HOCO-

PROPELLER

E 0107.72

HO-V 62

Manual for Operation and Maintenance

of series HO-V 62 and

HO-V 62 R

PROPELLERWERK HOFFMANN GMBH. & CO. KG

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WESTERN GERMANY

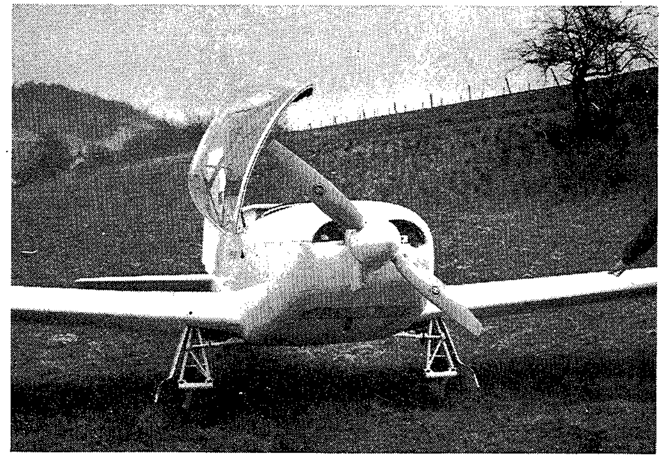


Figure 1
SCHLEICHER AS K-16

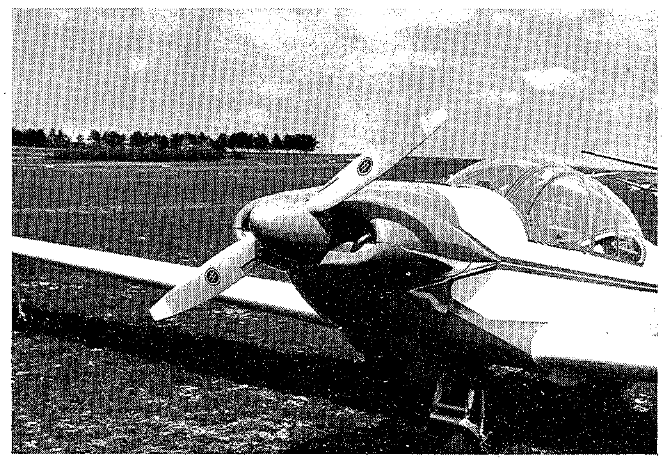


Figure 2
SPORTAVIA RF 5 B Sperber

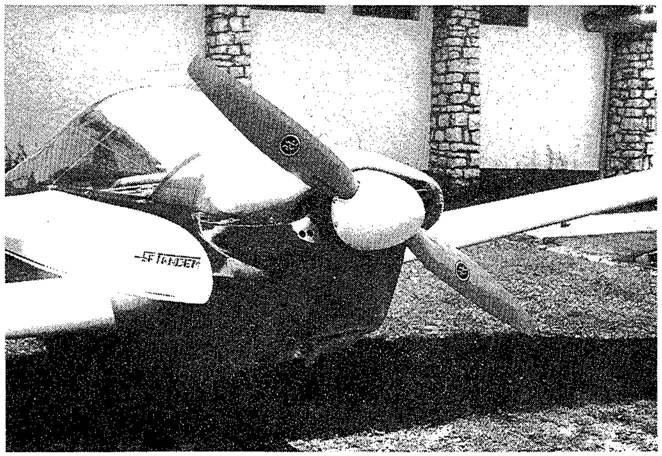


Figure 3
SCHEIBE SF 28 A

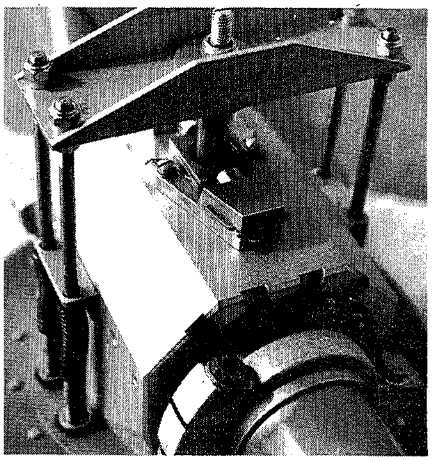


Figure 4
with cruising position

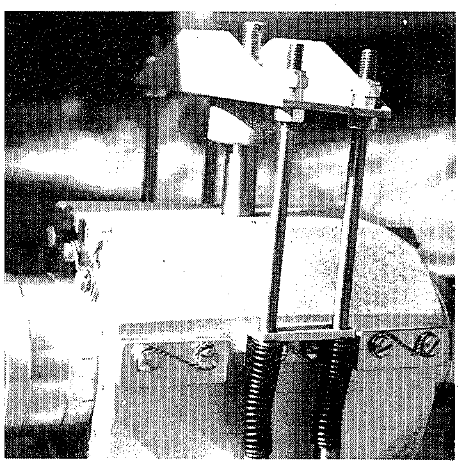


Figure 5
without cruising position

Figure 4 and 5 show propellers in feathering position

I N D E X

Febr. 1974

General

The HO-V 62 Propeller was developed mainly for powered gliders and has a start and a feathered blade position. The HO-V 62-R has an additional cruising position which allows a better utilization of engine performance in cruising flight.

