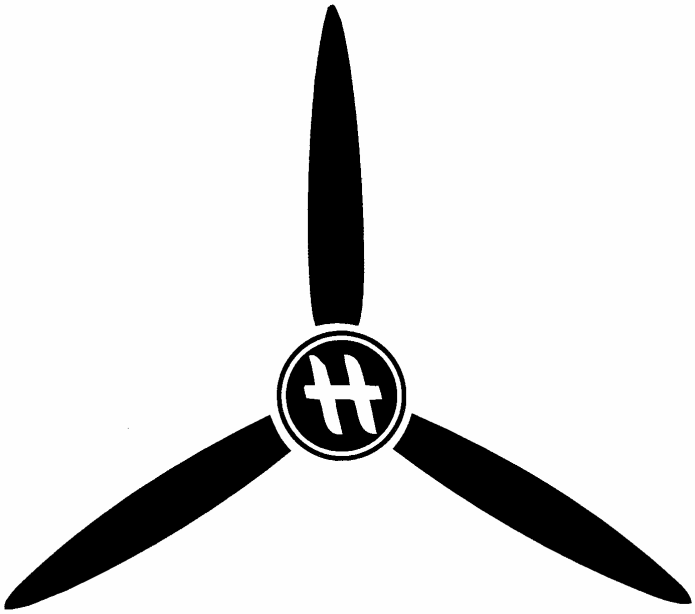
OPERATION AND MAINTENANCE MANUAL

No. E 0110.74

for

FIXED PITCH PROPELLER

HO( ) Series
HO4( ) Series



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Chapter

Record of Revisions to this Manual

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

List of Illustrations

1 Designation

Designation of 2-bladed propeller

HO-	**27**	**( )**	**( )**	**-( )**	**183**	**( )**	**100**	**( )**	**( )**
1	2	3	4	5	6	7	8	9	10

1: Hoffmann GmbH & Co. KG

2: key number of hub connection (according. to manufacturers list)

3: additional modification to hub connection (figure or letter, according to manufacturer's listing

4: blank: hardwood propeller

HM: hardwood, fibre covering

5: number of blade design, contains construction and aerodynamic data (according to manufacturer's listing

6: propeller diameter in cm

7: blank: standard blade

S: narrow blade

B: wide blade

8: pitch H at the reference station. Reference station standard 0,75 R. Older models can differ in ref. station.

9: blank: right-hand tractor

D: right-hand pusher

L: left-hand tractor

LD: left-hand pusher

10: denotes hub shape

blank: cylindrical hub

K: conical hub

Designation of 4-bladed propeller

HO	**4 /**	**27 ( )**	**( )**	**-170**	**( )**	**128**	**( )**
1	2	3	4	5	6	7	8

1: Hoffmann GmbH & Co. KG

2: number of blades

3: key number of hub connection (according to manufacturers list)

4: blank hardwood

HM: hardwood, fibre reinforced epoxy covering

5: propeller diameter in cm

6: blank: standard blade

S: narrow blade

B: wide blade

7: pitch H at reference station. Reference station standard 0,75 R. Older models can differ in ref. station.

8: Blank: right-hand tractor

D: right-hand pusher

L: left-hand tractor

LD: left-hand pusher

2 Construction

2.1. Standard hardwood composite construction

2.1.1 **Basic material** for these propellers is ashwood, selected for this special application and conditioned according to our manufacturing specifications. Continuous testing guarantees high quality. The wood is glued together to a block with water resistant glue. During manufacturing continuous quality control is applied. Dense lamination prevents the wood from wrapping.

This fact guarantees equal performance for propellers of the same type.

2.1.2 **Leading edge protection**

The special Blade-Tipping was developed by Hoffmann Propeller. There is no need to use rivets to fasten the metal sheet onto the blade. Therefore penetration of moisture, which causes problems on wooden propellers is nearly impossible. The blade tipping can be replaced as often as required.

Type A is a brass metal strip soft soldered to a bronze fabric and glued to the blade FRP cover (Figure 2-1).

