



ATA 61-00-83

- E-1083 -

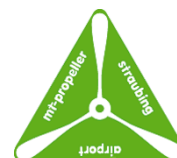
OPERATION- AND INSTALLATION MANUAL

REVERSIBLE HYDRAULICALLY CONTROLLED
VARIABLE PITCH PROPELLER
(CONSTANT SPEED PROPELLER)
for
PT6A-67 - Series

MTV-16-1-()-R(P)
MTV-27-1-()-R(P)
MTV-27-1-()-R(P)-J
MTV-27-2-()-R(P)
MTV-47-1-()-R(P)
MTV-47-1-()-R(P)-V

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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 cannot 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, 7 and 8 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	13-08-2004	Initial Revision	-----
2	14-12-2004	4, 5, 9, 10, 11, 13, 15, 34;	Correction of Flange description
3	08-03-2005	4, 5, 8, 13, 14, 15, 16, 16-1;	Update of Installation- and Operation Instructions for PT6A-() – Engines only
4	27-05-2005	3, 4, 5, 8, 9, 10, 11, 12, 13, 13-1, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36;	General Update / Adding MTV-27-2-()
5	21-11-2005	4, 5, 12, 16;	General Update
6	06-12-2005	3, 4, 5, 6, 8, 9, 10, 11, 12, 12-1, 13, 13-1, 14, 15, 16, 16-1, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 27, 28, 29, 30, 31, 32, 33, 33-1, 34, 35;	General Update
7	22-02-2007	4, 5, 12-1;	Assembly Instruction
8	03-04-2007	4, 5, 6, 7, 25;	Overhaul
9	18-09-2007	4, 5, 20, 25, 25-1, 35, 36;	Blade Root Shrinkage, De-Ice Boots Update of Propeller Drawings
10	19-03-2008	3, 4, 5, 34, 35-1;	MTV-27-1-N-C-F-R(P)
11	04-06-2009	3, 4, 5, 9, 10, 11, 12, 13, 13-1, 13-2, 14, 15, 15-1, 16, 17, 18, 19, 20, 34, 35, 36, 37;	General Update
12	15-10-2009	4, 5, 13-2, 34, 36, 37;	Torques; Grease to be used; Update of Drawings P-955-E, P-1061-C
13	15.12.2009	4, 5, 17;	Inspections
14	26.02.2010	4, 5, 13;	Installation Instruction
15	23.06.2010	3, 4, 5, 6, 34-1, 35;	Vendor Publications; Airworthiness Limitations Section
16	16.09.2010	4, 5, 22, 25;	Possible Damage along Erosion Sheat; De-Ice Boots
17	02.11.2010	4, 5, 15, 15-1, 34;	Installation Instructions Tool T-718-()

**LIST OF REVISIONS**

Rev. No.	Date of Issue	Pages	Remark
18	2011-02-10	4-1, 5, 13, 13-1, 22, 23, 33-1;	Tool D-375-D, Possible damage along Erosion Sheath;
19	2011-08-26	4-1, 5, 13;	First Step before Installation!
20	2011-12-19	4-1, 5, 29;	Dynamic Balance
21	2012-04-16	4-1, 5, 12;	Spinner also of truncated aluminum alloy
22	2014-11-10	4-1, 5, 17, 17-1, 17-2, 18;	Blade Angle Play
23	2015-05-28	4-1, 5, 7, 7-1, 25-1;	Overhaul / Repair
24	2016-02-08	3, 4-1, 5, 5-1, 6-1, 33-1, 34-1;	MT-Propeller Airworthiness Limitation
25	2016-08-12	3, 4-1, 5, 37, 38;	MTV-27-1-()-R(P)-J
26	2017-01-19	2, 4-1, 5, 13, 13-1, 13-2, 13-3, 17, 17-1, 29, 30, 33;	Monitoring Grease Leak! Increase from 100 flight hours to 150 hours flight hours (page 17-1)
27	2017-03-29	4-1, 5, 12-1, 12-2, 12-3;	Work Routine: Increase of torque from dry 60-65 Nm to wet for 65-70 Nm for in-field removable blades!
28	2018-11-13	4-1, 5, 33-2;	Anti-Rotation Propeller Protection Installation
29	2019-02-26	4-1, 5, 22, 33-2;	Remedy of Possible Damages along Erosion Sheath; Anti-Rotation Propeller Installation
30	2019-06-25	4-1, 5, 14, 39;	Addition of P-1593 spinner assy. for MTV-27-1-N-C-F-R(P) Radial clearance of carbon blocks
31	2019-10-18	4-1, 5, 11, 15-1, 40;	New model MTV-47
32	2020-04-09	4-1, 5, 17-2, 29-1, 30, 33-1;	Balancing procedure, storage, torque checks
33	2020-11-30	4-1, 5, 30;	Dynamic Balance
34	2021-06-23	4-1, 5, 11, 16;	Test/check flight adjusted Start lock
35	2021-10-15	3, 4-1, 5, 13-1, 14, 15-1, 16, 40;	MTV-47-1-()-R(P)-V added

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LIST OF EFFECTIVE PAGES

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2	2017-01-19	20	2009-06-04
3	2021-10-15	21	2005-12-06
4	2010-11-02	22	2019-02-26
4-1	2021-10-15	23	2011-02-10
4-2	2024-05-15	24	2005-12-06
5	2024-05-15	25	2010-09-16
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9	2009-06-04	30	2020-11-30
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17-2	2020-04-09		
18	2014-11-10		
19	2009-06-04		

**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 GENERAL INFORMATION

1.1.1 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 troubleshooting data is included in this publication. However, the airplane manufacturer's manuals should be used in addition to this information.

1.1.2 Additional Available Publications

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

- OVERHAUL MANUAL ATA-61-16-80 (E-680)
- Service Bulletin No. 1() latest Revision

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

For MT-Propeller service literature contact

MT-Propeller Entwicklung GmbH
Flugplatzstr. 1
D - 94348 Atting
Germany
Tel.: xx49-9429-9409-0
Fax: xx49-9429-84 32
Email: sales@mt-propeller .com
Internet: www.mt-propeller.com

1.1.3 Vendor Publications

Propeller Governor Manual for

Pratt and Whitney PT6A: No. 33163-() Primary
No. 33048-() Overspeed

Woodward Governor Company
5001 North Second Street
P.O. Box 7001
Rockford, Illinois 61125-7001
USA

B.F. Goodrich – De-icing Systems:
Manual No. ATA 30-60-02 (68-04-712-D)

B.F. Goodrich De-Icing Systems
1555 Corporate Wood Parkway
Uniontown, Ohio 44685
USA



1.1.4 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.**

1.1.5 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.



1.2 DEFINITION OF COMPONENT LIFE AND SERVICE

1.2.1 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 ground strike or a foreign object damage (FOD) with a non-rotating propeller does not require an overhaul, it only needs a blade repair or a blade exchange. A ground strike or a FOD with a non-rotating propeller cannot damage the propeller hub and therefore does not require an overhaul.

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 61-16-80 (E-680). The overhaul interval for the propellers is shown in Service Bulletin No. 1() latest Revision.

1.2.2 Repair

Repair is correction of minor damage caused during normal operation.
It is done on an irregular basis, as required.
Consult Service Bulletin No. 32 () latest revision.

A repair does not include an overhaul.

Amount, degree and extent of damage determines whether or not a propeller can be repaired without 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.

- 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.
- If the blade damage is beyond airworthy limits, repair the blade before further flight in accordance with SL-32.
- If the blade damage is beyond major repair limits, return the blade to the factory for evaluation or retire the blade.

**1.2.3** 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.

1.2.4 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).

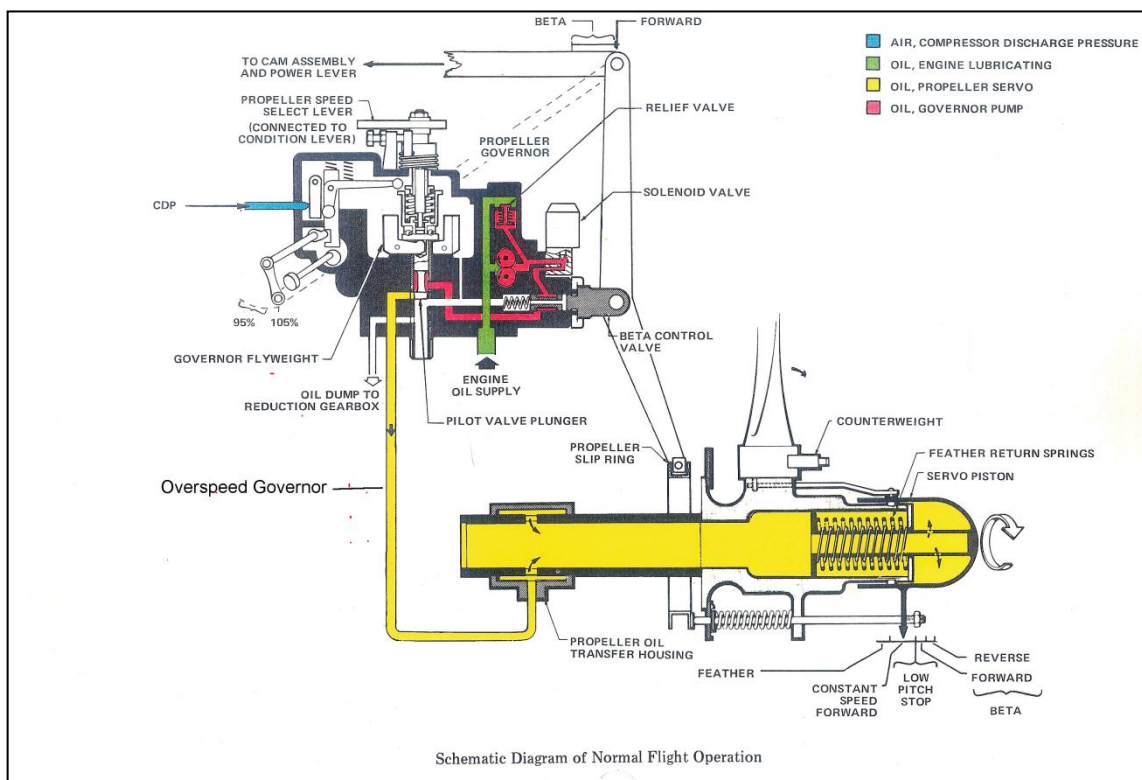
Both references are necessary in defining the life of the component. Occasionally a part may be "life limited", which means that it must be replaced after a specified period of use. Life limited parts are listed in Overhaul Manual No. ATA 61-16-80 (E-680).

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



1.3 REVERSIBLE PROPELLERS FOR PWC ENGINES, PT6-() SERIES

- 1.3.1** Reversible propellers, used primarily for turboprop installations, are similar to the feathering propellers except the pitch is extended into the beta range and a hydraulic low pitch stop is introduced. Mechanical stops are full feathering and full reverse.
- 1.3.2** The hydraulic low pitch stop, which prevents the blade pitch from entering the reverse range unless desired, consists of a „beta„ valve which stops the governor oil to the propeller when the pitch reaches the low pitch position.
- 1.3.3** This valve is actuated by a linkage to the pitch change mechanism. In order to move the propeller into beta range and reverse, the pilot effectively changes the linkage to the beta valve with the power lever and allows the propeller to travel into reverse.
- 1.3.4** The beta feedback connection of the propeller is external on PT6A-series engines.
- 1.3.5** The propellers have full feathering and reversing.
- 1.3.6** 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.
- 1.3.7** Blades from forged aluminum alloy may also be used. In this case a weight increase is to be expected.



