



mt-propeller

ATA 61-09-03

E-1903

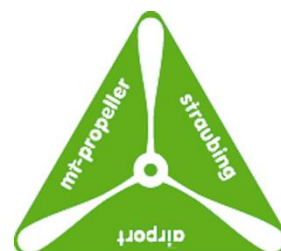
OPERATION AND INSTALLATION MANUAL

HYDRAULICALLY CONTROLLED
VARIABLE PITCH PROPELLER
(CONSTANT SPEED AND FEATHERING PROPELLER)
for
ALLISON V-1710 - () and V-1650- ()

MTV-4-1-T/50-C-F

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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.

Any grease beyond allowable limitations as mentioned in chapters 6, 8 and 9 as well as unusual vibration or unusual operations 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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**LIST OF REVISIONS**

Rev. No.	Date of Issue	Pages	Remark
1	2010-05-13	Initial Revision	- - - - -
2	2010-07-12	4, 5, 9, 10, 11, 15, 16, 18, 25, 36, 39, 44, 45, 46;	Installation Instructions and minor rework;
3	2010-10-26	4, 5, 15, 18, 36, 37, 39, 44, 45, 46;	Tools / Drawings, Prop Drawing and Spare Parts
4	2017-01-17	2, 4, 5, 5-1, 6-1, 7, 7-1, 25, 29, 35;	Overhaul Repair; Eventual Grease Leakages;
5	2019-02-26	4, 5, 21;	Remedy to possible damages along Erosion Sheath
6	2021-06-10	4, 5, 17;	Editorial Changes, Test/check flight adjusted
7	2022-03-22	4, 5, 8, 9, 36, 44, 45;	Blade Type corrected Drawing P-1158-() updated Typo corrected
8	2022-10-05	4, 5, 7, 7-1;	Bird Strike
9	2022-11-18	4, 5, 7, 8;	Correction Model Designation; Update Bird Strike
10	2024-05-15	4, 5, 15, 17, 18-1, 29, 35, 36;	Permatex No. 2 changed to CM13 as Loctite 242 is also permitted. Grease Leakage chapters revised.



LIST OF EFFECTIVE PAGES

Page	Date		Page	Date
			24	2010-05-13
2	2017-01-17		25	2017-01-17
3	2010-05-13		26	2010-05-13
4	2024-05-15		27	2010-05-13
5	2024-05-15		28	2010-05-13
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8	2022-11-18		34	2010-05-13
9	2022-03-22		35	2024-05-15
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MT-Propeller Airworthiness Information

Every owner should stay in close contact with his MT-Propeller dealer or distributor and Authorized MT-Propeller Service Shop to obtain the latest information pertaining his propeller and its installation.

MT-Propeller takes a continuing interest in having the owner get the most efficient use of his propeller and keeping it in the best mechanical condition.

Consequently, MT-Propeller from time to time Revisions Service Bulletins, Service Letters and Manuals relating to the propeller and its installation.

Service Bulletins are of special importance and should be complied with promptly.

These are sent to dealers, distributors and latest registered owners. Service Letters deal with products improvements and service hints pertaining to the propeller and its installation. Occasionally they also are sent in case of need to latest registered owners.

If an owner is not having his propeller serviced by an Authorized MT-Propeller Service Shop or MT-Propeller USA or MT-Propeller Germany, he periodically should check with a MT-Propeller dealer or distributor (see MT-Propeller's homepage to find out the latest information) to keep his propeller up to date.

The list of valid MT-Propeller Manuals, Service Bulletins, AD's and their latest revisions can be downloaded from the MT-Propeller homepage (www.mt-propeller.com).

Hardcopies can also be obtained from MT-Propeller Germany and MT-Propeller USA.

If any changes to the ICA have been made, the list of revisions in chapter 13 will be revised.



1. GENERAL

1.1 STATEMENT OF PURPOSE

This publication provides operation, installation and line maintenance information for the MT hydraulically variable pitch propeller with single acting system and reverse.

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 airplane manufacturer's manuals should be used in addition to this information.

1.2 ADDITIONAL AVAILABLE PUBLICATIONS

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

- OVERHAUL MANUAL ATA-61-19-04 (E-1904)
- Service Bulletin No. 1() latest Revision

Consult the manufacturers' manuals for the propeller governor (see Vendor Publications).

For MT-Propeller service literature contact

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1.3 VENDOR PUBLICATIONS

1.3.1 Propeller Governor Manual for MT-Propellers No. E-1048

1.3.2 Unfeathering Pump WELDON PUMPS



1.3.3 Abbreviations

TBO	Time Between Overhaul
TT	Total Time
TSO	Time Since Overhaul
RPM	Revolutions per Minute
SAE	Society of Automotive Engineers
UNF	Unified National Fine Thread Series
TCDS	Type Certificate Data Sheet
PU	Polyurethane
MAP	Manifold Pressure
AFM	Airplane Flight Manual
IPS	Inch per Second
FAA	Federal Aviation Administration
ICA	Instruction for Continued Airworthiness
TSN	Time Since New
STC	Supplement Type Certificate

NOTE: **TSN/TSO IS CONSIDERED AS THE TIME ACCUMULATED BETWEEN AIRCRAFT LIFT OFF AND AIRCRAFT TOUCHDOWN, I.E. FLIGHT TIME.**

1.3.4 Terms and Definitions:

Blade Angle	Measurement of blade airfoil location described by propeller rotation
Constant Speed	A propeller system which employs a governing device to maintain a selected engine RPM
Crack	Irregularly shaped separation within a material, sometimes visible as a narrow opening at the surface
Delamination	Internal separation of layers of a composite material
Erosion	Gradual wearing away or deterioration due to action of the elements
Feathering	A propeller with blades that may be positioned parallel to the relative wind, thus reducing aerodynamic drag
Overhaul	The periodic disassembly, inspection, repair, refinish and reassembly of a propeller assembly to maintain airworthiness
Overspeed	Condition in which the RPM of the propeller or engine exceeds predetermined maximum limits; the condition in which the engine or propeller RPM is higher than the RPM selected by the pilot through the propeller control lever
Pitch	Same as "Blade Angle"
Windmilling	The rotation of an aircraft propeller caused by air flowing through it while the engine is not producing power.



1.4 DEFINITION OF COMPONENT LIFE AND SERVICE

1.4.1 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.

Attention:

A blade damage by a ground strike with a rotating propeller requires an overhaul only if the blade damage is beyond the limitation of an in-field repair according to SL-32. In case of FOD (rocks, etc.) exceeding the limit of the SL-32, the blade can be replaced or repaired with an engineering order or only the damaged blade can be overhauled. If vibration occurs after blade replacement that cannot be corrected by dynamic balancing, the propeller must be removed and sent to an approved MT service station for further investigation.

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. ATA 61-19-04 (E-1904). The overhaul interval for the propellers is shown in Service Bulletin No. 1() latest Revision.

1.4.2 Repair

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

1.4.2.1 A repair does not include an overhaul.

1.4.2.2 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 always requires an overhaul.

Attention:

In case of foreign object damage (FOD) or a ground strike with a non-rotating propeller only a blade repair in accordance with SL-32 or a blade exchange is required.

A blade damage by a foreign object (FOD) or a ground strike with a rotating propeller requires an overhaul only if the blade damage is beyond the limitation of an in-field repair according to SL-32.

- a) Perform a thorough visual and coin tap inspection of the exposed portion (de-ice boot removal is not required) of each blade including the steel / nickel erosion protection sheath.
- b) If the blade damage is beyond airworthy limits, repair the blade before further flight in accordance with SL-32.
- c) If the blade damage is beyond major repair limits, return the blade to the factory for evaluation or retire the blade.



1.4.2.3 Bird Strike

A bird strike requires a detailed inspection for the damages on the propeller especially the blades. Special attention should be given to any delamination or loose parts along the blade or the blade metal leading edge and as applicable the de-icing system. If no visible damage can be found, just the cleaning of the prop and an entry into the prop log book is sufficient with an additional email of the event to Techsupport@mt-propeller.com.

Information is needed about the flight condition, power setting, and if available, the type and size of the bird.

1.5 COMPONENT LIFE

Component life is expressed in terms of total hours of service (TSN, Time Since New) 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. ATA 61-16-04 (E-1904).

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



2. MODEL DESIGNATION

2.1 HUB DESIGNATION

Hub										Blade										
MT	V	-	4	-	()	-	T/50	-	C	-	F	-	()	/	()	()	335	-	141	()
1	2		3		4		5		6		7		8		1	2	3		4	5

- 1:** MT-Propeller (Manufacturer)
- 2:** Variable Pitch Propeller
- 3:** Identification of propeller type
- 4:** Identification of variant of the propeller type
- 5:** Letter / Number Code for Propeller Flange and / or Spline Shaft:
 - T/50 = SAE No.50 Spline Shaft
- 6:** Letter Code for Counterweights
 - blank = non or small counterweights for pitch change forces to decrease pitch
 - C = counterweights for pitch change forces to increase pitch.
- 7:** Letter Code for Feathering Provisions
 - blank = no feather position
 - F = feather position allowed
- 8:** Letter Code for Hub Design Changes
 - Small letter for changes which do not affect interchangeability
 - Capital letter for changes which affect interchangeability



2.2 BLADE DESIGNATION

() () 335 - 141 ()
1 2 3 4 5

1: Letter code for position of pitch change pin

- Blank = pin position for pitch change forces to decrease pitch
- C = pin position for pitch change forces to increase pitch
- CF = pin position to allow feather; pitch change forces to increase pitch
- CR = pin position to allow reverse; pitch change forces to increase pitch
- CFR = pin position to allow feather and reverse; pitch change forces to increase pitch

2: Direction of Rotation

- Blank = right-hand tractor
- RD = right-hand pusher
- L = left-hand tractor
- LD = left-hand pusher

3: Propeller Diameter in cm

4: Identification of Blade Design

5: Letter code for blade design changes:

Small letter for changes which do not affect interchangeability of blade set
Capital letter for changes which affect interchangeability of blade set

2.3 The complete propeller designation is a combination of both designations, for instance MTV-4-1-T/50-C-F(L)335-141. The hub serial number starts with the year of manufacture. All records of the propeller are registered in respect to this number.

2.4 The propeller for a certain aircraft-engine combination is always defined according to the hub-, blade- and spinner combination. For the actual blade settings, depending on the aircraft model, the propeller-logbook or the "Gerätelaufkarte" must be considered.

3. PERFORMANCE DATA

For the general performance data refer to the applicable propeller TCDS.
For operation refer to your Propeller-Logbook.



4. DESIGN- AND OPERATION INFORMATION

The variable pitch propeller system consists of the following main groups:

- Hub with Blade Retention
- Pitch Change Mechanism
- Blades
- Counterweights
- Spinner
- Propeller Governor
- Unfeathering Pump

4.1 HUB

The one-piece hub is made from forgings or billets of aluminum alloy with the outer surface shot-peened 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 big bearing race is a one-piece part and pressed into the hub, while the opposite race is split and installed on the blade ferrule. A second ball bearing set is used in the blade preload system, adjusted by a blade retention nut, which preloads the blade.

The aluminum hub is bolted to a steel spacer flange which matches the SAE No. 50 or any other spline shaft of the engine. The spacer flange must be installed onto the hub before the entire propeller is installed on the engine.