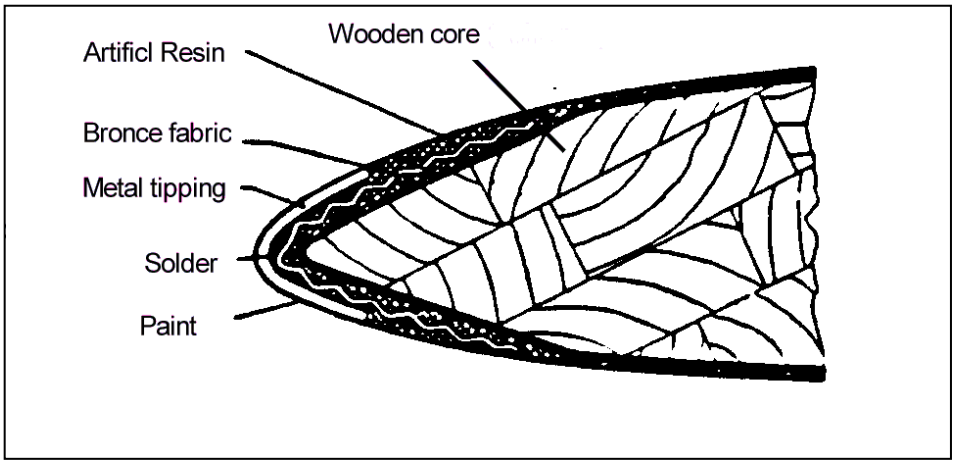

Figure 2-1 Hoffmann Blade tipping (Type A)

Blade tipping Type B is a special aluminium strip glued directly to the wooden core of the blade (Figure 2-2).

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.
(Figure 2-2)

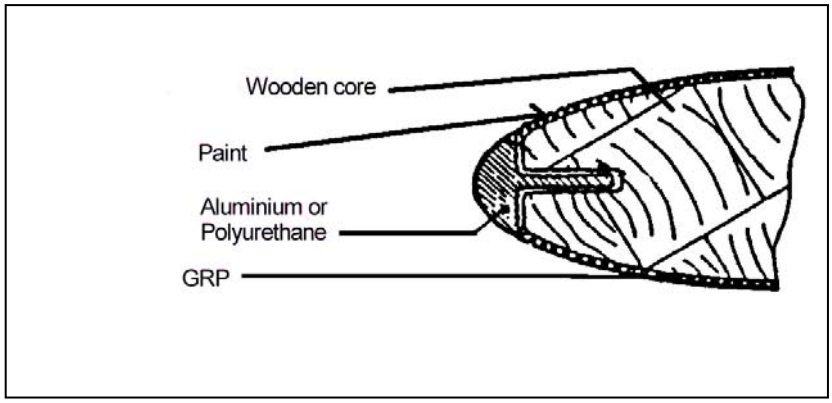

Figure 2-2 Hoffmann Blade tipping (Type B, or C)

2.1.3 Surface protection and finish

Several layers of special polyurethane paint (PU- paint) are sprayed onto the wooden body, or the fibre reinforced epoxy covering if installed, 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 standard 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.

2.1.4 Special design

Some propellers have a plastic covering of fibre reinforced epoxy to improve surface protection and stability characteristics of the blade.

2.2 Light weight propeller

The wooden core of this propeller is made of specially selected spruce. The wood is glued together in the same way as for the composite propeller.

An additional advantage is less weight at comparable stability. This propeller differs from the composite propeller only by the decreased weight.

The leading edge protection is conform with that of the composite propeller.

Surface protection:
All light weight propellers are covered with fibre reinforced epoxy to increase torsion stiffness and erosion protection. Then they are varnished like the composite propellers.

2.3. Hoffmann 4-bladed propeller

This propeller was designed to decrease propeller noise. 4-bladed propellers allow a smaller diameter than 2-bladed propellers at comparable performance and produce less noise.

2.3.1 Wooden core

The ashwood lamellas are only half as thick as for a 2-bladed fixed pitch propeller. They are glued crosswise so that one long lamella is for two opposite blades. Between there are two short lamellas. This is done alternatively until the necessary height of the block is reached.

2.3.2 Leading edge protection

The leading edge protection is conform with that of the 2 bladed composite propeller.

2.3.3 Surface protection

The same methods are applied as for the light weight propeller.

3 Installation Instructions

3.1 Installation

WARNING

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

3.1.1 Check propeller type and condition, clean propeller hub and let dry.

3.1.2 Clean the propeller and engine flange using solvent. Engine torque is mainly transferred by friction, therefore the surfaces have to be smooth and clean. Check bolts and thread for cracks and corrosion.

