



ATA 61-05-70

(E-570)

OPERATION AND INSTALLATION MANUAL

**HYDRAULICALLY CONTROLLED
VARIABLE PITCH PROPELLER**

MTV - 8 - ()

Issue 10: 26th February 2019

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Warning

People who fly should recognize that various types of risks are involved; and they should take all precautions to minimize them, since they can not be eliminated entirely. The propeller is a vital component of the aircraft. A mechanical failure could cause a forced landing or create vibrations sufficiently severe to damage the aircraft.

Propellers are subject to constant vibration stresses from the engine and airstream, which are added to high bending and centrifugal stresses.

Before a propeller is certified as being safe to operate on an airplane, an adequate margin of safety must be demonstrated. Even though every precaution is taken in the design and manufacture of a propeller, history has revealed rare instances of failures, particularly of the fatigue type.

It is essential that the propeller be properly maintained according to the recommended service procedures and a close watch be exercised to detect impending problems before they become serious. Any grease or oil leakage, unusual vibration, or unusual operation should be investigated and repaired as it could be a warning that something serious is wrong.

As a fellow pilot, I urge you to read this Manual thoroughly. It contains a wealth of information about your new propeller.

The propeller is among the most reliable components of your airplane. It is also among the most critical to flight safety. It therefore deserves the care and maintenance called for in this Manual. Please give it your attention, especially the section dealing with Inspections and Checks.

Thank you for choosing a MT-Propeller. Properly maintained it will give you many years of reliable service.

Gerd R. Mühlbauer
President
MT-Propeller Entwicklung GmbH

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Operation and Installation Manual for hydraulic constant speed propeller

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1.0 GENERAL

1.0.1 Statement of purpose

This publication provides operation, installation and line maintenance information for the MT hydraulically variable pitch propeller with single acting system developed for Piasecki Compound Helicopter and Airodium.

In addition to the propeller assembly, the propeller governing system is addressed in this manual.

Installation, removal, operation and trouble shooting data is included in this publication. However, the helicopter manufacturer's manuals should be used in addition to this information (only applicable for the Piasecki application).

1.0.2 Additional available publications

In addition to this manual the following applicable publications should be used for repair and overhaul:

OVERHAUL MANUAL E-571

Consult the manufacturers' manuals for the propeller governor .

For MT-Propeller service literature contact

MT-Propeller Entwicklung GmbH
Flugplatzstr. 1
D-94348 Atting
Germany

Tel.: XX49-9429-9409-0
Fax: XX49-9429-8432

E-mail: sales@mt-propeller.com
Internet: www.mt-propeller.com

1.1 Definition of Component Life and Service

1.1.1 Overhaul

Overhaul is a periodic process and contains the following items:

- Disassembly
- Inspection of parts
- Reconditioning of parts
- Reassembly

The overhaul interval is based on hours of service (operating time) or on calendar time.

However, in case of a blade damage by a foreign object an overhaul is always required.

At such specified periods, the propeller assembly should be completely disassembled and inspected for cracks, wear, corrosion and other unusual or abnormal conditions. As specified, certain parts should be refinished, and certain other parts should be replaced.

Overhaul is to be accomplished in accordance with the latest revision of the Overhaul Manual No. E-571.

1.1.2 Repair

Repair is correction of minor damage caused during normal operation. It is done on an irregular basis, as required.

1.1.2.1 A repair does not include an overhaul.

1.1.2.2 Amount, degree and extent of damage determines whether or not a propeller can be repaired without overhaul. A blade damage, due to a ground strike, requires always an overhaul.

2007/04/03

1.1.3 Component Life

Component life is expressed in terms of total hours of service (TT, or Total Time) and in terms of hours of service since overhaul (TSO, or Time Since Overhaul).

Both references are necessary in defining the life of the component. Occasionally a part may be "life limited", which means that it must be replaced after a specified period of use. Life limited parts are listed in Overhaul Manual No. E-571.

Overhaul returns the component or assembly to zero hours TSO (Time Since Overhaul), but not to zero hours TT (Total Time).

1.2 The hydraulically variable pitch propeller MTV-8- are designed for two applications:

- The Piasecki Compound Helicopter with a turbine of up to 2250 hp.
- Airodium with a piston engine up to 1500 hp.

The pitch change is conducted by a propeller governor. Once an engine rotational speed is selected it will be held constant at variations of airspeed and power. Usually, this is called a constant speed propeller. For Airodium a special governor system was invented. It contains an oil tank, an external hydraulic pump and a control unit. For environment-system temperatures up to 40°C (105°F) hydraulic oil HLP 32 should be used. For environment-system temperatures over 40°C (105°F) hydraulic oil HLP 46 should be used. The rpm could be selected by adjusting the knob on the control unit. This system is in flight adjustable, but not constant-speed. If the knob is in minimum position the blades are in low pitch position (min. power absorption of the engine) and if the blades are in max. position the blades are in high pitch position (max. power absorption). Mechanical stops for low pitch and high pitch limit the pitch change travel. In case of the oil pressure of the governor to be lost, the blades return automatically to low pitch, enabling the pilot to continue the flight. The oil pressure is single acting.

Natural composite blades with fiber reinforced Epoxy cover and metal leading edge protection are used to minimize weight at the highest amount of safety against fatigue fractures due to vibrations.

2.0 MODEL DESIGNATION

2.1 Hub-designation

MTV - 8 - H - ()
1 2 3 4 5

5 Letter designation counterweights

blank = none or small counterweights for pitch change moment into low pitch

C = counterweights for pitch change moment into high pitch

4 Code for prop. Flange

H = PW 115 flange with 12 9/16" - 18 UNF studs

3 numerical code for propeller design/size

2 Variable pitch propeller

1 MT-Propeller (manufacturer)

Blade designation

() LD 244 - 107 ()
4 5

5 Capital letter: modifications, restricting or excluding Interchangeability.
Small letter: modifications, not affecting interchangeability.

4 numerical code for blade design (includes aerodyn. data)

3 diameter in cm

2 sense of rotation

blank = right hand tractor

RD = right hand pusher

L = left hand tractor

LD = left hand pusher

1 Position of actuation pin

blank = automatic pitch change into low pitch

C = automatic pitch change into high pitch

2.3 The complete propeller designation is a combination of both designations, for instance MTV-8-H/LD244-107. The hub-serial No. starts with the year of manufacture. All records of the propeller are registered in respect to this number.

3.0 PERFORMANCE DATA

The following data are the design criteria of the propeller at the current point of development.

For operation refer to your Propeller-Logbook.

Propeller	NO. Blades	Max. kW/Power HP		max.rpm	max. cm	diam. inch	pitch range ° /degrees	app. weight kg lbs		flanges
MTV-8-()	5	1655	2250	2220	244	96	ca. 40 °	85,5	188	H
MTV-8-()	5	1120	1500	1500	300	118	ca. 40 °	115,5	254	H

Quoted information depends on diameter and hub configuration.

Quoted weights are without spinner. Weight of spinners depends on diameter 4.0 - 6.5 lbs.

Flange types:

H = PW 115/118	bolts 9/16" - 18 UNF studs
N = PT6A-67A	bolts 9/16" - 18 UNF studs

4.0 DESIGN AND OPERATION INFORMATION

The variable pitch propeller consists of the following main groups:

- Hub with blade bearings and pitch change mechanism
- Blades
- Spinner
- Counterweights (if applied)
- Propeller governor
- Oil transfer unit

4.1 Hub

The one-piece hub is made from forged or milled aluminum alloy with the outer surface shot-penned and anodized. The blade bearings are special designed ball bearings, whereas the balls act as split retainers in order to hold the blades in the hub, creating an increased safety factor against blade loss. The outer bearing race is a one-piece part and pressed into the hub, while the inner race is split and installed on the blade ferrule. The blade tip play is adjusted by a ring, which can be turned to increase and decrease the preload. Additionally the preload-ring holds the blade and the preload bearing in the hub.

