 1 mm (0.04 inch).

5.3 Propeller governing

5.3.1 On-Speed condition

In this condition, the forces acting on the engine-governor-propeller combination are in balance. The speed adjusting control lever has been set by the pilot to obtain the desired engine rpm. The propeller blades are at the correct pitch to absorb the power developed by the engine. The centrifugal force of the rotating flyweights exactly balances the force of the speeder spring. The pilot valve is positioned in the drive gear shaft so that the control ports from the oil pump and to the propeller pitch changing mechanism are covered. Pressured oil from the gear type pump circulates through the open governor relief valve back to the inlet side of the pump.

5.3.2 Over-speed

This condition occurs when the air speed and/or engine power is increased and the engine exceeds the speed for which the control lever is set. The force of the rotating flyweights is pulling outward while their increased centrifugal force overcomes the force of the speeder spring. The flyweight toes raise the pilot valve plunger, uncovering ports in the drive gear shaft that permit pressured oil to flow to the propeller pitch change mechanism. As the propeller blades increase pitch, the load on the engine is increased and engine rpm is reduced.

This, in turn, reduces the centrifugal force of the flyweights. The speeder spring returns the flyweights to a vertical position and the pilot valve plunger once more covers the ports in the drive gear shaft, blocking flow of pressured oil to the pitch change mechanism of the propeller. The system is in the On Speed Condition.

5.3.3 Under-speed

An under-speed condition occurs when the air speed and/or engine power is decreased and engine rpm drops below the speed for which the control lever is set. The decrease in the centrifugal force of the rotating flyweights causes them to pivot inward under the force of the speeder spring. The pilot valve plunger is forced downwards, uncovering the ports in the drive gear shaft, allowing oil to flow from the pitch change mechanism of the propeller to the engine sump. This permits the natural twisting moment of the blades to decrease propeller pitch. This reduces the load on the engine, thereby the engine speed increases and the centrifugal force develops by the rotating flyweights. As the flyweights return to the vertical position, the flyweight toes lift the pilot valve plunger to cover the control ports. The system is in the On Speed Condition.

5.3.4 Governor model "oil pressure to decrease pitch" works similarly with following exceptions:

- Supply of pressured oil at under-speed condition
- Drain of oil at over-speed condition

5.4 Nearly all propeller systems for acrobatic flight use governor model "oil pressure to decrease pitch" to prevent over-speed of the propeller if the oil supply from the engine is interrupted for a short time.

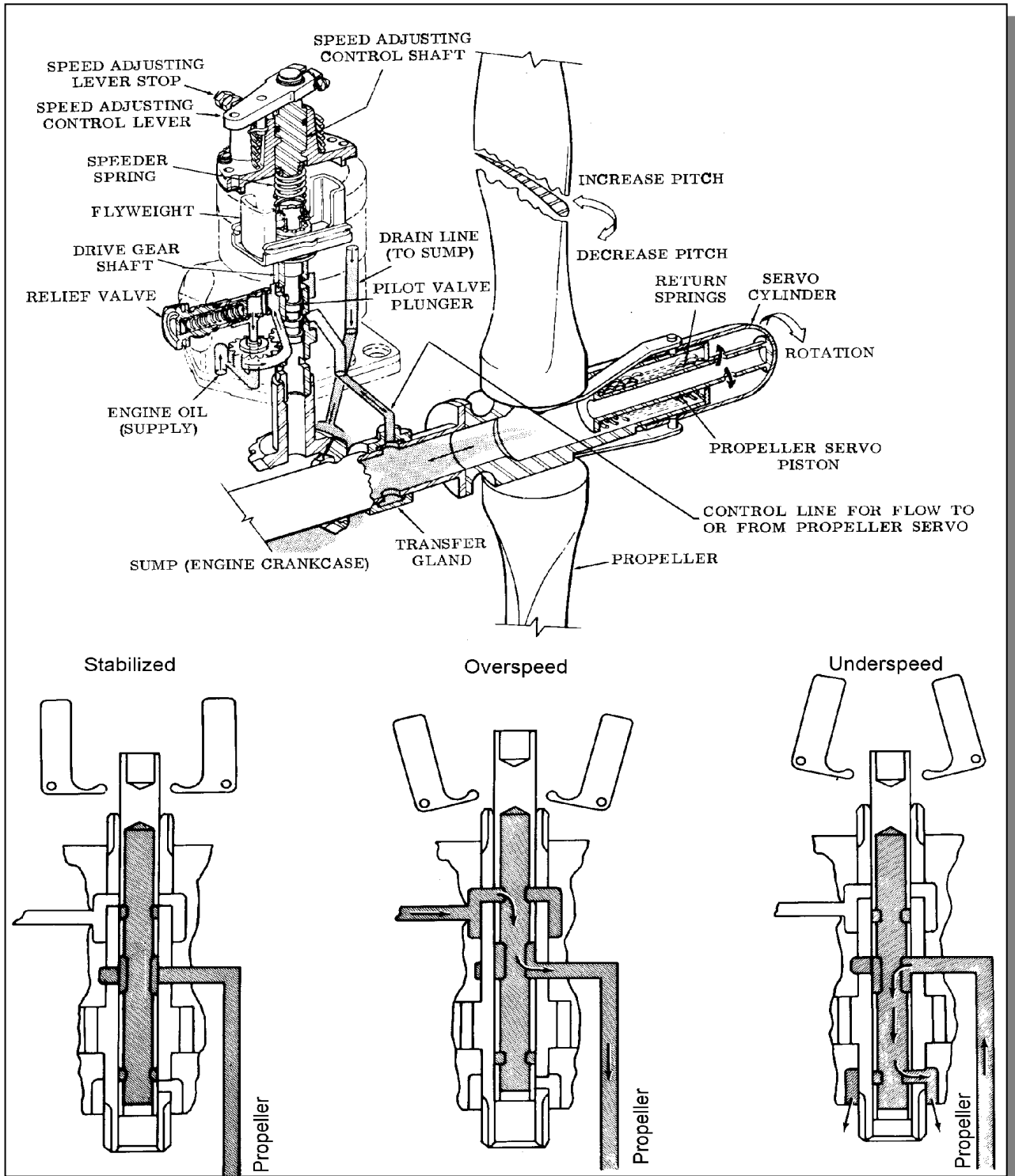


Fig. 5-1 Governor function "Oil pressure to increase pitch"