- Figure 1 -



2. MODEL DESIGNATION

2.1 HUB DESIGNATION

MT V - 16 - () - () - () - () - () - () - () - () / () () Blade
1 2 3 4 5 6 7 8 9 10 / 1 2 3 4 5

Hub

- 1 MT-Propeller Entwicklung GmbH
- 2 Variable Pitch Propeller
- 3 Identification of propeller type
- 4 Identification of variant of the propeller type
- 5 Letter code for flange type:
 - B = AS-127-D, SAE No.2 mod., 1/2 inch – 20 UNF bolts
 - D = ARP 502, Type 1
 - E = ARP 880
 - N = BCD 5.125 in, twelve 9/16 inch-18 UNF bolts, 2 index pins
 - H = BCD 5.125 in, twelve 9/16 inch-18 UNF bolts, 2 index pins
- 6 Letter code for counterweights:
 - blank: no or small counterweights for pitch change forces to decrease pitch
 - C = counterweights for pitch change forces to increase pitch
- 7 Letter code for feather provision:
 - blank: no feather position possible
 - F = feather position allowed
- 8 Letter code for reverse provision:
 - blank: no reverse position possible
 - R = reverse position allowed
- 9 Letter code for reversing system:
 - A = System Allison
 - G = System Garrett
 - M = System Mühlbauer
 - P = System P&W Canada
 - W = System Walter
- 10 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

() () 280 - 65 ()
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

The complete propeller designation is a combination of both designations, for instance MTV-16-1-N-C-F-R(P)/CFRLD 280-65 or MTV-16-1-N-C-F-R(P)/CFRLD 280-416.

The hub-serial No. starts with the year of manufacture. All records of the propeller are registered in respect to this number.

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

3. PERFORMANCE DATA

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

Flange type:

N = Bolt Circle 5,125 inch, twelve bolts 9/16" - 18 UNF, 2 index pins
for PT6A-67series engines.



4. DESIGN- AND OPERATION INFORMATION

The variable pitch propeller consists of the following main groups:

- Hub with Blade Retention
- Pitch Change Mechanism
- Blades
- Counterweights
- Spinner
- Propeller Governors

4.1 HUB

The one-piece hub is made from forged or milled 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 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 or blade root. The blade preload is adjusted by the thickness of plastic shims. Blade and bearing are held in the hub by a retention ring.

The inner rear part of the hub is used as the cylinder for the servo pressure oil. This arrangement allows a simple and lightweight design. The front spinner support is used for the static balance weights. The rear spinner bulkhead is prepared for the weights of the dynamic balance.

4.2 THE PITCH CHANGE MECHANISM

The pitch change mechanism of the blades is obtained with a pin in the blade root. A plastic block connects the blade with the piston extension and the axial movement of the servo piston turns the blades. On the front piston guide the return spring is installed enabling feathering.

The hydraulic pitch change mechanism contains a piston. In the normal operating range the pitch change piston moves between full feathering and the hydraulic low pitch stop. In the beta range the hydraulic low pitch stop moves via the beta linkage until the needed negative thrust is reached.

To prevent feathering during normal engine shutdown, the propeller can be equipped with a start lock. The start lock engages at approx. 680 RPM and freezes the blade angle by engaging at the center guide rod. With the RPM higher than approx. 680 RPM the centrifugal force frees the lock and the blade angle against the spring force of the start lock

4.2.1 For Pratt and Whitney Application

In front of the hub there are check nuts as feathering stops and in the inner part of the hub there are stop nuts as low pitch stops. Feathering can be set by turning the check nuts. Low pitch can be set by turning the 4 each (MTV-16) , 3 each (MTV-27, MTV-47) internal stop nuts. The full reverse stop is not adjustable in the field.

WARNING:

THE 4 EACH (MTV-16), 3 EACH (MTV-27, MTV-47) STOP NUTS MUST ALWAYS HAVE THE SAME SETTING TO EACH OTHER, OTHERWISE THE PITCH CHANGE MECHANISM WILL BE DAMAGED BECAUSE OF A WOBBLING BETA RING.



4.3 BLADES (COMPOSITE OR METAL)

There are two different blade roots available. One is for the composite blades with direct blade bearing installation. One is for the metal blades which have threaded ferrules, allowing them to be installed and removed in the field.

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 covers the entire blade surface and is painted with acrylic lacquer. The outer portion is protected against erosion by a bonded on stainless steel or nickel erosion sheath. The stainless steel erosion sheath is approximately 50 cm long. The inner portion of the blade is protected by a self-adhesive PU-strip or de-ice boots. The blade ferrule is installed with special lag screws on the blade root.

4.3.2 Propeller models with blades made from forged aluminum have steel ferrules as a blade retention feature. Blades are according to common aluminum blades. Depending on hub design, blades can be removed or installed in the field, because of the threaded blade root.

For blade installation or exchange of aluminum blades in the field see chapter 5.0.

4.4 COUNTERWEIGHTS

Single acting propellers with reverse and feathering have counterweights installed on the blade root. The pitch change pin is in a defined position and the blades are identified with a "C", for example C200-15. Propeller blades for feathering propellers are identified with "CF". Propeller blades for reversible propellers are identified with "CFR".

4.5 SPINNER

The spinner dome is a one-piece part made from fiber reinforced composite or truncated aluminum alloy.

The bulkhead is spin-formed 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.

4.6 PROPELLER GOVERNOR:

See Woodward Manual for:

Pratt and Whitney PT6A:	No. 33163-() Primary
	No. 33048-() Overspeed
	or others according to the aircraft listing.



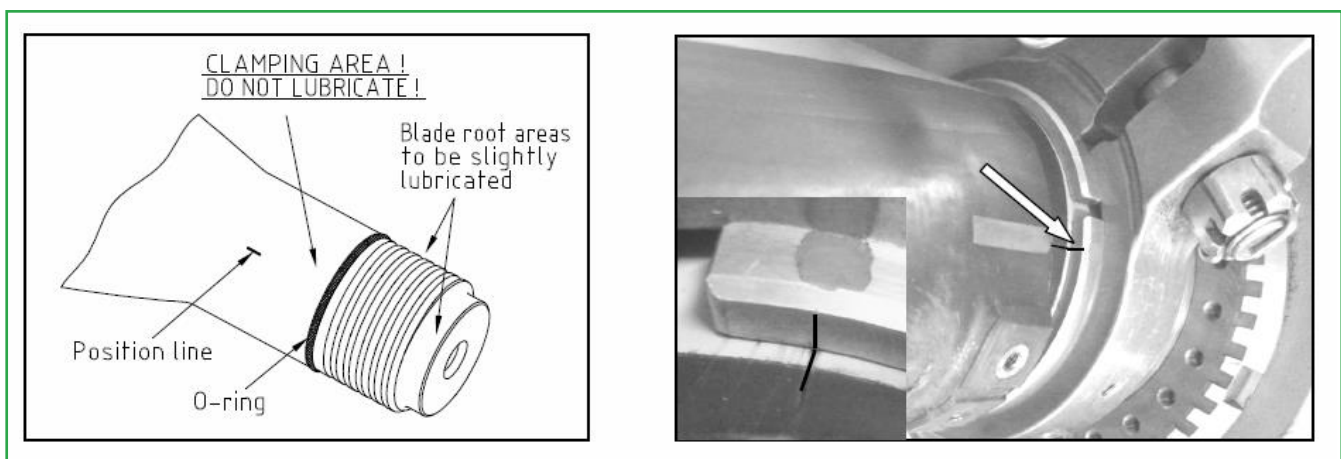
5. ASSEMBLY INSTRUCTION FOR REMOVABLE METAL BLADES

Work Routine:

1. Remove the spinner dome. Loosen the nut of the clamp bolt for the counterweight.
2. Install the O-ring No. C-056-63 in groove on the blade shank (see Figure 2).
Lubricate the blade center collar with MTP No. 2 Grease as shown in Figure 2.
Turn the blade totally into ferrule 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.
Slightly lubricate the thread of the clamp bolt with graphite grease and tighten with a torque of 65-70 Nm (48-52 lb-ft).
Secure the nut by cotter pin 4 x 28, DIN 94 or equivalent.

WARNING:

DO NOT USE SAFETY WIRE INSTEAD OF A COTTER PIN, BECAUSE A LOOSE NUT CAN LEAD TO A LOOSE BLADE WHICH AFFECTS THE AIRWORTHINESS.



- Figure 2 -

**Attention:**

Pay close attention to correct seating of the bolt head when tightening the nut (see Figure 2-1)!

Position the bolt head and hold in place with the fingers of one hand, while tightening the nut with other hand until snug.

Then, still hold the bolt head, use the torque wrench to torque the nut as specified.

Finally, check correct position of the bolt head after torquing.

Incorrectly or inaccurately tightened clamp bolt will cause the change of blade angle setting in operation.

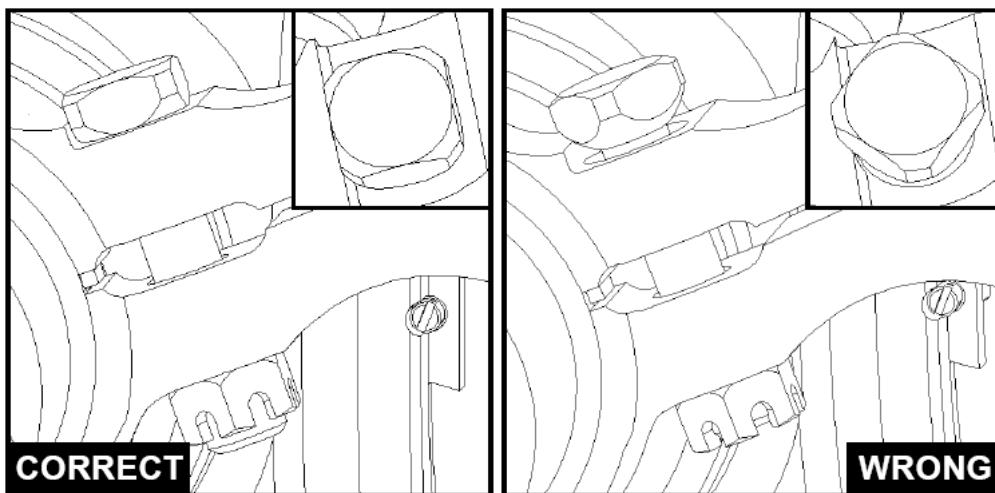


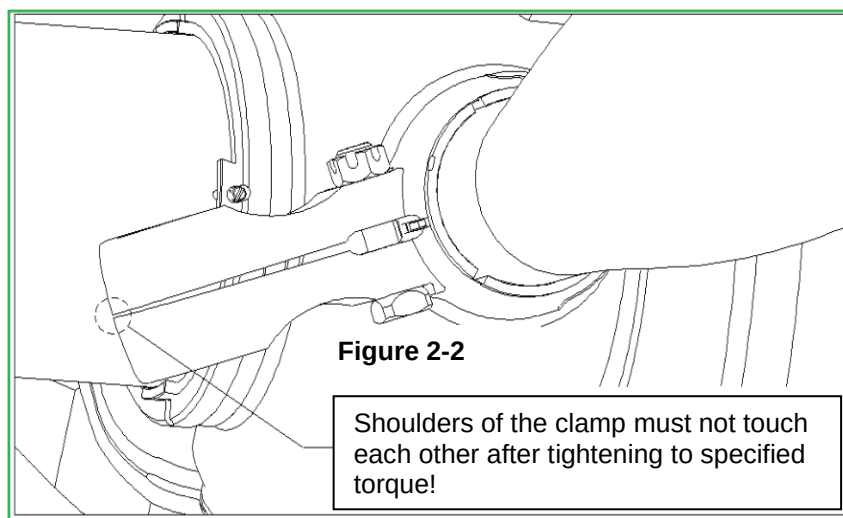
Figure 2-1

Attention:

Make sure that the shoulders of the clamp do not touch each other after tightening the clamp bolt to specified torque (Figure 2-2)!

If the shoulders touch each other, remove the propeller from service and contact manufacturer or adequate Service Center.

Touching of the shoulders after additional tightening of the clamp bolt for safety with a cotter pin does not affect serviceability of the propeller.



**Attention:**

Place the position pin in the clamp cutout (if existing) to the centre of cutout prior to tightening the clamp (Figure 2-3).

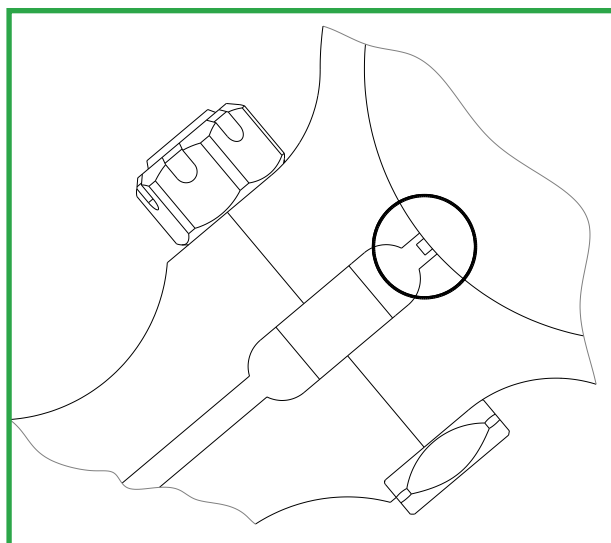


Figure 2-3

3. If de-ice boots are installed, connect the lead wires to the system

CAUTION:

O-ring prevents moisture to get into the blade ferrule.