The change from start to cruising position and vice versa must be done with the engine running. On both propellers the change to the feathered position is done with the engine stopped or idling. The tendency of the HO-V 62-R is always to return to the starting position. In any case, however, on both propellers if the feathered position fails, the blades will always return to the starting position.

Designation

2.1 Hub designation

Model designation and serial number are stamped into the hub.

HO-V 62 - ( ) R ( )

- ( ) — Minor alteration with no effect on interchangeability
- R — cruising position
- ( ) — hub mounting sign
- 2 — Number of blades
- 6 — Number of basic construction
- V — Variable pitch
- HO — Hoffmann GmbH & Co KG

2.2 Blade designation

The blade designation, serial number, date and number of inspection are on a label on the root end of the blade. The serial number of the blade is also stamped onto the butt face of the blade ferrule (not visible from the outside).

L 150 A - ( ) ( ) - ( )

- ( ) — Shortening of the standard diameter in cm
- ( ) — Construction material of blades: compressed wood/lightweight joint composition; wood has no identification; P = compressed wood
- ( ) — B = de-icer installed
- A — Key number for basic design
- 150 — Basic diameter in cm
- L — Direction of rotation
  - None = righthand, tractor
  - D = " , pusher
  - L = lefthand , tractor
  - LD = " , pusher

2.3 The complete designation of a propeller is a combination of the hub designation and blade designation,

e. g. HO-V 62-R / L 150 A

The serial number of the complete propeller is the hub serial number.

Performance data

The following data are guidelines. For approval purposes, only the data which are given in the Geraete-Kennblatt No. 32.130/13 of the German Luftfahrt-Bundesamt are binding.

N_{max}		75 HP
n		3600 rpm
Number of blades		2
Diameter		150 - 160 cm
Range of pitch change		approx. 75°
Weight HO-V 62	(Ø 150 - 160cm)	8.500 kg (18,7 lbs)
HO-V 62-R	(Ø 150 - 160cm)	9.450 kg (20,8 lbs)
Spinner		1.100 kg (2,4 lbs)
Mounting flange		80 mm diameter boltcircle 6 bolts 7/16 - 20 UNF center bore 47 mm dia.

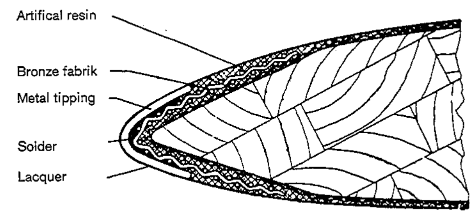
Construction

4.1 Blade assembly

The Hoffmann-Composite-blade is of a joint construction. It consists of totally compressed veneers (compreg) in the root part, and spruce in the rest of the blade. In addition, blades may be constructed totally from compreg. Special lag screws provide excellent connection between compreg and metal ferrule. The blade has the same leading edge protection as successfully used over the years on our fixed pitch composite-propellers. To increase the torsional stiffness the blade is covered with layers of fiberglass epoxy.

Fatigue failures due to vibration are unknown with such blades because the internal damping of the material used is considerably higher than that of Duraluminum.

The fiberglass epoxy covering is sprayed with several layers of polyurethane lacquer which insures high resistance to moisture, erosion and mechanical damage without loss of necessary elasticity.



Hoffmann-Blade Tipping

4.2 Blade bearing

An axial needle bearing absorbs the centrifugal force of the blade. The bearing races are made of corrosion resistant 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 from forged aluminum alloy which is shot peened to prevent fatigue cracks. The blades are fixed into the hub by blade retention nuts also manufactured from aluminum alloy.

On the HO-V 62 the blades have no counterweights. The blades of the HO-V 62-R have counterweights to lessen the force needed to change the pitch. The blade nuts are sealed from the outside by silicon rubber so no water can enter the blade bearing. A lip-sealing of Vulcollan seals the shaft.

4.3 Hub

The hub is forged from aluminum alloy, shot peened and anodized. At the mounting flange it has 7/16" - 20 UNF studs. The propeller is mounted to the engine flange by self locking nuts. A VP 20-483 flange with mounting parts can be obtained for engines of the Limbach SL 1700 series which are not equipped with an engine flange fitting the variable pitch propeller.

4.4 Pitch change mechanism

In this description, all parts of the pitch change mechanism which lie outside the hub will be termed "outside change mechanism" and all parts inside the hub will be termed "inside change mechanism."

An important feature of the mechanical change device of the HO-V 62 is that no bearings within the change mechanism run constantly with the engine, but only in the short intervals of the change.

4.4.1 HO-V 62-R

For the following description, refer to figure 6. When a change in propeller pitch is desired, a movable U-arm 6-2 mounted on the engine presses against thrust plate 6-3 by means of two ball bearings mounted on the U-arm 6-2. The force of the U-arm acts against the pressure of four

springs 6-4 onto four studs 6-5 and in addition, because of the running engine, against the centrifugal twisting moment of the propeller blades. The force lifts the yoke 6-6 with the stop 6-11 on the front end of the hub 6-7.