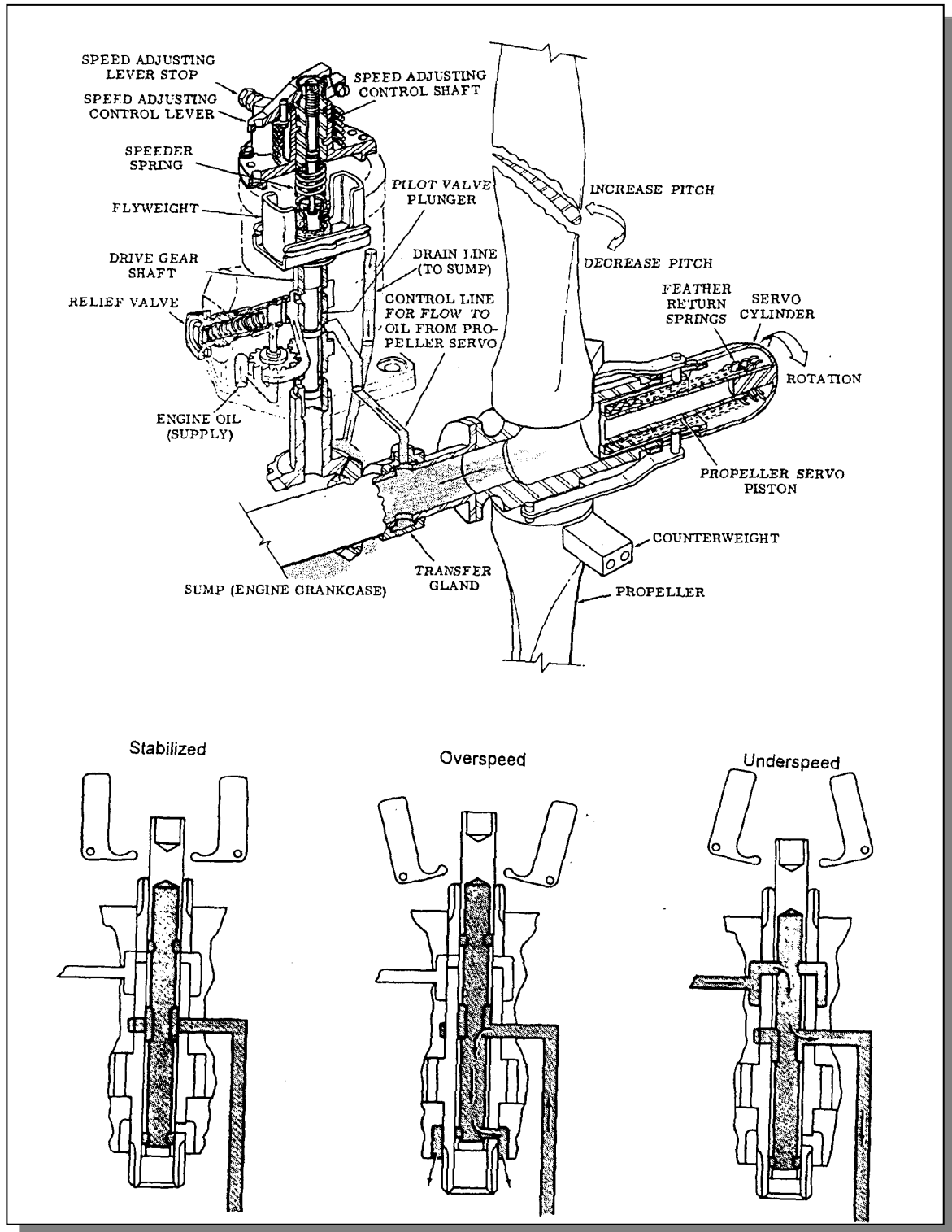


Fig. 5-4 Governor function "Oil pressure to decrease pitch"

6 Installation and Operation

WARNING

Before starting any work on the propeller follow the precautions in the flight manual!

CAUTION

Propeller installation is subject to an immediate inspection by a licensed engineer.

- 6.1 Clean the propeller and engine flange with solvent. Engine torque is mainly transferred by friction, therefore the surfaces have to be smooth and clean.
- 6.2 Check if both o-rings are installed in the centre ring. Place centre ring in the hub, if not yet installed.

CAUTION

Do not install an additional o-ring on the engine flange.

6.3 Installing the HO-V352F / HO-V352F-S1 Propeller

- 6.3.1 Apply a thin coat of oil to the o-ring. Slide propeller carefully onto the engine flange. Take care not to damage the o-ring in the centre ring.
- 6.3.2 Slide washers onto the bolts. Torque stop nuts equally crosswise.

6.4 Torque values for dry threads:

F- flange: 1/2" -20 UNF	80 - 90 Nm	(765 - 780 inlbs.)
K- flange: 1/2" -20 UNF	80 - 90 Nm	(765 - 780 inlbs.)
L- flange: 7/16"-20 UNF	55 - 60 Nm	(480 - 525 inlbs.)

- 6.5 Check the track of the propeller blades on the trailing edge about 10 cm inboard from the blade tip. Maximum permissible track is 3 mm. While checking the propeller track turn the propeller against the direction of rotation to avoid possible ignition of the engine.

6.6 Operational Test

WARNING

When operating the propeller without the spinner dome remove the front spinner support!

WARNING

Make sure the distance between the ball bearings and the thrust plate is at least 1mm (0.04 inch) (HO-V352F S1 only)

WARNING

Before starting the engine secure the aircraft according to the aircraft flight manual!

CAUTION

Perform engine run-up only on paved and clean surfaces.

6.6.1 Engine and propeller manufacturers do not recommend high rpm during ground operation because the engine can be overheated and the propeller be damaged by foreign objects.

6.6.2 Start engine according to the flight manual and warm it up (oil temperature in the green). Use the power lever to adjust about 1800 rpm. Pull the governor control in the cockpit to obtain an rpm decrease of at least 300 rpm. Slowly push governor control forward and observe rpm increase. The time required for pitch change should be about the same in both directions (rpm increase and decrease). Repeat this procedure at least three times. The flight manual may contain additional information.

6.6.3 Propeller Model HO-V 352()-F or HO-V 352 ()-V

The behaviour of propellers with counterweights is not different from those of normal propellers when testing the pitch change mechanism.

CAUTION

Before performing any adjustments to the propeller make sure the engine develops its full power and the rpm indicator is correct. Adjustments may be performed only by certified mechanics.