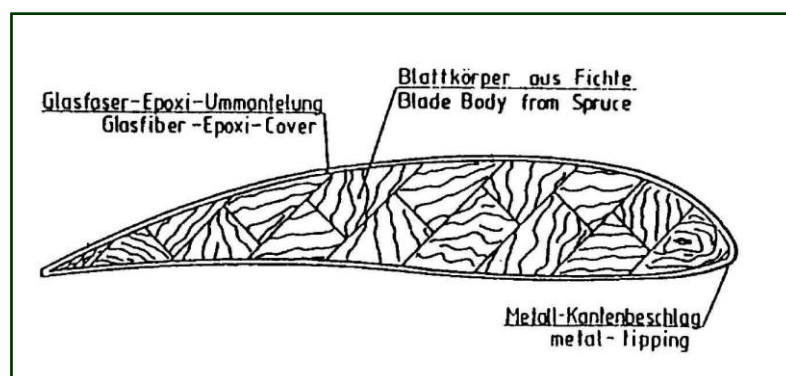
4.2 PITCH CHANGE MECHANISM

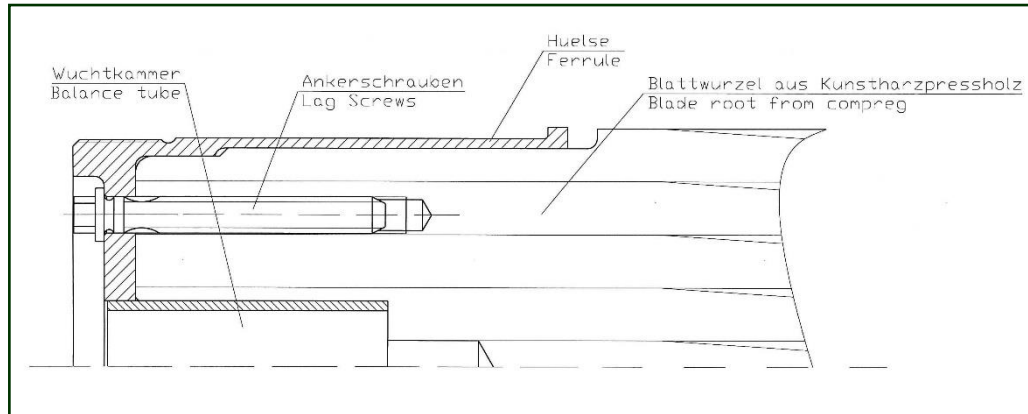
The pitch change mechanism of the blades is single acting, oil pressure to decrease pitch and actuated by a pin in the hub ferrule. A plastic block connects the blade with the piston extension and the axial movement of the servo piston turns the blades. A return spring is installed on the cylinder, enabling feathering.

The hydraulic pitch change mechanism contains a piston. In the normal operating range the pitch change piston moves between full feathering stop and the low pitch stop. In case of loss of servo pressure, the propeller will automatically feather. A centrifugal latch is installed to prevent feathering at normal engine shut-down (pitch lock at high pitch).

4.3 BLADES

The composite blades have steel blade ferrules and are screwed into the hub ferrules, allowing them to be installed and removed in the field. Clamp forces of the counterweights and pins hold the blades in position.





- 4.3.1 Propeller models with blades made from natural composite, using high compressed wood in the root and lightweight wood in the remaining body. Epoxy fiberglass / carbon fiber covers the entire blade surface and is painted with acryl lacquer. The outer portion is protected against erosion by a bonded on nickel erosion sheath. The nickel erosion sheath is approximately 27,5 inch (70 cm) long. 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.

4.4 COUNTERWEIGHTS

The single acting propeller with feathering has counterweights installed on the blade root. The counterweights are of two parts. One is the base and one is the weight. The base acts like a clamp to hold the blade in position.

4.5 SPINNER

The spinner dome is a one-piece part made from fiber reinforced composite (Glass / Aramid). The rear bulkhead is spin-formed or truncated aluminum alloy and mounted to the hub. It will also carry the balance weights for static and dynamic balancing.

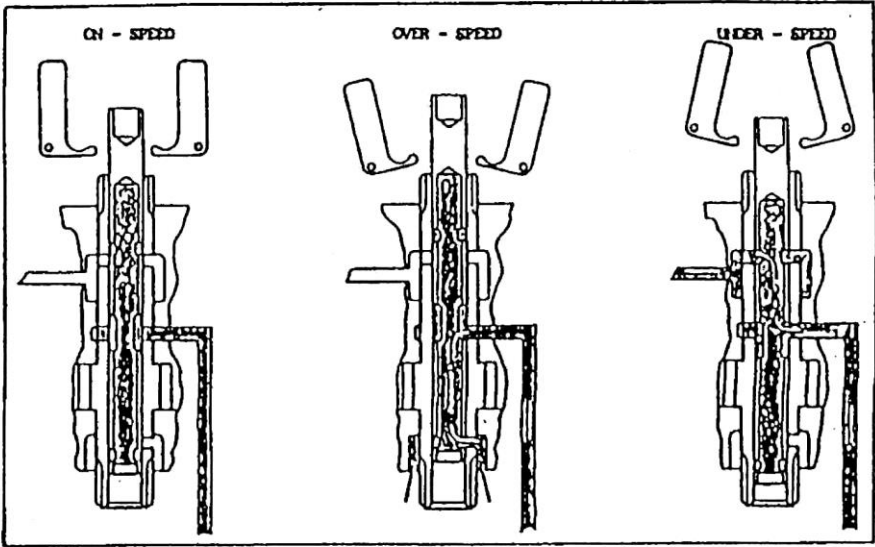
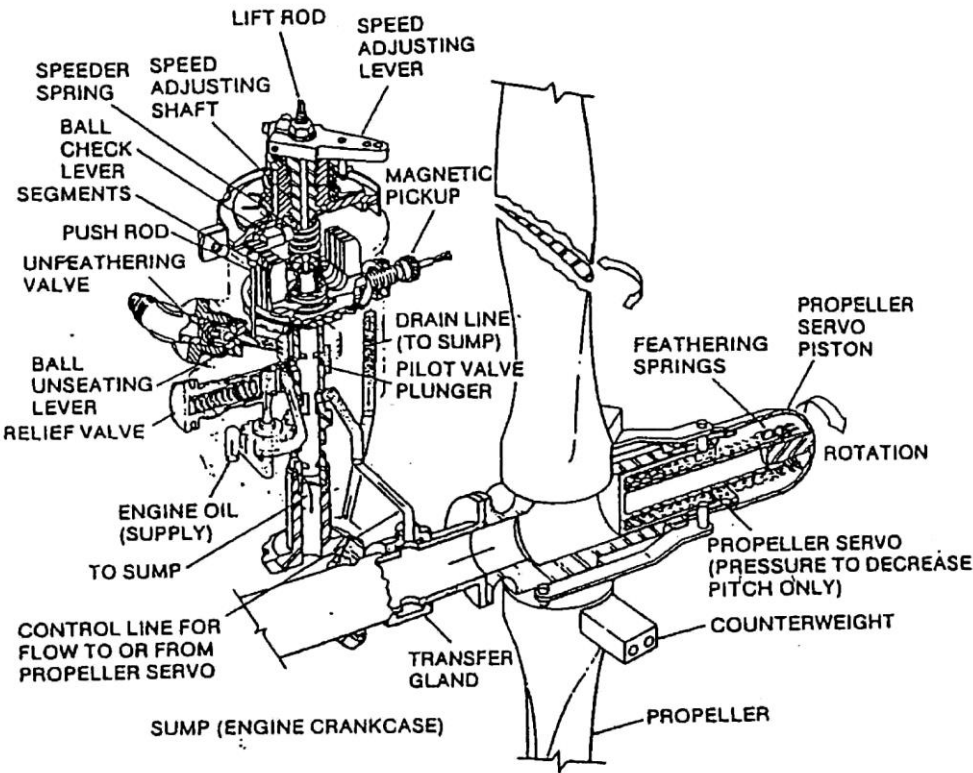
The front support is bonded into the dome. Filler plates increase the stiffness of the dome on the cutouts for the blades. The dome is mounted on the bulkhead by means of screws.

4.6 PROPELLER GOVERNOR

A single acting constant speed propeller governor is provided with oil pressure to decrease pitch and a lift rod for feathering position. It also contains a fitting which includes a check valve for the unfeathering pump.



Propeller Governor



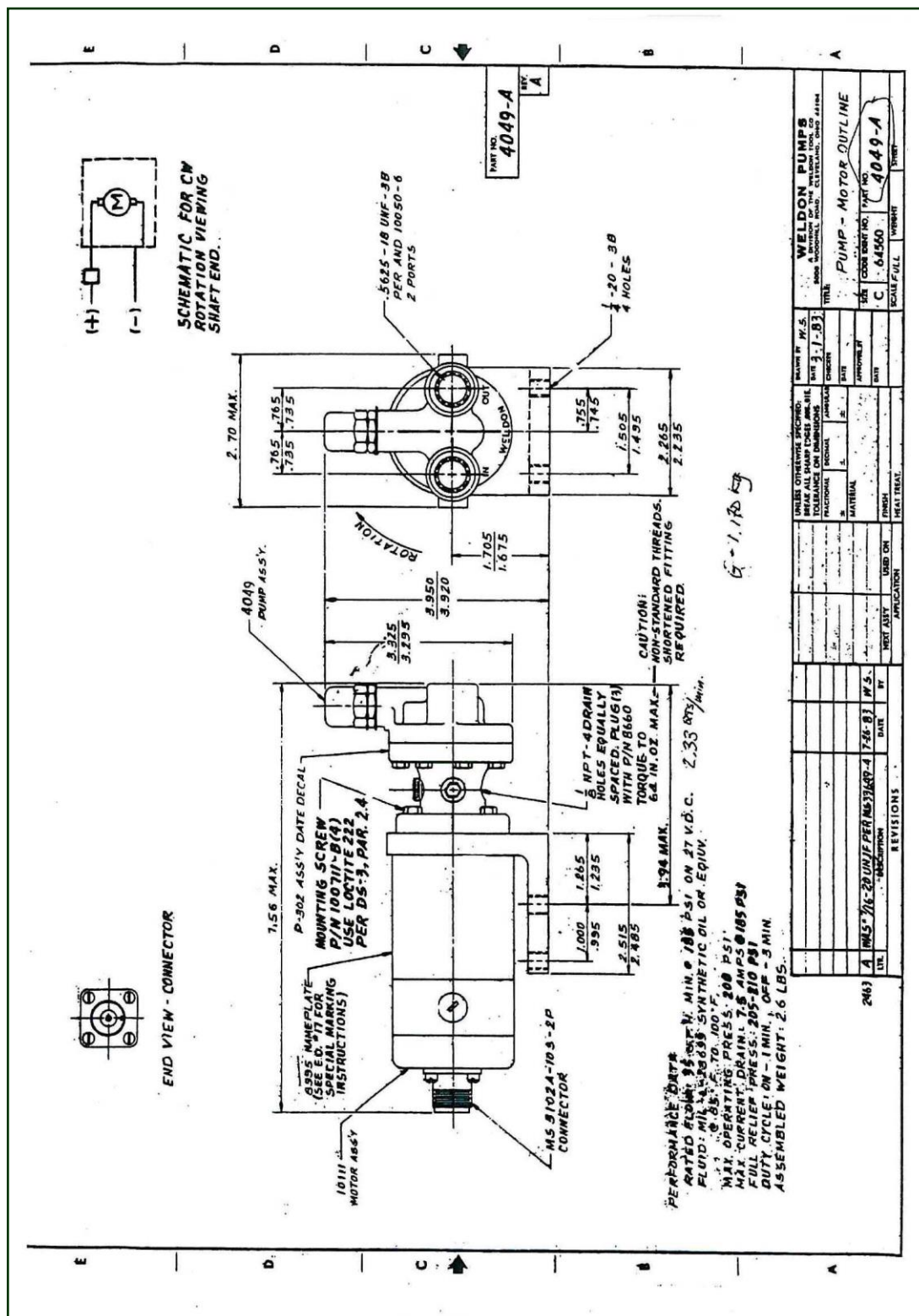
Governor Oil Pressure to Decrease Pitch, Twin Engine



4.7 UNFEATHERING PUMP

In order to simplify starting the engine after shut down with feathering, an electrical unfeathering pump is provided.