3.1.3 If there is a bolt hub, carefully check the connecting surface (cone, hub nut) parts and threads.

WARNING

Check the correct length of the bolts

3.1.4 Put the propeller on the engine flange or hub flange. Install front plate, bolts, washers and nuts, if applicable. Tighten bolts or nuts uniformly, torque crosswise (see 3.1.7).

CAUTION

If no spinner is used, the front plate must completely cover the centre bore of the propeller, to avoid water entering this part of the hub which destroys the propeller.

CAUTION

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

3.1.5 In case of bolt hubs 2 - 3 mounting bolts are necessary to centre the propeller.

3.1.6 If the bushings or the mounting bolts are stuck do not install the propeller (the hub may split open), it has to be removed and checked again. An excessive layer of lacquer in the bore can be scraped out. In case of discrepancies contact the manufacturer.

3.1.7 Use the recommended torque for tapered-, spline- or Hirth- hub installations, as specified by the engine manufacturer.

Torque values for dry threads:

M 6	9 - 10 Nm	(80 - 88 inlbs)	3 / 8 - 24 UNF	23 - 25 Nm	203 - 221 inlbs
M 8	15 - 17 Nm	(133 - 150 inlbs)	7 / 16 - 10 UNF	25 - 27 Nm	221 - 239 inlbs
M 10	23 - 25 Nm	(203 - 221 inlbs)	1 / 2 - 20 UNF	33 - 35 Nm	292 - 310 inlbs

Observe information on the sticker on the propeller. Use additional torque for the stop nuts, as required. Torque bolts crosswise.

Make sure that the propeller fits to the flange or hub. No space is allowed between those two parts.

WARNING

Not following step 3.1.9 may result in the loss of the propeller

WARNING

Do not loosen the bolts while performing step 3.1.9

3.1.9 Check torque after the **first flight**, after the **first 25 hours** and after that as necessary, but at least **each 50 hours** by applying the required torque only. In hot and dry climate the wood may shrink, therefore closer re-torque intervals have to be established.

NOTE:

Some bolts, not specified herein, may require different torque. Please ask the company for the correct values.

WARNING:

Do not use any shimming material or paper to correct the track

3.1.10 Check blade track 10 cms (4 inches) from the blade tip on the trailing edge. Max. permissible are 3 mms (1/8"). If propeller is not within this limit, remove it, check mating surfaces or turn propeller 180°. If this procedure doesn't change the situation, send the propeller back to the factory.

3.1.11 Wire-lock the bolts in pairs or use the correct cotter pin to secure castellated nuts. Secure hub nut as specified in the engine manual.

3.1.12 It is strongly recommended to send the bolt-hubs to the manufacturer if the propeller has to be repaired or a new will be purchased. There the bolt-hubs will be checked, installed and balanced together with the propeller.

3.2 Removal

WARNING

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

WARNING

For removing the propeller do not use a screw driver or a chisel!

3.2.1 The removal of the propeller has to be done in the opposite sequence than installation see paragraph. 3.1. If propeller fits very tight loosen it by knocking with the hand at the centre of the blade near the hub. Knocking on the blade tips or the trailing edge with hard objects would damage the propeller.

3.2.2 Protect engine flange, -cone or -spline shaft against damage and corrosion.

3.2.3 It is strongly recommended that the bolts and attaching parts are shipped with the propeller for inspection and overhaul.
Tapered hubs, spline- hubs or any other detachable hubs should stay with the propeller. These parts should be inspected and overhauled as well.

4 Inspection and Maintenance

4.1 Daily inspection

WARNING

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

WARNING

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

4.1.1 Inspection of the propeller.

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

4.1.2 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 A and B) becomes visible under the paint.

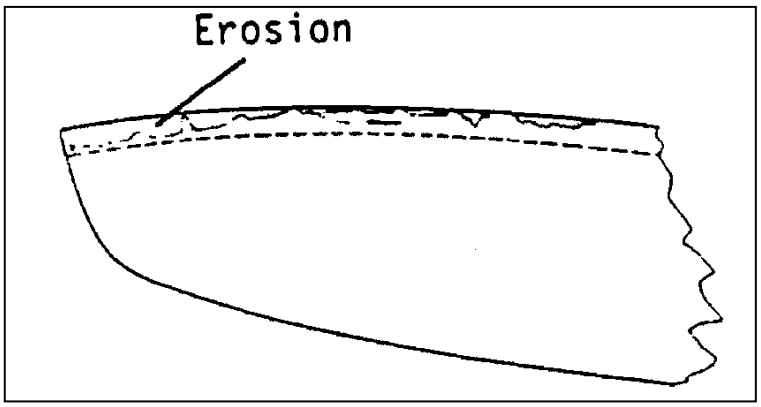

Figure 4-1 Normal erosion no matter of concern

4.1.3 The erosion tipping (Type A) of the propeller blades ends in the inner third of the blade. Fine cracks in the paint along the tipping are no reason for concern