6.6.4 The mechanical pitch stops have been set at the factory to meet the aircraft/ engine specifications. The high and low pitch stops can be readjusted in the field without disassembling the propeller. Maximum static rpm shall be limited by the low pitch stop to 80 - 120 1/min below the maximum propeller take off rpm. In flight the max propeller rpm has to be limited by the governor.

Section 8 "Trouble shooting" describes how to find out whether the propeller or governor limits the static rpm.

6.6.5 After the static run inspect the propeller for oil leaks and the blade retention for grease leaks.

6.6.6 Spinner Installation

Apply a thin coat of oil to the o-rings in the front spinner support (if applicable) and slide it onto the High Pitch Stop Bracket.

Apply a coat of oil to the o-ring mating surface of the spinner dome and install the dome according to the markings.

Use plastic washers and torque the screws to 2.5 - 3.0 Nm (22 - 27 in lb).

6.6.7 Parking Position

Hoffmann strongly recommends that the propeller is not left outside the hangar with the propeller blades in the horizontal position to avoid water accumulation in the spinner dome. The water, or ice in the winter time, may cause vibrations and corrosion

6.7 Propeller Removal

CAUTION

Before removing the propeller from the aircraft turn the propeller horizontally.

6.7.1 The removal of the propeller has to be done in the opposite sequence than installation.

7 Inspection

WARNING

Do not use the propeller as a handle to move the aircraft!

7.1 Daily inspection

CAUTION

Before performing any work on the propeller follow the precautions in the flight manual

Check blade installation. No blade shake is allowed. Blade angle play up to one degree is permitted. Check the propeller for loose screws and safety wires, the propeller blades and the propeller spinner for cracks and damage. Turn blades by hand to check for smooth pitch change. Check the correct position of counterweights, if installed.

HO-V352F-S1 only, check the condition of the actuating mechanism, the ball bearings and the thrust plate. There must be a minimum distance between the ball bearings and the thrust plate of at least 1mm (0.04 inch) with the propeller at the low pitch stop.

7.2 100 hour inspection

To be carried out every 100 hours until TBO is reached.

7.2.1 Remove spinner dome. Perform daily inspection. Check flange bolts for correct torque by applying the required torque only (Do not loosen the bolts before). Check for oil and grease leakage. Check sealing of the blade retention nuts. If damaged, repair with silicone rubber.

7.2.2 Inspection of the blades

Clean the blades. Inspection of wooden composite blades is easy and gives reliable results. Critical condition will show up early as surface cracks in the paint. Therefore correct judgement of such cracks is very important.

7.2.2.1 Erosion on the leading edge of the blades is normal and not critical. Metal propellers erode too. On a composite propeller the erosion sheet (Type B) becomes visible under the paint.

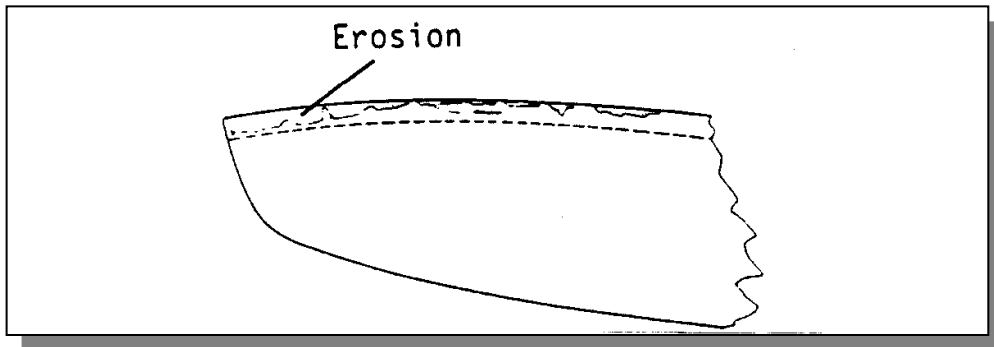


Fig. 7-1 Normal erosion, no matter of concern

7.2.2.2 The area around the blade root between blade body and metal ferrule is sealed with silicone rubber. **No** cracks in the silicone rubber and **No** separation from the metal ferrule or the blade body is permitted. A crack might indicate that the blade got loose in the ferrule.

The propeller has to be removed from service **Immediately**

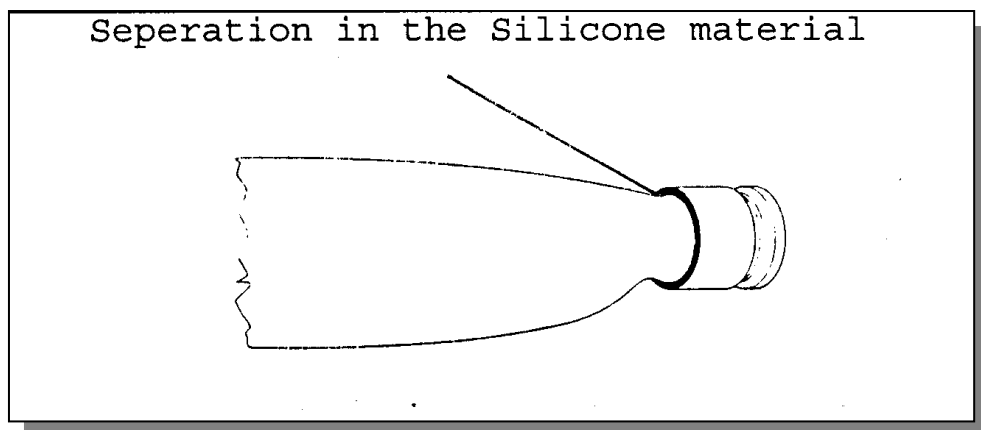


Fig. 7-1 Blade root **NO** cracks in the silicone

7.2.2.3 The erosion tipping (Type B and C) ends in the inner third of the blade. Fine cracks in the paint along the tipping are no reason for concern. Cracks in the tipping perpendicular to the blade axis are not dangerous as long as the tipping does not lift off from the blade body. Slide your fingernail along the leading edge from the hub to the tip. If the tipping lifts off from a crack, remove propeller for repair.