- Duty Cycle is 1 Minute on 3 Minutes off.
- Power draw is 7 Amps at 24 VDC.





5. ASSEMBLY INSTRUCTION FOR REMOVABLE BLADES

Work Routine:

1. Blade Removal:
Remove the spinner dome and filler plates.
Remove the index pins from the counterweights with the puller tool T-710-1.
Loosen the stop nuts of the clamp bolts for the counterweights and turn the blades out (right hand threads).
2. Blade Installation:
Lubricate the thread of the blade ferrule with engine oil
Turn the blade totally into the hub until it bottoms out and turn it back to the right position as marked.
The mark on the blade shank must be in line with the mark on the blade ferrule and the counterweights.
Install the index pins through the counterweights and the ferrules.
Tighten the stop nuts of the 5/8 – 18 clamp bolts of the counterweights and torque (lubricated) with 111 to 122 ftlbs (150 to 165 Nm)



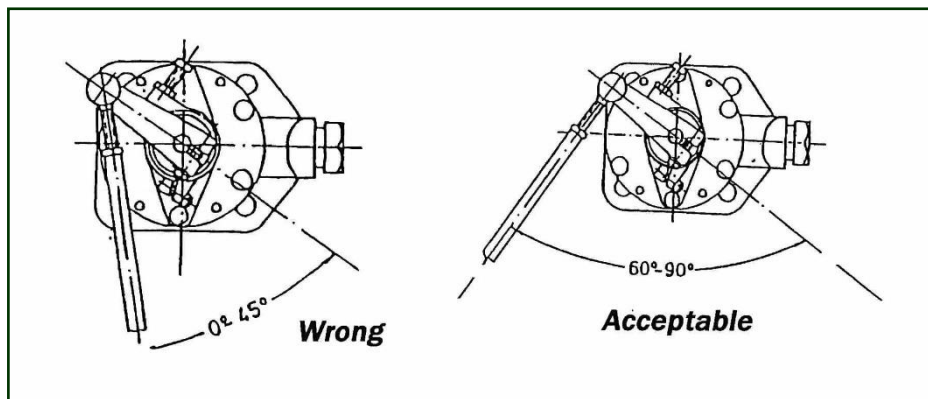
6. INSTALLATION INSTRUCTION

Warning: Never put the propeller on the flange bolts for storage as the flange bolts are pressed into the hub from inside, if the splined spacer flange is removed. If propeller is stored on the flange bolts same might be pushed into the hub.

- 6.1** Propellers of this design are only suitable for installation with a spacer flange on SAE No. 50 engine shafts. The code for the spline type and size can be seen from the model designation (see Chapter 2).
- 6.2** The described propeller is usually installed on the engine with the spacer flange installed. The blades may or may not be installed. However, for torquing the shaft nut it is preferable to have at least one blade installed in the hub and with the blades in low pitch position. In case the spacer flange was not installed do it now and torque the 9/16" - 18 stop nuts (lubricated) 89 to 96 ftlbs (120 to 130 Nm). Install the spinner bulkhead and distance ring. Torque the 5/16-24 screws 15 to 16 ftlbs (20 to 22 Nm) and safety wire in pairs.
- 6.3** Clean propeller and engine shaft with solvent or gasoline. Both surfaces must be dry and clean. Remove all surface defects. The length of the SAE No. 50 spline shaft from the gear box must be approximately 8.812 inch (223.8 mm).
- 6.3.1** Remove the plug in the engine shaft which secures the oil transfer tube or make sure, that the oil transfer tube is correctly installed.
- 6.4** Install rear cone on the engine shaft. Slightly lubricate the engine shaft with engine oil but not the cone. Apply a thin coat of anti-seize compound on the shaft threads.
- 6.5** Slide the propeller with the spacer flange onto the engine shaft with the blades preferable in low pitch position. Make sure that the index spline is in line with the propeller splines. Be careful not to damage the thread on the engine shaft.
- 6.6** Use the propeller shaft nut wrench tool T-683-1 and turn the shaft nut tight. Use a 5 ft (1.5 m) bar and torque the shaft nut with 1000 ftlbs (1356 Nm). Make sure, that a slot in the nut aligns with a hole in the shaft for the safety pin. Apply more torque in order to align this. Do not loosen the nut for alignment.
- 6.7** Install the copper seal and the inner piston guide with the tool T-683-2 into the engine shaft. Make sure that the O-Ring, which seals the engine oil is installed. Torque the inner piston guide with 200 to 220 ftlbs (270 to 300 Nm). Make sure that a slot aligns with the hole in the engine shaft for the safety pin with positive torque only. Install safety pin with the spring wire on the left over the nut through the engine shaft into the inner piston guide.
- 6.8** Install piston extension on the pitch change fork. Coat 7/16-20 screws with **CM13 (see E-9000 List of Consumables)** and torque with 33 to 35 ftlbs (45 to 47 Nm). Turn the blades by hand into feathering position. Be careful by twisting the blades and do not use heavy force or tools. Install the two O-Rings on the piston extension and the high pitch stop assembly.
- 6.9** Install the feathering spring assembly with the O-ring into the inner piston guide. Install the piston with O-rings, back-up ring and guide ring on the piston extension. Apply engine oil on the O-rings and lubricate the surface of the inner piston guide. Coat 7/16-20 screws with **CM13 (see E-9000 List of Consumables)** and torque with 33 to 35 ftlbs (45 to 47 Nm).
- 6.10** Lubricate the inner surface of the cylinder with engine oil and install the cylinder over the piston onto the hub. Torque the 5/16-24 screws 15 to 16 ftlbs (20 to 22 Nm). Install washer and check nut on the guide rod of the feathering spring assy and torque with 64 to 74 ftlbs (90 to 100 Nm). Safety wire the nut via the slot on the guide rod.



- 6.11** If the blades are not finally installed and clamped in the hub by the counterweights, turn blades into the hub until they bottom out and turn them back out until they align with the pin hole. Install the index pin with a plastic hammer through counterweight, hub ferrule and blade ferrule. Torque the stop nuts of the clamp screws on the counterweights (lubricated) with 111 to 122 ftlbs (150 to 165 Nm). Turn the blades by hand (two hands on two opposite blades) from feathering into high pitch position until you hear the high pitch stop engage or unfeather with the pump.
- 6.12** Check track of the blades approximately 8 inch inboard from the tip with the blades in high pitch position at the trailing edge. Max. perm. is ¼ inch (6 mm).
- 6.13** Install filler plates on the rear bulkhead. Do not torque the spinner screws. Lubricate the O-Ring in the front bulkhead. Install spinner dome over the cylinder onto the rear bulkhead and filler plates. Observe mating marks. Torque screws with plastic washers 34 to 44 inlbs (4 to 5 Nm). Check run out of the dome. Max. 0,080 inch (2,00 mm) permissible.
- 6.14** A governor with suitable oil pressure direction has to be installed on the engine, the control lever being mounted as shown below.



- 6.15** Carry out a Functional Check / Propeller Check:

Warning:

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. Observe the Airplane Flight Manual!

6.16 ADJUSTING

Mechanical stops in the propeller hub for low pitch and feathering are adjusted during manufacturing, according to the requirements of the aircraft/engine combination. Low pitch can only be adjusted via the thickness of the distance ring behind the pitch change fork. Feathering can only be adjusted by trimming the nose lip of the piston. Stop screws and a lift rod are adjustable on the governor according to 4.6.



6.17 After the ground runs, check for oil leaks, blade shake.

6.18 Perform check flight in accordance with the description in the Aircraft Flight Manual. In case no instructions from the flight manual are available, carry out general handling check during the next flight.

6.19 OPERATION

Propeller and governor are selected as a result of tests.

The governor must allow constant speed as well as feathering.

All power and rpm settings must be performed as required in the Aircraft Flight Manual.

In case of failure of oil pressure, the propeller automatically goes into feathering.

REMARK:

MOVE POWER LEVER AND RPM LEVER ALWAYS SLOWLY TO AVOID OVERSPEED. THE LIGHTWEIGHT BLADES RESULT IN FASTER REACTION OF RPM AND POWER CHANGES THAN PROPELLERS WITH METAL BLADES.

6.20 PRE-FLIGHT CHECK

Before take-off, check the propeller pitch change according to the Aircraft Flight Manual.

If it is recommended to change pitch three times to remove air from the system before the first flight and one time before every following flight.

6.21 IN FLIGHT

Set power and rpm according to the Aircraft Flight Manual for climb, cruise, decent (approach).

6.22 FEATHERING

These propellers have feathering which must be reached under every flight condition, once the propeller governor is moved into feather position.

6.23 UNFEATHERING MODUS

This propeller system comes with an electrical unfeathering pump. The pump capacity is about 2 qts/min and it will take about 2 minutes to unfeather.

Duty circle is 1 Minute on, 3 Minutes off.

If the pump is not working, the propeller can also be unfeathered with the engine starter, if the engine operation permits it.

6.24 GREASE LEAKAGE

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 DOES NOT MEAN THAT IT WILL BE A CONTINUING GREASE LEAKAGE.

Condition	Resolution
Minor film of grease (sweating), but not present on Blades, Hub, etc.	Normal operation, monitor only. Clean with mild solvent as required.
Grease Leakage spraying 18 cm (7 inches) or less from blade root (when first detected).	First occurrence, clean blade(s), hub and spinner with mild solvent as required and monitor for 5 flight hours.
Grease Leakage spraying 18 cm (7 inches) or less from blade root when continuing past initial 5 hours of monitoring.	Clean blade(s), hub and spinner with mild solvent as required and monitor for an additional 20 flight hours.
Grease Leakage spraying 18 cm (7 inches) or less from blade root when continuing past additional 20 hours of monitoring.	Within 5 flight hours, remove prop and send to authorized shop.
Grease Leakage spraying greater than 18 cm (7 inches) from the blade root when first detected.	Take photos and send to MT Techsupport for instructions to proceed. 5 flight hours are allowed after initial detection of grease leakages beyond 18 cm (7 inches) from the blade root.

IN CASE OF DOUBT, CONTACT MANUFACTURER / MT TECHSUPPORT FOR FURTHER ACTION!