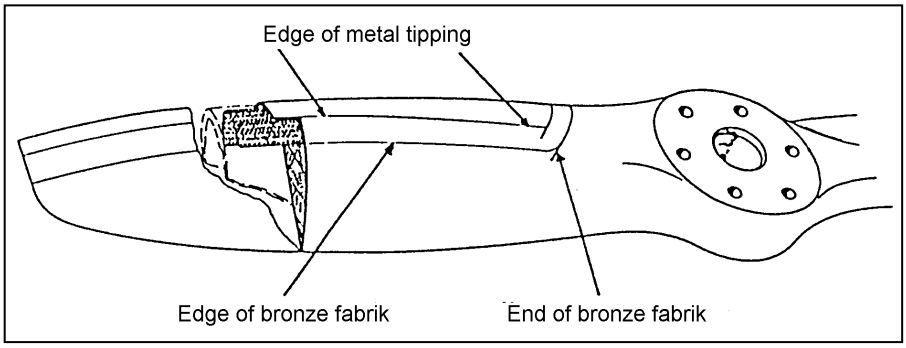

Figure 4-2 Hoffmann Blade erosion (Type A)

4.1.4 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.

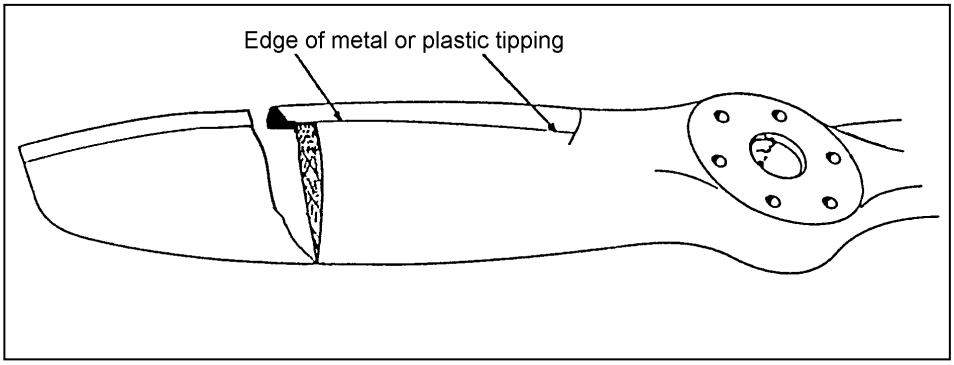

Figure 4-3 Hoffmann Blade erosion (Type B or C)

4.1.5 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.

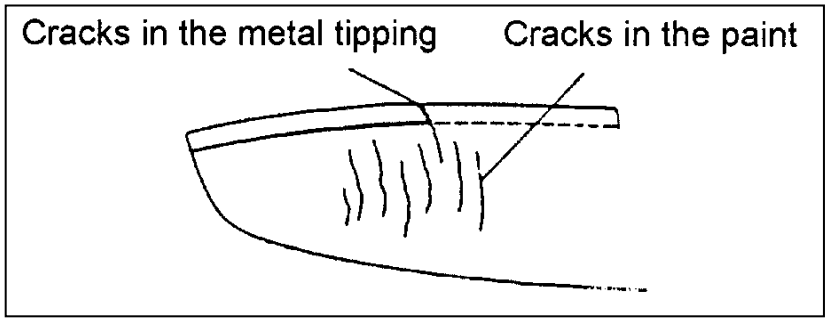

Figure 4-4 Cracks in the paint or tipping

4.1.6 Cracks in the paint or in the blade, starting from the blade tip and extending parallel or at any angle to the blade axis, are indications for torsional vibrations. Such cracks occur very seldom. If such cracks occur, contact the factory or a service station authorised by Hoffmann.