The centrally located rod 6-8 reaches into the hub 6-7 and holds the fork 6-9 of the internal change mechanism. Out from the fork are the pitch change blocks 6-10, which when moved, axially, change the blade angle.

The centrifugal twisting force of the blades and the force of the springs 6-4 tend to return the blades to the low pitch take-off position.

Figure 6 shows the three possible blade angle positions. Figure 6a shows the propeller in take-off position, e. g. at the smallest blade angle. The stop 6-11 lies within the stop plates 6-12, and the springs 6-4 hold it in this position.

Figure 6b shows the propeller in cruising position with stop 6-11 lying against 6-12. This means that the stop is now further forward. A movement of 1.5 mm equals a 5° greater blade angle which drops the engine rpm (full power) approximately 500 rpm lower than take-off position.

The change from take-off position to cruise position is only possible at rpm's higher than 1800 because the stop plates 6-12 are held by the springs 6-13 in inside position. Only at rpm's greater than 1800 does the centrifugal force of the stop plates 6-12 overcome the force of their springs 6-13.

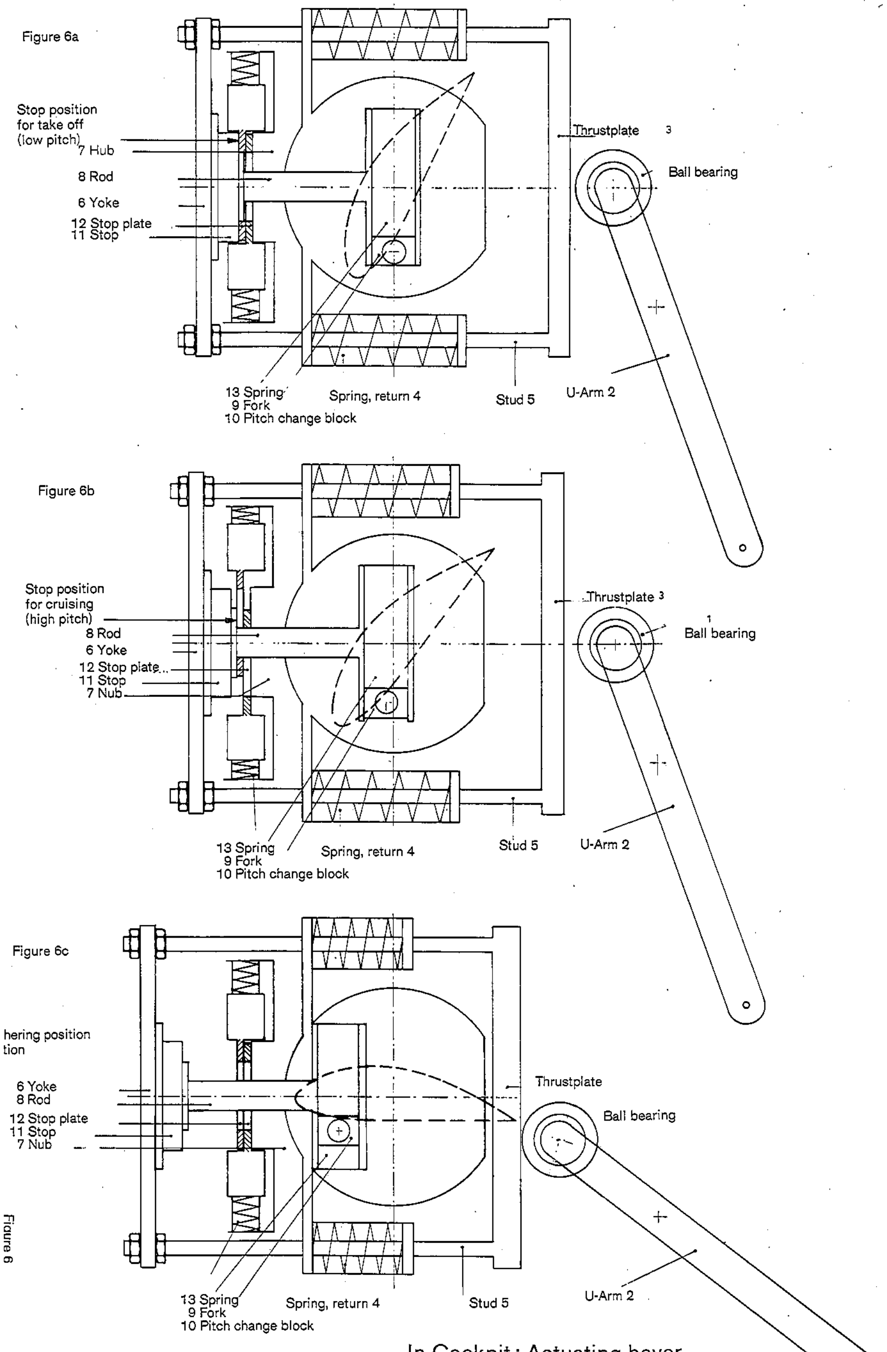


Figure 6

If the actuating lever in the cockpit is pulled at rpm's higher than 1800, the yoke 6-6 is lifted from the hub 6-7 and centrifugal force presses down the springs 6-13. This allows the plates 6-12 to move outward until the holes lie on rod 6-8. This is the stop for the cruising position.