7. REMOVAL INSTRUCTION

Warning:

The propeller must be in feathering position before starting the removal process. High spring forces of the feathering spring can result in parts damage or personal injury.

- 7.1 Normal engine shut down will put the propeller on the high pitch stop. There is no means to release this stop except rotating the propeller above 700 rpm.
- 7.2 Therefore feather the propeller on the aircraft before engine shut down.
- 7.3 Start the removal process by reversing the installation procedure from 6.13 down to 6.4.
- 7.4 If, for any reason, the propeller cannot be feathered with the engine rotational, the puller tool T-375-9 must be used, once the check nut of the feathering spring assy is removed and the cylinder is also removed.
- 7.5 Install puller tool T-375-9 on the feathering spring assy and compress the piston against the feathering spring approximately 2 windings of the nut. Remove the socket head cap screws from the piston, release the piston from the spring forces of the feathering springs.
- 7.6 Continue the removal of the other parts until you have access to the propeller nut.



8. INSPECTIONS

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 DOES NOT MEAN THAT IT WILL BE A CONTINUING GREASE LEAKAGE.

Condition	Resolution
Minor film of grease (sweating), but not present on Blades, Hub, etc.	Normal operation, monitor only. Clean with mild solvent as required.
Grease Leakage spraying 18 cm (7 inches) or less from blade root (when first detected).	First occurrence, clean blade(s), hub and spinner with mild solvent as required and monitor for 5 flight hours.
Grease Leakage spraying 18 cm (7 inches) or less from blade root when continuing past initial 5 hours of monitoring.	Clean blade(s), hub and spinner with mild solvent as required and monitor for an additional 20 flight hours.
Grease Leakage spraying 18 cm (7 inches) or less from blade root when continuing past additional 20 hours of monitoring.	Within 5 flight hours, remove prop and send to authorized shop.
Grease Leakage spraying greater than 18 cm (7 inches) from the blade root when first detected.	Take photos and send to MT Techsupport for instructions to proceed. 5 flight hours are allowed after initial detection of grease leakages beyond 18 cm (7 inches) from the blade root.

In case of doubt, contact manufacturer / MT Techsupport for further action!

8.1 DAILY INSPECTION (CAN BE CONDUCTED BY THE PILOT)

Before each flight inspect the condition of the blades and spinner. Blade shake is allowed up to 1/8 inch (3mm) and a blade angle play of 2° is acceptable.

No critical cracks in the blades or spinner. Metal erosion sheath must not be loose or debonded. PU-strip proper and existing. If not, replace within the next 2 hours after last inspection. No oil leaks.



8.2 INSPECTIONS

- According to Aircraft Maintenance Manual or
- 100 flight hours, if no maintenance schedule available

- 8.2.1 Remove spinner dome and check hub for cracks. Check blade shake, max. 1/8 inch (3 mm). 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 of feather spring for tightness. Check all safety means to be intact. Check rear spinner plate for cracks and fixing. Inspect blade root and hub for oil and grease leaks. Check position of blades and counterweights by the slipping mark. Inspect natural composite blades as shown in Chapter 7.4.

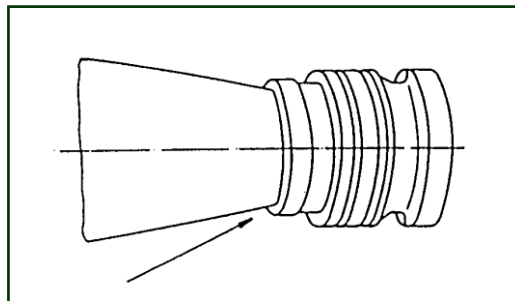
8.3 COMPOSITE BLADES (WOOD)

Check natural composite blades for cracks in the composite cover and blade erosion sheath. There are only certain cracks allowed. See also Service Letter No. 32 "Field Repairs Limits".

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 (debonded). Cracks in the painted surface are allowed as long as no moisture can enter the load carrying body. Blisters or delaminations up to 1 square inch (6,45 cm²) are permissible. In case of questionable conditions please contact the service department of MT-Propeller.

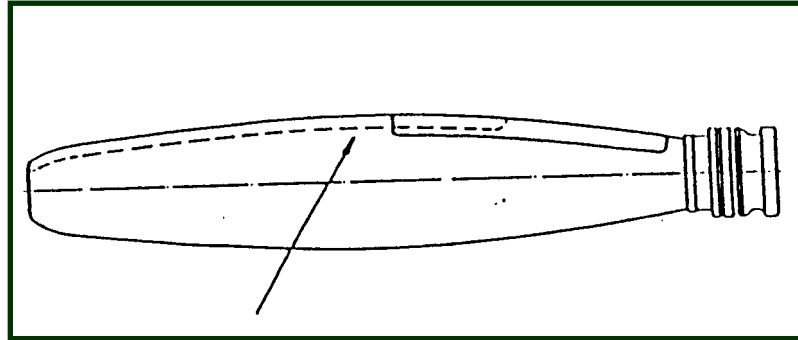
8.4 ILLUSTRATIONS OF POSSIBLE CRACKS IN THE BLADE:

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

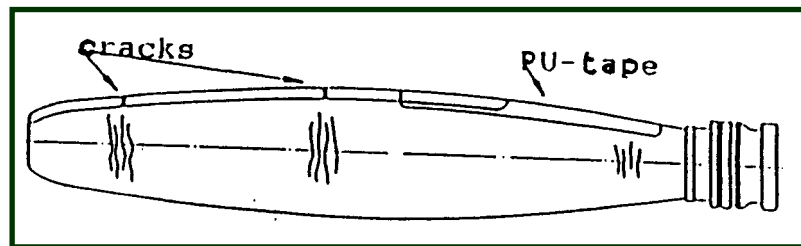




- 8.4.1 Perform visual inspection in case of notches, dents, nicks or other damages to the blade body (for example stone nicks). If no cracks exist, fill void with an appropriate Epoxy resin (5 min. Epoxy). The aerodynamic of the airfoil must not be destroyed. Afterwards sand the filled spot with sandpaper. 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.



- 8.4.2 Possible cracks along the metal erosion sheath. If there is an indication that the erosion sheath gets loose on the transition area to the blade, inspect it according to item 7.4.2.



- 8.4.3 Cracked erosion sheath requires immediate repair. If chordwise cracks appear, return propeller to manufacturer. Replace PU-tape as soon as possible (within max. 2 flight hours) if loose or damaged.



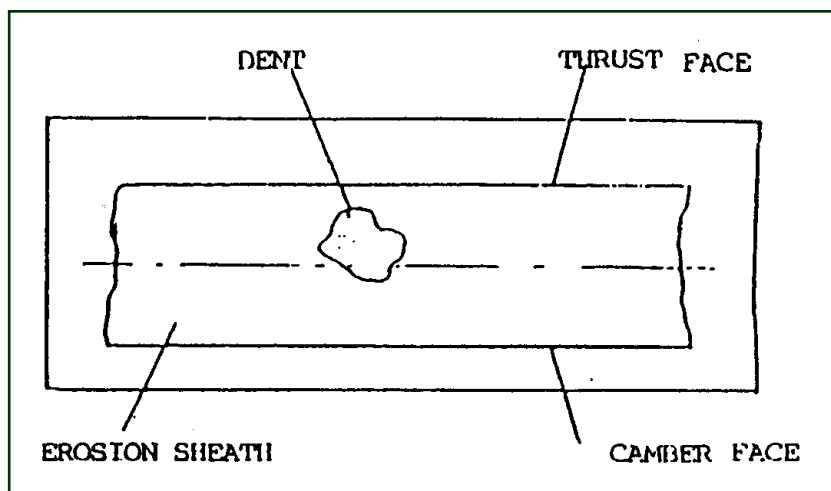
8.4.4 Possible Damage along Erosion Sheath

- a) Circular Dents (more than 0,24 inch x 0,24 inch / 6 mm x 6 mm)
Do not repair, change erosion sheath.
- b) Pointed Dents (more than 0,24 inch x 0,24 inch / 6 mm x 6 mm).
Do not repair, change erosion sheath.
- c) Cracks not allowed in the erosion sheath, otherwise change erosion sheath,
- d) Hollow and debonded spots (max. 0,39 square inch / 2,5 mm)
Not more than two spots are allowed within 5,5 inch / 140 mm of each other, otherwise blade must be repaired,
- e) Erosion,
- f) Lightning strike

8.4.5 In case of any impact of Circular Dents (according to item a) check whether it penetrates through the erosion sheath. If not, fill dent with Epoxy and grind off until there is a smooth surface.

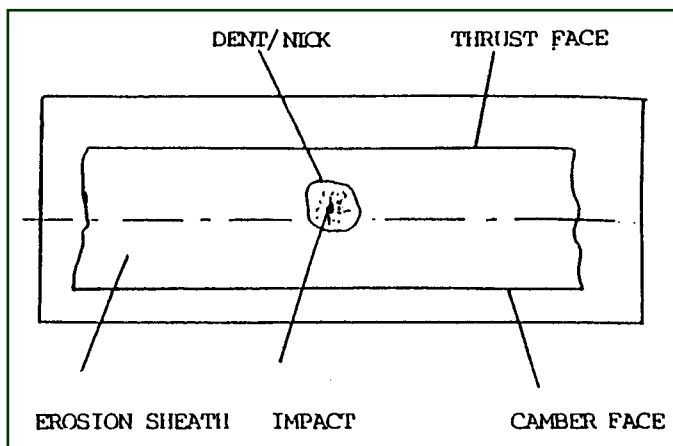
NOTE: EPOXY MAY BE APPLIED FOR COSMETIC REASONS BUT NOT "MUST BE DONE".

Check this area carefully for possible cracks whenever performing pre-flight inspection. Erosion sheath may remain until next repair/overhaul will be done.

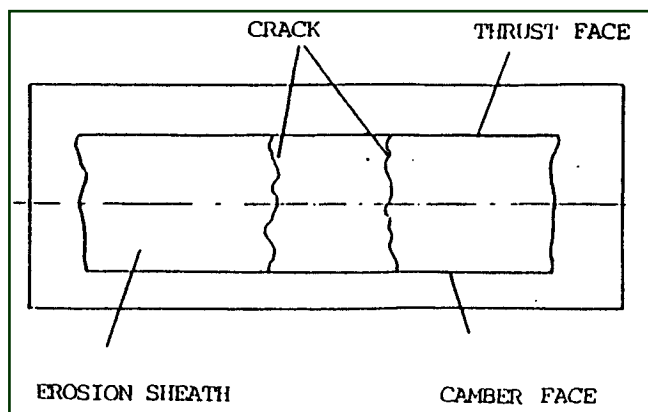




- 8.4.6 In case of impacts in the erosion sheath (as mentioned under item b) the sheath may possibly be penetrated. If not, proceed as described under item 6.3. If yes, check erosion sheath for possible cracks. If there are no cracks, the dent must be filled with Epoxy so that no moisture can enter into 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.