If the O-ring is not installed, the blade shank can be affected by corrosion.

Use only original O-rings approved by manufacturer.



6. INSTALLATION INSTRUCTION FOR PT6A-() ENGINES ONLY

First Step!

**Remove the shipping plug and protective wrap!
Clean engine and propeller flange with solvent of gasoline.
Both surfaces must be dry and clean.
Remove all surface defects.**

Attention:

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

WARNING:

NEVER PUT THE PROPELLER ON THE FLANGE BOLTS FOR STORAGE AS THE FLANGE BOLTS ARE ONLY PRESSED INTO THE HUB FROM INSIDE.

IF PROPELLER IS STORED ON THE FLANGE BOLTS SAME MIGHT BE PUSHED INTO THE HUB. IN SUCH A CASE, PROPELLER MUST BE DISASSEMBLED IN ORDER TO RE-POSITION FLANGE BOLTS.

ALSO DO NOT PUT THE PROPELLER ON THE BETA RING BECAUSE THE BETA RING CAN BE DAMAGED AND MUST BE REPLACED.

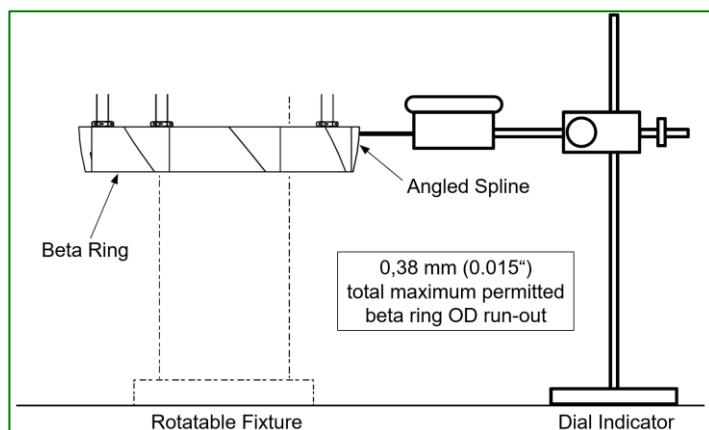
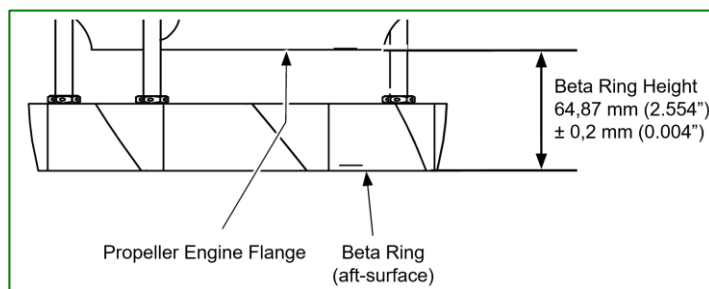
- 6.1 ALL PROPELLERS OF THESE DESIGNS ARE ONLY SUITABLE FOR INSTALLATION ON FLANGE TYPE ENGINES.**
The code for the flange type and size can be seen from the model designation (see Chapter 2).
- 6.2 THE DESCRIBED PROPELLERS ARE USUALLY INSTALLED ON THE ENGINE WITH THE BLADES IN FEATHERING POSITION.**
- 6.3 CLEAN PROPELLER AND ENGINE FLANGE WITH SOLVENT OR GASOLINE.**
Both surfaces must be dry and clean.
Remove all surface defects.

**6.4 CHECK POSITION OF O-RING IN PROPELLER FLANGE.**

WARNING:
DO NOT INSTALL AN ADDITIONAL O-RING ON ENGINE FLANGE!

6.5 CHECK THE DISTANCE FROM THE BETA RING TO THE PROPELLER FLANGE WITH $60,4 \pm 0,2\text{MM}$ (2.377 ± 0.078); IF THE DISTANCE IS DIFFERENT CONTACT MT-PROPELLER SERVICE CENTER.

Beta ring for the MTV-47-1-N-C-F-R(P)-V installed on the FADEC PT6E engines the distance from the beta ring to the propeller flange is $64,87 \pm 0,1 \text{ mm}$ ($2.554 \pm 0.004 \text{ inch}$).

**6.6 REMOVE CAP SCREWS (SEE FIGURE 3, NO. 3) OF THE BETA-RODS ON THE FRONT PLATE.**

After removal of all caps and parts, the beta-ring can be moved forward by hand for better access of the stop nuts on the flange. On some propeller models, you must use T-375-() Beta Puller tool to pull pitch change mechanism towards fine pitch in order to free the stop nuts.

See drawing Beta Puller T-375-D next page!

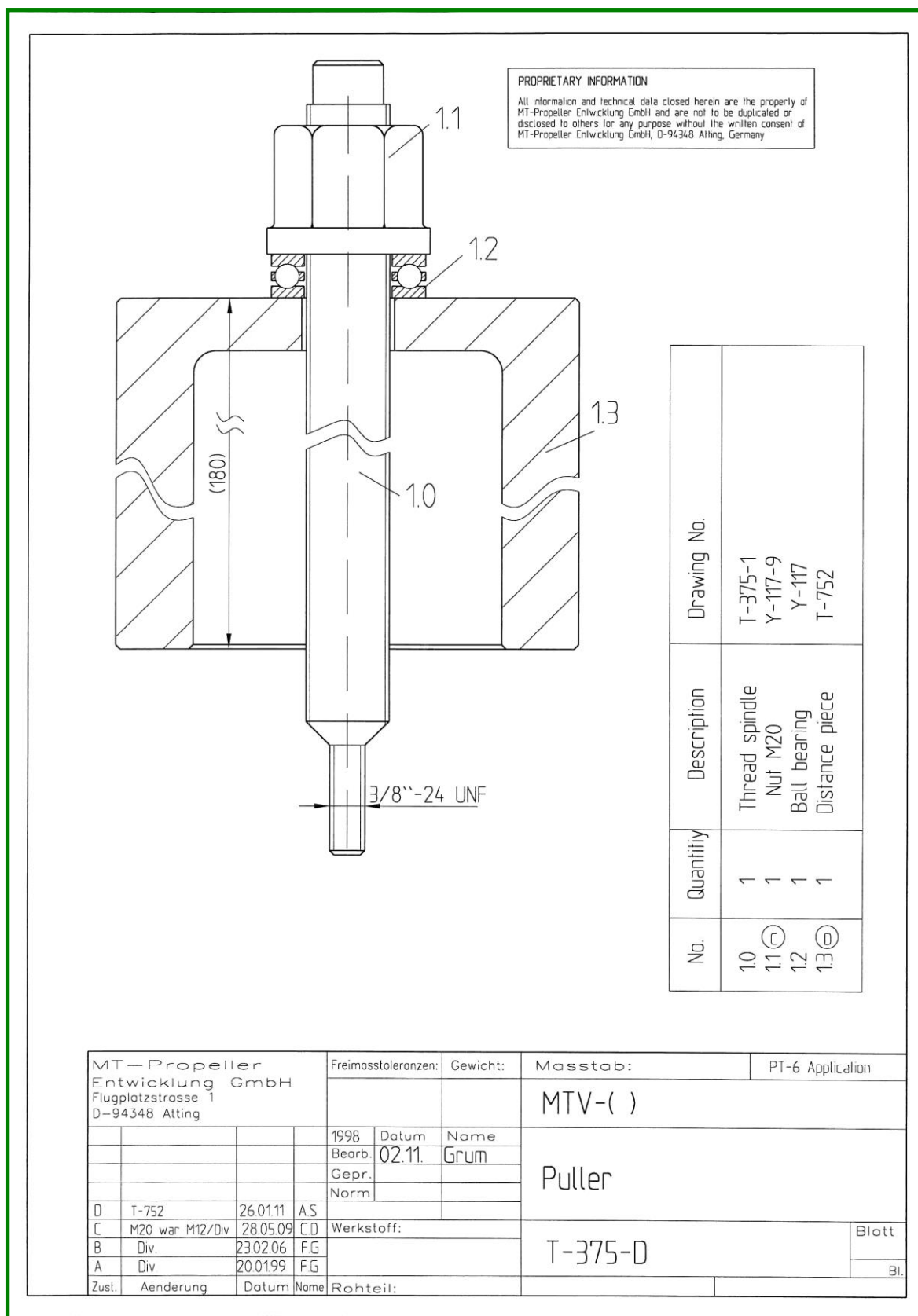
NOTE:

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.

FOR MORE INFORMATION ON THE SUBJECT OF GREASE LEAKAGE PLEASE SEE CHAPTER 7.



Puller: Drawing T-375-D





- 6.7 INSTALL THE PROPELLER CAREFULLY TO THE ENGINE FLANGE. OBSERVE THE POSITION OF THE INDEX PINS. PLEASE NOTE THAT THE PROPELLER SHOULD NOT BE PULLED ONTO THE ENGINE FLANGE WITH THE NUTS IN ORDER TO AVOID DAMAGE OF THE HUB AND TO AVOID SHEARING OFF CHIPS CAUSING OIL LEAKS ON THE O-RING.

- 6.8 STOP NUTS WITH WASHERS SHOULD BE TIGHTENED CROSSWISE WITH EQUAL FORCE.

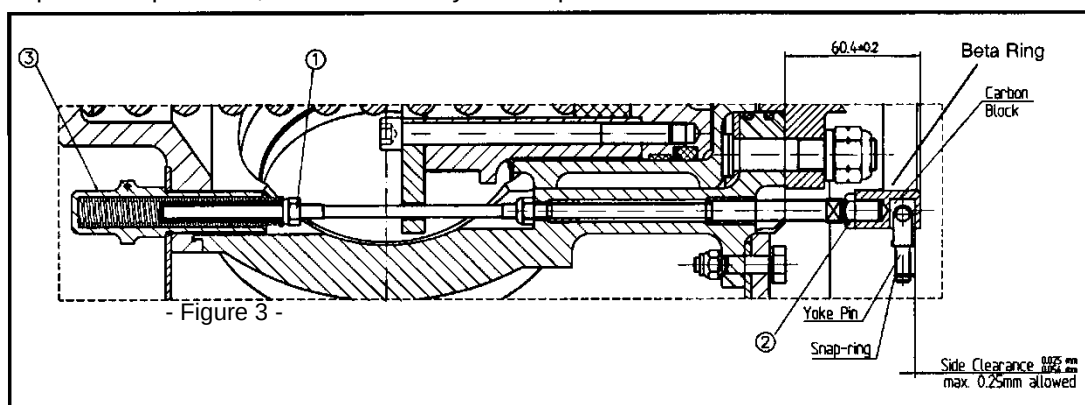
Torque: 9/16" - 18 UNF stop nuts 68 - 72 ftlb (92 - 97 Nm)

NOTE: TORQUE VALUES ARE VALID FOR WET (LUBRICATED) FREE-MOVING THREADS ONLY.

Liberally apply anti-seize thread compound per MIL-T-83483 (e.g. Loctite®Moly 50TM) to threads of studs and nuts and also to faces of nuts and washers.

- 6.9 RELEASE BETA PULLER TOOL AND REMOVE. MOVE BETA-RING BACK. APPLY ENGINE OIL ON TO THE THREAD OF THE COVER CAPS, REINSTALL SPRING GUIDES, SPRINGS AND CAPS BY HAND.

Torque the caps with 7,5 ftlbs and safety wire in pairs.



NOTE: INSTALL COVER CAPS JUST BY HAND, OTHERWISE THE THREAD IN THE FRONT PLATE MAY BE DAMAGED.

