



mt-propeller

ATA 61-20-48
(E-1048)

Operation and Installation Manual

**Hydraulically
Constant Speed Governor**

P-8() () ()

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EASA.21J.020



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 governor is a vital component of the aircraft.

A mechanical failure could cause a forced landing.

Governors are subject to constant vibration stresses from the engine.

Before a governor is certified as being safe to operate on an airplane engine, an adequate margin of safety must be demonstrated.

Even though every precaution is taken in the design and manufacture of a governor, history has revealed rare instances of failures, particularly of the fatigue type.

It is essential that the governor be properly maintained according to the recommended service procedures and a close watch be exercised to detect impending problems before they become serious.

Unusual operation characteristics 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 governor.

The governor is among the most reliable components of your airplane. 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 governor, manufactured by AVIA Propeller. Properly maintained it will give you many years of reliable service.

Gerd R. Mühlbauer
President
MT-Propeller Entwicklung GmbH



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No.	Date of Issue	Pages	Remark
1	2004-05-02	all	Initial Issue
2	2004-05-26	2, 3, 9, 10	
3	2006-05-24	2, 3, 14	
4	2006-11-14	2, 3, 5,	Model Designation
5	2007-01-12	2, 3, 5	Governor Performance Data
6	2007-06-26	2, 3, 9	Installation- and Operation Instruction
7	2008-01-31	2, 3, 5, 5-1, 6, 9, 12, 13-1	Supplemetation with Electric Control Version
8	2008-03-19	2, 3, 5-2, 5-3, 11	Electronic Control Governor Governor Head: Lever and RPM Adjustment
9	2009-05-11	2, 3, 5, 15;	Performance Data
10	2009-07-14	2, 3, 5-1, 9, 10, 10-1;	Governor Installation / Update of Governor Drawings
11	2009-10-08	2, 3, 5-4, 5-5	P-8()-() Propeller Governor: Fig. C P-8()1-() Propeller Governor with Feathering: Fig. D
12	2010-06-23	2, 3, 5-6;	Governor Flange AND 20010
13	2012-01-18	2, 3, 9, 14	Installation- and Operation
14	2012-02-21	2, 3, 4-1;	Model Designation : S/No.
15	2013-06-06	2, 3, 9;	Installation- and Operation Instruction
16	2014-04-30	2, 3, 16-1, 16-2, 16-3.	Propeller Gouverner reset after ECU warning

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26	2020-12-10		



1. GENERAL

The P-8() ()-() hydraulic propeller governors are single acting governors developed for hydraulically variable pitch propellers with or without feathering, with or without oil accumulator ports.

WARNING:

MT-Propeller governors are intended to be used only in combination with MT-Propellers.

All certified combinations are listed in MT-Propeller Service Bulletin No. 14.

- **The propeller manufacturer and/or airframe manufacturer must demonstrate and show compatibility for a safe operation.**
- **The compatibility and safe operation must be shown independently from MT-Propeller.**
- **MT-Propeller is not responsible for a safe and airworthy operation of the governor not operated and approved by SB 14.**

Statement of Purpose

This publication provides operation, installation and line maintenance information for these governors.

Installation, removal, operation and troubleshooting data is included in this publication. However, the airplane manufacturer's manuals and applicable propeller manuals should be used in addition to this information.

1.1 DEFINITION OF COMPONENT LIFE AND SERVICE

1.1.1 Overhaul

Overhaul is a periodic process and contains the following items:

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

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

At such specified periods, the governors 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.

For overhaul interval for the governors please refer to Service Bulletin 1

1.1.2 Repair

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

1.1.2.1 A repair does not include an overhaul.

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



1.1.3 Component Life

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

Both references are necessary in defining the life of the component. Occasionally a part may be "life limited", which means that it must be replaced after a specified period of use.

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

No life limit is established for the P-8() ()-() governors!



2. MODEL DESIGNATION

P - 8 6 0 - 17 A

1 2 3 4 - 5 6

Legend:

- 1** P = Propeller Governor
- 2** 8 = Manufactured by MT-Propeller Entwicklung GmbH
- 3** 5 = Pressure to increase pitch. CCW facing engine mounting pad
 6 = Pressure to increase pitch. CW facing engine mounting pad
 7 = Pressure to decrease pitch. CCW facing engine mounting pad
 8 = Pressure to decrease pitch. CW facing engine mounting pad
- 4** = Special arrangements
 0 = Standard
 1 = Feathering
 2 = Higher Pump Capacity
 3 = Electric Control
 4 = Accumulator Connection / Standard
 5 = Accumulator Connection / Feathering
 6 = Accumulator Connection / Feathering / Unfeathering valve
 7 = Electric Control (3) + Accumulator Connection Standard (4) + Electric Feathering
 8 = Feathering (1) + Electric Control (3)
- 5** = Application Number, Settings of Control Lever and Relief Valve Pressure etc.
- 6** = Model designation
 A = old style (Hamilton) control head
 B = prolonged body for direct replacement other manufacturers governors
 C = big pump capacity (gear pump width b = 25 mm)
 D = decreased pump capacity
 F = "F" style control lever
 G = control wheel (instead of lever)
 K = cable instead of connector (for electric control head)
 R = lowered electric control head, open
 S = synchrophasing coil in the governor
 AB = old style (Hamilton) control head with prolonged body
 Z = control ring