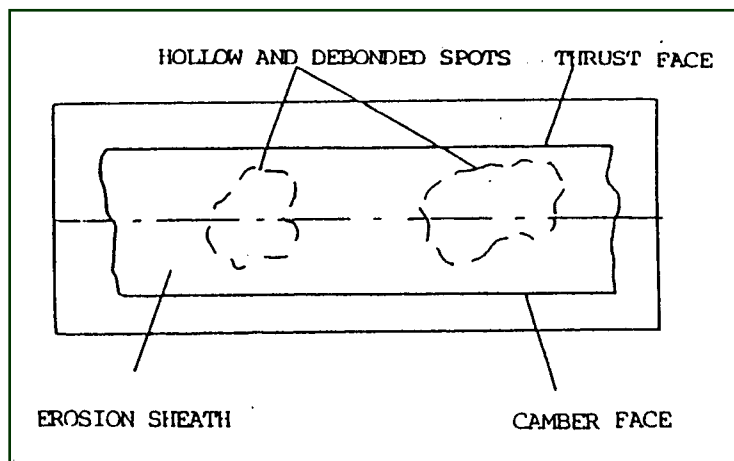


- 8.4.7 If there are any cracks (as mentioned under item c), the erosion sheath must be replaced as soon as possible. The propeller is to be returned to the manufacturer or to an authorized service station.

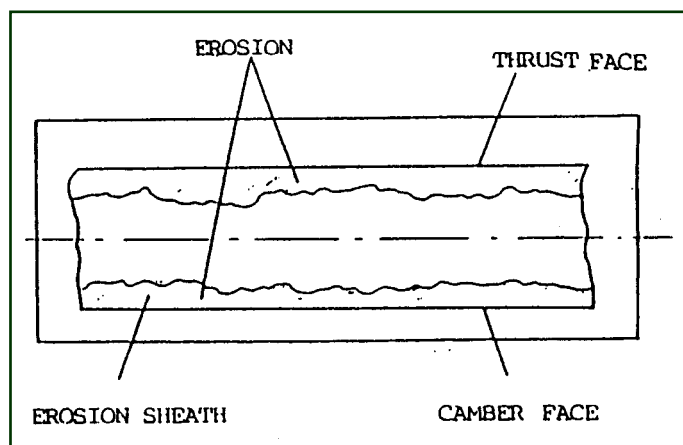




- 8.4.8 If any hollow and debonded spots exist (as mentioned under item d), mark them. Whenever performing pre-flight inspection, monitor whether there are further delamination and/or whether the already existing delamination becomes worse. The inspection can be executed by using an appropriate coin (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.



- 8.4.9 The erosion (as mentioned under item e) 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.



**8.4.10 Lightning Strike**

If a blade has an indication of lightning strike, check the entire blade and erosion sheath. Also send a report to the manufacturer.

8.4.11 Crunched Trailing Edges

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

8.4.12 Blisters and Delaminations

Visible blisters or delaminations shall be marked and checked 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.

8.4.13 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 immediately (max. 2 flight hours). This can be done by a qualified person.

8.4.14 Blade Root Shrinkage

In rare cases blade root shrinkage may occur. In such a case the composite layer may create some ripples which are only of cosmetic nature and those ripples will be corrected during next overhaul (OH) or at the onwers discretion.



8.5 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.

Special inspections are shown in the "Propeller – Logbook".
Consult MT-Propeller, if you have questions.

8.6 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 Revision. In any case, a calendar time 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 calendar time TBO can be max. 96 months. The extend of the overhaul and the replacement of life-limited parts is ruled in the applicable Overhaul Manual.

Attention:

In case of a blade damage by a foreign object an overhaul is always required in case that the blade damage is beyond the limitation of an in-field repair.

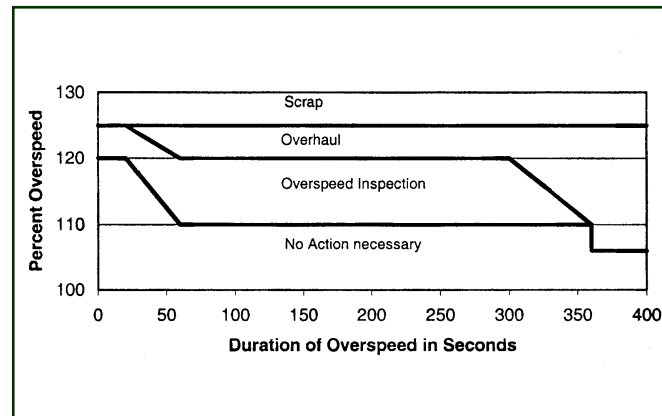
A non-rotating propeller FOD does not require an overhaul, it only needs a blade repair or a blade exchange.

A blade damage with a non-rotating propeller cannot damage the propeller hub and therefore does not require an overhaul.



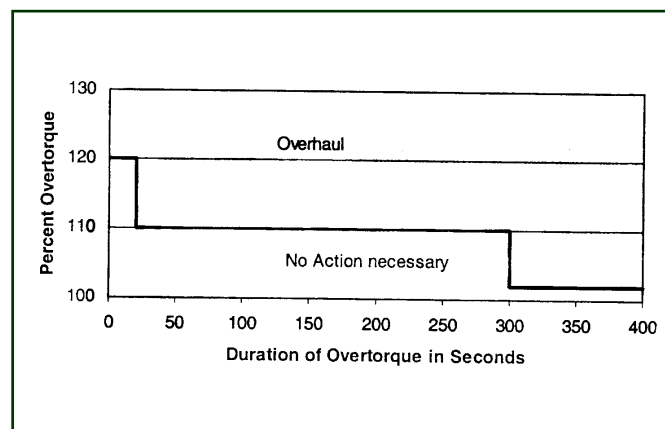
8.7 OVERSPEED

When a propeller is installed on an engine that has an overspeed event, refer to the Engine Overspeed Limits in order to determine the corrective action to be taken for the propeller.



8.8 OVERTORQUE

When a propeller installed on an engine that has an overtorque event, refer to the Engine Overtorque Limits in order to determine the corrective action to be taken for the propeller.





8.9 ACCESSORIES

For engine mounted accessories (for example, governors, pumps, and propeller control units), any overspeed at a severity level and /or duration sufficient to require at least a search inspection for the propeller, will require the accessory to be disassembled and inspected in accordance with the applicable maintenance manual(s).

Regardless of the degree of damage, make a log book entry to document the overspeed or overtorque event.

8.10 CORRECTIVE ACTION

The corrective action is based on the severity and the duration of an overspeed or overtorque for a single event.

8.11 NO ACTION NECESSARY:

Where no action is necessary, no maintenance is necessary other than to verify that the overspeed was not caused by a mechanical problem.

8.12 OVERSPEED / OVERTORQUE INSPECTION:

An overspeed / overtorque inspection requires the disassembly of the propeller in accordance with the appropriate propeller overhaul manual and performance of the following:

- General:
Visually inspect for signs of abnormal wear and/or damage. Evidence of wear and/or damage should be further evaluated using the inspection criteria from the appropriate propeller or blade overhaul manual. Special attention must be given to blade retention components.
- Aluminum Hubs:
Visually inspect the blade retention area of the blade socket.
- Natural Composite Blades:
Perform a thorough visual and coin tap inspection of the exposed portion of each blade including the stainless steel erosion sheath and the de-ice boots.
Perform a torque test of the lag screws.

8.13 OVERHAUL

When an overhaul is the corrective action for an overspeed or an overtorque, the Propeller must be overhauled in accordance with the appropriate overhaul manual at a certified repair station.

8.14 SCRAP

When the corrective action requires scrapping the propeller, the propeller must be removed from service and clearly identified as unairworthy.



9. MAINTENANCE

- 9.1** There is no special maintenance schedule for this propellers beyond the usual inspections as per item 8.

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.

- 9.2** 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.

- 9.3** 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.

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

- 9.5** Broken tips and damaged composite 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 every time a new erosion sheet can be installed. For field repairs, see Service Letter No. 32.

In case of a ground strike the hub is still airworthy if 50% of the composite blade is still crack free. In any case a crack inspection and dimensional check of the hub must be performed. In case of doubt send the affected hub and broken blades to the manufacturer for evaluation.



9.6 DYNAMIC BALANCE

9.6.1 General

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

9.6.1.2 Follow the instructions from the equipment manufacturers for dynamic balance and the Maintenance Manual of the aircraft for selecting rpm and power setting.

9.6.1.3 If the dynamic imbalance is bigger than 1,2 ips, the propeller must be removed and statically re-balanced.

9.6.2 Inspection Procedures Prior to Balancing

9.6.2.1 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 DOES NOT MEAN THAT IT WILL BE A CONTINUING GREASE LEAKAGE.

Condition	Resolution
Minor film of grease (sweating), but not present on Blades, Hub, etc.	Normal operation, monitor only. Clean with mild solvent as required.
Grease Leakage spraying 18 cm (7 inches) or less from blade root (when first detected).	First occurrence, clean blade(s), hub and spinner with mild solvent as required and monitor for 5 flight hours.
Grease Leakage spraying 18 cm (7 inches) or less from blade root when continuing past initial 5 hours of monitoring.	Clean blade(s), hub and spinner with mild solvent as required and monitor for an additional 20 flight hours.
Grease Leakage spraying 18 cm (7 inches) or less from blade root when continuing past additional 20 hours of monitoring.	Within 5 flight hours, remove prop and send to authorized shop.
Grease Leakage spraying greater than 18 cm (7 inches) from the blade root when first detected.	Take photos and send to MT Techsupport for instructions to proceed. 5 flight hours are allowed after initial detection of grease leakages beyond 18 cm (7 inches) from the blade root.

In case of doubt, contact manufacturer / MT Techsupport for further action!

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

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

9.6.2.4 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.



- 9.6.2.5 Drilling holes for use with the AN3-() or AN4-() type bolts with self-locking nuts is acceptable. On some applications already installed nut plates offer the fixing for the balancing weights. In this case no holes must be drilled.

NOTE: CHADWICK-HELMUTH MANUAL AW-9511-2, "THE SMOOTH PROPELLER" SPECIFIES SEVERAL GENERIC BULKHEAD REWORK PROCEDURES.

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

9.6.3 Placement of Balance Weights for Dynamic Balance

- 9.6.3.1 The preferred method of attachment of dynamic balance weights is to add the weights to the rear (front for pusher props) spinner bulkhead. The static balancing weights are also installed on the spinner rear (front for pusher props) plate, if applicable.
- 9.6.3.2 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.
- 9.6.3.3 Use only stainless steel washers or plated steel washers as dynamic balance weights on the spinner bulkhead.
- 9.6.3.4 Do not exceed maximum weight per location of 50 g. This is approximately equal to ten AN970-3 or seven AN970-4 style washers.
- 9.6.3.5 Weights are to be installed using aircraft quality 10-32 inch or 1/4" - 28UNF screws.

Caution:

Take care that there is enough clearance between balance washers or screw heads and the engine / airframe components.

- 9.6.3.6 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.
- 9.6.3.7 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.
- 9.6.3.8 Record number and location of dynamic balance weights, and static balance weights if they have been reconfigured, in the Propeller Logbook.



10. TROUBLE SHOOTING

10.1 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.

10.2 STATIC RPM TOO LOW

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

- Check blade and counterweight position according to the markings.
- 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: Low pitch of counterweighted or feathering propellers can be changed only by trimming the height of the distance ring. Decreasing the thickness by 0,050 inch (1,27 mm) increases the static rpm by approximately 100.

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.