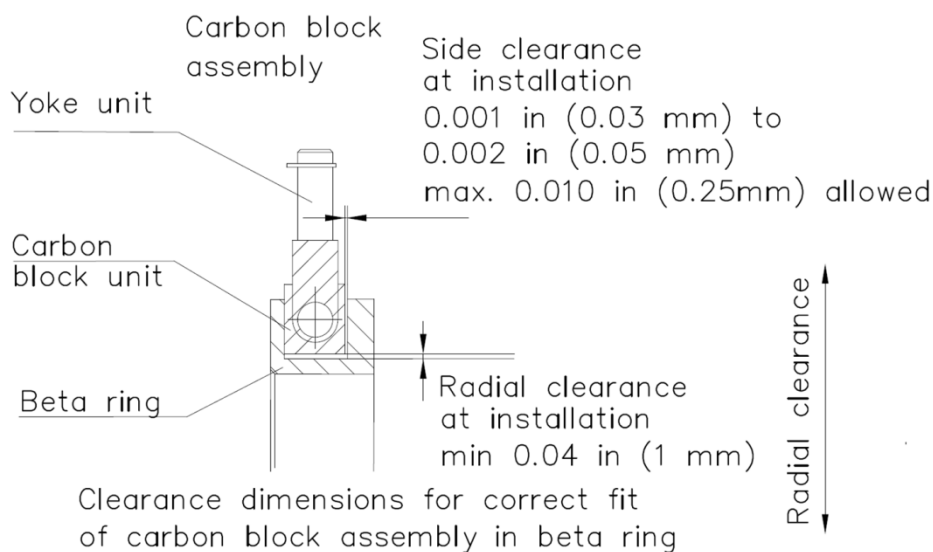
- 6.10 CHECK RUN OUT (WOBBLE) OF THE BETA-RING TO BE WITHIN 0,008 INCH (0,20 MM) WITH BLADES IN FEATHER POSITION.

NOTE: POSITION AND WOBBLE CAN JUST BE ADJUSTED. THEREFORE LOOSEN CHECK NUTS NO. 2 (SEE FIGURE 3) BY TURNING THE BETA RODS.

- 6.11 CHECKING TRACK OF THE BLADES IS NOT POSSIBLE, BECAUSE OF FEATHERING POSITION OF THE BLADES, EXCEPT YOU USE T-375-() BETA PULLER TOOL FOR MOVING BLADES INTO LOW PITCH STOP.

**6.12 CARBON BLOCK ASSEMBLIES FOR PT6A-67 SERIES – APPLICATIONS EXCEPT PT6E INSTALLATIONS**

- 6.12.1** Check free movement of the carbon block in beta ring. If there is not the required clearance, re-work according to Figure 4 by sanding the block(s) side(s) as required.
- 6.12.2** Install carbon block assy in beta lever of the engine.
- 6.12.3** There have been a number of instances when the clearance between the yoke pin of the carbon block and the corresponding linkage have become too close due to a build-up of plating and foreign particles between the two pieces. This may cause a binding action and result in excessive wear to the carbon block, beta-ring and beta linkage (see Figure 4).



- Figure 4 -

WARNING:

WHEN ASSEMBLING ENSURE A RADIAL CLEARANCE OF MIN 1 MM (0.04 IN) FROM CARBON BRUSH TO THE BETA RING TO AVOID FATIGUE LOADS AND THUS DAMAGE TO THE YOKE UNIT. THE CARBON BLOCK NEEDS TO BE ASSEMBLED WITHOUT ANY PRE-LOAD

- 6.12.4** If the system indicates a presence of binding, the following steps are to be followed:
- Remove the carbon block assemblies from the beta lever,
 - Polish the yoke pin to provide adequate clearance (see Figure 4),
 - Reinstall the carbon block assembly into the beta lever using a dry lubricant between the yoke pin and the beta collar. Safety with snap ring.



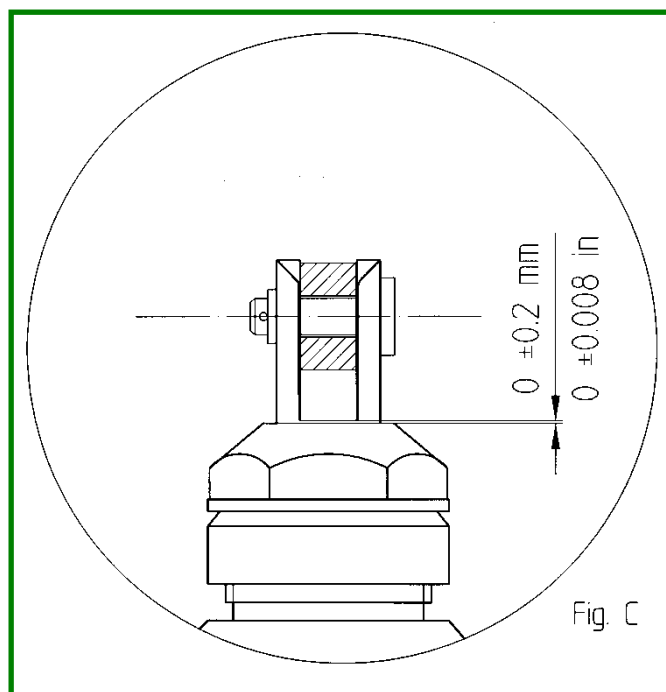
6.12.5 Install the beta linkage with carbon block assy. into the beta ring and inspect system for free movement.

Make sure that the power lever position in the cockpit is in accordance with the appropriate Engine- and/or Aircraft Manuals. If no information of the power lever position is available, advance power lever to the maximum forward position.

Check the position of the beta-valve in the propeller governor (beta-zero-position).
Check free movement of the beta valve in the governor.

After the whole beta linkage is installed and connected to the beta control, the slot on the valve plunger must be flush with the front of the beta valve cap.

If this is not the case, the connection of the beta control must be rigged according to the engine manufacturers instructions (see Figure 5).



- Figure 5 -



- 6.12.6** Install spinner on front- and rear bulkhead. Observe mating marks. Torque screws with plastic washers 34 - 44 inlb (3,7 - 3,8 Nm). Check run out of the dome. Max. 0,080 inch (2,00 mm) permissible.

6.13 CARRY OUT A FUNCTIONAL CHECK / PROPELLER CHECK:

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.

6.14 ADJUSTING, APPLICABLE FOR PT6A AND PT6E ENGINES:

Mechanical stops for reverse and feathering are adjusted during manufacture, according to the requirement of the aircraft/engine combination. Low pitch can only be adjusted via the beta nuts. Feathering can be adjusted by turning the check nuts. The pitch stop for reverse cannot be changed in the field.

- 6.14.1** Turning in the beta nuts in or out by using tool **T-718-()**, hydraulic low pitch stop can be adjusted. Therefore remove the cover caps with the springs and spring guides.
Turning **IN** results in higher (coarser) pitch or higher engine torque.
Turning **OUT** results in lower (finer) pitch or lower engine torque.



T-718-()

WARNING:

ALL 4 EACH (MTV-16) OR 3 EACH (MTV-27, MTV-47) BETA NUTS MUST HAVE THE SAME SETTING (DISTANCE).

IF NOT, THE PITCH CHANGE MECHANISM COULD BE DAMAGED BECAUSE OF THE WOBBLING OF THE BETA RING.

IF YOU ARE NOT SURE ABOUT THE RUN-OUT OF THE BETA RING, USE T-375-() BETA PULLER TOOL AND PULL BLADES INTO LOW PITCH UNTIL THE BETA RING IS MOVING AND CHECK RUN-OUT.

WARNING:

LOW PITCH STOP HAS TO BE ADJUSTED IN COMPLIANCE WITH THE DESCRIPTION OF THE AIRPLANE MANUFACTURER, FOR EXAMPLE ON PT6A-67 ENGINE, TORQUE VERSUS RPM, DEPENDING ON DENSITY ALTITUDE AND TEMPERATURE, SHOULD BE ABOUT 1650 FTLBS AT 1500 RPM AT SL, STANDARD DAY.

ADDITIONALLY, THE MINIMUM STATIC PROPELLER RPM MUST BE REACHED AT GROUND IDLE, SEE AIRCRAFT FLIGHT MANUAL.



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

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

6.15 OPERATION

Propeller, governors and beta-system 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.

6.15.1 Pre-Flight Check

Before take-off, check the propeller pitch change according to the Aircraft Flight Manual. If it is allowed, change pitch two times to remove air from the system.

6.15.2 In Flight

Set power and rpm setting according to the Aircraft Flight Manual.

6.15.3 Feathering

These propellers have feathering which must be reached in every flight condition.

6.15.4 Reverse Modus

For these propellers reverse is initiated by pulling back the power lever over the flight idle gate. The power lever also controls the beta-valve on the governor. By pulling the power lever back over the gate, the beta valve moves. Because of that, negative blade angle increase and negative thrust is produced with power and rpm increase. At the same time a yellow lamp inside the cockpit must illuminate, which informs the pilots that the propeller is in beta mode (reverse). Because of alternate designs from aircraft manufacturers, there are different safety provisions possible to avoid unintended reverse during flight.

The Aircraft Flight Manual as well as the Maintenance Manual describe the systems more detailed.

6.16 REMOVAL INSTRUCTION FOR PT6A-67 SERIES ENGINES:

For PT6E engines start at 6.16.4

6.16.1 Disconnect beta lever from engine controls,

6.16.2 Disconnect beta lever from beta valve,

6.16.3 Remove beta lever with carbon block assy. from beta ring,

6.16.4 Remove beta caps on the propeller and move beta ring forward by hand to get access to the stop nuts. Use of beta puller tool T-375-() for better access.

6.16.5 Lose stop nuts and remove propeller from engine flange.



7. 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.

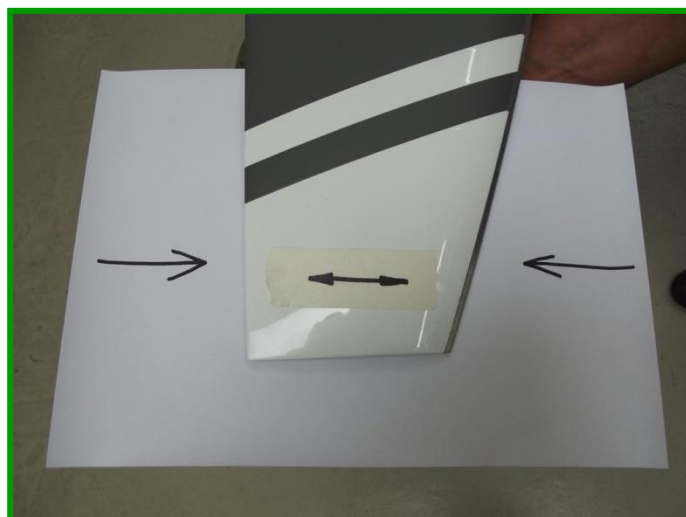
IN CASE OF DOUBT, CONTACT MANUFACTURER / MT TECHSUPPORT FOR FURTHER ACTION!

7.1 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.

Attention:

The blade shake must be checked IN and OPPOSITE the direction of rotation. Measure blade shake 4 inch (10 cm) from blade tip at the trailing edge



NOTE:

DO NOT MEASURE IN FLIGHT DIRECTION AS THE BLADE BENDING WILL ALSO BE MEASURED.

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 allowed!



7.2 INSPECTIONS

- According to Aircraft Maintenance Manual or
- Not later than 400 flight hours or annually, if no schedule available

7.2.1

Inspection Procedure:

Remove spinner and check 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 stop for tightness. Check all safety means to be intact. Check front and rear spinner plate for cracks and fixing. Inspect blade root and hub for oil and grease leaks.

Check position of counterweights. Inspect natural composite blades as shown in Chapter 7.4.

Visually inspect the entire blade (leading edge, trailing edge, face and camber side) for nicks and cracks. If any damage is discovered, refer to chapter 6.1 and 6.2.2 to identify if it is an allowable crack or a non-critical crack.

Visually inspect the De-Ice Boots

Remove spinner dome.

Check all visible hub parts for cracks, deformation, position and safety. A cracked hub is not allowed.

Check wire harness, wiring of cable and the correct connection. If there is any damage with the cabling, repair it and make a preflight check.



Check Slip Rings (Fig. 1) and Brush Block for abrasion.

Replace brushes if they are worn below 7 mm (0.276 inches).