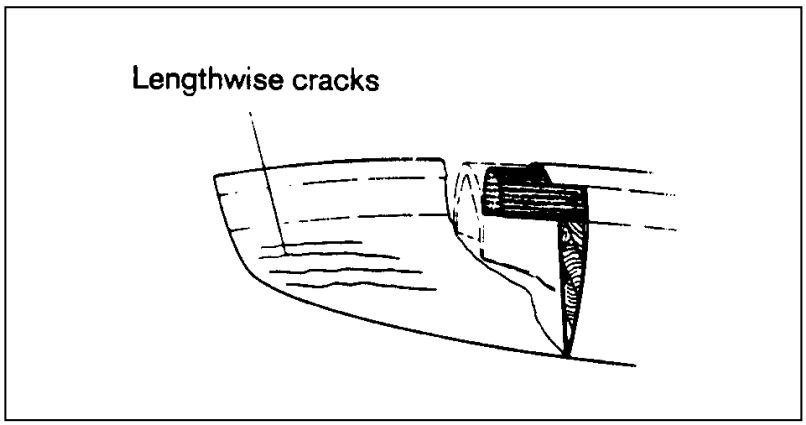

Figure 4-5 Cracks in the paint or blade

4.1.7 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 uncritical as long as they are paint cracks only. If they start growing quickly and penetrating into the fibre cover contact the factory or a service station authorised by Hoffmann.

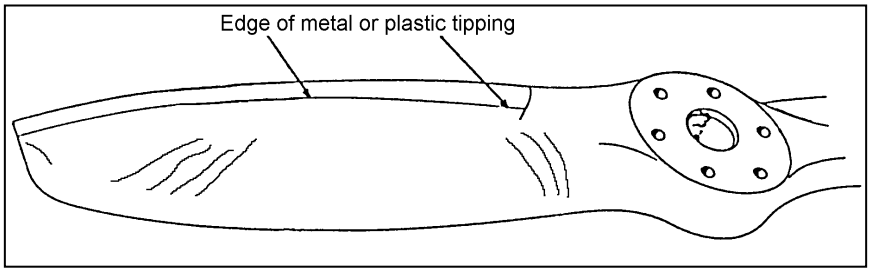

Figure 4-6 Hair cracks in the paint

4.1.8 Radial crack, is less critical if it is limited to the outer lamella, and the crack is not longer than the flange diameter. This is an indication that the propeller was loos. It may be repairable.

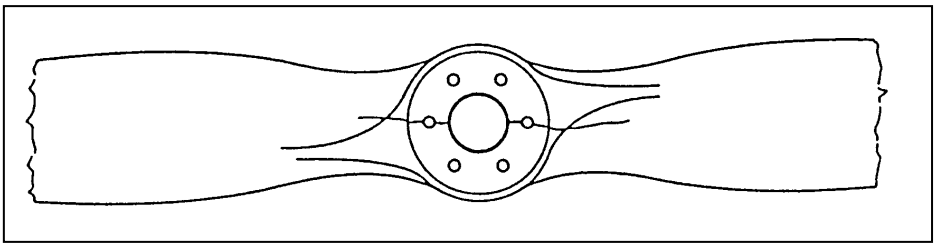

Figure 4-7 Radial cracks

4.1.9 Tangential crack is critical and an indication of overload. The propeller has to be removed from service **immediately**

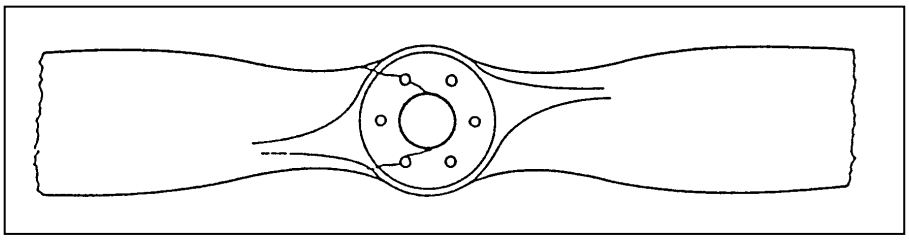

Figure 4-8 Tangential cracks

4.1.10 A hair crack at the end of a short lamella (see para. 2.2.1) is less critical. Paint has to be used to close the crack in order to avoid the penetration of moisture.