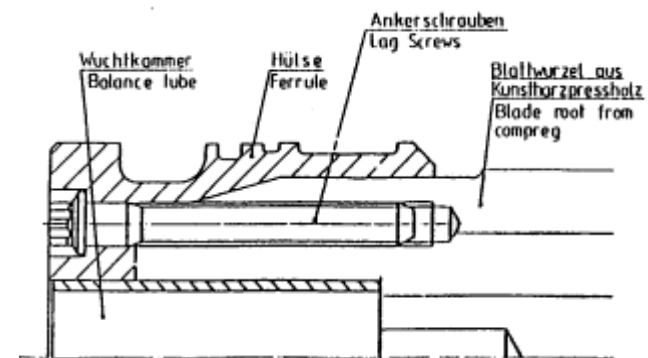
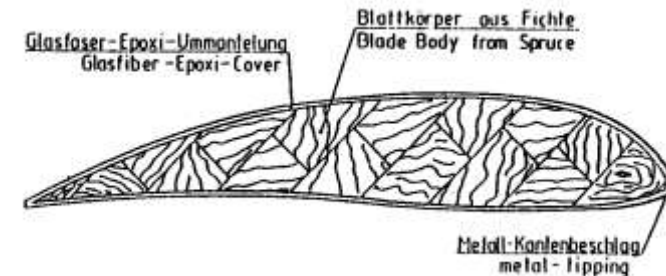
The pitch change of the blades is obtained with a pin in the blade root. A plastic block connects the blade with the piston and the axial movement of the servo piston turns the blades. On the front piece the return spring and the sleeve, which acts as high pitch stop, are installed.

Outside the hub, behind the oil transfer unit, are two check nuts with which the low pitch stop can be adjusted. The inner part of the hub is used as the cylinder for the pressure oil. This arrangement allows a simple and lightweight design. The front spinner support is used to have the balance weights installed.

4.2 Blade

The presently used blades are in natural composite, using high compressed wood in the root and lightweight wood in the remaining body. Additionally a foam core is used to reduce the weight and the natural twisting moments of the blades. Epoxy fiberglass covers the entire blade surface and is painted with acryl lacquer. The outer portion is protected against erosion by a bonded on stainless steel erosion sheath. The inner portion of the blade is protected by a self-adhesive PU-strip.

The blade ferrule is installed with special lag screws on the blade root and is additionally bonded with Epoxy resin.



4.3 Spinner (Piasecki)

The spinner dome is a one-piece part made from fiber reinforced composite. The bulkhead is spinformed or truncated aluminum alloy. The front support is part of the hub. Filler plates increase the stiffness of the dome on the cutouts for the blades. The dome is mounted on the supports by means of screws.

4.3.1 Spinner (Airodium)

The spinner is a two piece part made from fiber reinforced composite. The upper part of the spinner is mounted on a tube with vibration dampers. It can be moved vertically for easier maintenance. It acts as a torque stabilizer for the oil transfer unit.

The front support is part of the hub. Filler plates increase the stiffness of the dome on the cutouts for the blades. The dome is mounted on the supports by means of screws.

4.4 Counterweights

Propellers may be equipped with counterweights on the blade root. The pitch change pin is in a different position and the blades are identified with a "C", for example C200-15.

4.5 Propeller Governor

The necessary servo pressure of the engine oil is reached by a gear pump in the governor, which increases the oil pressure. Flyweight and a speeder spring move a pilot valve, allowing servo oil flow to and from the piston in the propeller. In on speed condition there is no oil flow. A speed adjusting lever changes the preload of the speeder spring. This results into an engine speed change. The following picture is showing the system. Please note, that the propeller has a single acting system where the natural twisting forces of the blades always turn them into low pitch position. The governor produces oil pressure to increase pitch.

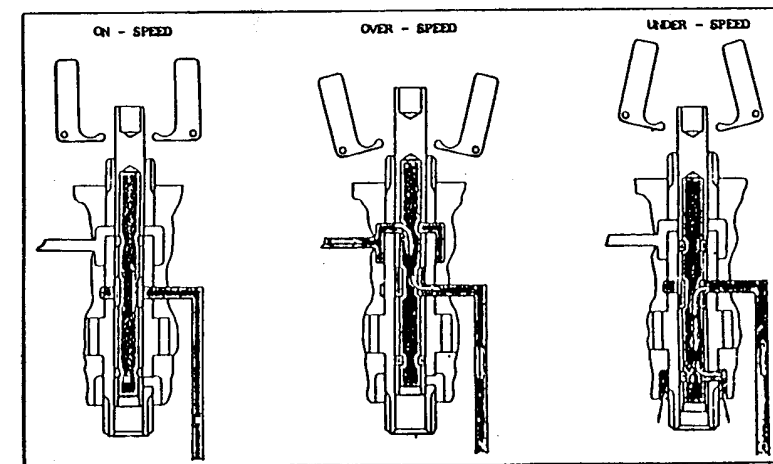
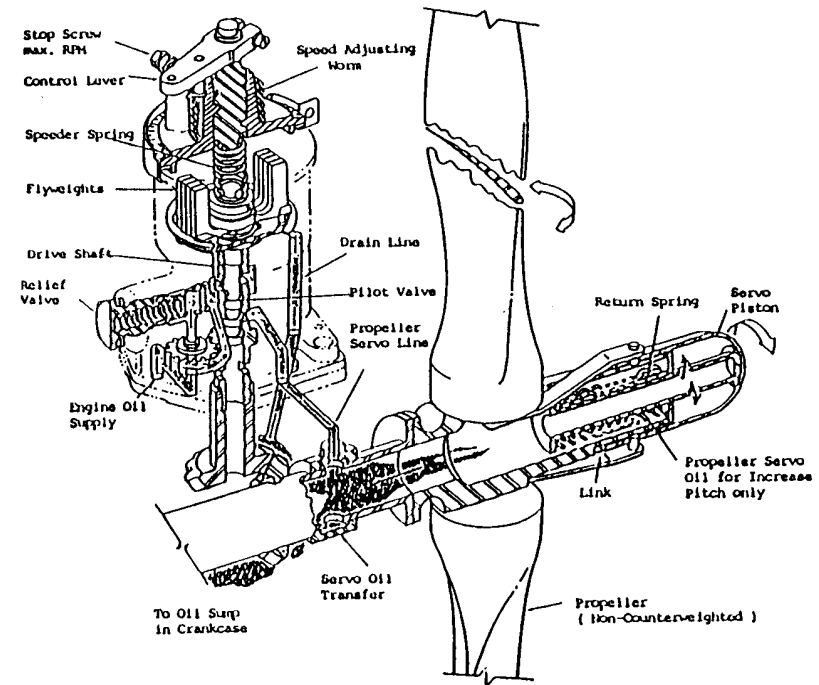
For the Airodium application see item 1.2 on page 5.

4.6 Oil transfer unit

The unit enables to supply oil via the front plate.

The transfer system is the connection between the rotating system (propeller - hub) and the static system (oil pump - governor).

Additional a support on the fuselage must be mounted to prevent that the system rotates with the propeller (see page 25). The system is designed for a max. governing pressure of 385 PSI and 2500 rpm.