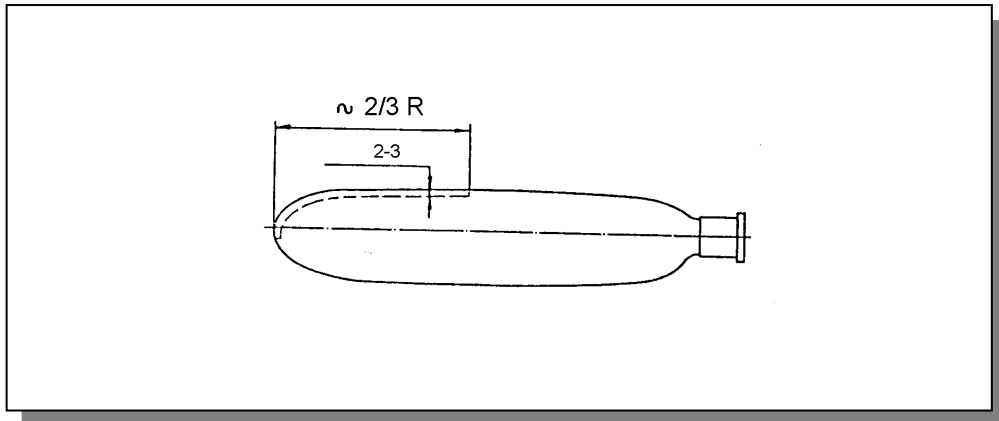


Fig. 7-2 Erosion tipping Type B and C

7.2.2.4 Fine cracks in the paint or the tipping across the blade axis, especially in the outer third of the blade, are indications of bending vibration. In an advanced stage the tipping may break or come off piece by piece. Notches in the tipping support this procedure. If such cracks occur, contact the factory or a service station which is authorised by Hoffmann.

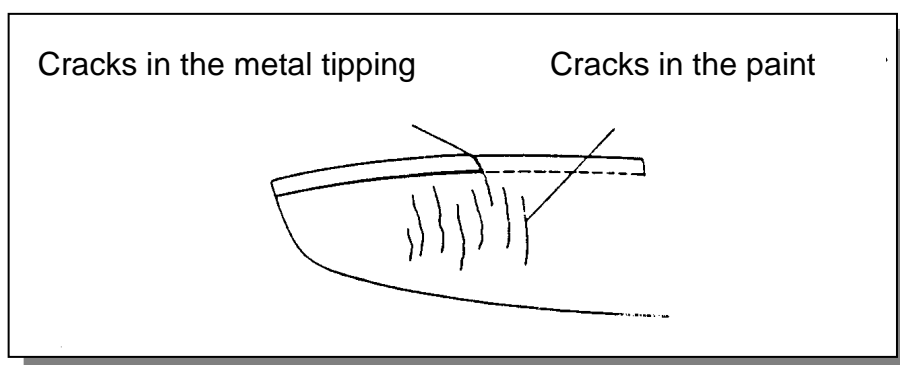


Fig. 7-3 Fine cracks in the paint or the tipping

7.2.2.5 Cracks in the paint or in the blade, starting from the blade tip and extending parallel to the blade axis, are indications for torsional vibration. Such cracks occur very seldom, but if they do, contact the manufacturer or a HOFFMANN approved repair shop.

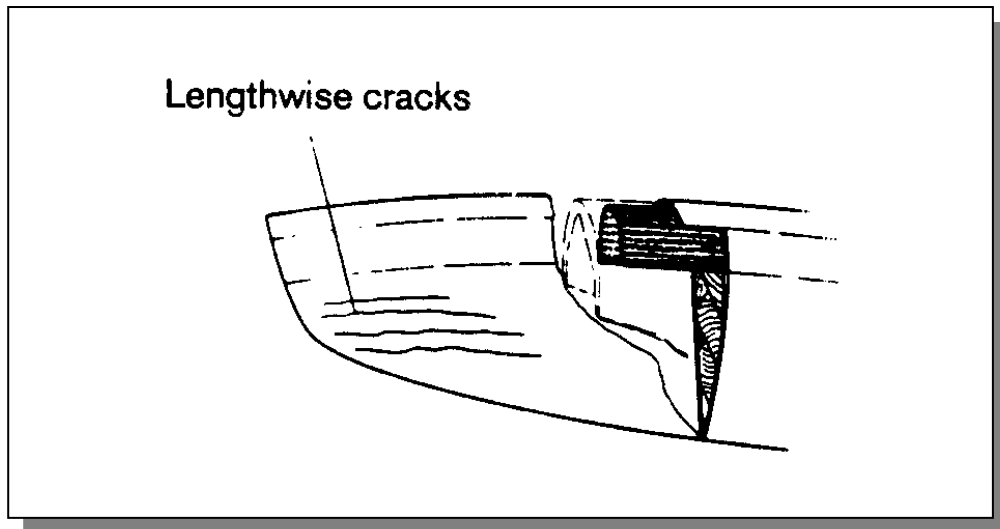


Fig. 7-4 Cracks in the paint of blade

7.2.2.6 Hair- cracks in the paint of the blade, starting from the blade tip and / or in the blade root area and extending in any direction are indications of vibrations or overload of the propeller blade. They are unimportant as long as they will be paint cracks only. If they start growing quickly and penetrating into the fibre cover contact the factory or a service station authorised by Hoffmann.

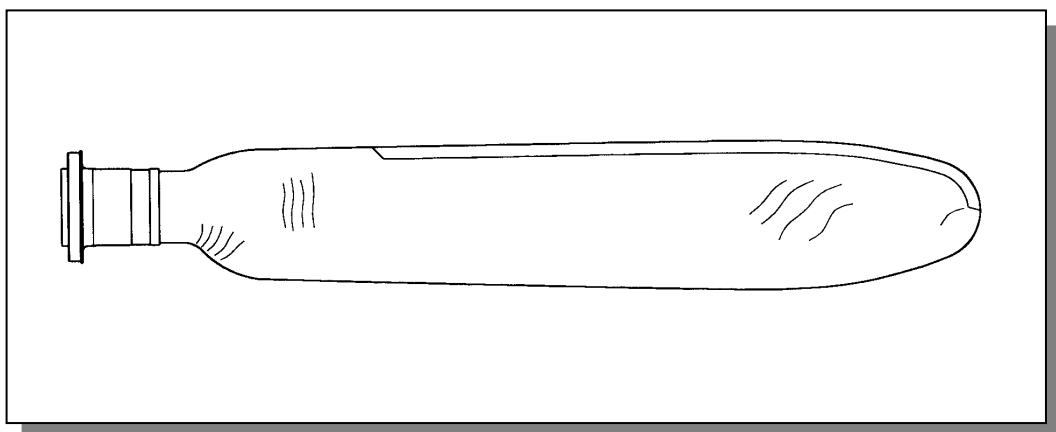


Fig. 7- 5 Hair- cracks in the paint

7.2.2.7 Damaged fibre glass cover

Normal stone nicks are unimportant as long as the wooden core is protected. Air bubbles with a maximum diameter of 1.5 cm (0.6 inch) are unimportant, if the size does not increase during operation.