If a change to the take-off position is desired without stopping the engine or moving to the feathered position (after which the propeller would come back to the take-off position automatically) it is necessary to reduce the rpm below 1300. Now the force of the springs 6-13 is higher than the centrifugal force of the stop plates 6-12; a slight pull on the actuating lever loosens them and the blades return to the take-off position.

Figure 6c shows the propeller in feathered position. The correct blade angle is determined by the length of the cable from the cockpit. The propeller blades are held against the pressure of the springs 6-4 by means of a lock in the cockpit. The fork 6-9 constitutes only a safety stop within the hub. It prevents the blades from reaching an angle from which the pressure of the springs 6-9 would not be able to return the blades to take-off position.

4.4.2 HO-V 62

The functions of the internal and external change mechanisms are the same as on the HO-V 62-R. Since this propeller has only a take-off and a feathered position, the parts 6-12 and 6-13 are deleted. The change to feathered position and return is the same, with activation done only by a stopped or idling engine.

4.5 Spinner

The spinner is one piece and spun from an AlMgSi alloy. The spinner is screwed to the spinner bulkhead which consists of an aluminum alloy centering plate and a spun ring. Parts are riveted together. The spinner bulkhead, which adjusts the outside change mechanism, is fastened to the hub by four screws M 8.

Installation instructions

5.1 Propeller HO-V 62 and HO-V 62-R

5.1.1 Clean propeller and engine flanges with petrol or solvent. The engine power is transferred to the propeller mainly by friction, therefore mating surfaces must be smooth and clean.

5.1.2 Remove the spark plug from number one cylinder (nearest to propeller flange.) Turn the engine until the piston of this cylinder is on upper dead center.

5.1.3 In this position put the propeller onto the flange with the blades vertical. Use washers under nuts and torque to 4.5 - 4.7 mkp (390 - 410 inlb).

5.1.4 Grease the thrust plate along the track of the ball bearings with Calypsol H 442 or equivalent. Carefully turn the propeller while checking alignment. Maximum allowance blade track is 3 mm, measured about 10 cm from the tip of the blade on the trailing edge.

5.1.5 The actuating mechanism must be installed according to the instructions given by the aircraft manufacturer, or according to 5.2. The ball bearings must be at least one mm from

the thrust plate at take-off position. Check the pitch change by cycling several times to the feathered position. If no difficulties are encountered, mount the spinner and run up the engine. Perform a static rpm check according to the requirements of the aircraft manufacturer. If the engine runs rough, remount the propeller 180°.

5.2 Modification from fixed pitch propeller to variable pitch propeller entails installation of the Hoffmann VP 20-483 flange and VP 60-175 actuating mechanism on Limbach SL 1700 E series engines.

5.2.1 First remove the engine cowling, spinner and fixed pitch propeller from the engine flange. Then remove the flange screw and engine flange.

5.2.2 For the following work refer to figure 7.

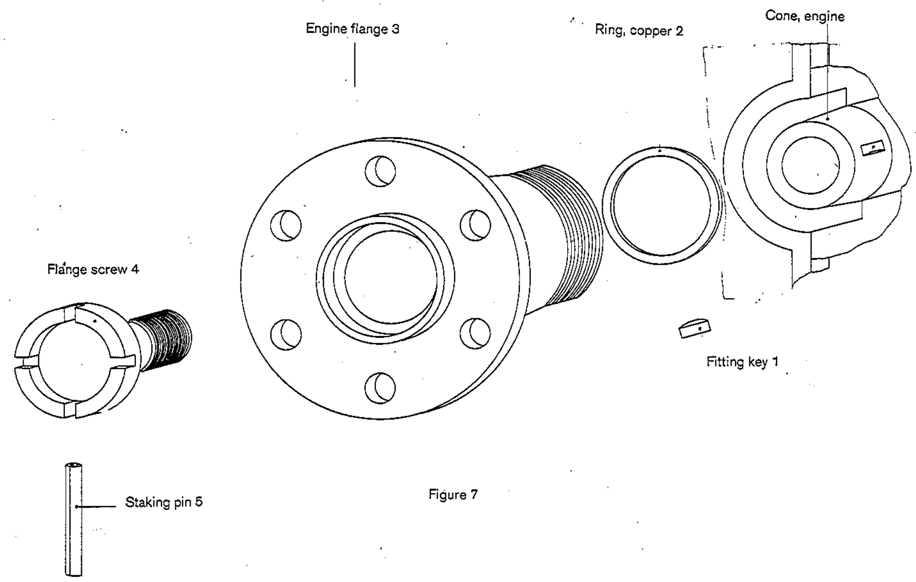


Figure 7

Clean the taper of the crankshaft and push engine flange 7-3 onto it. Check and rework the fit with grinding paste if necessary. Check that the copper ring 7-2 is between the engine flange and the engine, and that the fitting key 7-1 is properly seated. Install flange screw 7-4 with special wrench PV-758 and torque to 19 - 20 mkp (1650 - 1750 inlb). Drill a five mm hole in the shaft of the engine flange for the staking pin 7-5.