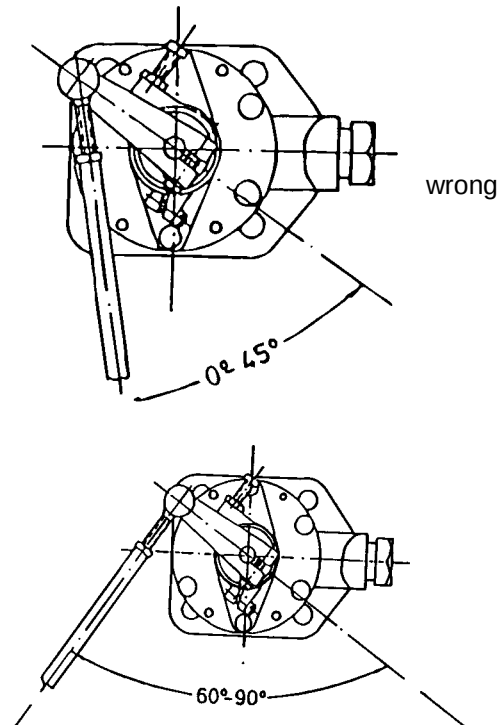


Governor oil pressure to increase pitch

2000/03/13

5.0 INSTALLATION AND OPERATION INSTRUCTION

- 5.1 All propellers of these designs are only suitable for installation on flange type engines. The code for the flange type and size can be seen from the model designation (see chapter 2).
- 5.2 If applicable, a governor with a suitable oil pressure direction has to be installed on the engine. The control lever has to be mounted as shown below.



- 5.3 Clean engine and propeller flange with solvent of gasoline. Both surfaces must be dry and clean. Remove all surface defects.

ATTENTION:

Two dowel pins must be installed in the engine flange, supplied by the engine manufacturer.

- 5.4 Install the propeller carefully to the crankshaft. Observe the position of the spinner backplate for the blade position. The propeller should not be pulled onto the crankshaft with the bolts in order to avoid damage to the hub and to avoid shearing off material causing improper installation.
- 5.5 Mounting stop nuts with washers should be tightened crosswise with equal force.

Torque:

9/16" 18 UNF stopnuts 135 - 150 Nm /100 - 110 ftlb

Note: Torque values are valid for dry, free-moving threads only.

A device from the fuselage to the oil transfer unit must be installed to avoid that the unit turns with the rotating propeller.

ATTENTION:

Hereby any possible movement of the propeller relative to the fuselage has to be taken into account.

The „ELBOW“ which should be used has a 1/4" - NPT thread to the unit and a 9/16" - 18UNF thread to the oil - line.

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- 5.6** Check track of the blades. There is max. 0,2 inch allowed, measured approx. 4 inches from the tip on the trailing edge.

Turn propeller for safety reasons (ignition) always opposite the usual direction of rotation.

- 5.7** Install spinner on support plates, observe mating marks. Torque screws with plastic washers 35 - 44 inlb. Check runout of the dome. Max. 0,08 inch permissible.

- 5.7.1** For Airodium: Mount the upper part of the spinner on the tube with the vibration dampers (see page 23-1). During installation of the upper part of the spinner on the lower part of the spinner take care that the guide tube fits into the bushing device of the oil transfer unit. The minimum distance of the upper and lower spinner part is 0,2 inch. Take care that the oil tube in the spinner dome is long enough, that any movement of the piston guide rod to the spinner dome does not damage the oil system.

Attention:

Never pull a propeller onto the engine flange by the bolts, only install by hand.

- 5.8 Carry out a functional check (Piasecki)**

Note: Engine and propeller manufacturers recommend not to use high engine speed on ground because it can result in an excessive engine temperature and blade damage.

Adjust power lever for approx. 1300 rpm. Pull propeller lever back (out) until the rpm drops by 300 - 500. Push propeller lever full forward (in) for take off position and observe rpm increase. Decrease and increase of engine speed should have about the same time. Cycle three times to bleed air out of the system.

- 5.9** Adjust power lever at approx. 1700 rpm now. Pull propeller lever back until rpm drops about 100 rpm. When the rpm is stabilized, increase manifold pressure by about 3 inhg and observe the governor function. rpm must stabilize.

- 5.10** Watch for a clean ground surface to avoid blade damage and advance power lever and propeller lever for take off power and rpm. The static rpm must be limited by the propeller and should be 50 - 100 rpm. lower than max. rpm. See chapter "Trouble shooting" to check, if the propeller or governor limits the rpm.

- 5.11** Low and high pitch stops are adjusted during manufacture, according to the requirement of the helicopter/turbine combination. Low pitch stop can be adjusted by varying the check nuts. High pitch can only be adjusted in a service station.

- 5.12 After the ground runs, check for oil leaks, blade shake and condition of the oil transfer unit.**

- 5.13 Perform a test flight.**

- 5.14 Operation (Piasecki)**

Propeller and governor are selected as a result of tests. The governor must allow constant speed. On take off, the static rpm should be approx. 50 - 100 rpm. lower than max. rpm and the propeller must limit this rpm. If the governor limits rpm, it must be readjusted. During the take off run, the rpm must increase with airspeed and the governor must limit max. rpm.

The rpm can be changed at all power and rpm settings and must be held constant automatically within the entire flight envelope.

If oil pressure is lost and high speeds are used, overspeed is possible and throttle must be retarded immediately to correct the situation.

High pitch is set to such a value that in case the oil return line is blocked it should be possible to continue flight with reduced power.

Remark: Move power lever and rpm lever always slowly to avoid overspeed.
The lightweight composite blades result in faster reaction of rpm and pitch change than usual variable pitch propellers with metal blades.

5.15 Pre-flight check

The propeller should be cycled at least twice to spill oil before every flight. In cruise flight an infinite number of power and rpm settings are possible because there is no restriction between the stops. Rpm restrictions from the engine or propeller manufacturer must be observed and the tachometer must be marked.

5.16 Carry out a functional check (Airodium)

Cycle three times to bleed air out of the system. Therefore turn the knob on the control unit from min. pitch to max. pitch.
After engine run up at 1500 rpm turn the knob from min. pitch to max. pitch. During that the power consumption indicator must reach 100 %. After that turn the knob back to min. pitch.

5.17 Low and high pitch stops are adjusted during manufacture, according to the requirement of the helicopter/turbine combination. Low pitch stop can be adjusted by varying the check nuts. High pitch can only be adjusted in a service station.

5.18 After the ground runs, check for oil leaks, blade shake and condition of the oil transfer unit.

5.19 Operation (Airodium)

The hydraulic unit must enable to vary the power consumption from min. to 100 %.

Remark

Turn the knob always slow, to avoid rpm surging.

5.20 Starting the engine (Airodium)

Knob to min. pitch position. Hydraulic unit on. Start up the engine.

5.21 Operation Check (Airodium)

Cycle two times to bleed air out of the system.

6.0 INSPECTIONS

6.1 Daily Inspection

Before each flight inspect the condition of the blades and spinner. Blade shake is allowed up to 0,2 inch and a blade angle play of 2° is acceptable.

No critical cracks in the blades (see 6.2). Metal erosion sheath may not be loose. PU-strip proper and existing. If not, replace within the next 10 hours after last inspection. No oil leaks.

6.2 100-Hours Inspection

6.2.1 Remove spinner and check for cracks. Check blade shake, max. 0,2 inch.

The blade shake must be checked IN and OPPOSITE the direction of rotation.
Measure blade shake 4 inch from blade tip at the trailing edge.

Note:

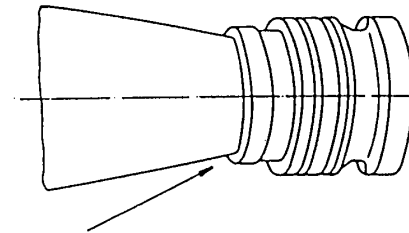
DO NOT measure in flight direction, as the blade bending will also be measured.

Check blade angle play, max. 2°.

If the check shows values above these tolerances, contact the service department of MT-Propeller. Inspect outside condition of the hub and parts for cracks, corrosion, deterioration. Inspect check nut for low pitch stop for tightness. Check all safety means to be intact. Check flange bolts or stopnuts for tightness. Check front and rear spinner plate for cracks and fixing. Inspect blade root and hub for oil and grease leaks. Check position of counterweights if applicable. Check oil transfer unit for oil leakage.