Scratches and nicks should be protected with water resistant lacquer during routine maintenance.

7.3 Additional periodic inspections

New propeller-engine-aircraft combinations may require additional periodic inspections between overhaul, such as partial disassembling and inspection of the thrust bearings. These inspections have to be carried out by the factory or by a propeller repair station authorised by HOFFMANN.

7.4 Overhaul

The TBO (time between overhaul) is normally the same as for the engine, but should not exceed the figures of HOFFMANN Service Bulletin No. E 1(), latest edition. Overhaul must be carried out by HOFFMANN or by a propeller repair station authorised by HOFFMANN.

7.5 Special inspections

7.5.1 Special inspection is required if the max. rated propeller speed according the "TCDS" (LBA - Kennblatt) has been exceeded by more than 10%. If the over - speed was above 20% of the max rated propeller - speed, the propeller has to be removed from service. Repair is not possible. These propellers have to be marked as scrap.

7.5.2 Special instructions may be necessary for unconventional installations.
A conventional installation is a tractor installation on a single engine aircraft.

8 Propeller Adjustment and Trouble Shooting

The high and low pitch stops of the propeller and propeller governor have been set at the factory to meet the aircraft / engine specifications. Therefore a readjustment of more than ± 100 rpm should not be necessary.

WARNING

**Before performing any adjustments to the propeller
make sure the engine develops its full power
and the rpm indicator is correct**

CAUTION

**Propeller installation and adjustment may only be performed
by a qualified mechanic and are subject to immediate
inspection by a licensed engineer!**

ATTENTION

For adjustments Refer to Figure 8 -1

8.1 Static rpm (RPM is propeller rpm)

With the propeller and governor adjusted correctly, the maximum static rpm (without wind or at right angles to the wind) should be 80 - 120 rpm below max. take off rpm of the propeller. The static rpm has to be limited by the mechanical low pitch stop of the propeller and **NOT** by the governor.

This can be checked as follows:

- push governor control lever fully forward (rpm increases)
- slowly open throttle until maximum rpm is reached
- pull governor control lever back until rpm decreases by at least 25 rpm
- if a considerable movement of the governor control lever is necessary to obtain a reduction of 25 rpm, the static rpm is limited by the low pitch stop in the propeller.

8.1.1 Adjustment of low pitch stop (Refer to Figure 8-1)

8.1.1.1 Model oil pressure to increase pitch (HO-V 352()-F, HO-V352F-S1)

CAUTION

For adjustment of the low pitch stop do not turn the High Pitch Stop (cylinder screw M8).

Remove the spinner- dome and the front spinner support

- Remove the six screws No. 10-24 and pull off the High Pitch Stop Bracket
- Hold the piston rod in place using a screw driver, change low pitch with stop nut M8.
Turning clockwise (facing the nut) increases low pitch (rpm decrease).
Turning counter-clockwise (facing the nut) decreases low pitch (rpm increase).
Turning the low pitch stop about 120 degrees changes the low pitch stop about 1 deg. or about 100 rpm
- check static rpm
- readjust low pitch stop again if required
- install high pitch stop bracket with six screws No. 10-24 torque: 3.0- 3.2 Nm (22 - 27 in lbs) (self-locking inserts). Install front spinner support and spinner- dome

8.1.1.2 Model oil pressure to decrease pitch (HO-V 352()-V)

CAUTION

For adjustments of the low pitch stop do NOT turn the stop nut M8

- Remove the spinner- dome and the front spinner support
- Low pitch can be adjusted with the low pitch stop (cylinder screw M8) (self-locking insert).
Turning clockwise (facing the nut) increases low pitch (rpm decrease).
Turning counter-clockwise (facing the screw) decreases low pitch (rpm increase)
Turning the low pitch stop about 120 degrees changes the low pitch stop about 1 deg. or about 100 rpm
- check static rpm
- readjust low pitch stop again if required
- Install front spinner support and spinner- dome

8.1.2 Adjustment of governor setting

If the maximum static rpm decreases immediately when pulling the governor control lever, the static rpm is limited by the governor. Readjust the stop of the propeller as described in paragraph 8.1.1.

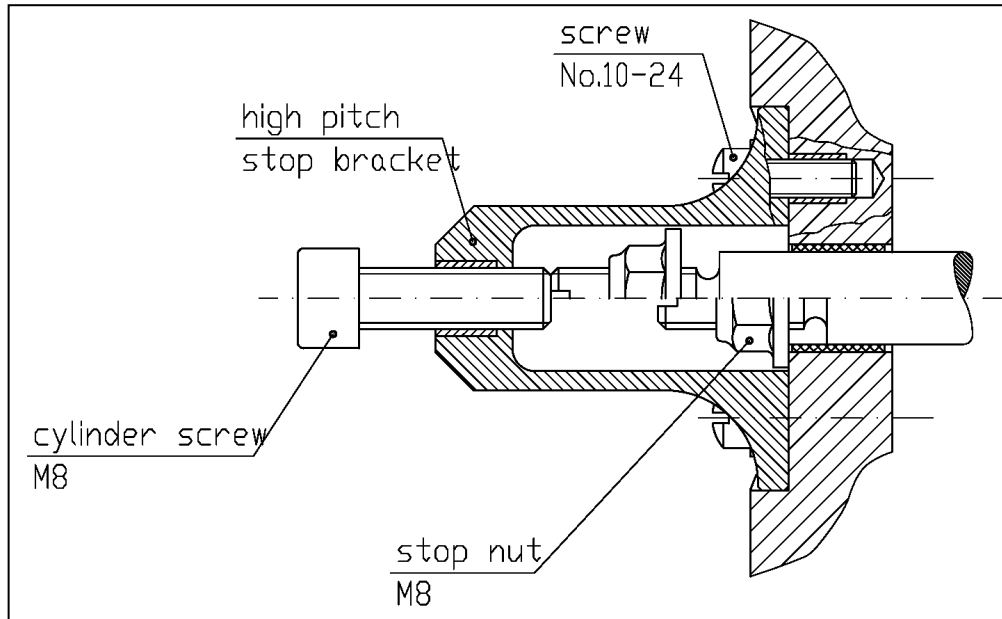


Fig. 8-1 Low and high pitch stops

8.2 RPM in flight (RPM is propeller rpm)

CAUTION

The max. propeller rpm must be checked in flight.