5.2.3 For all further work refer to figure 8. Remove the two upper screws 8-22 from the tachometer drive and remove the coverplate. This will be replaced by part 8-7. Only the screws will be reused.

5.2.4 Chamfer the right crankcase edge five mm 45° so that the actuating mechanism does not touch it. Cover the reworked area with primer.

5.2.5 Install the actuating mechanism according to drawing VP 60-175 (figure 8). Secure nuts with 0.6 mm stainless steel safety wire.

5.2.6 Mount spring 8-8.

5.2.7 The ball bearings 8-16 must be at least 8 mm from the engine flange, and they must simultaneously touch the thrust plate of the propeller when actuated.

5.2.8 Install the actuating mechanism according to the aircraft manufacturer's instructions. Adjust the cable to the correct length to meet the feathered blade angle. The yoke 6-6

must travel 30 mm between start and feathered position. (The cable is not a part of the material covered by drawing No. VP 60-175.)

5.2.9 Continue mounting the propeller as described in 5.1.

5.3 HO-V 62-R, check of rpm's

5.3.1 The data of the aircraft handbook are binding; the following values are for your information.

5.3.2 The change to cruising position (high pitch) is only possible with a running engine. With the engine rpm at about 2200, pull the actuating lever about one fourth of the way and release. With the throttle position constant, the engine rpm will drop by about 500.

5.3.3 The change from cruising position to take-off position is possible with either a running or a stopped engine. With the engine running, reduce the rpm to 1000, pull back the actuating lever short and release. Open the throttle and check the rpm.

5.3.4 Repeat this test three times, and if no difficulties are encountered, mount the spinner and conduct a flight test.

6. Inspection

6.1 Check the blade installation for absence of blade shake and radial play (angle) up to one degree allowed. Change the pitch by turning the blades from low to high pitch and watch for smooth operation. Check for loose screws and safety wires. Check all visible hub parts, spinner and bulkhead for cracks. If counterweights are installed, check them for proper position. Check the parts of the actuating mechanism, ball bearings and thrust plate.

6.2 Fifty hour inspection (periodically up to the overhaul time each fifty hours).

6.2.1 Remove the spinner and check the blade installation for absence of blade shake and radial play. Check for smooth turning of the blades. Grease the four studs 6-5 of the outside change mechanism where they slide in the bushings. Grease thrust plate 6-3 slightly.

ATTENTION

The preload of the blade bearings will be obtained by the required torque moment of the retention nut. Sometimes new propellers will show considerable friction in the pitch change mechanism. After the first few runs the blades will turn smoothly.

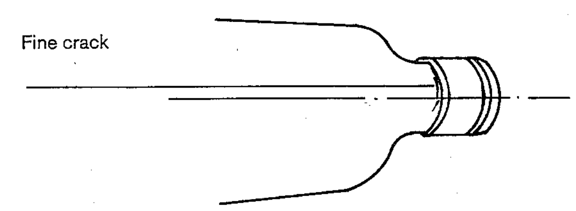
Check visible hub parts for cracks and corrosion. Check screws and safety wires. Check torque moment of the attaching bolts or stop nuts by applying the specified torque 4.5 - 4.7 mkp (390 - 410 inlb) without loosening the parts beforehand. Check for grease leakage. Check the spinner and the spinner bulkhead for cracks and loose rivets. Check counterweights for proper position. Check that the sealing compound on the blade retention nuts is intact. Use new sealing compound if the existing gasket leaks.

6.2.2 Inspection of the blades

The inspection of the composite-blades is easy and sure. Critical vibrations will be indicated through the plastic covering on the blade surface. No sudden failure can occur with these blades because of the wood material, even though cracks may exist. Following subsections will be important for the determination of whether or not cracks are critical.

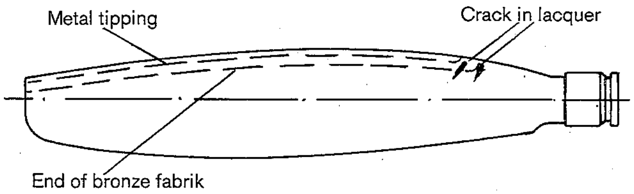
6.2.2.1 A fine crack in the lacquer on the joint between metal ferrule and blade is not dangerous because this is a natural indication of expansion due to normal loads.

If the crack increases over.010 inch, the propeller should be removed from service and shipped to the factory for examination.

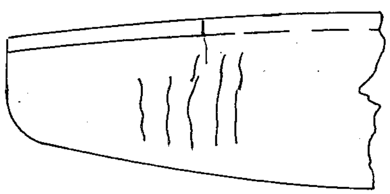


6.2.2.2 A fine crack along the blade tipping or along the end of the bronze fabric is not dangerous. A fine crack at the starting point of the bronze fabric or blade tipping is also not dangerous. Sometimes such cracks occur and are a normal indication of the different expansion of the different materials (wood, brass, bronze fabric.)