Replace slip ring if worn below 1 mm (0,04 inch) beyond the slip ring support.
Clean slip rings and brush blocks (no grease and oil).

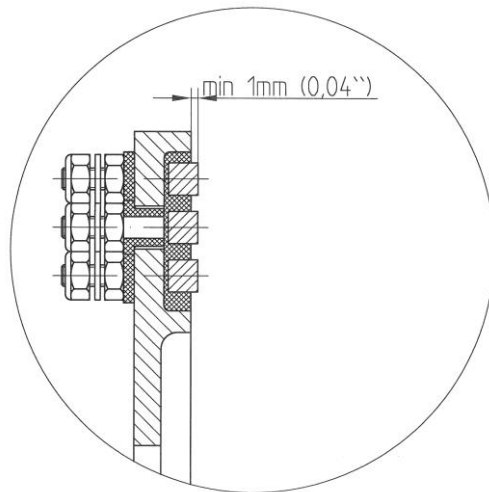


Fig. 1

Perform Functional Check of the De-Ice Boot.

Check back plate and spinner for cracks and loose screws. Repair of spinner parts is not permissible. Cracked spinner domes and back plates have to be replaced by airworthy parts. Missing screws have to be replaced.

Check Beta Carbon Block clearances according to the limits in item 6.12

Check all locks and safety wires for function. If any damage, exchange it before next flight.

Check torque of flange bolts and stop nuts (for torque values see 6.8). No check of torque is required if safety paint is still intact in place.

Install spinner dome.

If one or more of the checks shows any noticeable problem contact the service department of MT-Propeller.

Blade tip play max. 1/8 inch, angular play max. 2°. If the check shows values beyond these tolerances, contact the service department of MT-Propeller.

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.

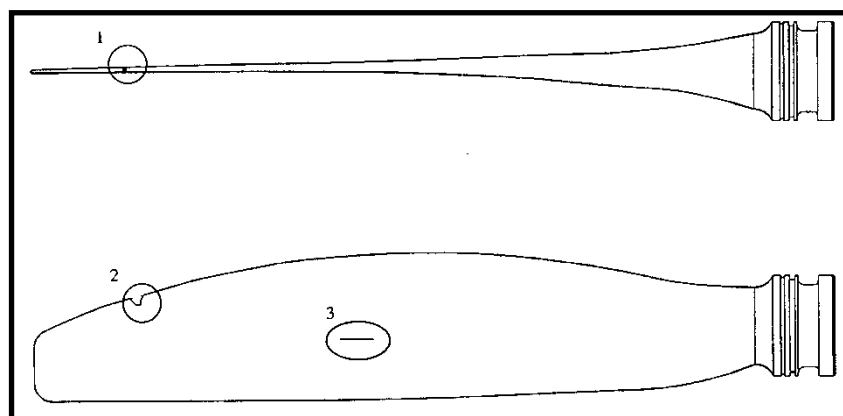


7.3 METAL BLADES (ALUMINUM):

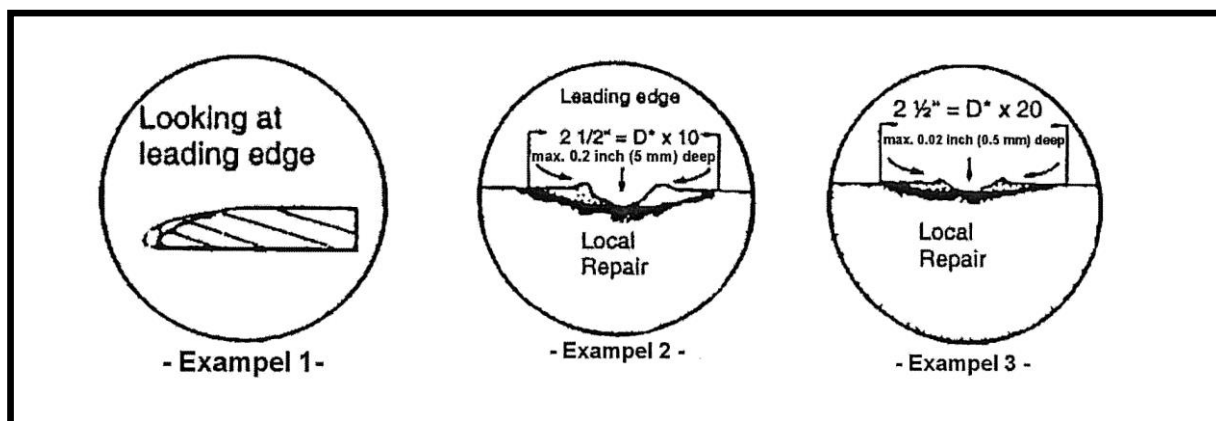
Check **metal blades** for nicks, gouges, and scratches on blade surface or on the leading or trailing edges of the blade, they must be removed before flight. Field repair of small nicks and scratches may be performed by qualified personnel as shown in this chapter.

7.3.1 Repair of Nicks or Gauges on Metal Blades

Local repairs may be made using files, electrical or air powered equipment. Emery cloth, Scotch Brite, and crocus cloth are to be used for final finishing.



Depth of Nick or Gauges



- Figure 6 -



Repairs to the leading or trailing edge are to be accomplished by removing material from the bottom of the damaged area. Remove material from this point out to both sides of the damage, providing a smooth, blended depression which maintains the original airfoil general shape.

Repairs to the blade thrust or camber face should be made in the same manner as above. Repairs that form a continuous line across the blade section (chordwise, blade leading to trailing edge) are unacceptable.

The space between the area of repair should be determined as follows:

Leading and trailing edge damage: Depth of nick times 10.

Face and camber: Depth of nick times 20.

NOTE: **LEADING EDGE INCLUDES THE FIRST 10% CHORD OF THE BLADE FROM THE LEADING EDGE. THE TRAILING EDGE CONSIST OF THE LAST 20% CHORD OF THE BLADE ADJACENT TO THE TRAILING EDGE.**

After filing or sanding of the damaged area, the area must then be polished, first with emery cloth, and finally polished with crocus cloth to remove any traces of filing. A liquid penetrate inspection is recommended.

Protect the repaired area to prevent corrosion. Properly apply chemical conversion coating and approved paint to the repaired area before returning the blade to service. Refer to painting after repair in this chapter.



7.3.2 Repair of Bent Blades:

CAUTION: Do not attempt to “pre-straighten” a blade prior to delivery to an approved propeller repair station. This will cause the blade to be scrapped by the repair station.

Repair of a bent blade or blades is considered a major repair. This type of repair must be accomplished by an approved propeller repair station, and only within approved guidelines. An overhaul of the propeller is required.

7.3.3 Painting after Repair:

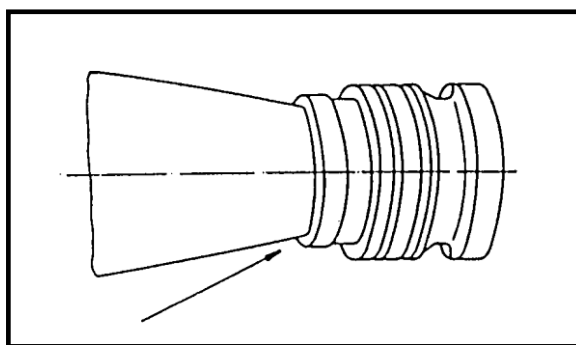
Propeller blades are painted with a durable specialized coating that is resistant to abrasion. If this coating becomes eroded, it is necessary to repaint the blades to provide proper corrosion and erosion protection. Painting should be performed by an authorized propeller repair station in accordance with MT-Propeller Overhaul Manual No. ATA 61-18-09 for metal blades. It is permissible to perform a blade touch-up with aerosol paint in accordance with the procedures in Painting of Aluminum Blades see Overhaul Manual No. ATA 61-18-09 for metal blades.

7.4 COMPOSITE BLADES (WOOD):

Check natural **Composite blades** for cracks in the fiberglass 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.

7.4.1 Illustrations of possible cracks in the blade:

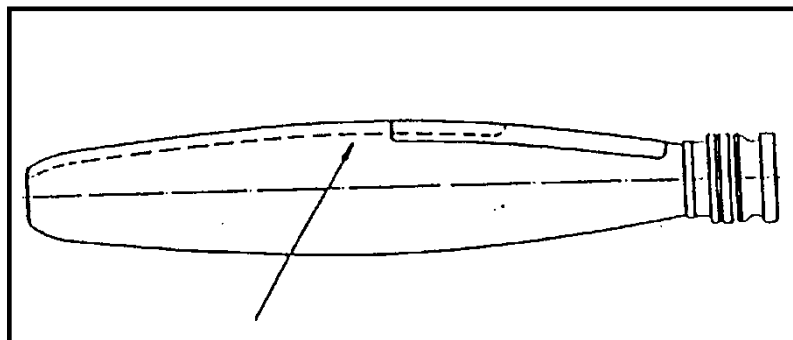


- Figure 7 -

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.

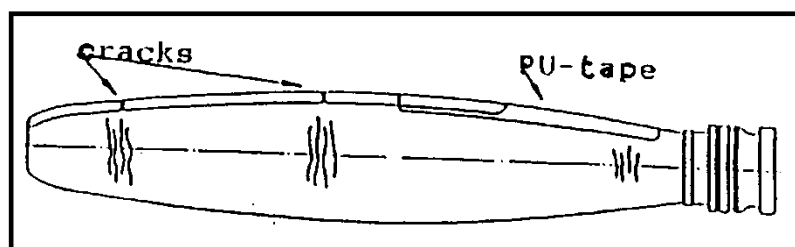


- 7.4.2** Perform visual inspection in case of notches, dents, nicks or other damages to the blade body (for example stone nicks). If no cracks exist, fill void with an appropriate Epoxy resin (5 min. Epoxy). The aerodynamic of the airfoil must not be destroyed. Afterwards sand the filled spot with sandpaper.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



- Figure 8 -

- 7.4.3** 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.



- Figure 9 -

- 7.4.4** 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.



7.4.5 Possible Damage along Erosion Sheath

- a) Circular Dents (more than 0,24 inch x 0,24 inch / 6 mm x 6 mm)
If within 2 inches (51 mm) no other dents of that size are visible, the dent size may exceed the original maximum size by 0,12 inch (3 mm) to 0,36 inch x 0,36 inch (9 mm x 9 mm).

If within 3 inches (76 mm) no other dents of that size are visible.
The dent size may exceed original maximum size by 0,197 inch (5 mm)
to a maximum of 0,433 inch x 0,433 inch (11 mm x 11 mm).

→ If dent is bigger, do not repair. Change erosion sheath!

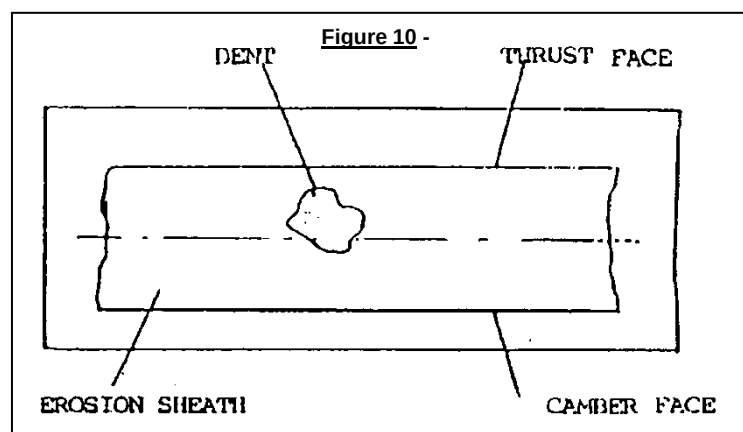
- b) Pointed dents (more than 0,24 inch x 0,24 inch / 6 mm x 6 mm)
If within 2 inches (51 mm) no other dents of that size are visible, the dent size may exceed the original maximum size by 0,12 inch (3 mm) to 0,36 inch x 0,36 inch (9 mm x 9 mm).

If within 3 inches (76 mm) no other dents of that size are visible.
The dent size may exceed original maximum size by 0,197 inch (5 mm)
to a maximum of 0,433 inch x 0,433 inch (11 mm x 11 mm).

→ If dent is bigger, do not repair. Change erosion sheath!