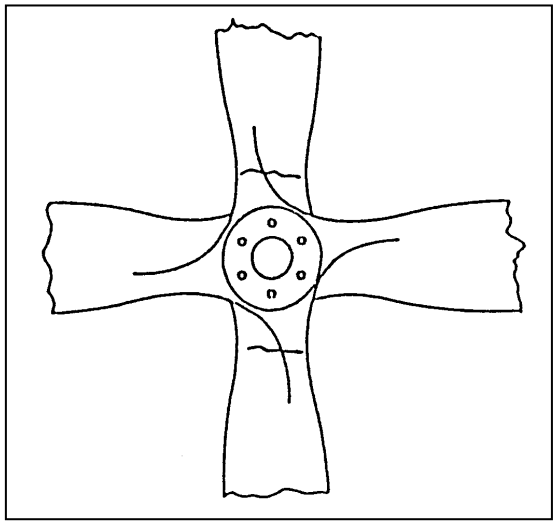

Figure 4-9 Cracks in paint caused by short lamellas

4.2 50 hour inspection

WARNING

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

Same as daily inspection from para 4.1.1 through 4.1.3.

WARNING

Do not loosen the bolts while performing the next step

Check torque of hub bolts by, applying the necessary torque only. Lock wire bolts again.

Recommended torque values for dry threads:

M 6	9 - 10 Nm	(80 - 88 inlbs)	3 / 8 - 24 UNF	23 - 25 Nm	203 - 221 inlbs
M 8	15 - 17 Nm	(133 - 150 inlbs)	7 / 16 - 10 UNF	25 - 27 Nm	221 - 239 inlbs
M 10	23 - 25 Nm	(203 - 221 inlbs)	1 / 2 - 20 UNF	33 - 35 Nm	292 - 310 inlbs

Observe information on the sticker on the propeller. Use additional torque for the stop nuts, as required. Torque bolts crosswise.

4.3 100 hour inspection

Same as 50 hour inspection. Check track of propeller according to para 3.1.10.

4.4 Annual inspection

Same as daily inspection from para 4.1.1 through para 4.1.9.

CAUTION

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

While performing the annual inspection of the aircraft it is recommended to remove the propeller from the mounting flange. This is in order to check the normally not visible hub parts for deformation, cracks or paint damage. The wooden core should not be visible. The paint damage has to be repaired. Install propeller following the procedures given in chapter 3.

4.5 Over-speed

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 rejected

4.6 Extreme Climatic Conditions

Operation in hot, dry climate requires shorter inspection intervals for the torque of the hub bolts, caused by slight shrinking of the wood, the bolts may loose the required torque. Inspection intervals have to be established upon experience. Do **NOT** loosen the bolts, apply the required torque only.

4.7 Overhaul

There is no calendar time limitation to observe. Repair or overhaul is only necessary after damage or in case of cracks in the blade tipping, the paint or the bore. Overhaul may only be carried out by the manufacturer of by a propeller shop, which is approved by the manufacturer.

5 Maintenance and Repair

5.1 Maintenance

5.1.1 A clean propeller always gives better performance!
Clean the propeller with any gentle detergent or equivalent and protect it with regular car polish, that doesn't contain silicone.

5.2 Minor repair

Minor damage (scratches etc.) may be repaired in the field. Please check that the wooden core or the plastic cover is not damaged. A service kit with all necessary materials can be ordered from the manufacturer.

5.2.1 Remove oil or grease from the damaged area with regular solvent and grind it with abrasive paper, grit 220.

5.2.2 If necessary fill the sanded area with filler. Make sure not to apply too much filler.

5.2.3 Allow the filler to dry and polish it using abrasive paper, grit 220.

5.2.4 Repaint repaired area. Use only original paint.

5.2.5 In case the repaired area is painted repeatedly, observe drying time of the paint.

5.2.6 If moisture is penetrated into the wooden core it is necessary to send the propeller to the manufacturer.

5.3 Major Repair

Major repair is carried out by the manufacturer only.

For example:

a) Exchange of blade tipping
b) Splicing of the tips, provided 90% of the blade is still existing and undamaged
c) Repair of split trailing edges
d) Repair of the hub

6 Storage and Shipping

6.1 Shipping

Careful packing is the best protection to avoid damage during shipping. Therefore HOFFMANN provides special wooden- or cardboard- boxes which are reusable if they will be treated carefully. The blade tips, leading and trailing edges have to be protected sufficiently. If a wooden case is used for shipping, the propeller should be fastened through the centre bore or the bolt holes.

6.2 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 fixed pitch propellers is not necessary, the existing surface protection is sufficient. The propeller should not be stored near heating systems or in rooms with extreme temperature changes.