10.3 RPM IN FLIGHT TOO HIGH:

If the static rpm is within the limits, only the governor allows overspeed. 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.



10.4 BLADE SHAKE

10.4.1 Fore and aft movement

Cause: Blade bearing loose

Remedy: If more than 3 mm, return propeller to the factory or any approved repair station to correct the pre-load of the blade retention bearing by adjusting the blade nut.

10.4.2 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.

10.5 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.

10.6 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 1800 rpm with a drop of about 500 rpm.
2. Clean oil tubes in the motor, in the propeller piston and 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.

**10.7 RPM VARIATIONS BETWEEN CLIMB, 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.

10.8 RPM DECREASE DURING NORMAL OPERATION WITHOUT CHANGE OF PROPELLER LEVER POSITION:

- Cause:
1. Oil leakage or hot oil
 2. Worn oil transfer system 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 system on the propeller shaft. Repair engine.
 3. Contact manufacturer.
 4. Check governor drive and governor on the test bench.

Attention:

If sudden oil leakage occurs, the rpm will decrease. In this condition the propeller goes automatically into feathering.

**10.9 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 engine.
 2. Clean propeller and crankshaft.

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.

10.10 OIL LEAKAGE (VISIBLE OUTSIDE OR HIDDEN INSIDE)

Cause: Damaged gaskets

Remedy: Replace gaskets or repair propeller.

10.11 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.
 3. Refer to airplane flight manual. Check rpm tachometer for correct reading. Repair or replace if necessary.

10.12 SLOW FEATHERING

If more than 10 sec. are needed for full feathering, there is one of the following problems: sticking blades or pitch change mechanism, control too long or wrong adjusted governor. If no discrepancies are found during inspection, readjustment of the liftrod/checknut is possible. Turn out lift rod only in steps of $\frac{1}{4}$ turn. If the lift rod is turned too far out, early feathering is the result and must be corrected by turning the lift rod in.

10.13 UNFEATHERING PUMP

Cause: No function of pump!

- Remedy:
1. Check electric motor operation.
 2. Check electric power and connection.
 3. Check oil supply line.



11. AIRWORTHINESS LIMITATIONS SECTIONS

This Airworthiness Limitations Section (ALS) is EASA Approved in accordance with Part 21A.31(a)(3) and CS-P40(b) and 14 CFR Part 35.4 (A35.4) and JAR-P20(e). Any change to mandatory replacement times, inspection intervals and related procedures contained in this ALS must also be approved.

The Airworthiness Limitations Section is FAA approved and specifies maintenance required under §§ 43.16 and 91.403 of the FAR unless an alternate program has been FAA approved.

Rev. No.	Description of Revision

12. SHIPPING AND STORAGE

- 12.1** For any shipment of the propeller use original container. If this is impossible it will be very important to fix the propeller at the inner portion of 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.

- 12.2** 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.

- 12.3** The TBO starts with the installation on the aircraft.
However, if the installation is later than 24 months after new assembly or overhaul and proper storage provided, the TBO automatically starts after this 24 months, up to maximal 96 months calendar time.

- 12.4** If the propeller is stored for longer than 24 months it **can** be disassembled before installing on the aircraft and all seals be replaced. This will bring calendar time TBO back to zero.

- 12.5** 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.

- 12.6** 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.

**13. LIST OF INSTALLATION PARTS / MATERIALS**

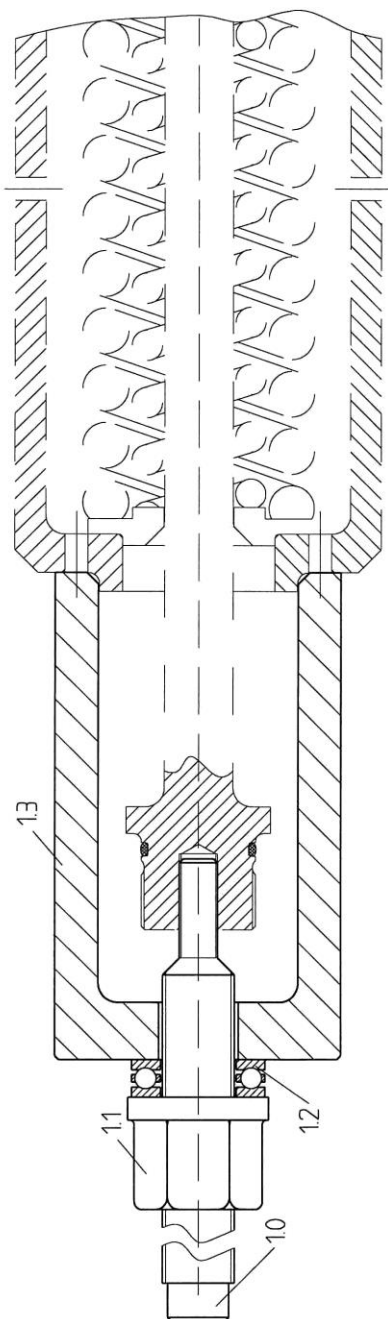
Part. No.	Part	Pieces
A-1732	Safety pin, hub nut;	1
C-049-78	O-Ring, inner piston guide;	1
C-052-80	O-ring piston inner;	1
C-047-200	O-ring, piston outer;	1
C-050-104	O-Ring, piston extension;	1
C-050-140	O-Ring, piston extension	1
C-047-230	O-Ring, spinner front	1
C-050-30	O-Ring, spring guide	1
CM13	Sealant	
MIL-T-83483	Lubricant	

14. SPECIAL TOOLS

Part. No.	Part	Pieces
T-375-9	Puller, Feathering Spring	1
T-410-1	Socket, 7/16" Cap Screw	1
T-609	Socket, Stop Nut 9/16"	1
T-683-1	Wrench, Prop Nut	1
T-683-2	Wrench, Piston	1
T-710-1	Puller; Pin in Counterweight	1

Drawings of tools see next pages!

Drawing T-375-9: Puller, Feathering Spring



No.	Quantity	Designation	Drawing No. or material	Dimension
10	1	Thread spindle	T-375-1	M20x230
11	1	Nut M20	Y-117-9	DN 6331
12	1	Ball bearing	Y-117	FAG 51104
13	1	Distance Bushing	T-375-10	

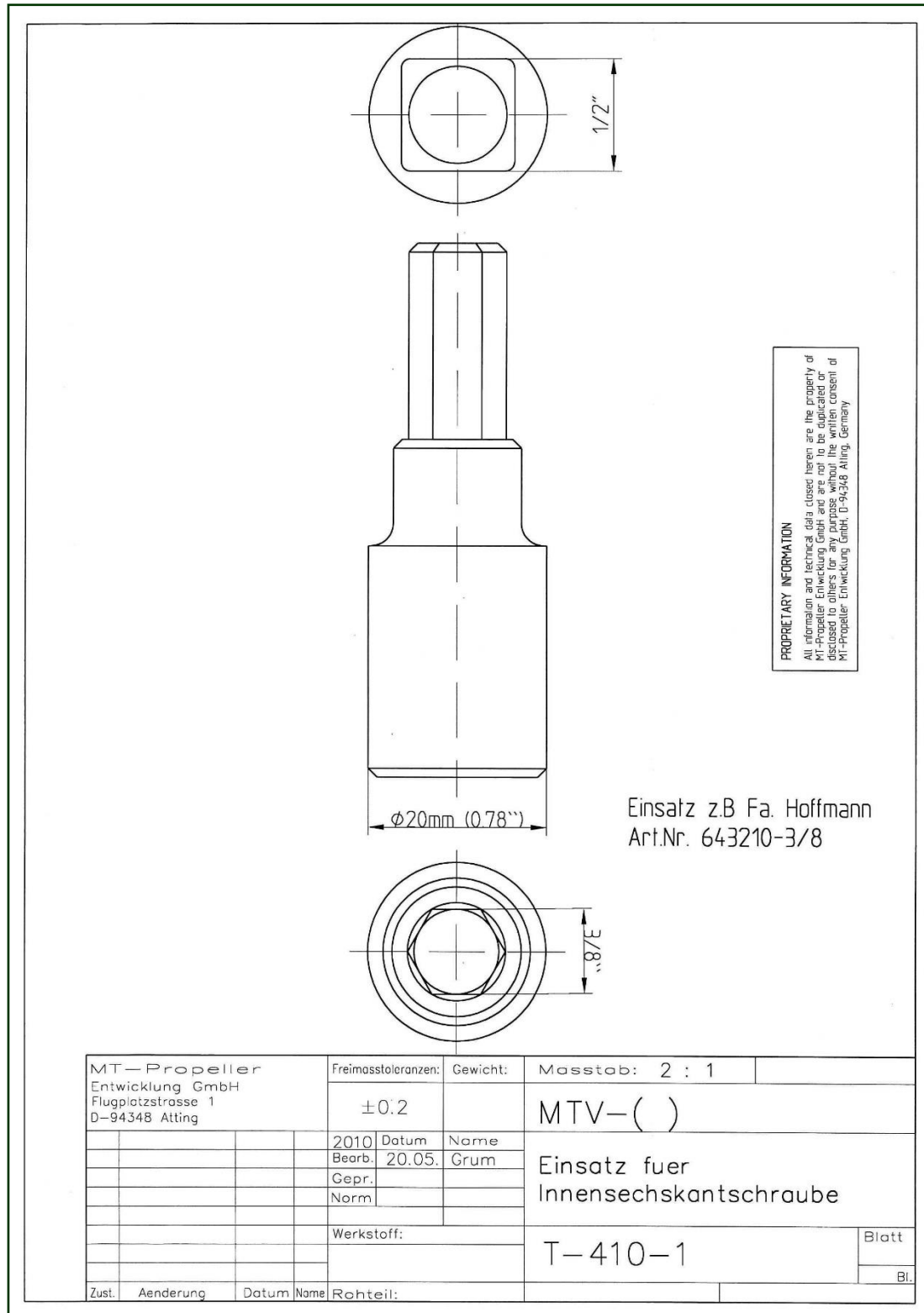
MT-Propeller Entwicklung GmbH Flugplatzarosse 1 D-94348 Aiting		Freimastklonzen:	Gewicht:	Maßstab: 1:1
			± 0,2 mm	MTV-()
		2010 Datum	Name	
		Bearb. 25.10	Gium	
		Gepr.		
		Norm		Preload Device
		Werkstoff:	T-375-9	
			Blatt	
			Bl	

PROPRIETARY INFORMATION

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Drawing T-410-1: Socket, 7/16" Cap Screw