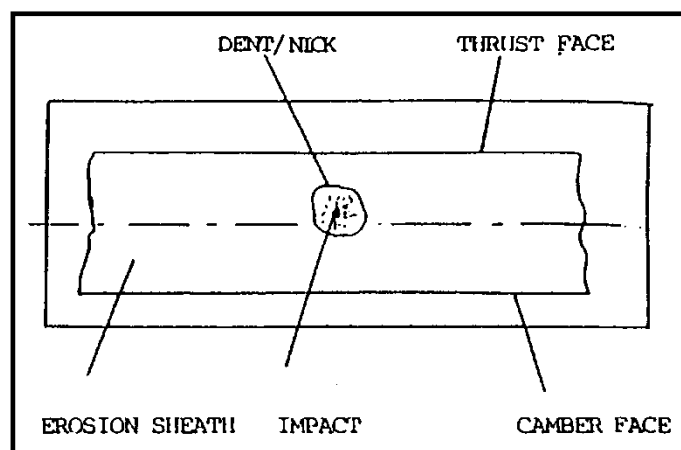
- c) Cracks are not allowed in the erosion sheath, otherwise change erosion sheath,
- d) Hollow and debonded spots (max. 0,39 square inch / 2,5 cm²)
Not more than two spots are allowed within 5,5 inch / 140 mm of each other, otherwise blade must be repaired,
- e) Erosion.
- f) Lightning strike.

- 7.4.6 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.
Please 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.



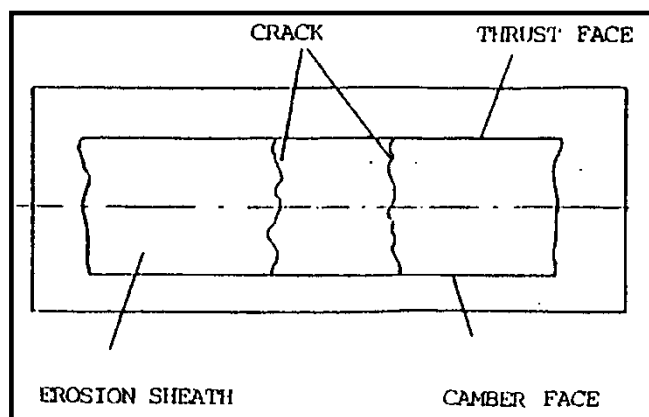


- 7.4.7** In case of impacts in the erosion sheath (as mentioned under item b) the sheath may possibly be penetrated. If not, proceed as described under item 6.3. If yes, check erosion sheath for possible cracks. If there are no cracks, the dent must be filled with Epoxy so that no moisture can enter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



- Figure 11 -

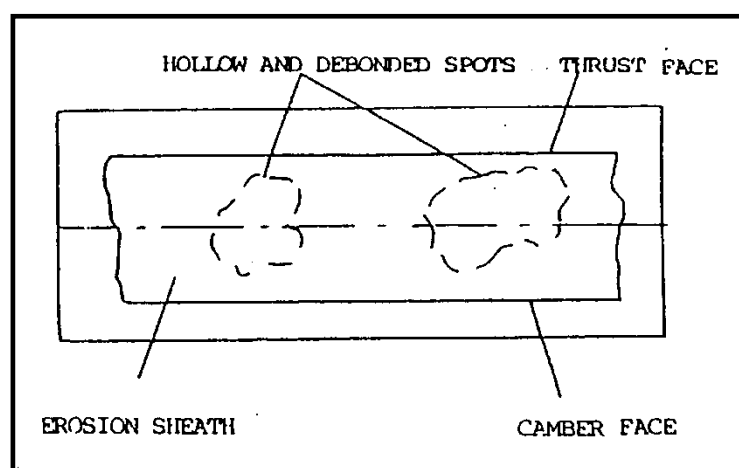
- 7.4.8** If there are any cracks (as mentioned under item c), the erosion sheath must be replaced as soon as possible. The propeller is to be returned to the manufacturer or to an authorized service station.



- Figure 12 -

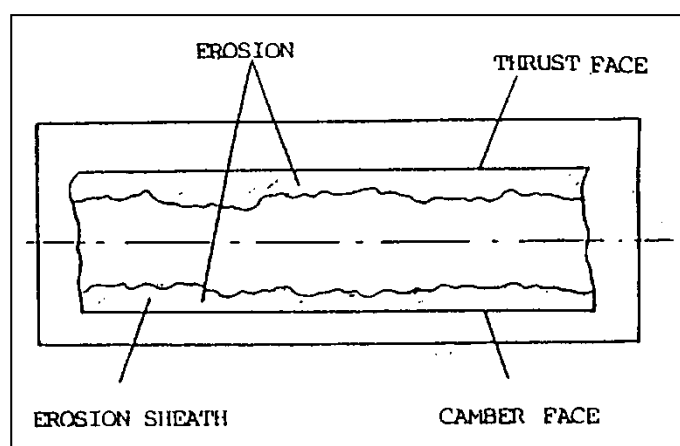


- 7.4.9** If any hollow and debonded spots exist (as mentioned under item d), mark them. Whenever performing pre-flight inspection, monitor whether there are further delamination and/or whether the already existing delamination becomes worse. The inspection can be executed by using an appropriate coin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



- Figure 13 -

- 7.4.10** 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.



- Figure 14 -

**7.4.11** 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.

7.4.12 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.

7.4.13 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.

7.4.14 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.

7.4.15 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).

7.4.16 De-Ice Boots

Installed De-Ice Boots must be checked for their correct bonding. In case a delamination is found (maximal 8 mm x 8 mm / 0,31 inch x 0,31 inch are allowed), repair with glue (i.e. Loctite 401).

After repair seal area with sealer (i.e. 3M Scotch Seal 800-AF) to avoid any moisture entering below the boot.

Finally overpaint repaired area with some black varnish.

In case a de-ice boot is damaged and inoperative, the de-ice boot can be changed in-field, following the applicable Goodrich - Manuals or MT - Manuals.

In case of doubt contact the manufacturer for the correct part number and documentation. Part number is normally shown on the de-ice boot.



7.5 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.

7.6 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.

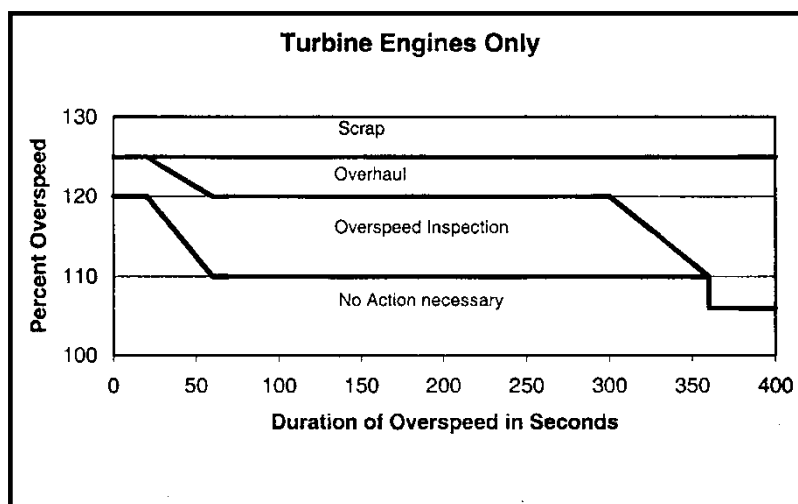
A non-rotating propeller FOD does not require an overhaul, it only needs a blade repair or a blade exchange.

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



7.7 OVERSPEED

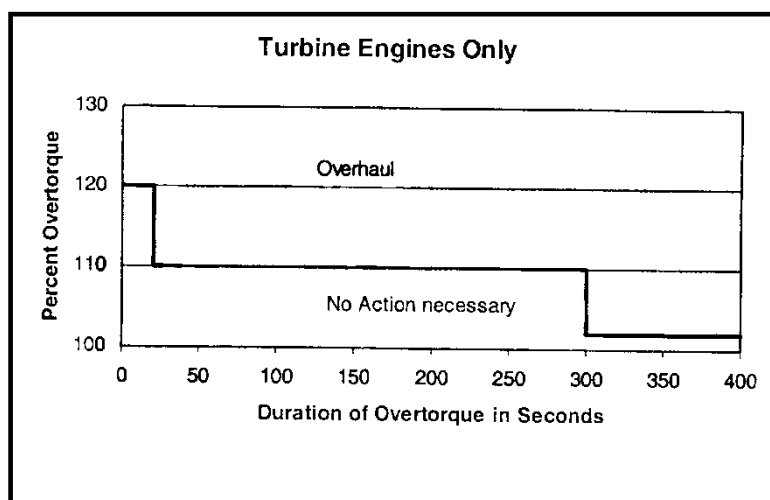
When a propeller installed on a turbine engine has an overspeed event, refer to the Turbine Engine Overspeed Limits in order to determine the corrective action to be taken for the propeller. See Figure 15.



- Figure 15 -

7.8 OVERTORQUE

When a propeller installed on a turbine engine has an overtorque event, refer to the Turbine Engine Overtorque Limits in order to determine the corrective action to be taken for the propeller. See Figure 16.



- Figure 16 -

**7.8.1** 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.

7.8.2 Corrective Action

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

7.8.3 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.

7.8.4 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.
- Aluminum Blades:
Visually inspect the blade and blade root for evidence of damage or premature wear. This may require removal of the bearing races.
- 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.

7.8.5 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.

7.8.6 Scrap

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



8. MAINTENANCE

- 8.1** There is no special maintenance schedule for these 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.
- 8.2** 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.
- 8.3** 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.
- 8.4** Repair of spinner parts is not permissible. Cracked spinner domes, filler plates and backplates are to be replaced by airworthy parts.
- 8.5** 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. 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.
- 8.5.1** In case of a ground strike with Aluminum blades, refer to Manual ATA 61-18-09 for evaluation.



8.6 DYNAMIC BALANCE

8.6.1 General

8.6.1.1 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.

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

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

8.6.2 Inspection Procedures Prior to Balancing

8.6.2.1 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!

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

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

8.6.2.4 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.

8.6.2.5 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.



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

Attention:

In case that anchor nuts are installed on the backplate to mount the dynamic balance weights, make sure that the dynamic balance fixing screws do not extend the anchor nuts by more than 1 turn.

Otherwise the de-icing cables will be damaged or the counterweight can touch the mounting screw.

8.6.3 Placement of Balance Weights for Dynamic Balance

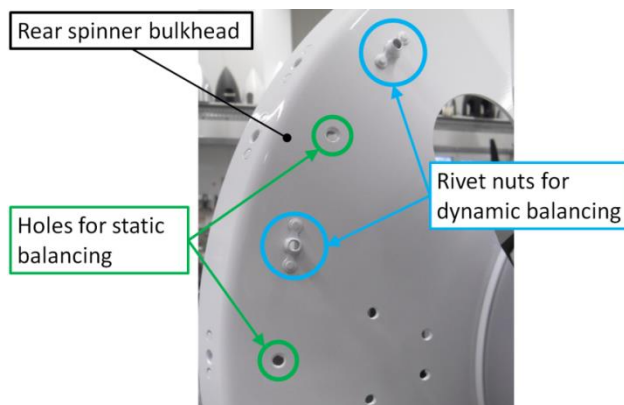
- 8.6.3.1 The method of attachment of dynamic balance weights is to add the weights to the rear (front for pusher props) spinner bulkhead.

If applicable:

For turbo-prop engines the static balancing weights are also installed on the rear spinner bulkhead.

On turbo-props 12 rivet nuts (each 30°) are prepared at the rear spinner bulkhead to receive the dynamic balance weights.

Additionally 12 holes between these rivet nuts are designated to receive the static balance weights



For reciprocating engines the static balancing weights are installed on the spinner front plate.

- 8.6.3.2 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.
- 8.6.3.3 Use only stainless washers or plated steel washers as dynamic balance weights on the spinner bulkhead.



8.6.3.4 Do not exceed maximum weight per location:

- For up to 1700 rpm of 110 grams
- For up to 1900 rpm of 100 grams
- For up to 2000 rpm of 90 grams
- For up to 2200 rpm of 75 grams
- AN970-3, AN970-4 or similar shape lead style washers are approved to be used.

8.6.3.5 Weights are to be installed using aircraft quality 10-32 inch or 1/4" - 28UNF screws bolts.

Caution:

Take care that there is enough clearance between balance washers or screw heads and the beta linkage in feather and full reverse position.