- 8.2.1 RPM too high during climb or cruise:
If static rpm is correct the governor has to be readjusted according paragraph 8.2.2.

CAUTION

**Make sure the hard stop of the governor is reached
before the lever in the cockpit reaches the stop.**

- 8.2.2 Maximum rpm is adjusted by the stop screw of the governor. Turning the stop screw of the governor one turn changes the propeller rpm about 25 rpm. If maximum rpm can not be obtained after the stop screw has been turned out completely, the governor has to be readjusted in an approved propeller repair station. Check for correct rigging of the linkage to the speed adjusting control lever.

- 8.2.3 Increasing rpm during descent at high speed indicates that the high pitch is too low.

- 8.2.4 Readjustment of high pitch stop according 8.2.4.1

8.2.4.1 **Model oil pressure to increase pitch (HO-V 352()-F, HO-V352S-S1)**

High pitch can be adjusted with the high pitch stop (cylinder screw M8) (self-locking insert).

Turning clockwise (facing the screw) decreases high pitch.

Turning counter-clockwise (facing the screw) increases high pitch.

Turning the high pitch stop about 120 degrees changes the pitch stop about 1 deg or about 100 rpm.

8.2.4.2 Model oil pressure to decrease pitch (HO-V352()-V)

CAUTION

For adjustment of the high pitch stop do not turn the cylinder screw M8 (low pitch stop)

- Remove the six screws No. 10-24
- Pull off the high pitch stop bracket
- Adjust high pitch with stop nut M8 (keep the pitch change rod in place using a screw driver)
Turning clockwise (facing the nut M8) decreases high pitch.
Turning counter-clockwise (facing the nut M8) increases the high pitch
Turning the stop nut about 120 degree changes the high pitch stop about 1 deg. or about 100 rpm
- Install the high pitch stop bracket and secure with the six screws No. 10-24 and torque them to 3.0-3.2 Nm (22-27 inlb) (self locking inserts)

	TROUBLE	PROBABLE CAUSE	REMEDY
8.3	Blade shake	Blade bearing loose	Tighten retention nut to 25-30 Nm (220-260 inlbs.). Use new lock plate and sealing. Contact HOFFMANN!
8.4	Sluggish pitch change on ground	<ol style="list-style-type: none"> 1. Cold oil 2. Friction of the pitch change mechanism 3. Oil sludge 	<ol style="list-style-type: none"> 1. Run engine until a sufficient oil temperature is reached. 2. Move pitch change mechanism by turning the blades by hand. If excessive friction is revealed, contact HOFFMANN. 3. Cleaning of the oil lines, the governor or the propeller. Contact HOFFMANN!
8.5	Surging rpm	<ol style="list-style-type: none"> 1. Trapped air in the propeller system 2. Oil sludge in the system 3. Wrong governor 4. Wrong pitch setting of propeller 5. Abrupt movement of propeller control lever 6. Wrong carburettor setting 7. Oscillation of tachometer drive 	<ol style="list-style-type: none"> 1. Move the propeller control several times over the complete pitch change range to release air 2. Contact repair station to clean oil pipes in engine, propeller cylinder and governor. 3. Check governor designation according to aircraft TCDS. 4. Check pitch setting according to aircraft TCDS. Check static RPM. 5. Move lever slowly and smoothly. 6. Adjust setting per applicable instructions. 7. Repair of tachometer

	TROUBLE	PROBABLE CAUSE	REMEDY
8.6	Differences in rpm during climb, cruise and dive at the same rpm setting	Up to ± 50 rpm is normal if above: <ol style="list-style-type: none"> 1. Friction in propeller 2. Friction in governor 3. Tachometer malfunction 	<ol style="list-style-type: none"> 1. Contact HOFFMANN 2. Contact HOFFMANN 3. Replace tachometer
8.7	RPM increase during normal operation without moving the governor control lever on HO-V352()-F or RPM decrease with propeller models HO-V 352()-V	<ol style="list-style-type: none"> 1. Oil leakage, visible from outside 2. Leakage in internal oil system between governor and propeller causes blade pitch change 3. Internal leakage in the propeller 4. Malfunction of governor drive or relief valve 	<ol style="list-style-type: none"> 1. Replace seals 2. Contact engine repair station (oil transfer to propeller shaft may be faulty or supply of engine oil to governor is insufficient) 3. Contact HOFFMANN 4. Contact HOFFMANN, exchange governor CAUTION: If oil leakage appears suddenly during flight, take care to minimise oil pressure for pitch change. Accomplish as follows: <ol style="list-style-type: none"> a) Oil pressure to increase pitch HO-V352()-F): - set governor control lever at max. rpm - move power lever back to decrease rpm by at least 100 rpm b) Oil pressure to decrease pitch HO-V352()-V): - pull governor control lever completely back - reduce power as much as possible to continue flight to the next airfield.

	TROUBLE	PROBABLE CAUSE	REMEDY
8.8	RPM decrease during normal operation without moving the governor control lever on propeller models HO-V 352()-F	<ol style="list-style-type: none"> 1. Failure of governor speeder spring or sticking plunger in the governor 2. Malfunction or failure of connection between governor control lever in cockpit and lever on the governor 	<ol style="list-style-type: none"> 1. Contact HOFFMANN, exchange governor 2. Search for trouble and repair ATTENTION: flight may be continued to the next airfield with considerably decreased power to avoid high manifold pressure. RPM stays low.
8.9	Extremely sluggish pitch change after moving the governor control lever. (RPM changes with flight speed like a fixed pitch propeller)	<ol style="list-style-type: none"> 1. Oil lines between governor and propeller are closed. 2. Oil sludge in the prop cylinder 3. Failure of pitch change mechanism of propeller 	<ol style="list-style-type: none"> 1. Contact engine repair station to clean the pipes. 2. Clean cylinder. Contact HOFFMANN! to 1. and 2.: Malfunction does not appear abruptly. Function worsens slowly. This condition should be found during pre-flight inspect. 3. Contact HOFFMANN. Failure may occur suddenly.
8.10	Oil leakage (visible or not visible from outside)	Damaged sealing	<p>Replace sealing.</p> <p>ATTENTION: Flight may be continued according to paragraph 8.7</p>
8.11	Vibration or rough running engine	<ol style="list-style-type: none"> 1. Propeller unbalance 2. Propeller remains in high pitch. Indicated by high manifold pressure and/or low rpm 	<ol style="list-style-type: none"> 1. Remove propeller from engine, turn 180 degree and reinstall or rebalance. 2. Check pitch change mechanism.