6.2.2 Check blades, see 6.2.3, for cracks in the fiberglass cover and blade erosion sheath. There are only certain cracks allowed. Fine cracks only up to max. 0.010 inches width are allowed between metallic ferrule and blade root. If cracks are present return propeller immediately for repair.

Cracks along the leading edge and on the beginning of the erosion sheath area are allowed as long as the erosion sheath is not loose. Cracks in the painted surface are allowed as long as no moisture can enter the wooden body. Blisters or delaminations up to 1 square inch are permissible. In case of questionable conditions please contact the service department of MT-Propeller.



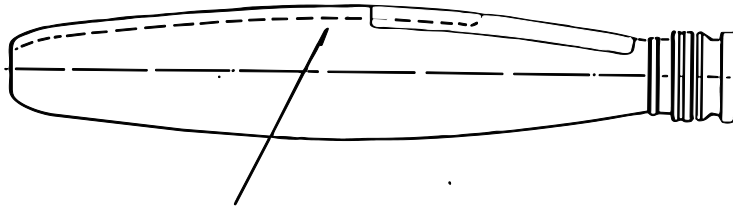
Illustrations of Possible Cracks in the Blade

Check that the silicone, sealing the blade to the blade ferrule, is not damaged. If a damage is obvious, **REPAIR IMMEDIATELY** that no moisture can enter into blade body and blade ferrule.

Perform visual inspection in case of notches, dents, nicks or other damages to the blade body (for example stone nicks). If no cracks exist, fill void with an appropriate Epoxy resin (5 min. Epoxy). The aerodynamic of the airfoil must not be destroyed. Afterwards sand the filled spot with sandpaper. Apply a lacquer layer to protect the repaired spot against moisture. Whenever performing pre-flight inspection, check this area carefully for possible cracks. During the next repair/overhaul at the manufacturer or service station this area will be inspected and repaired by a competent expert.

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Possible cracks along the metal erosion sheath.
If loose, replacement required.



Cracked erosion sheath requires immediate repair. If chordwise cracks appear, return propeller to manufacturer. Replace PU-tape as soon as possible, if loose or damaged.



6.2.3 Possible Damage along Erosion Sheath

6.2.3.1 Circular dents (more than 0,24 inch x 0,24 inch do not repair, change erosion sheath)

6.2.3.2 Pointed dents (more than 0,24 inch x 0,24 inch do not repair, change erosion sheath)

6.2.3.3 Cracks (no cracks allowed in the erosion sheath, otherwise change erosion sheath)

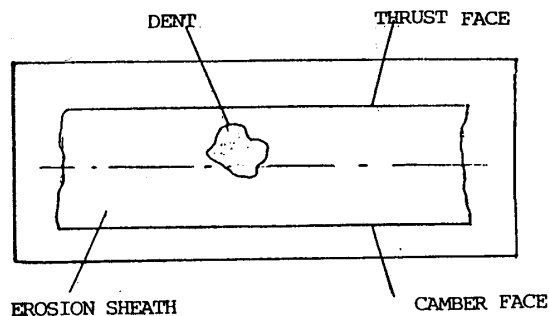
6.2.3.4 Hollow and debonded spots (max. 0,39 square inch, no two spots may occur within 5,5 inch of each other, otherwise blade must be repaired)

6.2.3.5 Erosion

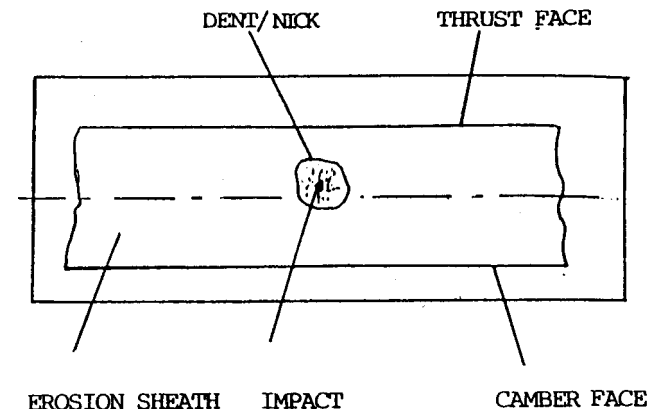
6.2.3.6 Lightning strike

6.3 In case of any impact as mentioned under **item 6.2.3.1 (Circular Dents)**, check whether it penetrates through the erosion sheath. If not, fill dent with Epoxy and grind off until there is a smooth surface.

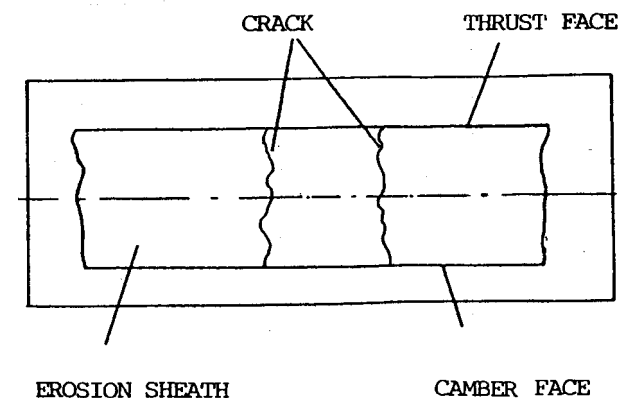
Note: Epoxy may be applied for cosmetic reasons but not "must be done". Check this area carefully for possible cracks whenever performing pre-flight inspection. Erosion sheath may remain until next repair/overhaul will be done.



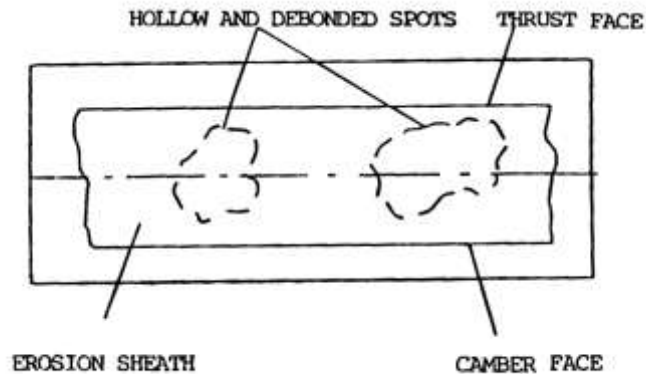
6.4 In case of impacts in the erosion sheath (as mentioned under item 6.2.3.2 the sheath may possibly be penetrated. If not, proceed as described under item 6.3. If yes, check erosion sheath for possible cracks. If there are no cracks, the dent must be filled with Epoxy so that no moisture can enter into the blade body. Check this area carefully for possible cracks whenever performing pre-flight inspection. The erosion sheath must be replaced as soon as possible.



6.5 If there are any cracks (as mentioned under item 6.2.3.3), the erosion sheath must be replaced as soon as possible. The propeller is to be returned to the manufacturer or to an authorized service station.