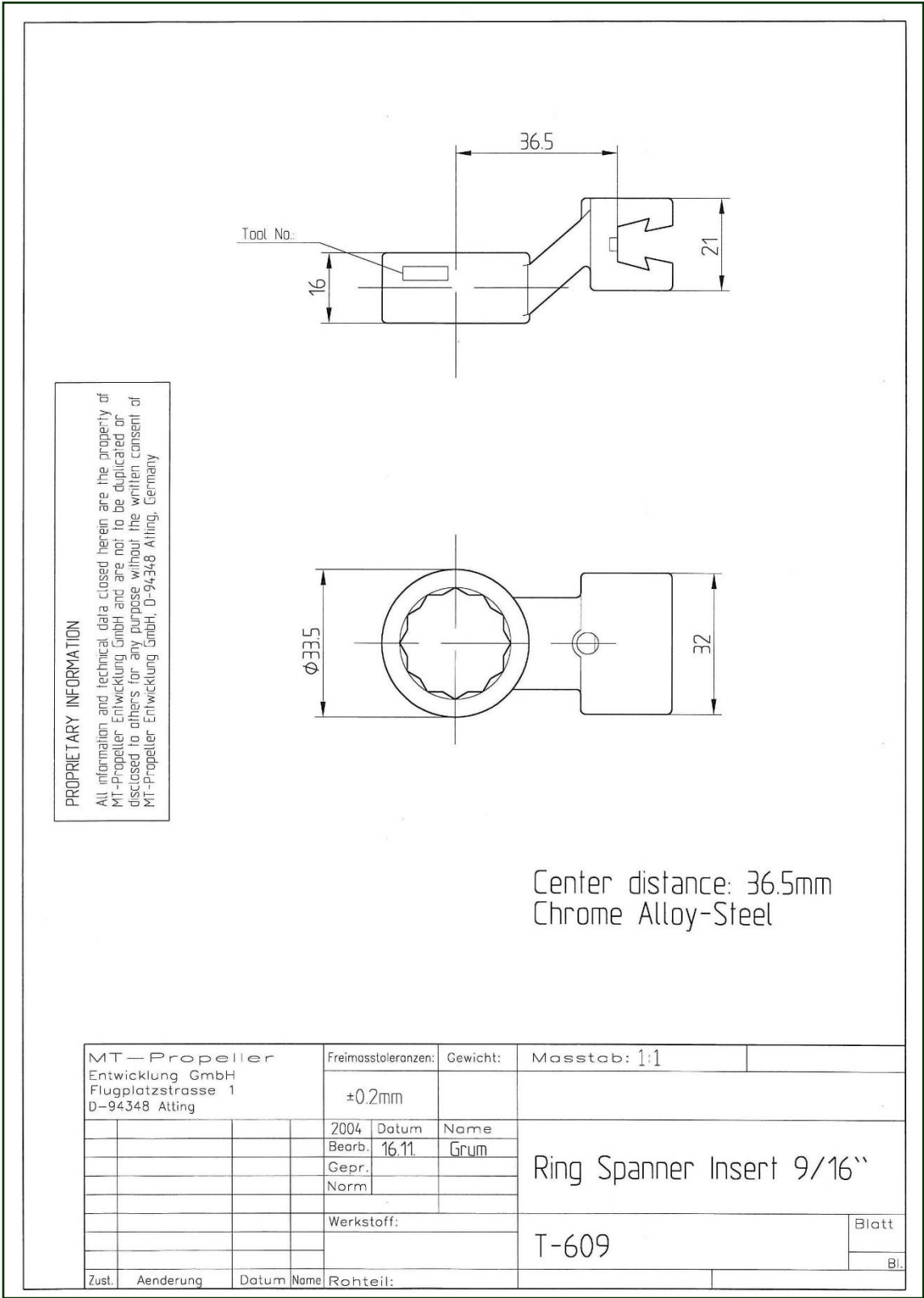




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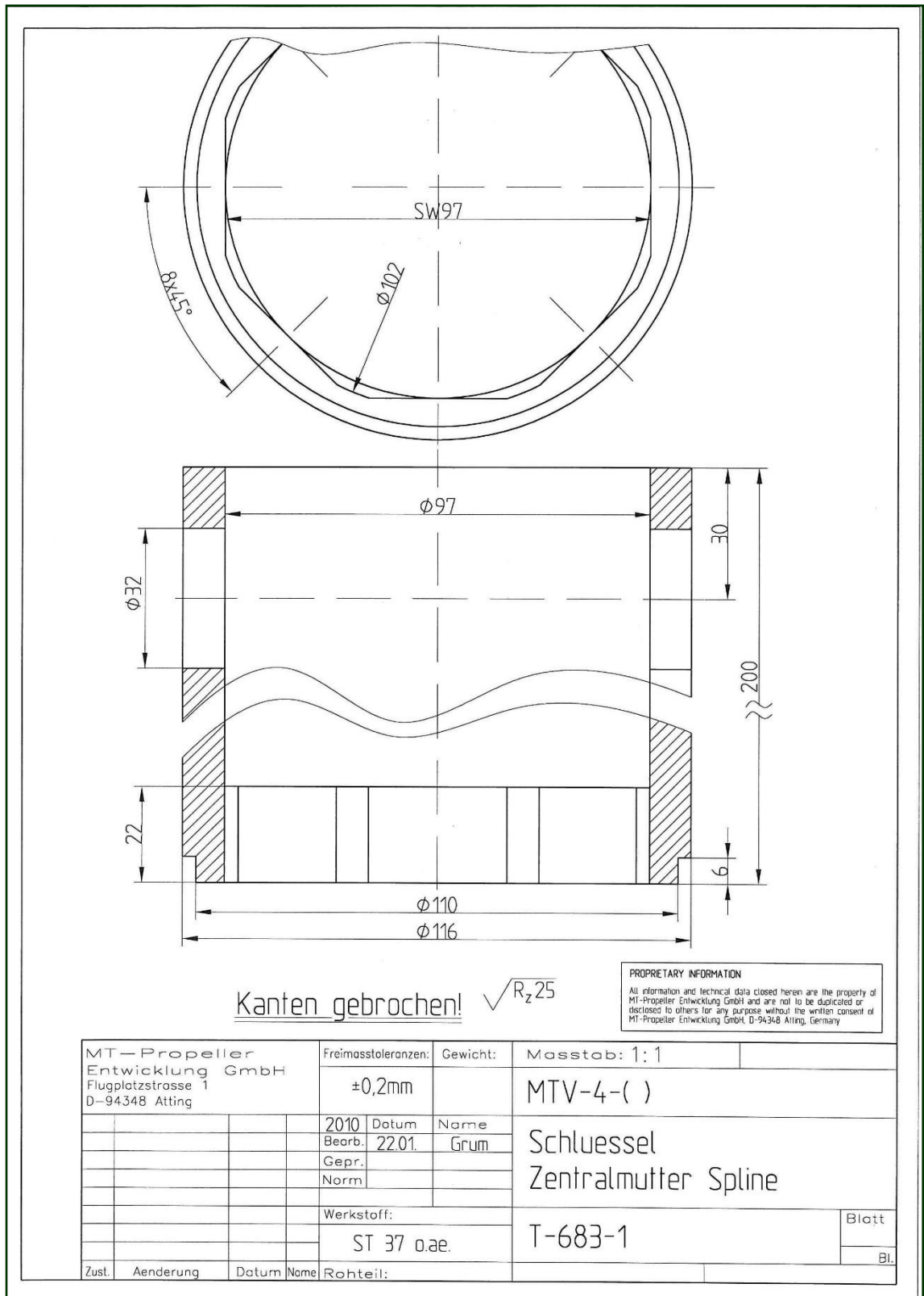


Drawing T-609:



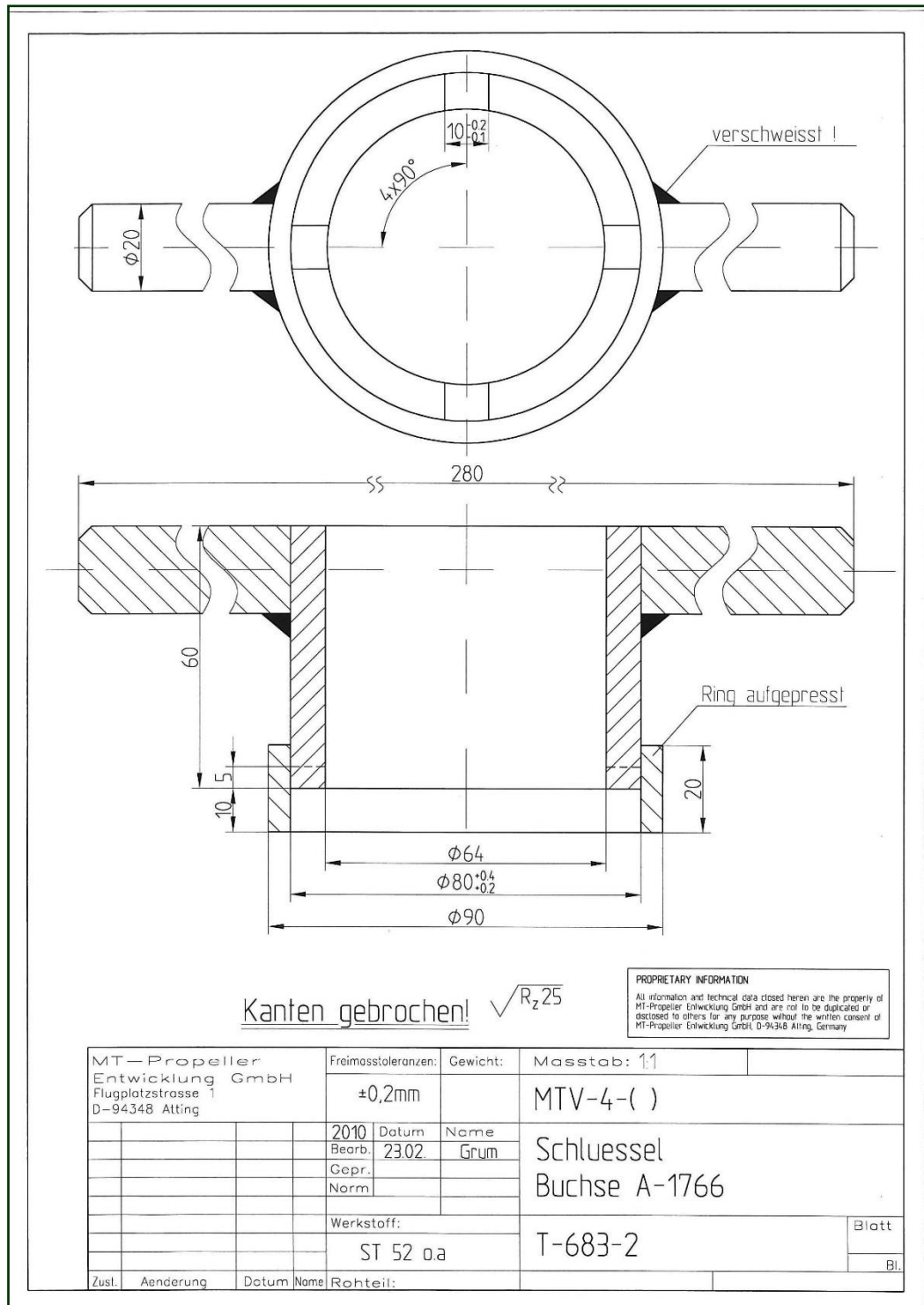


Drawing T-683-1:



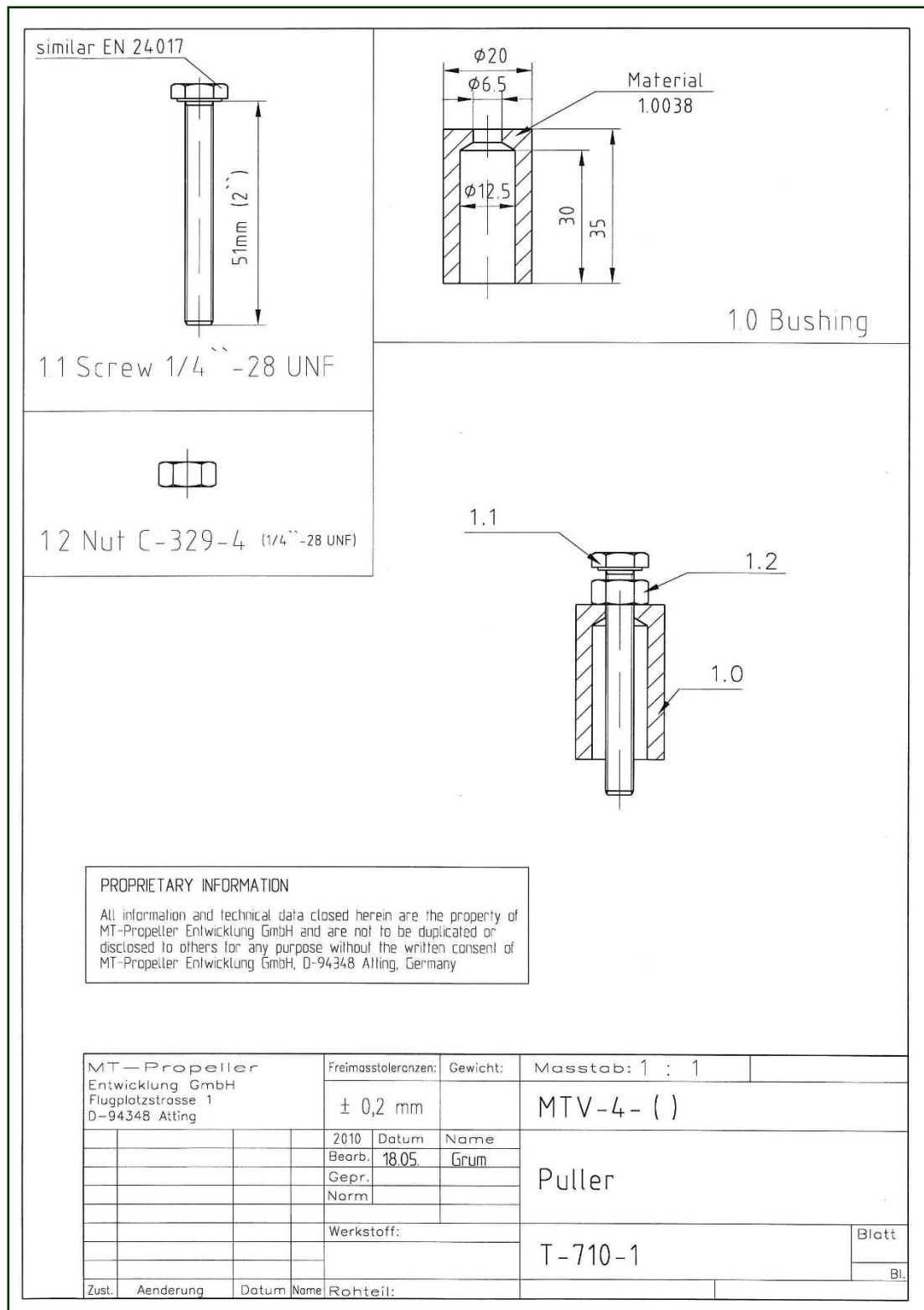


Drawing T-683-2:



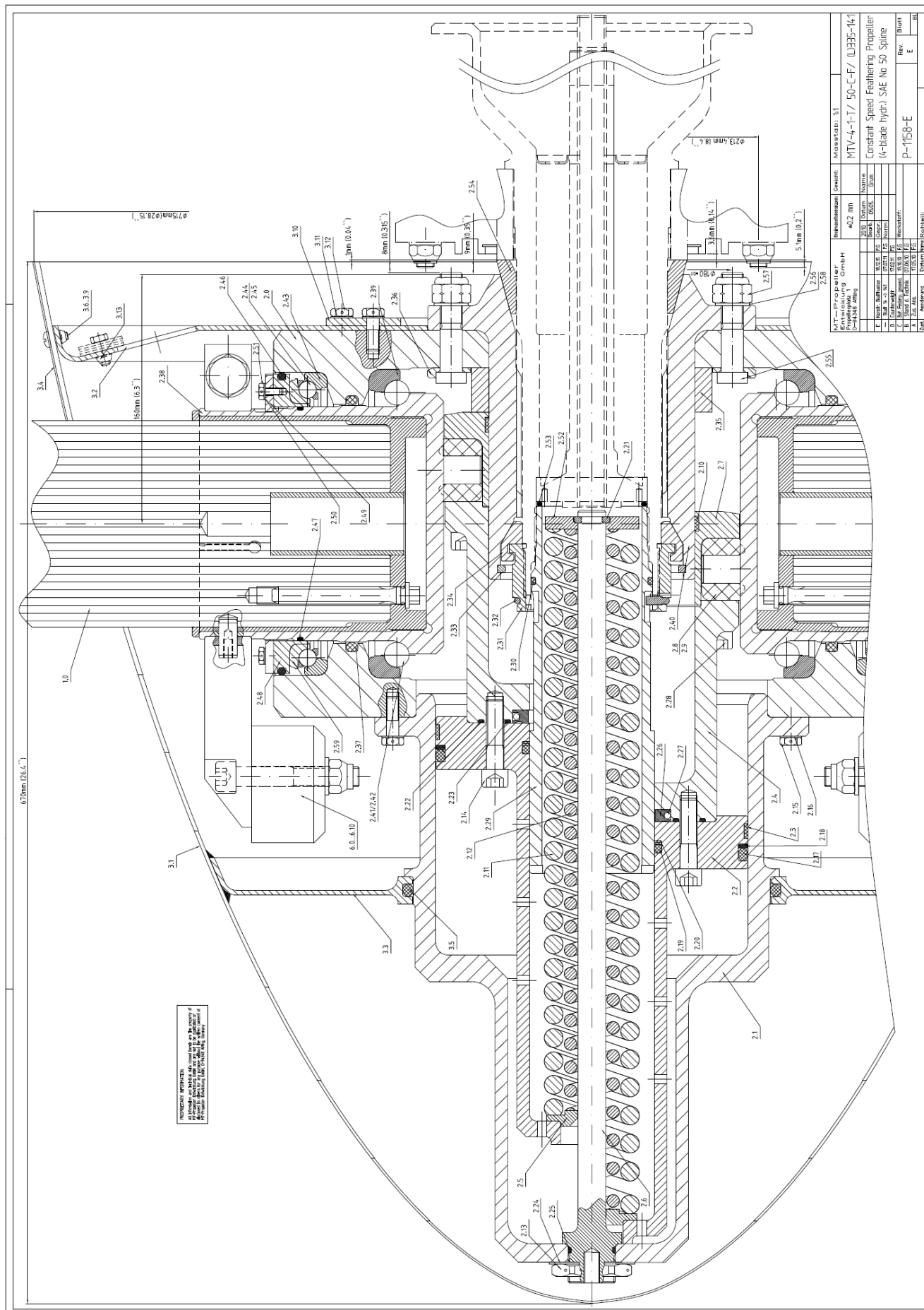


Drawing T-710-1:





15. PROPELLER DRAWING P-1158-F: MTV-4-1-T/50-C-F/(L)335-141





15.1 PART LIST

MTV-4-1-T/50-C-F/(L)335-141 according to drawing P-1158-() :

Quantity				Part. Number	Description	Pin Number Drawing Number
a	b	c	d			
4				1.0	Blade (L)335-141	P-1175-2
1				2.0	Hub	A-1762-A
1				2.1	Front Plate	A-1763-A
1				2.2	Piston	A-1757-A
1				2.3	Guide Ring	C-240-630
1				2.4	Piston Extension	A-1759-R/L
1				2.5	Spring Guide	A-1778-A
1				2.6	Guide Rod	A-1736
1				2.7	Fork	A-1760-R/L
4				2.8	Pitch Change Block	A-1768
4				2.9	Guide Block	A-1779
1				2.10	Guide Ring	A-240-425
1				2.11	Outer Spring	A-1764
1				2.12	Inner Spring	A-1765-A
1				2.13	Nut	A-817-1
4				2.14	Screw	C-398-1.75
16				2.15	Screw	C-304-8
16				2.16	Washer	C-336-5
1				2.17	O-Ring	C-047-200
1				2.18	PTFE Backup Ring	C-371-1
1				2.19	O-Ring	C-052-80
1				2.20	PTFE Backup Ring	C-375-0800
1				2.21	Ring	A-1793
1				2.22	O-Ring	C-050-140
1				2.23	O-Ring	C-050-104
1				2.24	Washer	A-1449-5
1				2.25	O-Ring	C-050-30
1				2.26	Stop Weight	A-1780
1				2.27	Stop Spring	A-1781
4				2.28	Screw	C-398-1,5
1				2.29	Inner piston guide	A-1766-A
1				2.30	O-Ring	C-049-78
1				2.31	Nut	A-1729
1				2.32	Safety Ring	A-1732
1				2.33	Ring	A-1731
1				2.34	Cone	A-1730
1				2.35	Pitch Stop	A-1782
1				2.36	Ring	A-1322-1
4				2.37	Blade Sealing	C-057-152
4				2.38	Outer Blade Ferrule	A-1754-A
4				2.39	Bearing	A-1753
1				2.40	Spline Insert	A-1724-A
124				2.41	Ball	C-393
128				2.42	Seperator	C-192
4				2.43	Bearing	A-1756
140				2.44	Ball	C-348

(to be continued)

**Part List:** (continued)

Quantity				Part. Number	Description	Pin Number Drawing Number
a	b	c	d			
4				2.45	Seperator Ring	A-1783
4				2.46	O-Ring	C-052-194
4				2.47	O-Ring	C-050-140
4				2.48	Preload Nut	A-1761
8				2.49	Safety Plate	A-1369-1
8				2.50	Washer	C-300-4
8				2.51	Screw	C-339-10
1				2.52	Spring Guide	A-1784-A
1				2.53	Gasket	C-409
1				2.54	Cone	A-1735
14				2.55	Stud	C-098-A
14				2.56	Washer	C-077
14				2.57	Stop Nut	C-066
2				2.58	Pin	A-1063-1
4				2.59	Bearing	A-1787
1				3.0	Spinner Assy	P-1148
1				3.1	Spinner dome	B-558
1				3.2	Spinner Bulkhead	B-559
1				3.3	Spinner Front Plate	B-564
4				3.4	Filler Plate	no Number
1				3.5	O-Ring	C-047-230
86				3.6	Rivet, countersunk hd.	C-346
20				3.7	nut plate	C-345
20				3.8	Screw	C-306-8
20				3.9	Washer	C-344
1				3.10	Distance Ring	A-1777
16				3.11	Washer	C-336-5
16				3.12	Screw	C-304-7
24				3.13	nut plate	C-408
4				6.0	Counterweight	A-1775
4				6.1	Clamp Screw	C-381-3.5
8				6.2	Cone	A-1530
4				6.3	Stop Nut	C-382
4				6.4	Weight	A-1776-47
8				6.7	Washer	C-076
8				6.8	Screw	C-397-3.0
8				6.9	Stop Nut	C-067
4				6.10	Pin	C-166-1