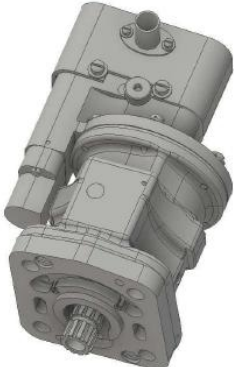
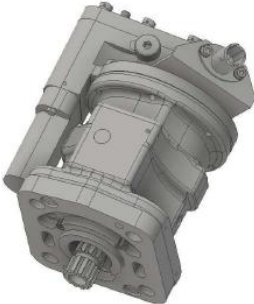
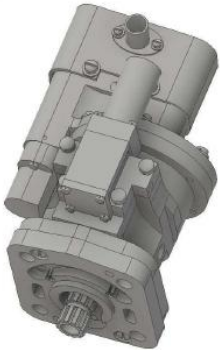
S/No. 03 G 003 - F/D

a b c d e

- a = Year of Manufacture
- b = Governor
- c = Consecutive Number
- d = Modification Letter (Standard Governors)
- e = Additional Modification Letter (Electronic Governors)



Available Governor Models

 Standard P-8()0-()	 Governor P-8()5-() with fitting for accumulator and feathering
 Governor P-8()5-()A with „old style head“ and fitting for accumulator	 P-8()0-()B with prolonged body for direct replacement of other manufacturers governors
 Standard FADEC governor P-8()3-()	 Shortened version of FADEC governor
 FADEC governor P-8()7-() with feathering	 Governor with larger pump P-8()x-()CA



3. PERFORMANCE DATA

Range of acceptable operation oil temperature from -25°C to $+120^{\circ}\text{C}$ (-13°F to $+248^{\circ}\text{F}$)

The governor uses engine supply oil with a pressure at the inlet port between 15 psi and 125 psi (1,02 bar and 8,50 bar).

The breakaway torque with engine oil SAE No. 40 at 4.5°C ($+40^{\circ}\text{F}$) is 40 Nm (30 ft lbs).

The torque required at 220 psi and 2700 rpm is 1 Nm (9 inch lbs)