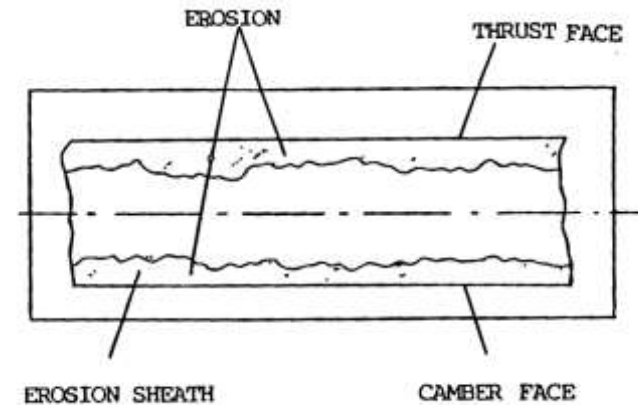


- 6.6** If any hollow and debonded spots exist (as mentioned under item 6.2.3.4), mark them. Whenever performing pre-flight inspection, monitor whether there are further delamination and/or whether the already existing delamination becomes worse. The inspection can be executed by using an appropriate coin (Tab-Test). The hollow and debonded spots must not exceed 30 % of the surface of the erosion sheath at all (lengthwise only 1 inch allowed). Otherwise the blade is to be sent to the manufacturer or to an authorized service station for repair as soon as possible. Check secure fixing of the erosion sheath in any case every time before flight.



- 6.7** The erosion mentioned under item 6.2.3.5, which erodes the lacquer layer from the erosion sheath, occurs due to the peripheral speed of the blade and is normal. However, always take care that

the erosion never becomes so deep that the FRP-coat is damaged and there is a possibility that moisture may enter into the blade body. In this case the blade must be repaired/overhauled immediately. Return the blades also, if the erosion sheath is eroded through. If the PU-protection tape is damaged, replace it immediately.



6.8 Blisters and delaminations

Are blisters or delaminations visible, mark them and check them periodically. Blisters from sap (resin) shall be opened to release the material. Fill void with 5-min Epoxy and sand. Larger delaminations shall be opened and the material be removed. Such areas must be covered with new fiber glass laminate. Damage on the trailing edge can be repaired the same way.

6.8.1 Crunched Trailing Edges

Crunched trailing edges can be repaired by using 5 minute Epoxy if the damage is not deeper than 5 mm (0,20 inches) and not wider than 15 mm (0,60 inches). Most important is, that no moisture can enter into the load carrying blade body.

If damage is bigger contact manufacturer.

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6.9 Lightning Strike

If a blade has an indication of lightning strike, check the entire blade and erosion sheath per item 6.3 and 6.6. Also send a report to the manufacturer (MT-Propeller).

6.10 PU-Erosion Protection Tape

If the PU-tape at the inner portion of the blade is damaged or does not exist any more, replace it as soon as possible (max. 10 hours). This can be done by a qualified person.

6.11 Special Inspections

Special inspections might be required on new installation without approved engine/propeller combinations or unconventional installations such as pusher propellers. A tractor propeller is conventional.

6.12 Overspeed

Up to 110 % take off rpm of the approved engine/propeller combination perform immediately a 100 hrs inspection. From 111 % to 120 % an overhaul at the factory is required. A ferry flight can be made after performing a 100-hours inspection. For overspeed above 121 % no further use of the propeller is permitted. The propeller must be returned to the factory for investigation.

WARNING:

Continuous overspeed (data shown in the propeller TCDS) can cause structural failures of the propeller and therefore can be dangerous and are strictly not allowed.

6.13 Overhaul

The time between overhauls is expressed in hours flown and calendar months since manufacture or overhaul. The figures are presented in Service Bulletin No. 1(), latest issue. They are also shown in Propeller Logbook.

In any case, a calendartime inspection must be performed after a maximum of 72 months from installation, if no more than 24 months have passed since manufacturing overhaul when properly stored.

This means that calendartime TBO can be max. 96 months. The extend of the overhaul and the replacement of life-limited parts is ruled in the applicable service manual, see item 1.0.2.

Attention:

In case of a blade damage by a foreign object an overhaul is always required.

7.0 MAINTENANCE

7.1 There is no special maintenance schedule for this propellers beyond the usual inspections as per item 6. For the repair of minor damages in the blade surface and edges, automotive material such as PU or acryl paint and Epoxy resin can be used.

7.2 The surface finish is made with PU lacquer or acryl lacquer. This material is resistant against nearly all solvents. The blades can be cleaned with normal car cleaners and polish. It is important to avoid moisture penetrating into the wooden core. If necessary, please consult an aircraft inspector for final decision concerning repair.

If the repair is made locally, please observe the curing time of resin and paint systems.

7.3 There are no frequent maintenance works required on the hub because all moving parts are inside the hub and not exposed to the environment. Blade bearings and pitch change mechanism are filled with special lubricants and there is no need to refill between overhauls. A corrosion protection of the hub with thinned engine oil or anticorrosion spray is recommended.

7.4 Repair of spinner parts is not permissible. Cracked spinner domes, filler plates and backplates are to be replaced by airworthy parts.

7.5 Broken tips and damaged blades can be repaired by the manufacturer if a minimum of 85 % of the blade remains without cracks. Damages on the trailing edge can be repaired because the epoxy cover can be replaced and a new erosion sheet can be installed. Blades can be replaced individual or as a complete set. Always tell the serial no. of the propeller.

7.6 DYNAMIC BALANCE

7.6.1 Overview

7.6.1.1 Dynamic balance is accomplished by using an accurate means of measuring the amount and location of the dynamic imbalance. After such a undertake the remaining imbalance should be below 0,2 ips.

7.6.1.2 The amount of balance weights added cannot exceed the number installed for static balance.

7.6.1.3 Follow the instructions from the equipment manufacturers for dynamic balance.

7.6.1.4 If the dynamic imbalance is bigger than 1,2 ips, the propeller must be removed and statically rebalanced.

7.6.2 INSPECTION PROCEDURES PRIOR TO BALANCING

7.6.2.1 Visually inspect the propeller assembly after it has been reinstalled on the aircraft prior to dynamic balancing.

NOTE: The First run-up of a new or overhauled propeller assembly may leave grease on the blades and inner surface of the spinner dome. This is normal and do not mean that it will be a continuing grease leakage.

Use a mild solvent to completely remove any grease on the blades or inner surface of the spinner dome.

7.6.2.2 Prior to dynamic balance record the number and location of all balance weights from the static balance.

7.6.2.3 It is recommended that placement of balance weights on aluminum spinner bulkheads which have not been previously drilled be placed in a radial location.

7.6.2.4 The radial location should be outboard of the slip ring and inboard of the bend at which point the bulkhead creates a flange to attach the spinner dome.

7.6.2.5 Drilling holes for use with the AN3-() type bolts with self-locking nuts is acceptable.

NOTE: Chadwick-Helmuth Manual AW-9511-2, „The Smooth Propeller“ specifies several generic bulkhead rework procedures.

7.6.2.6 All hole/balance weight locations must take into consideration, and must avoid, any possibility of interfering with the adjacent airframe, deice and engine components.

7.6.3 PLACEMENT OF BALANCE WEIGHTS FOR DYNAMIC BALANCE

7.6.3.1 The preferred method of attachment of dynamic balance weights is to add the weights to the spinner bulkhead. The static balancing weights are installed on the spinner front plate, if applicable.

7.6.3.2 Subsequent removal of the dynamic balance weights, if they exist, will return the propeller to its original static balance condition. The static balance weights are only allowed to remove exceptionally.

7.6.3.3 Use only stainless or plated steel washers as dynamic balance weights on the spinner bulkhead.

7.6.3.4 Do not exceed maximum weight per location of 32 g. This is approximately equal to eight AN970 style washers.

7.6.3.5 Weights are to be installed using aircraft quality 10-32 inch screws or bolts.

7.6.3.6 Balance weight screws attached to the spinner bulkheads must protrude through the self-locking nuts a minimum of one thread and a maximum of four threads.

7.6.3.7 All propellers which have been dynamically balanced must install a decal on blade no. 1. This will alert repair station personnel that the existing balance weight configuration may not be correct for static balance.

7.6.3.8 Record number and location of dynamic balance weights, and static balance weights if they have been reconfigured, in the Propeller Logbook.