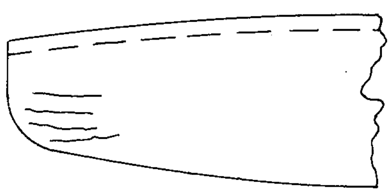
During the maintenance period a lacquer should be used to cover such cracks and protect the blades against penetration of moisture.



.2.2.3 Fine cracks in the lacquer surface or in the metal tipping across the blade axis are indications of bending vibrations. Such cracks occur mostly in the outer part of the blade. No sudden blade failure can occur due to these cracks since the load is carried by the wood core. If such cracks do occur, the factory should be consulted regarding airworthiness.



.2.2.4 Cracks in the lacquer surface which develop on the blade tips parallel to the blade axis are indications of torsional vibrations in the blade. These cracks occur very infrequently, but if they do the factory should be consulted regarding airworthiness.



6.2.2.5 Damaged fiberglass cover

Normal stone nicks are unimportant as long as the plastic protection of the wood core exists. Air bubbles with a maximum of 0.6 inches in diameter are unimportant only if the size does not increase during use.

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

6.2.2.6 If cracks form in the metal sheet of the blade tipping, the blade tipping must be replaced. Nicks and bulges are important only if they are sharp, since cracks may form them. If deep nicks and bulges exist, soft soldering can be used for repair. In any case, the wood core should be protected against moisture.

6.3 Additional periodic inspections

New propeller-engine-aircraft combinations may require additional periodic inspections such as partial disassembly and thrust bearing examination between overhaul periods. These inspections must be done in the factory or at authorized service stations. Obligatory instructions are published in our Technical Information Sheet No. 77, or are shipped with the propeller.

6.4 Overhaul

The time between overhauls is 500 flying hours or four calendar years. If the time changes, information will be given in the Technical Information Sheet No. 77, of which the newest edition is always binding. The overhaul must be done by an authorized firm.

5.5 Special Inspection

5.5.1 A special check in the factory is necessary if a propeller with a diameter of 160 cm was spinning at more than 3800 rpm.

5.5.2 For unconventional installations special instructions might become necessary. A conventional installation is a tractor installation on a single engine aircraft.

Maintenance and repair

7.1 The resistance of the polyurethane lacquer of our Hoffmann-Composite blades is excellent against nearly all solvents. The propeller should be periodically cleaned with car-wash solution or equivalent and polished with car wax. In every case the surface protection (lacquer and epoxy fiberglass) should be kept completely sealed so that no moisture can enter into the wood core and produce unbalance.

7.2 Small scratches and nicks can be easily repaired by using epoxy resin and polyurethane lacquer. Before repairing, check to see that the fiberglass covering is still well bonded to the wood.

7.2.1 Rub the damaged area with fine sandpaper and clean it with lacquer thinner. Use epoxy resin (Tixothrop) or equivalent to fill the bulges, then let the material dry as required.

7.2.2 Again rub the area with fine sandpaper to a smooth surface. Use a polyurethane lacquer

7.3 At present, no other company is authorized to repair our blades. Blade tips can be rebuilt if 75 % of the blade still exists. Blade tippings can be replaced, and a damaged wood core can be repaired.

8. Shipping and storage

8.1 Shipping

Careful packing is the best protection against damage during shipment; therefore the propeller is shipped to the client in a special wooden case. This case can be used more than once. The blade tips and trailing edge should be sufficiently protected. The propeller should be fastened to the packing case by the blades near the hub or by the hub mounting bolts.

8.2 Storage

No propeller should be stored by standing on the tips. If storage is required, it is recommended to use the original packing.

Usually the propeller need not be protected for storage periods of more than six months in dry, normal temperature rooms.

The aluminum parts are protected by chromatic acid anodizing, the steel parts by cadmium plating and the blades by polyurethane lacquer. No preservation is required for the blades. The metal parts can be protected with standard preservation mediums.

In cold weather conditions the propeller should not be stored close to heating systems or in rooms with extreme changes in temperature.

arts Lists and Special Tools

Parts List
Actuating Mechanism

umbers n fig. 8	Quantity	Description
1	1	lever
2	1	bushing
3	3	spacer
4	3	bushing
5	3	hex head screw
6	5	stop nut
7	1	fixture
8	1	spring
9	1	washer plate
10	1	rod
12	2	hex head screw
13	7	washer
14	1	yoke
16	2	ball bearing
17	2	hex head screw
19	1	bridge
20	3	washer
21	2	spacer
22	2	socket head cap screw