3.1 DIMENSIONS

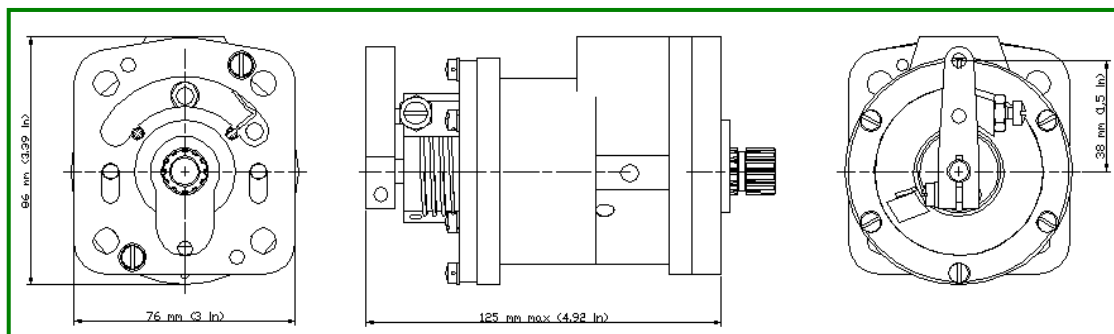


Figure 1
Weight = 1 kg (2,05 lbs) in basic configuration

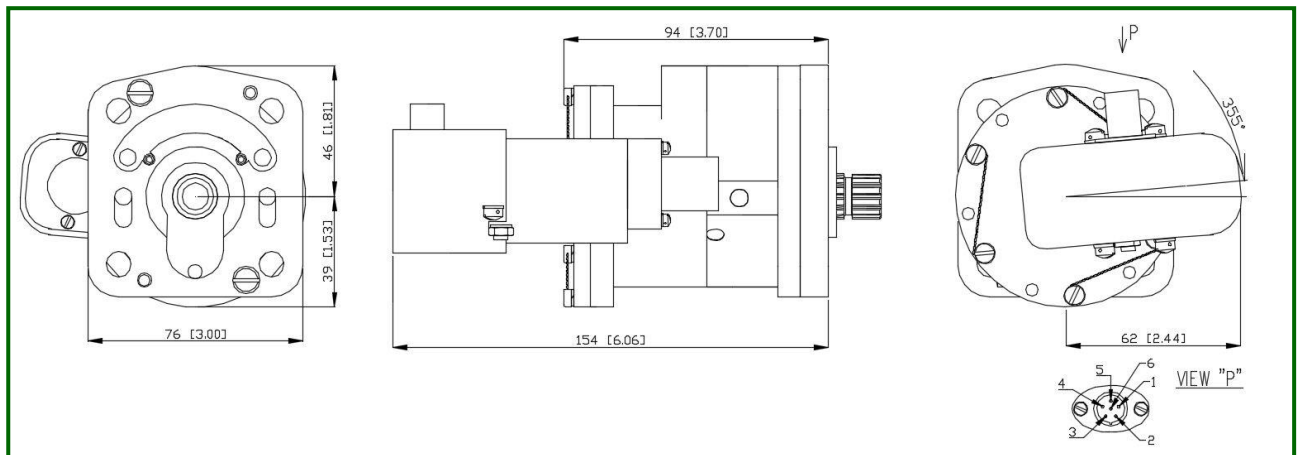


Figure 1a
Electric Control Version

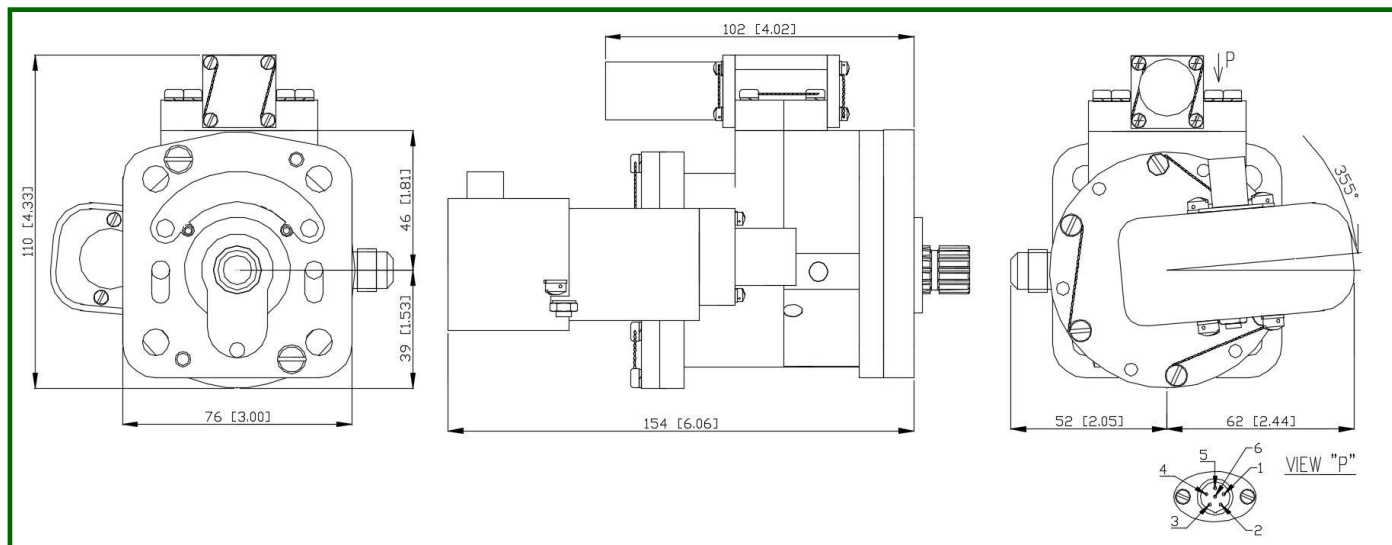


Figure 1b
Electric Control with Electric Feathering and Fitting for Accumulator
weight = 1,65kg

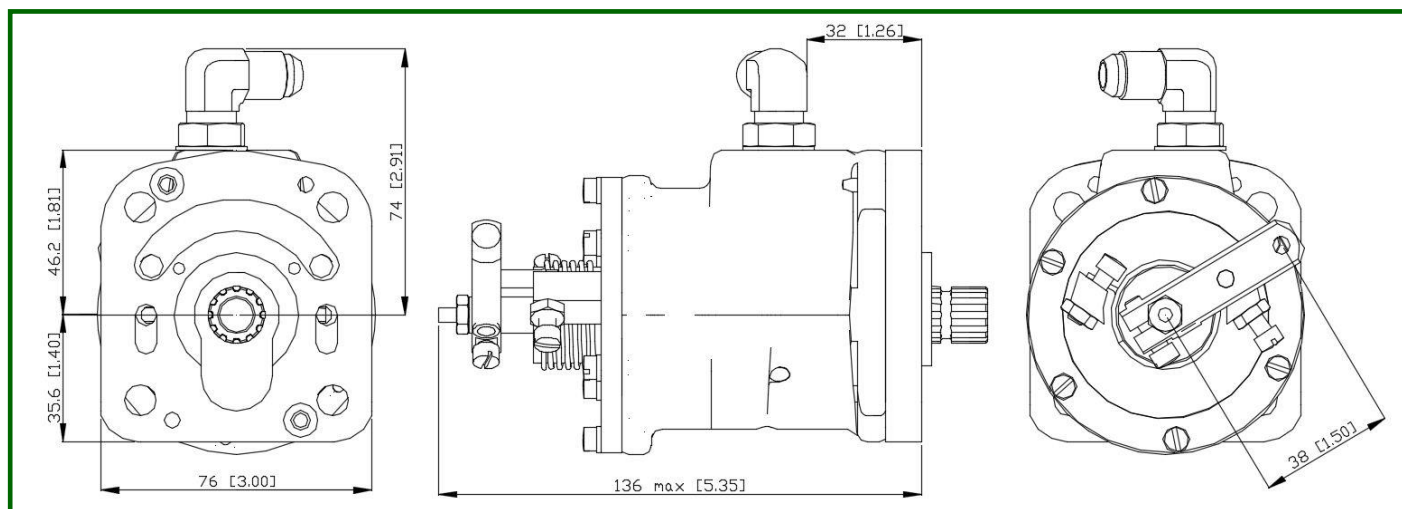


Figure 1c
Governor P-8()5-() with Fitting Control with Electric Feathering and Fitting for Accumulator,
weight = 1,25kg

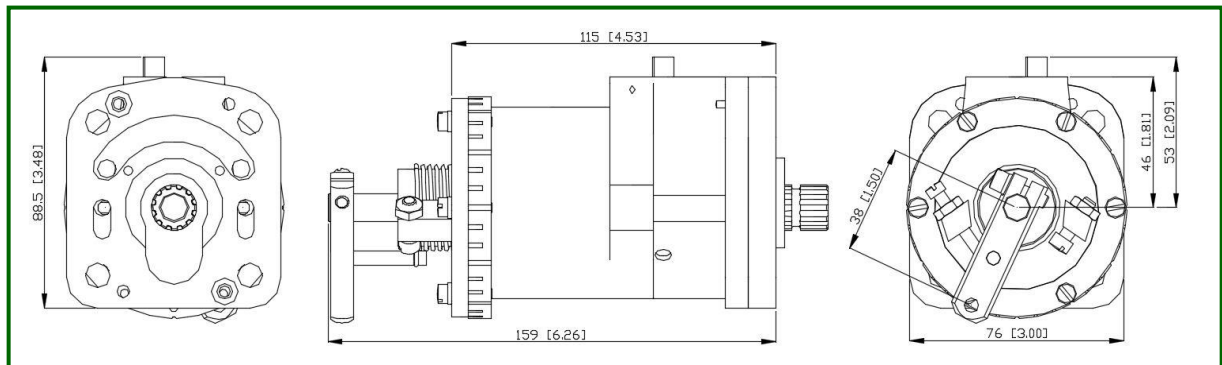


Figure 1d
Governor P-8()0-()B
with Elongated Body for Direct Replacement of other Governors
weight = 1,45kg