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8.1 TROUBLE SHOOTING (Piasecki)

8.1.1 Improper rpm

There are means on propeller and governor to adjust pitch and rpm in the field. Before the original adjustments are changed, please calibrate the tachometer.

Usually there are only two kinds of problems:

- static rpm is too low and/or
- rpm in flight is too high.

8.1.2 Static rpm too low:

To find out whether the governor or the propeller limit the engine, proceed as follows.

- Propeller control to max. rpm.
- Power lever to max. power.
- Pull propeller control back until rpm drops approx. 25 rpm.
- If there is a long way necessary to get the rpm drop, the pitch of the propeller will limit the static engine rotational speed.

Remedy: Reduce pitch with the check nuts on the piston guide. Turning loose nut by $\frac{1}{4}$ turn will increase rpm by approx. 100 rpm.

The torque between the check nuts is 100 Nm (73 ftlbs).

If the rpm drops immediately after a small movement of the lever, the governor will limit the static rotational speed.

Remedy: Increase governor rpm unscrewing the stop screw. One turn on the screw will change rpm by approx. 25 rpm.

Important:

The control must be long enough to have the necessary way in order to contact the stop. Secure screw with safety wire.

8.1.3 Rpm in flight too high:

If the static rpm is within the limits, only the governor allows over-speed. Adjust rpm to the desired value in flight and turn the stop screw in after landing until it touches the governor lever.

Important:

Do not change position of the rpm control during final approach. Secure screw with safety wire.

8.1.4 Blade shake

Fore and aft movement

Cause: Blade bearing loose

Remedy: If more than 1/8 inch, return propeller to the factory or any approved repair station to correct the pre-load of the blade retention bearing.

8.1.5 Blade angle play

Cause: Blade bearing loose by seating and/or increased play by wear in the pitch change mechanism (pitch change pin, pitch change block).

Remedy: If more than 2°, return propeller to the factory or any approved repair station.

8.1.6 Sluggish rpm change

- Cause:
1. Oil is cold.
 2. Excessive friction.

- Remedy:
1. Run the engine until the green arc of the oil temperature is reached.
 2. Move blades by turning them with hands within the angular play. If excessive friction exists, the blade retention system has to be inspected, contact factory.

8.1.7 Surging rpm

- Cause:
1. Trapped air in propeller piston
 2. Sludge deposit
 3. Wrong speeder spring in the governor
 4. Wrong pitch stops in the propeller
 5. Abrupt movement of propeller or throttle control
 6. Wrong carburetor setting
 7. Oscillating tachometer

- Remedy:
1. Move propeller control at least twice every time before flying at about 1300 rpm with a drop of about 300 to 500 rpm.
 2. Clean oil tubes in the oil pump, in the propeller piston, oil transfer unit eventually in the governor (only possible at the manufacturer's).
 3. Check that the governor part number corresponds to the aircraft data sheet. If the rpm does not stabilize after 5 periods this is an indication for a wrong speeder spring, contact factory.
 4. Compare pitch values to those of the data sheet. Note static rotational speed.
 5. Move the controls carefully and slowly.
 6. Correct as specified in the engine manual.
 7. Check tachometer and drive.

8.1.8 Rpm variations between ascend, cruise and descend although having identical propeller setting

Up to ± 50 rpm normal condition. If more:

- Cause:
1. Excessive friction in the hub
 2. Excessive friction in the governor
 3. Worn rpm tachometer

- Remedy:
1. Contact manufacturer.
 2. Contact manufacturer.
 3. Replace/repair instrument.

8.1.9 Rpm increase during normal operation without change of propeller lever position

- Cause:
1. Oil leakage or hot oil
 2. Worn oil transfer unit causes a decrease in blade angle of attack.
 3. Internal leakage in the propeller.
 4. Governor drive failure or broken relief valve spring .

- Remedy:
1. Check for oil leaks, replace gaskets, decrease oil temperature with higher airspeeds.
 2. If the system works with cold oil and fails at high oil temperature, this will indicate high leakage in the oil transfer unit on the front plate. Contact manufacturer.
 3. Contact manufacturer.
 4. Check governor drive and governor on the test bench.

Attention:

If sudden oil leakage occurs, move power lever back until the rpm will decrease. In this condition the propeller goes back to the low pitch stop automatically and no oil pressure is needed. Adjust the propeller control for take off position. Apply power again, no more than required to remain about 100 rpm below take off rpm.

Note that the propeller rpm should be always lower than adjusted with the propeller control. This will hold the governor in underspeed condition and no oil pressure will be transferred from the governor to the propeller.

8.1.10 Rpm decrease during normal operation without change of propeller lever position

Cause: 1. Speeder spring in the governor broken or sticking pilot valve.
2. Dirt in the fuel system or carburetor.
3. Control inoperative.

Remedy: 1. Check governor on the test bench.
2. Clean or repair.
3. Check free movement and positive stop contact.

Attention:

If the cause cannot be found in the fuel system the flight can be continued when throttle setting is reduced, avoiding excessive manifold pressure and overheating of the engine. The rpm will remain low because the propeller pitch is on the high pitch stop.

8.1.11 Extremely slow pitch change or no pitch change on ground (rpm changes with airspeed like a fixed pitch propeller)

Cause: 1. Blocked oil line.
2. Sludge deposit in propeller piston.
3. Damaged pitch change mechanism.
4. Corrosion in the blade bearings.

Remedy: 1. Check oil transfer unit.
2. Clean propeller and oil transfer unit.

Concerning 1 and 2:

This behavior does not appear at once and gets worse after some time. It should be observed at the preflight inspection.

3. Contact manufacturer.
This error may appear suddenly.
4. Repair propeller.

8.1.12 Oil leakage (visible outside or hidden inside).

Cause: Damaged gasket or oil transfer unit.

Remedy: Replace gaskets or contact manufacturer for repair of the propeller and oil transfer system.

8.1.13 Rough running engine, possibly in limited rpm range only

Cause: 1. Bad static balance.
2. Bad dynamic balance.
3. Operation in restricted rpm range.

Remedy: 1. Rebalance statically, mount balance weights to forward spinner bulkhead.
2. Rebalance dynamically. Install balance weights to rear spinner bulkhead, see item 7.6
3. Refer to airplane flight manual. Check rpm gauge for correct reading. Repair or replace if necessary.

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8.1.14 Oil transfer unit

Cause: Excessive oil leakage.

Remedy: 1. Contact manufacturer.
2. Install new sealing in the oil transfer unit.

8.2 TROUBLE SHOOTING (Airodium)

8.2.1 The max. power consumption of the engine is not possible.

8.2.2 The max. oil pressure of the hydraulic unit is decreased during operation.

Remedy

Readjusting the max. oil pressure on the hydraulic pump in the permitted range (max. 385 psi).

8.2.3 The oil pressure is limited by the control unit.

Remedy

Readjusting of the max. current on the control unit of the control valve until the max. oil pressure is reached (max. 385 psi).

8.2.4 Blade shake

Fore and aft movement

Cause: Blade bearing loose.

Remedy: If more than 1/8 inch, return propeller to the factory or any approved repair station to correct the pre-load of the blade retention bearing.

8.2.5 Sluggish rpm change

Cause: 1. Oil is cold.
2. Excessive friction.

Remedy: 1. Warm up the hydraulic unit. For environment-system temperatures up to 40°C (105°F) use HLP 32. For environment-system temperatures over 40°C (105°F) use HLP 46.
2. Move blades by turning them with hands within the angular play. If excessive friction exists, the black retention system has to be inspected, contact factory.

8.2.6 Surging rpm

Cause: 1. Trapped air in propeller piston.
2. Sludge deposit.
3. Fast change of the control knob.

Remedy: 1. Move propeller blades at least twice every time before starting the engine.
2. Clean oil tubes in the oil pump, the propeller piston and the oil transfer unit.
3. Always turn the knob slowly and constant.