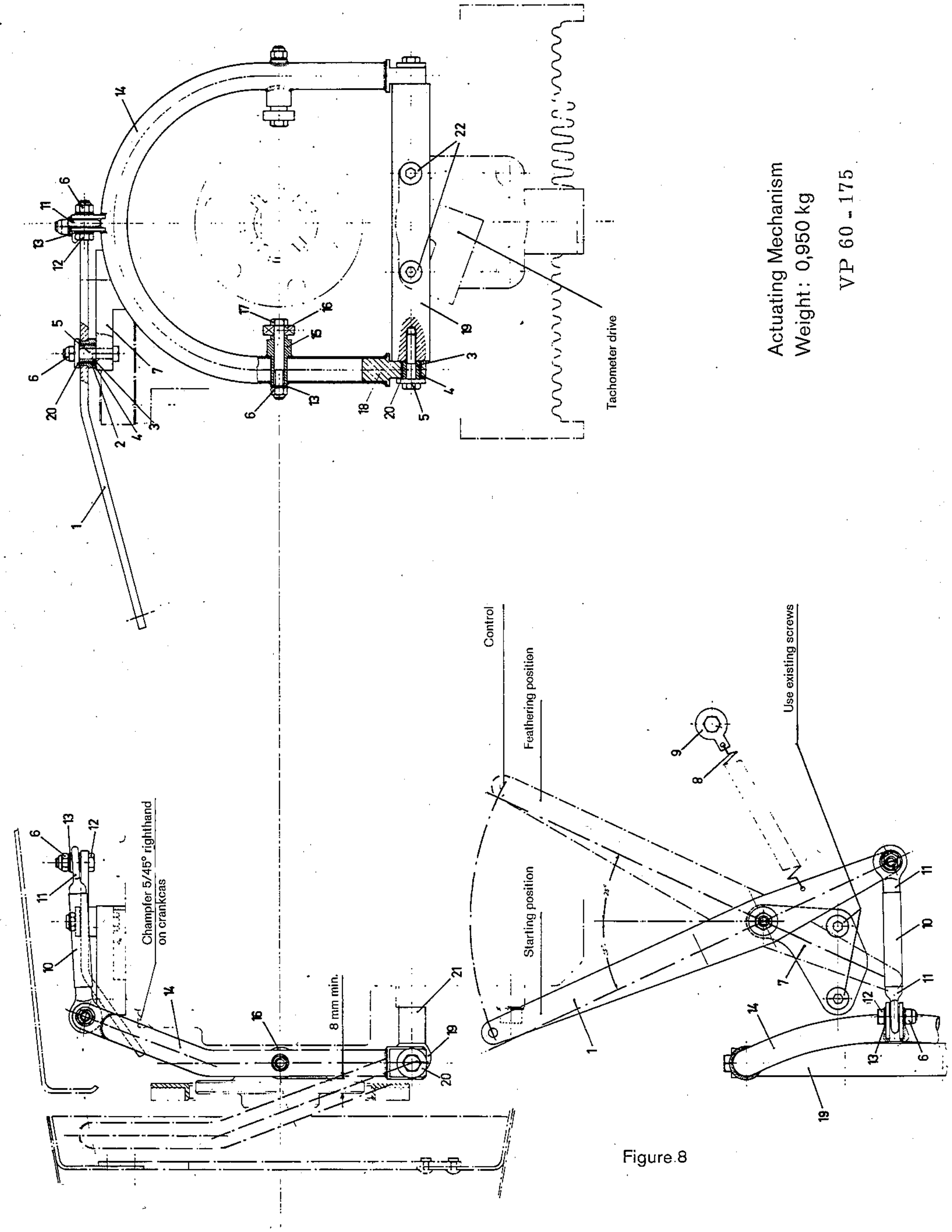


Figure 8

Actuating Mechanism
Weight: 0,950 kg
VP 60 - 175

Parts List
HO-V 62 and HO-V 62 R

ers ig. 9	Qty. V 62 R	Qty. V 62	Description	Remarks
	1	1	hub	
	1	1	thrust plate	
	4	4	stud	
	4	4	rod for stud	
	4	4	spring, return	
	1	1	rod, center	
	1	1	spacer, rear	
*	1	1	fork	* matched parts,
0 *	2	2	pitch change block	check dimensions for pitch set-
1 *	1	1	spacer, front	ting
2	1	1	yoke	
3	2	2	guide	
4	4	4	nut	
5	4	4	spacer	
6	4	4	elastic stop nut	
7	1	1	front washer	
8	5	5	washer	
9	5	1	elastic stop nut	
0	-	1	stop	
1	1	-	housing	
2	1	-	stop washer	
3	2	-	stop plate	
4	2	-	stop bushing	
5	4	2	staking pin	
6	2	-	spring	
7	2	-	spring guide	
8	2	-	cotter pin	
9	1	-	rest	
0	6	4	screw	
1	4	4	hex head screw	
2	4	4	bearing plate	
3	2	2	needle cage	

Parts List
HO-V 62 and HO-V 62 R

Numbers in fig. 9	Qty. V 62 R	Qty. V 62	Description	Remarks
1/34	6	6	stud	
1/35	6	6	elastic stop nut	
1/36	6	6	washer	
1/37	as required		balance weight	
1/38	4	4	screw	
1/39 *	as required		screw	* length as required for the amount of weights
1/40	2	-	counterweight	
1/41	4	-	hex head bolt	
1/42	8	-	washer	
1/43	2	2	lock, blade nut	
1/44	4	4	screw	
1/45	4	4	washer	

Parts List
Blades

Numbers in fig. 9	Qty. L 150 A	Qty. L 160 T	Description
2/2	2	-	blade assy
2/3	-	2	blade assy
2/6	2	2	gasket, blade root
2/7	2	2	needle cage, splitted
2/8	2	2	guide ring

Parts List
Spinners

ımbers ı fig. 9	Qty. VP 30-81	Qty. VP 30-82	Description
3/4	1	-	bulkhead assy
3/5	-	1	bulkhead assy
3/8	10	10	screw
3/10	1	-	spinner dome
3/11	-	1	spinner dome
3/2	4	4	sleeve
3/3	4	4	retaining ring

NOTE: Parts not listed are included in subassemblies.