8.6.3.6 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.

8.6.3.7 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.

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



9. TROUBLE SHOOTING

9.1 BLADE SHAKE

9.1.1 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.

9.1.2 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

9.2 WRONG MAX. RPM AND TORQUE

If the rpm and torque is set wrong, proceed according to item 5.13 and set according to the Airplane Flight Manual or Maintenance Manual.

9.3 SLUGGISH RPM CHANGE

Cause: 1. Oil is cold
2. Excessive friction

Remedy: 1. Run the turbine 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.

9.4 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. Instrumental error

Remedy: 1. Move propeller control at least twice every time before flying.
2. Clean oil tubes in the turbine 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. Check tachometer and drive.

**9.5 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 propeller
 2. Excessive friction in the governor
 3. Defect tachometer

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

9.6 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 increase in blade angle of attack.
 3. Failure of governor speeder spring
 4. Governor drive failure.

- 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 turbine.
 3. Contact manufacturer.
 4. Check governor drive and governor on the test bench.

9.7 RPM INCREASE DURING NORMAL OPERATION WITHOUT CHANGE OF PROPELLER LEVER POSITION

- Cause:
1. Sticking pilot valve in governor
 2. Control inoperative or broken.

- Remedy:
1. Check governor on the test bench.
 2. Check free movement, connection and positive stop contact.

9.8 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 turbine.
 2. Clean propeller and propeller shaft.

Concerning 1 and 2:

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

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

**9.9 OIL LEAKAGE (VISIBLE OUTSIDE OR HIDDEN INSIDE) (NO GREASE!!)**

Cause: Damaged seals

Remedy: Replace gaskets or repair propeller.

9.10 ROUGH RUNNING TURBINE – 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 front plate.
2. Rebalance dynamically. Install balance weights to rear spinner bulkhead. See item 7.6.
3. Refer to Airplane Flight Manual. Check rpm tachometer for correct reading. Repair or replace, if necessary.

9.11 SLOW REVERSING OR NO REVERSING

If reverse is not possible, the governor and the mechanical linkage between the rotating propeller and the turbine must be inspected. If necessary, inspect the carbon block and the beta ring for damage or wear, check the beta valve movement.

Relief valve pressure is too low, or the internal leakage of the oil transfer system is too high.

For PT6E engines check engine maintenance and electronic governor manual.

9.12 SLOW FEATHERING

If more than 10 seconds 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.
- Broken feathering spring.

If no discrepancies are found during inspection, check governor on a test bench.



10. SHIPPING AND STORAGE

- 10.1** 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.

- 10.2** 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.

MT Propellers can be stored for extended periods of time at temperatures up to 120 degrees Fahrenheit. It is important to ensure that the stored propeller has adequate ventilation to guarantee local temperatures on the propeller do not exceed 120°F. Additionally the propellers should not be stored for extended periods of time in direct sunlight. While it is not a requirement to inspect the propellers while in storage it is recommend they are visually inspected every 90 days.

- 10.3** 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.
- 10.4** If the propeller is stored for longer than 24 months it can be disassembled before installing to the aircraft and all seals have to be replaced. This will bring calendar time TBO back to zero.
- 10.5** 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.
- 10.6** 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.



SHIPPING AND STORAGE (TO BE CONTINUED)

- 10.7** If the propeller is delivered in a wooden shipping box, the shipping box must be opened after receipt. By opening the shipping box it is ensured that the chemically treated wood of the shipping box does not create any corrosion on the metal parts of the propeller due to chemicals used to treat the wooden shipping box.

10.8 ANTI-ROTATION PROPELLER PROTECTION INSTALLATION



CORRECT at outside temperatures above 0°, that no water can accumulate inside the spinner which can freeze and causing an unbalance in operation.



CORRECT at outside temperatures below 0°, but make sure the cover is opened that no water can accumulate inside the cover, which could lead to a damage of the blade.

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

Part No.	Part	Pieces
C-066	Stop Nuts 9/16"-18UNF	12 each
A-1181-1	Washer	12 each
C-048-H-1	O-Ring	1 each
C-306-8	Spinner Screws	a.r.
C-344	Spinner Washers	a.r.
C-132	Retaining Ring	1
C-131	Carbon Block	1
A-3074	Carbon Block Assy (Airplane PC12 only)	1
Loctite®Moly 50 TM	Grease for stop nuts	Approx.1 oz

12. SPECIAL TOOLS

Tool No.	Tool
T-375-()	Puller
T-609	Insert of torque wrench for 9/16"-18 UNF stop nuts
T-718-38	Tool to adjust low pitch stop nuts: wrench size 3/8 inch
T-718-716	Tool to adjust low pitch stop nuts: wrench size 7/16 inch



13. 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.

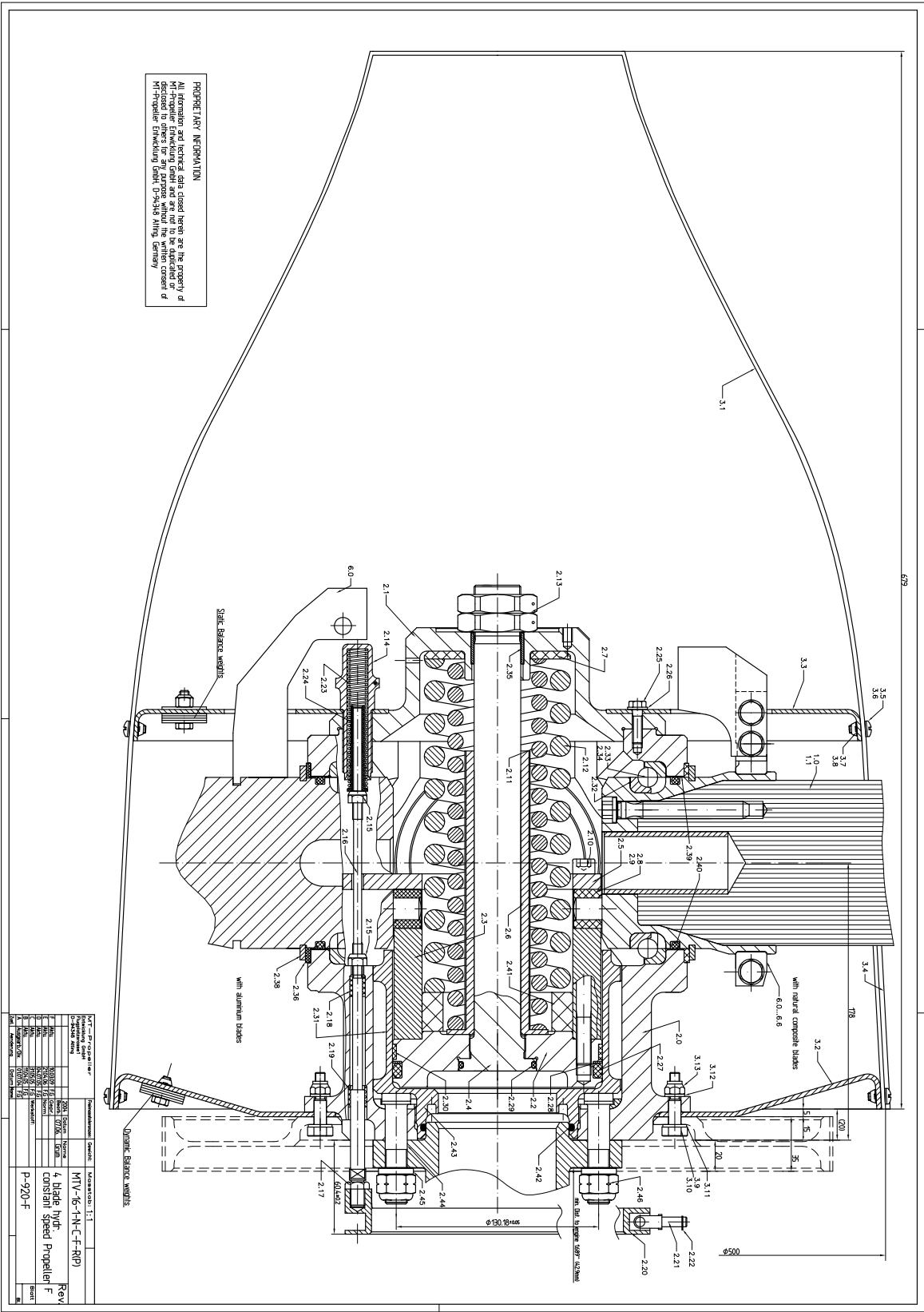
The Airworthiness Limitations Section is FAA approved and specifies maintenance required under 14 CFR §§ 43.16 and 91.403 of the 14 CFR unless an alternative program has been FAA approved.