8.2.7 Different power consumption after turning the knob from min. to max. pitch and back to its original position

Cause: 1. Excessive friction.
2. Power indicator defect.

Remedy: 1. Contact factory
2. Replace indicator.

8.2.8 Loss of power during normal operation

- Cause:
1. Oil leakage.
 2. Worn oil transfer unit causes a decrease in black angle of attack.
 3. Internal leakage in the propeller.
 4. Failure in the control unit.

- Remedy:
1. Contact factory.
 2. Contact factory.
 3. Contact factory.
 4. Contact factory.

Attention

If sudden oil leakage occurs during operation, set the control units to min. pitch that no oil is transferred from the hydraulic pump to the propeller.

8.2.9 Power consumption increases during normal operation

- Cause:
1. Defect pressure valve.
 2. Defect control unit.

- Remedy:
1. Contact factory.
 2. Contact factory.

8.2.10 Extremely slow pitch change or no pitch change

- Cause:
1. Blocked oil line.
 2. Sludge deposit in propeller piston.
 3. Damaged pitch change mechanism.
 4. Corrosion in the blade bearings.

- Remedy:
1. Check oil transfer unit.
 2. Clean propeller and oil transfer unit.

Concerning 1 and 2:

This behavior does not appear at once and gets worse after some time. It should be observed at the start-up inspection.

3. Contact manufacturer.
This error may appear suddenly.
4. Repair propeller.

8.2.11 Oil leakage (visible outside or hidden inside)

- Cause:
- Damaged gasket or oil transfer unit.

- Remedy:
- Replace gaskets or contact manufacturer of the propeller and oil transfer system.

8.2.12 Rough running engine, possibly in limited rpm

- Cause:
1. Bad static balance.
 2. Bad dynamic balance, see item 7.6.
 3. Operation in restricted rpm range.

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- Remedy:
1. Rebalance statically, mount balance weights to forward spinner bulkhead.
 2. Rebalance dynamically. Install balance weights to rear spinner bulkhead.
 3. Check rpm gauge for correct reading. Repair or replace if necessary.

8.2.13 Oil transfer unit

- Cause:
1. Excessive oil leakage.

- Remedy:
1. Contact manufacturer.
 2. Install new sealing in the oil transfer.

9.0 SHIPPING AND STORAGE

- 9.1** For any shipment of the propeller use original container. If this is impossible it will be very important to fix the propeller at the blades and the hub, if necessary, in a manner that avoids damage.

In case of returning the propeller it is furthermore recommended to return all accessories and parts together with the propeller. They will also be inspected and not considered to be missing.

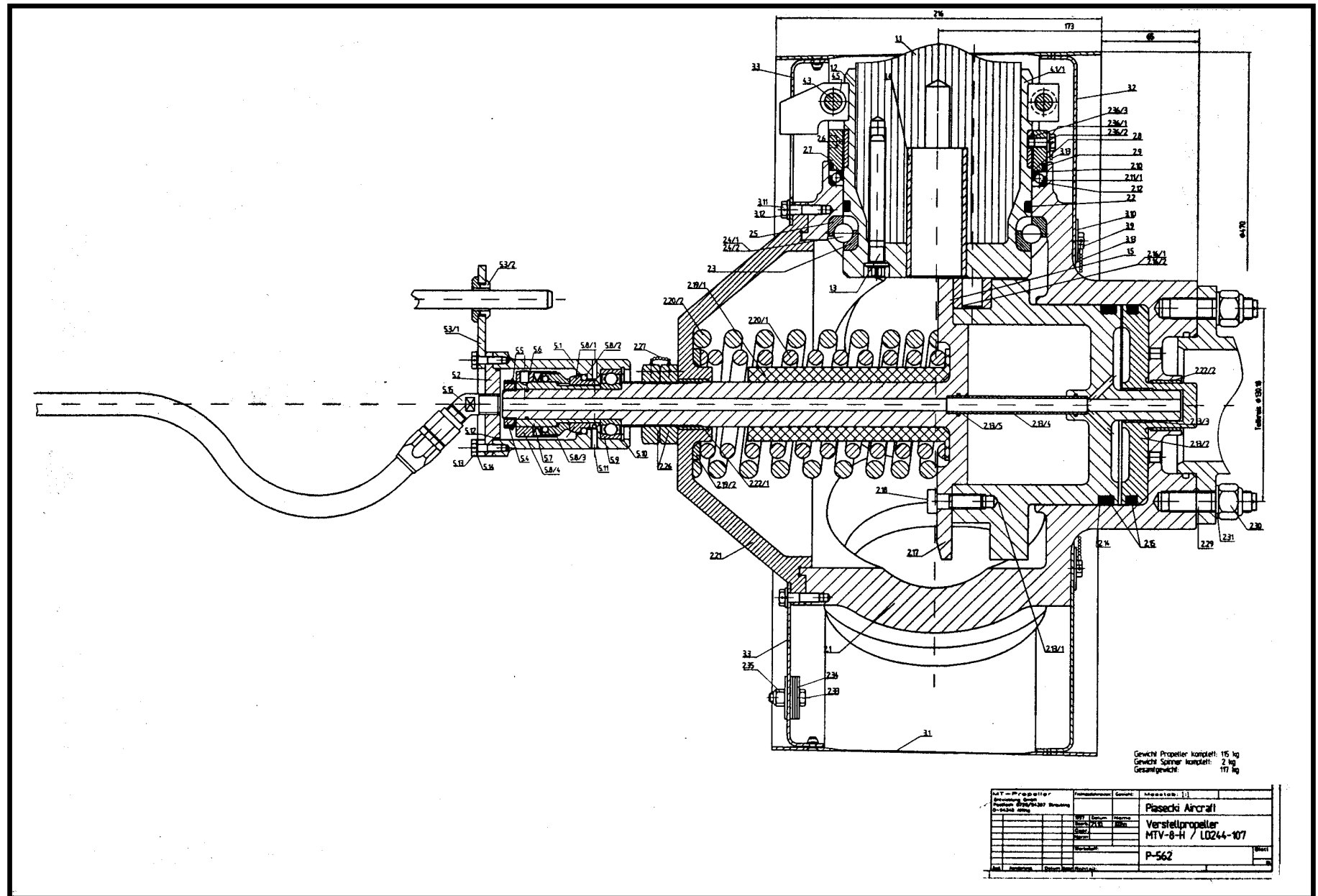
- 9.2** If the propeller is stored for a longer period of time, preferably use the original container or an equivalent one. Storage only in a controlled environment (temperature - 5°F to 95°F, rel. humidity 10 % to 75 %). Avoid extreme temperature/humidity differences or cycles. All metal surfaces should have anti-corrosion protection which is easy to remove. There is no need to protect the blades because its lacquer is sufficient.
- 9.3** The TBO starts immediately after the initial installation of the propeller to the aircraft and will not be interrupted by removals later on.
- 9.4** If the propeller is stored for longer than 24 months it has to be dismounted before installing to the aircraft and all seals have to be replaced. This will bring calendar time TBO back to zero.
- 9.5** Long-term storage could require additional preservation. All standard anti-corrosive preservation oils may be used if they do not affect the seals. Only metal parts have to be protected. The wood-composite blades need no special protection but mechanical damage has to be avoided, so that no moisture may enter the wooden blade core.