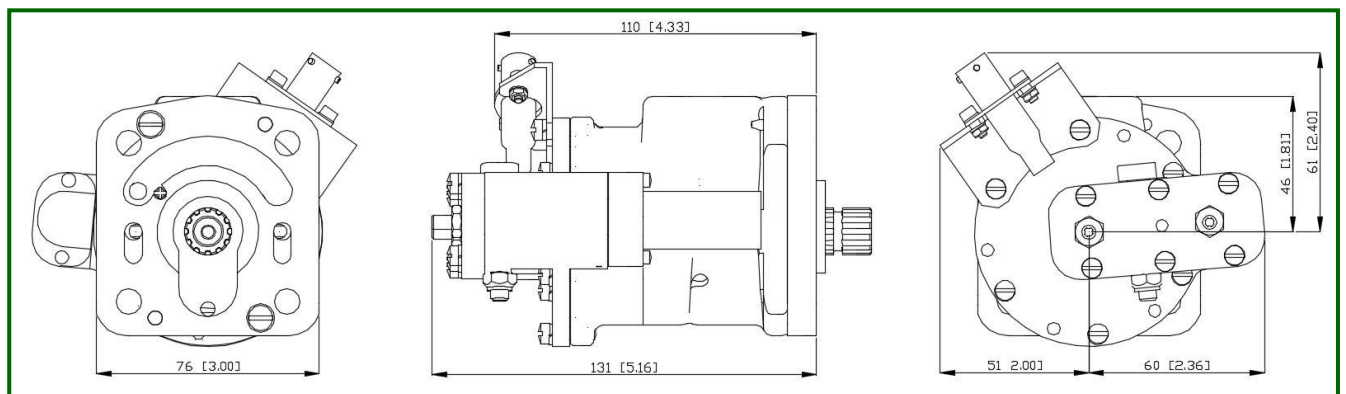


Figure 1e
Shortened version of FADEC governor,
weight = 1,30kg

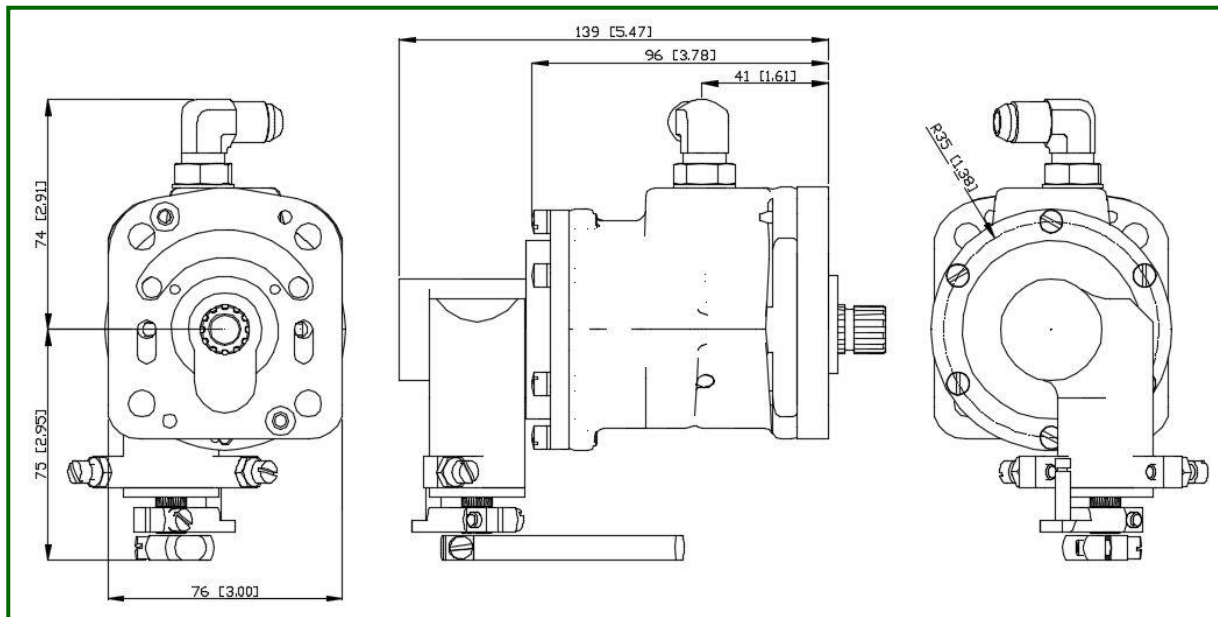


Figure 1f
Governor P-8()5-()A with Pulley Head and Fitting for Accumulator,
weight = 1,55kg