9 Maintenance and Repair

- 9.1** The paint of the HOFFMANN composite blades is resistant against fuel, oil and nearly all solvents. The propeller should be cleaned periodically using gentle detergent or equivalent and be protected with car polish that does not contain silicone. The surface protection (paint and epoxy fibre glass) should be completely sealed to prevent penetration of moisture into the wooden core. In special case contact a licensed inspector to prove the safe operation of the propeller.
- 9.2** Minor damage (small scratches, etc.) can be repaired easily. Prior to repair check that the fibre glass covering and the wooden core are not damaged. The materials required for repair can be obtained from HOFFMANN. Proceed as follows:
- 9.2.1** Clean damaged area using solvent and smooth it out using emery cloth # 220.
- 9.2.2** If required, apply epoxy resin filler to fill the bulges. Do not apply too much filler.
- 9.2.3** Allow filler to dry. Trim the surface using emery cloth # 220 again.
- 9.2.4** Apply paint (white, grey, black or yellow). It is recommended to use original lacquer, because resistance and bonding of other paints cannot be guaranteed. Observe drying times if several coats are painted.
- 9.3** Presently repair of HOFFMANN composite blades can only be carried out at HOFFMANN works or at Hoffmann authorised repair facilities. Blade tips can be repaired if 90% of the blade remains free of cracks. Trailing edges can be repaired, the fibre reinforced epoxy covering and the erosion leading edge protection can be replaced.

- 9.4** If the leading edge Type B or C shows sharp nicks or becomes jagged then it should be blended using a fine file or sand paper. Should the leading edge become eroded close to the wooden core or it starts cracking and small pieces come off the propeller should be returned for repair.

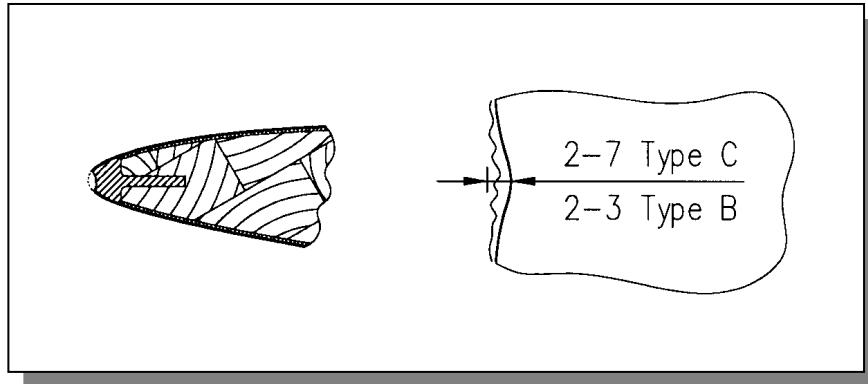


Fig. 9-1 Rework leading edge type B or C

- 9.5** Any damage in the paint in the area behind the metal- or PU- blade tipping has to be repainted immediately after occurrence. There must not be a joint between metal- or PU- leading edge and the blade body.

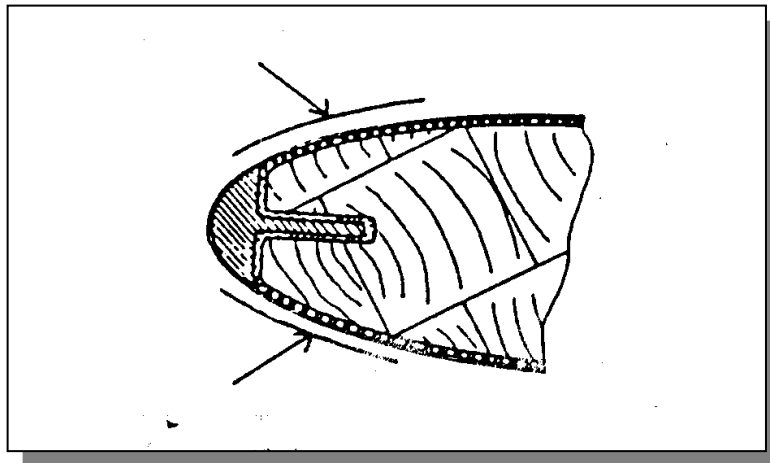


Fig. 9-2 Paint damage behind Blade Tipping B or C

10 Shipping and Storage

10.1 Shipping

Careful packing is the best protection to avoid damage during shipping. Therefore HOFFMANN provides special wooden or cardboard boxes which are re-useable if they will be treated carefully. The blade tips, leading and trailing edges have to be protected sufficiently.

10.2 Storage

No propeller should be stored standing on the blade tips. The best is to store the propeller in the original packing.

Special preservation of HOFFMANN composite blades is not necessary, the existing surface protection is sufficient. Also the hub does not need preservation if the propeller is stored in a dry room. The propeller should not be stored near heating systems or in rooms with extreme temperature changes.