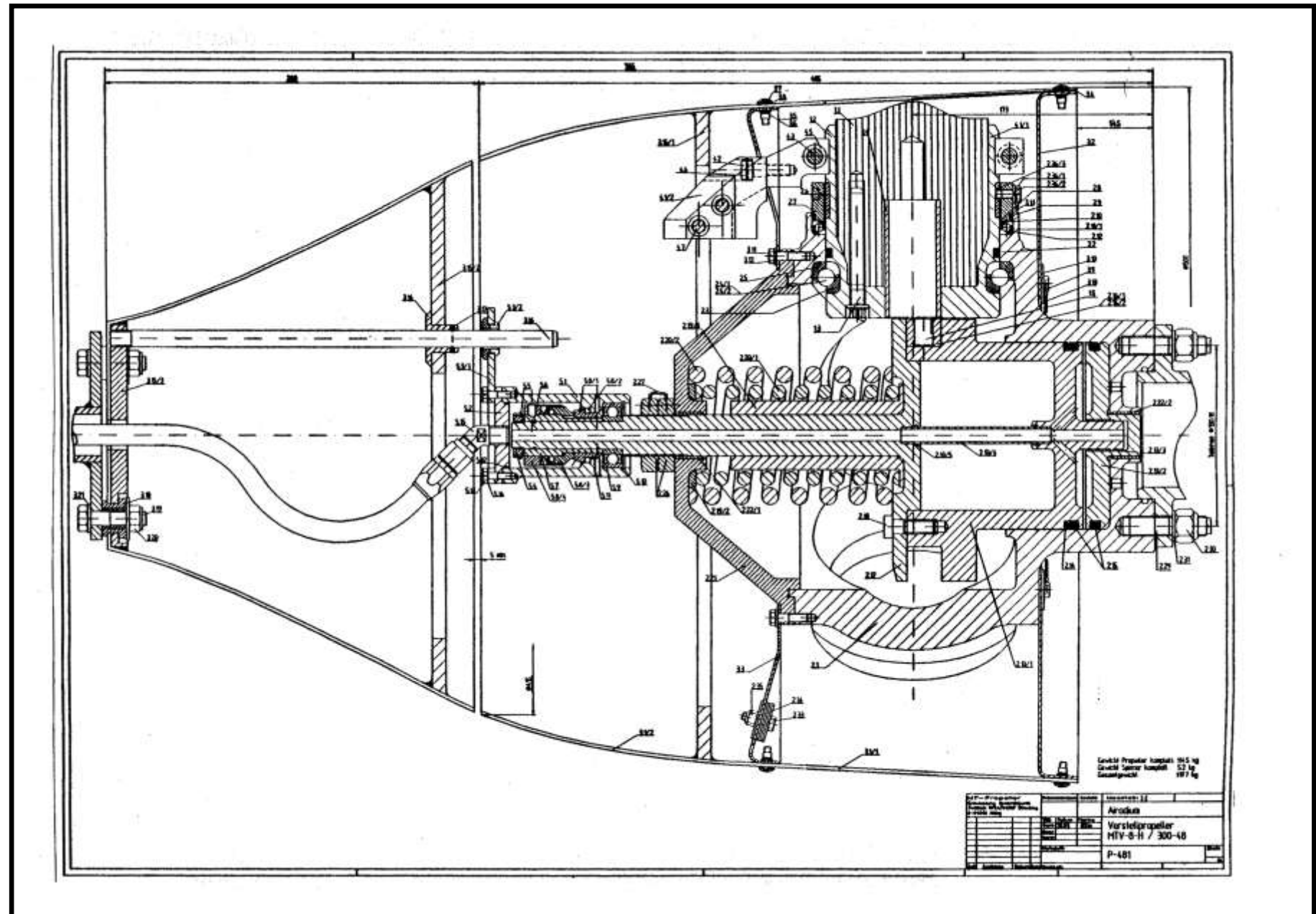
- 9.6** If the propeller is stored or transported in corrosive environment such as salt water or fog, it is recommendable to cover the visible outside surfaces of the metal parts with a thin film of light engine oil.

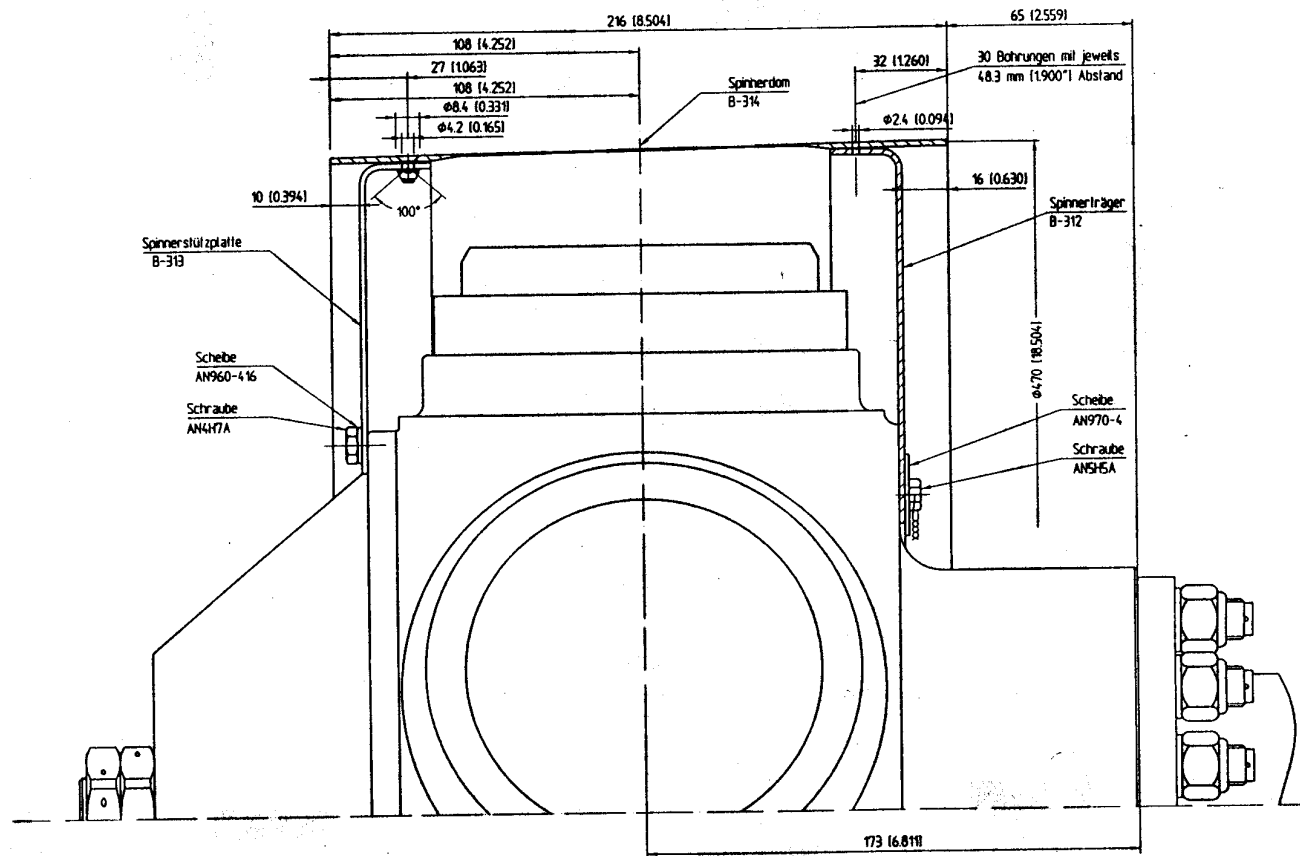
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10.0 SPECIAL TOOLS

No special tools are needed to service these propellers.







MTV-Propeller Entwicklung GmbH & Co. KG Postfach 0750/94307 Straubing D-94348 Aying		Flächenmaß: mm	Gewicht:	Messstab: [1]	Prüfung: [1]
		± 0,2 mm		MTV-8-H	
		Datum	Name	Spinner komplett Ø470	
		Bohr:	Edm		
		Gep:		P-558	
		Werkst:			
		Repl:			
		Repl:			