Rev. No.	Description of Revision



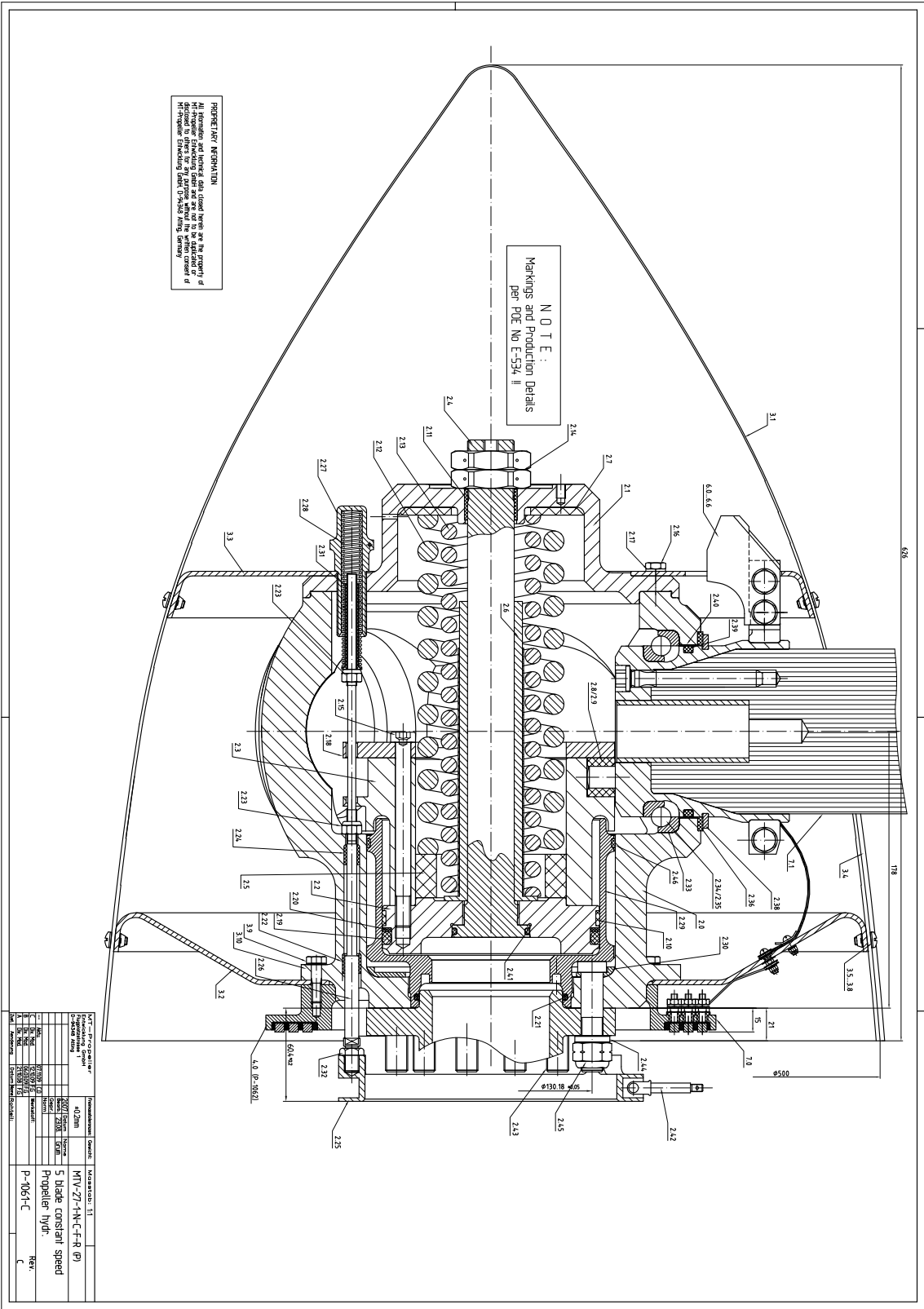
14. PROPELLER DRAWINGS

MTV-16-1-N-C-F-R(P): Drawing No. P-920-F



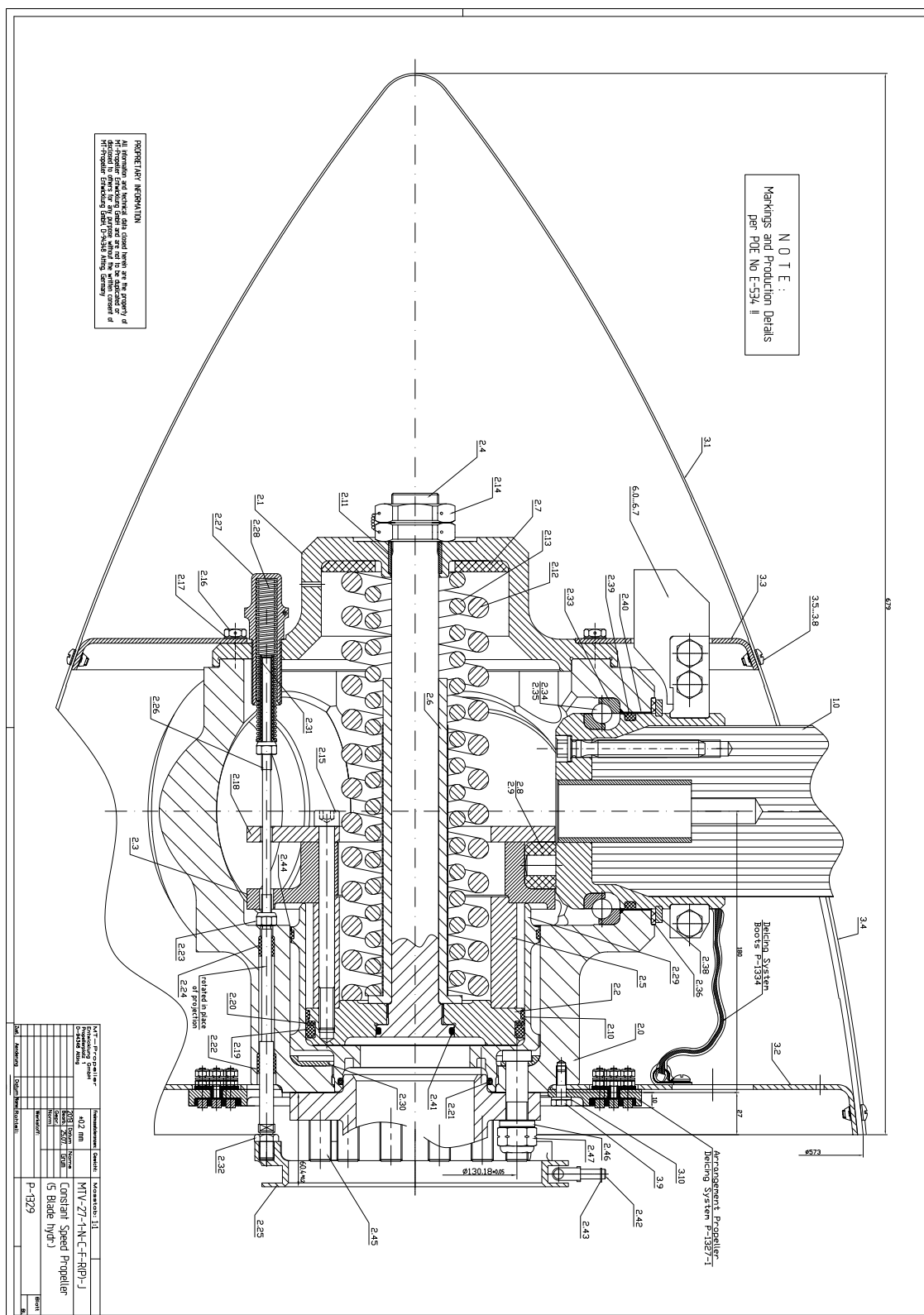


MTV-27-1-N-C-F-R(P); Drawing No. P-1061-C



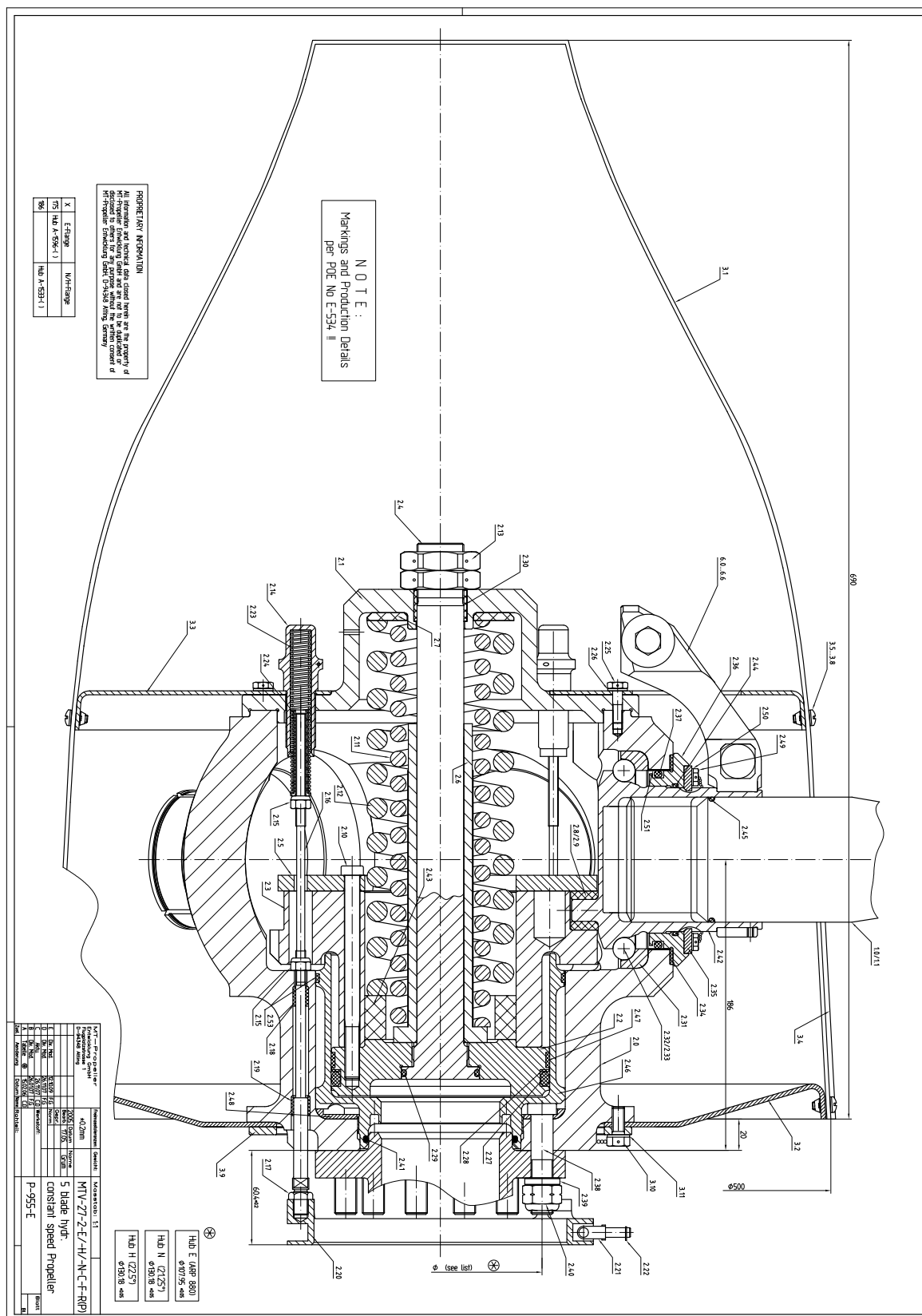


MTV-27-1-N-C-F-R(P)-J; Drawing No. P-1329



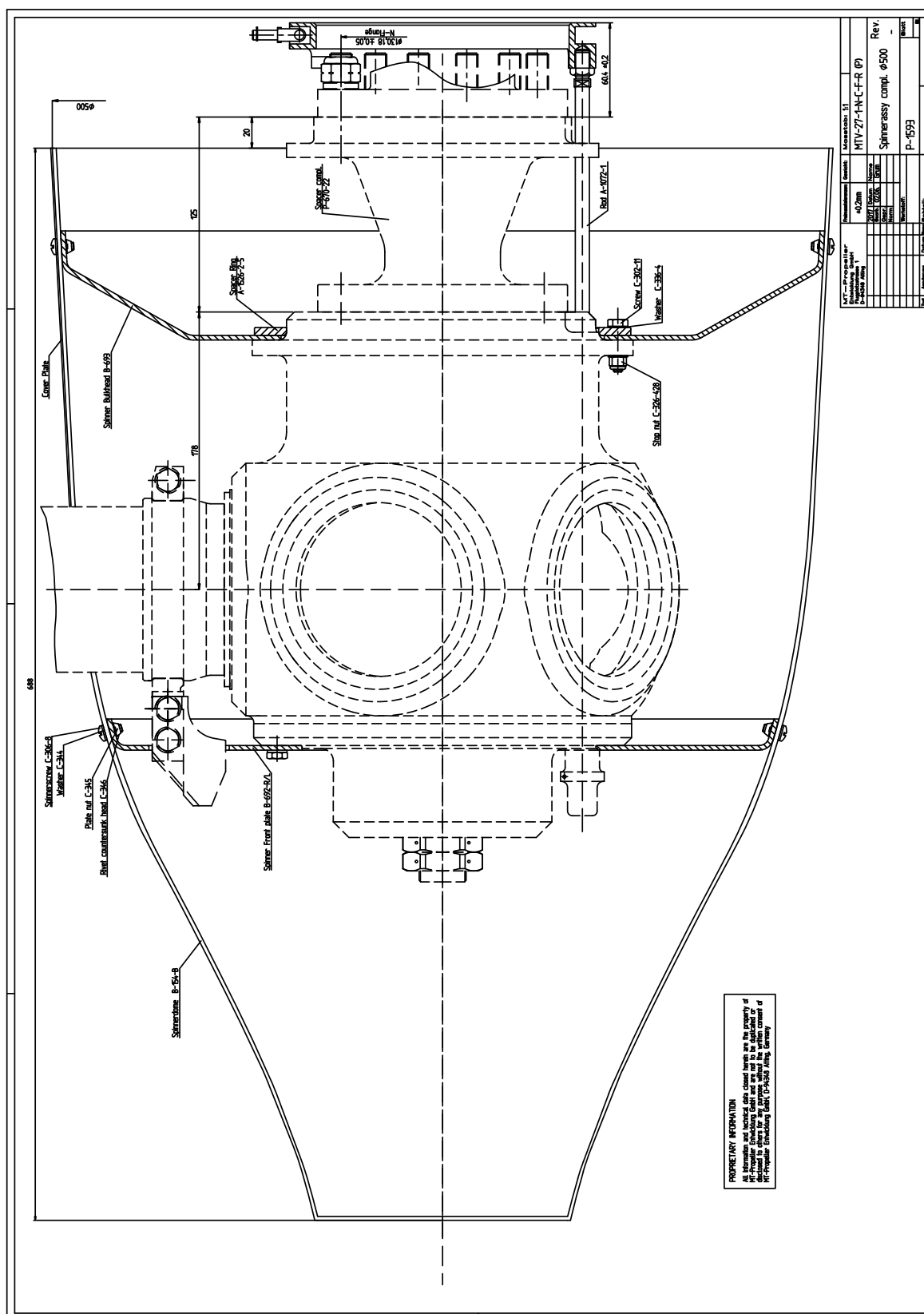


MTV-27-2-N-C-F-R(P); Drawing No P-955-E





MTV-27-1-N-C-F-R(P) spinner assembly, drawing P-1593





MTV-47-1-N-C-F-R(P) / MTV-47-1-N-C-F-R(P)-V spinner assembly, drawing P-1590-()