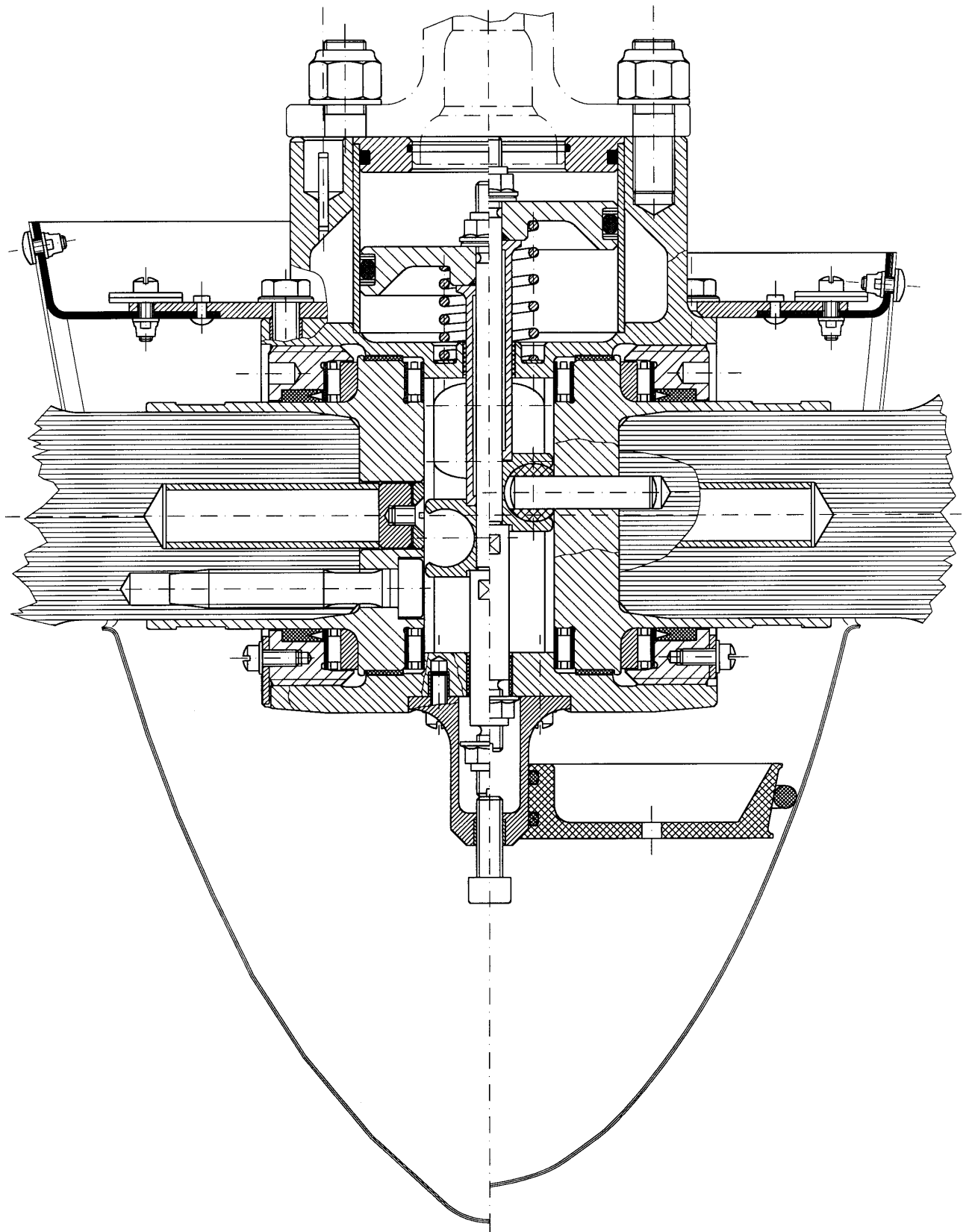


Fig.10-1 PropellerHO-V352F

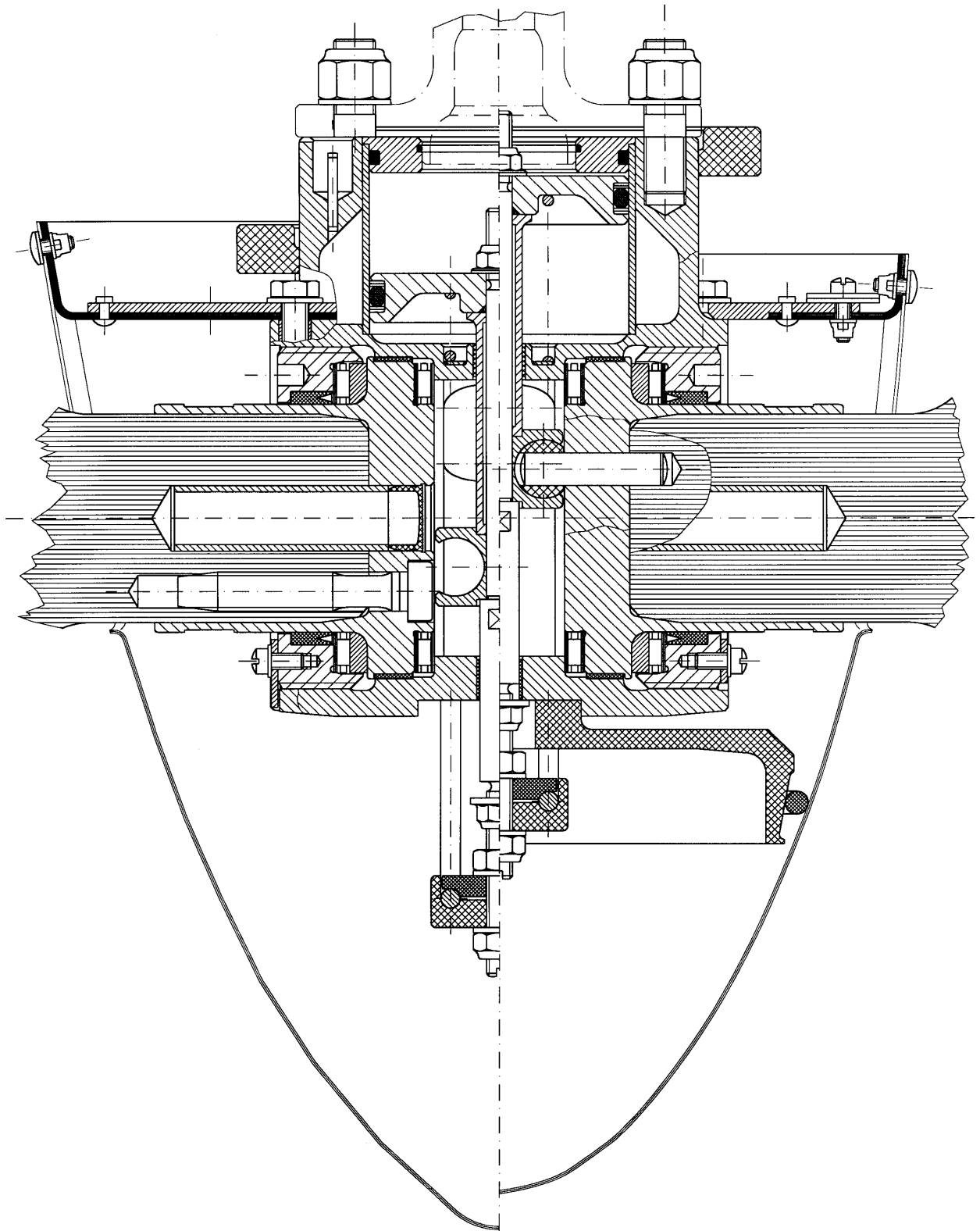


Fig.10-2 PropellerHO-V352F-S1