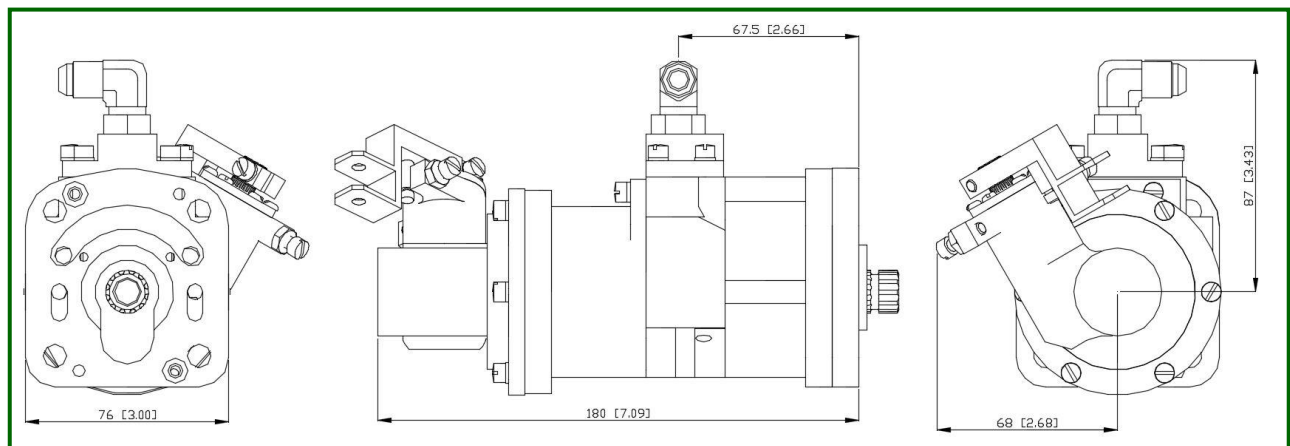


Figure 1g
Governor with Larger Pump and Pulley P-8()x-()CA ,
weight = 1,85kg

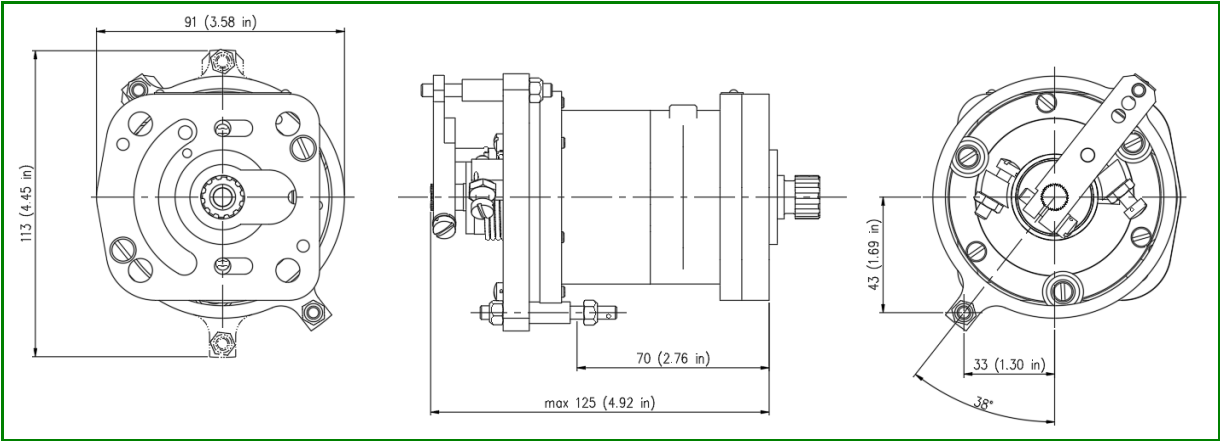


Figure 1h
Governor with control ring, P-8()0-()Z
weight = 1,1 kg

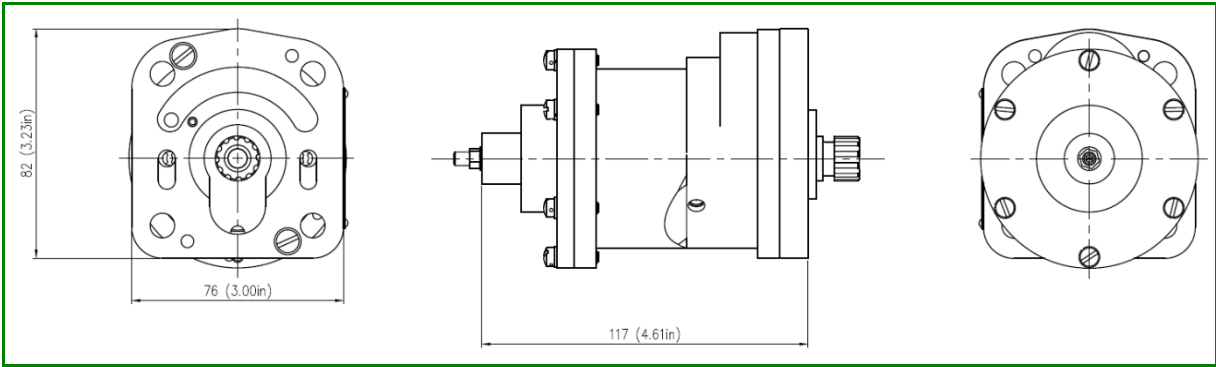


Figure 1i
P-860-161 governor
weight = 1 kg

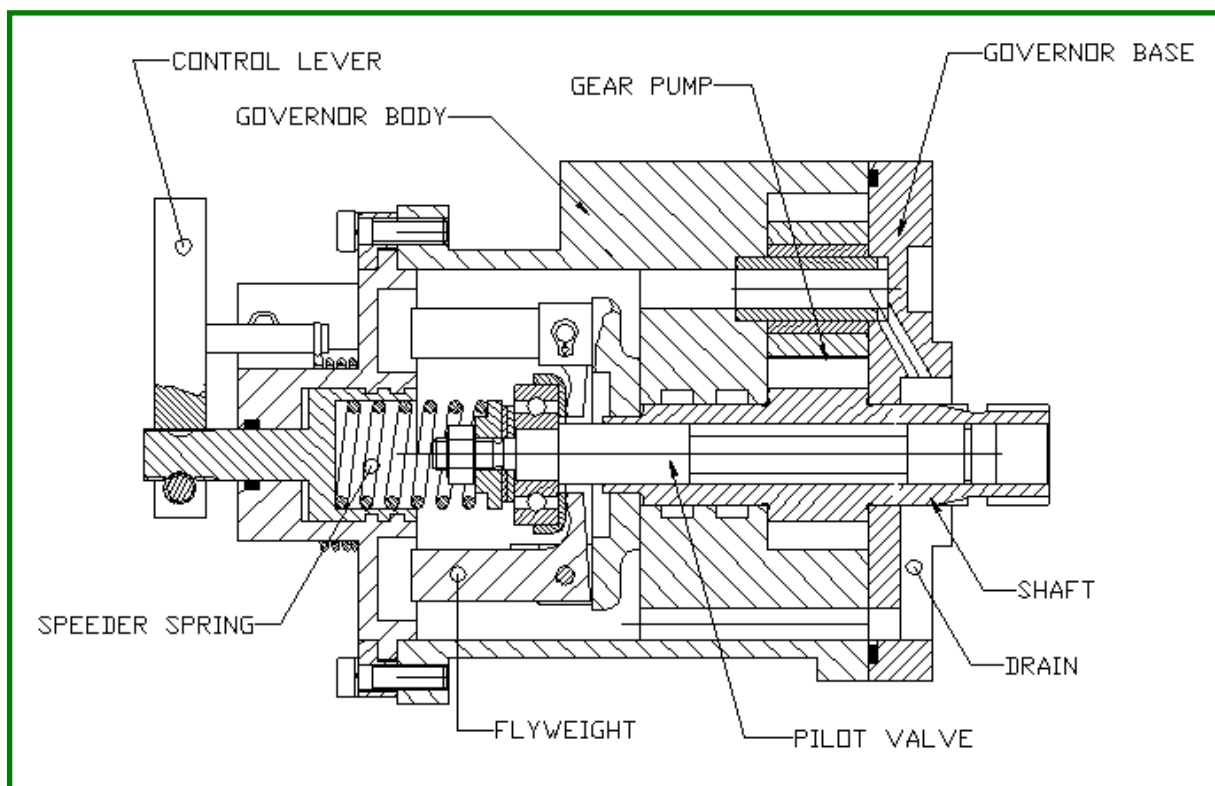


Figure 3
P-8()-() Propeller Governor

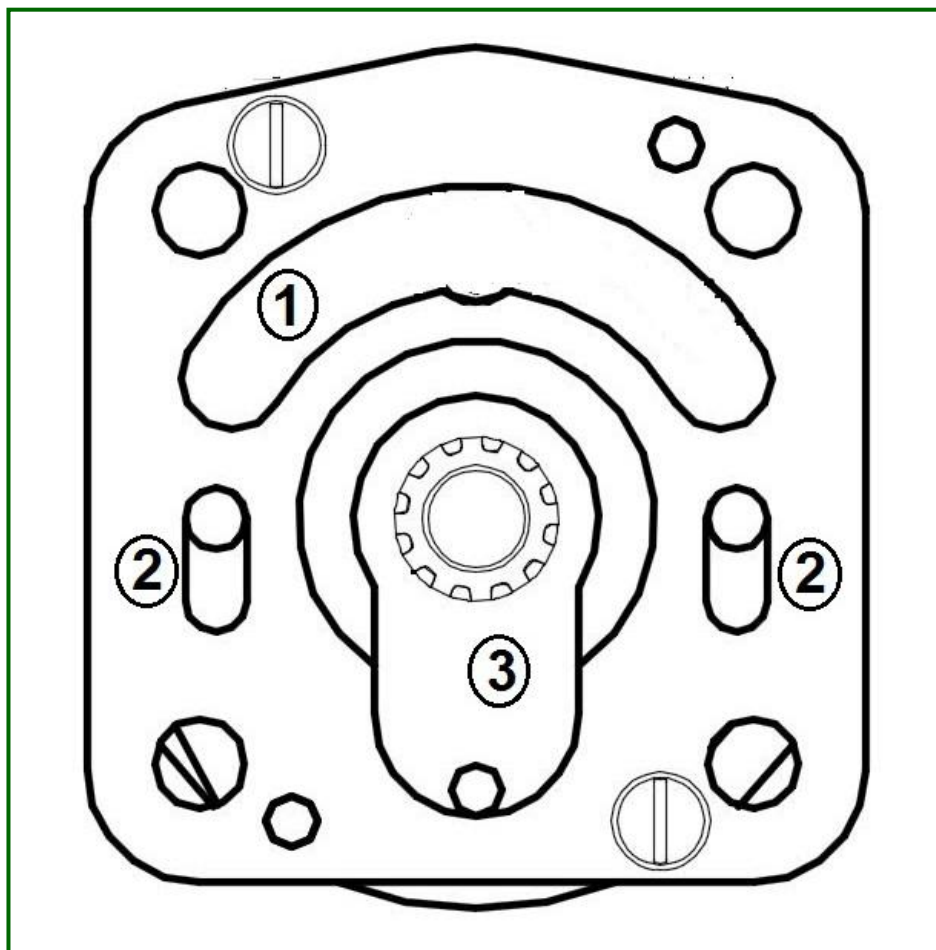
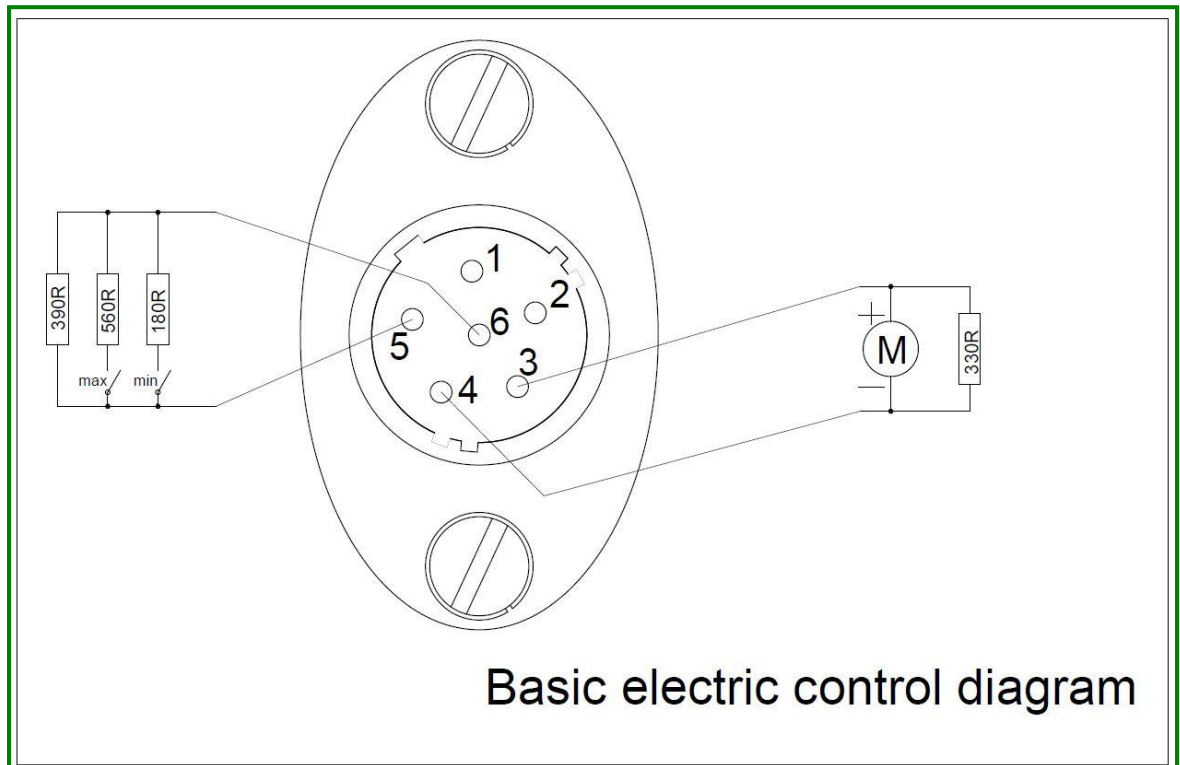
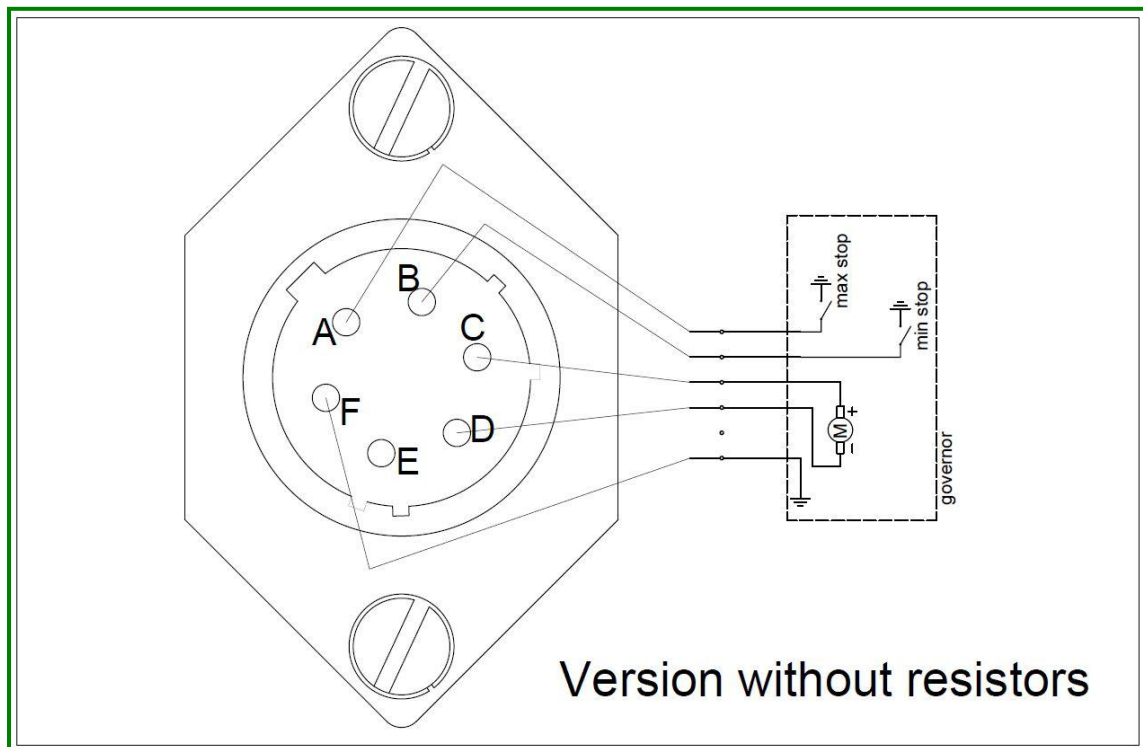


Figure 4
Governor Flange AND 20010

Designation of Channels:

- 1 Oil supply from engine oil system
- 2 Propeller servo oil
- 3 Return oil from the propeller hub and from the internal leakage of the governor into the engine oil sump.

**ELECTRIC DIAGRAM FOR GOVERNORS WITH ELECTRIC CONTROL****Figure 5****Figure 6**



4. DESIGN AND OPERATION INFORMATION

The governors of the **P-8()-()** series are engine mounted, single acting, centrifugal type designed to be operated in conjunction with hydraulic constant speed propellers, as installed on both single and multi-engine piston aircraft.

In flight as conditions change, the governor changes the blade angle to match the airspeed and engine torque maintaining a constant engine / propeller speed.

The governors are producing oil pressure either to increase or decrease pitch.

Pitch change in the opposite direction is accomplished by the force of the propeller blade twisting moment or propeller counterweights and return spring(s). If feathering is required, a lift rod is installed to block the movement of the pilot valve plunger. Some governors may also have a connecting port for the unfeathering accumulator.

The principal parts of the governor are a gear-type oil pump with a pressure relief valve, flyweights mounted on a rotating flyweight head, a spring-loaded pilot valve plunger positioned by the flyweights, an external control lever or a motion screw powered by a geared electric motor that varies the speeder spring preload on the pilot valve plunger. The body, cover and base are made of aluminum. The body contains the necessary passages to channel servo oil to the propeller pitch change mechanism. The base is designed to fit the standard AND20010 engine pad.