Special Tools

PV-625 wrench, blade nut

PV-758 socket wrench, VP 20-483 engine flange mounting.

owing combinations are approved:

Aircraft	Propeller/Blades	Spinner
SF-28 A and SF-25 CS	HO-V 62 /L 150 A or HO-V 62 R/L 150 A	VP 30-81 VP 30-81
RF 5 and RF 5 B	HO-V 62 R/L 150 A	VP 30-82
ASK 16	HO-V 62 R/L 160 T	VP 30-81

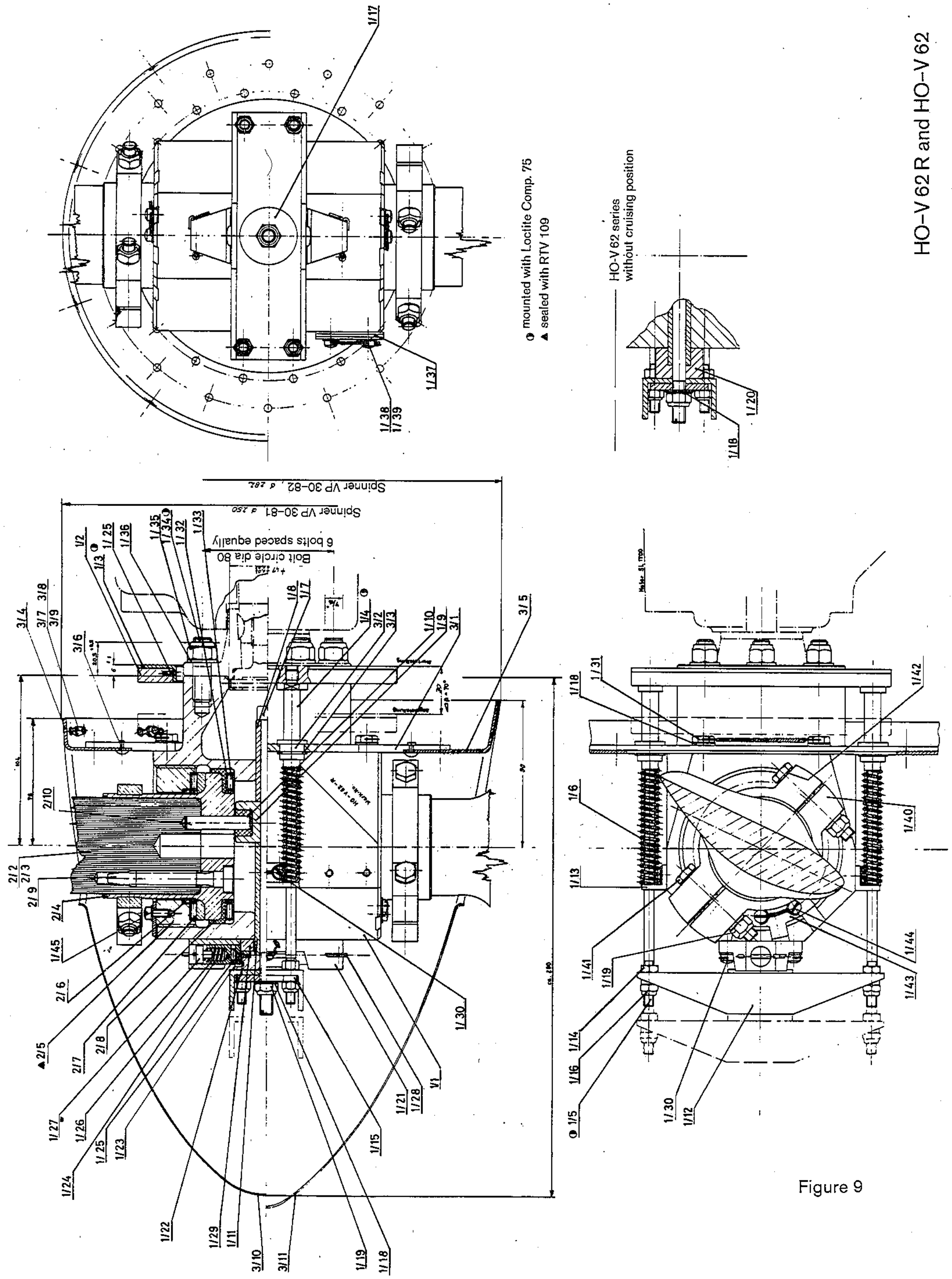


Figure 9