The centrifugal force is acting on the flyweights and the force of the speeder spring position the pilot valve plunger resulting to cover or uncover ports in the drive gear shaft and control the flow of the servo oil to or from the pitch change mechanism of the propeller.

Servo oil pressure to operate the propeller pitch change mechanism is supplied by a gear-type oil pump, taking oil from the engine lubricating system and increasing it to an operating pressure. This pressure is controlled by a relief valve, located within the governor housing. There are 2 types of basic governors for:

1. Oil pressure to increase pitch (non-feathering)
2. Oil pressure to decrease pitch (feathering)



4.1 **ONSPEED**

In this condition the forces in the governor are in a state of balance.

The speed adjusting control lever has been set by the pilot to obtain the desired engine / propeller rpm. The propeller blades are at the correct pitch to absorb the power developed by the engine as well as the aircraft speed. The centrifugal force of the rotating flyweights exactly balances the force of the speeder spring.

The pilot valve, located in the drive gear shaft, controls the port openings between the oil pump and the propeller pitch change. Pressure oil from the gear pump is circulating through the open governor relief valve back to the inlet side of the pump.

4.2 **OVERSPEED**

This condition occurs when airspeed or horsepower is increased and engine / propeller rpm increases above the setting of the speed adjusting control lever. The increase of the centrifugal force on the rotating flyweights overcomes the force of the preloaded speeder spring and opens the port to the propeller servo.

On **Non-Counterweighted Propellers**, using oil pressure to increase pitch (see Figure 7) the pilot valve plunger is moved up uncovering the ports in the drive gear shaft to permit servo oil pressure to increase and change the propeller blades to a higher pitch.

On **Counterweighted Propellers**, using oil pressure to decrease pitch, (see Figure 8) the pilot valve plunger is moved up, uncovering the ports in the drive gear shaft to permit servo oil pressure to drop and open the return line from the propeller pitch change mechanism. This allows the propeller counterweights on the blades to turn the propeller blades to a higher pitch.



ON-SPEED FOR NON-COUNTERWEIGHTED PROPELLER – THE PROPELLER TURNS WITH REQUESTED SPEED – PRESSURE TO INCREASE PITCH

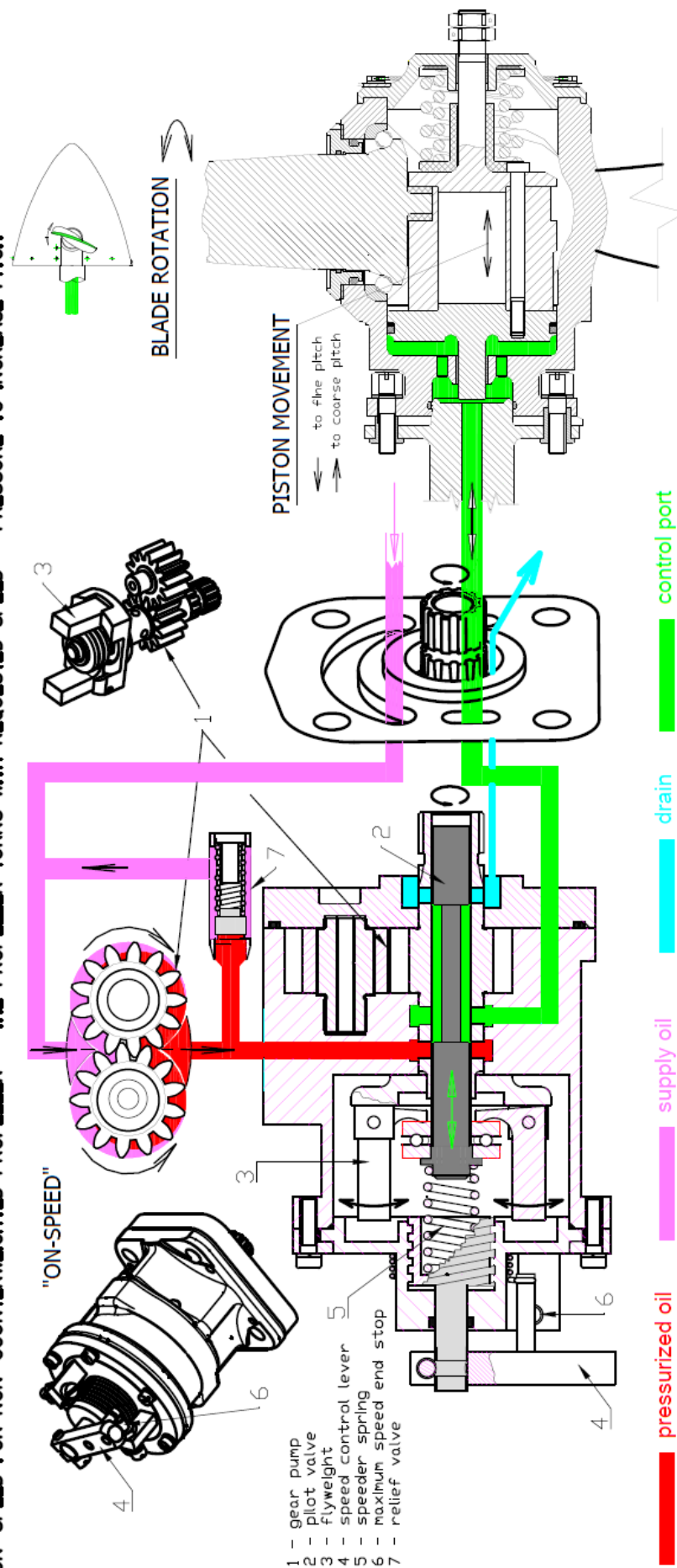


Figure 7

Hydraulic Diagram for Onspeed Condition of Non-Counterweighted Propeller

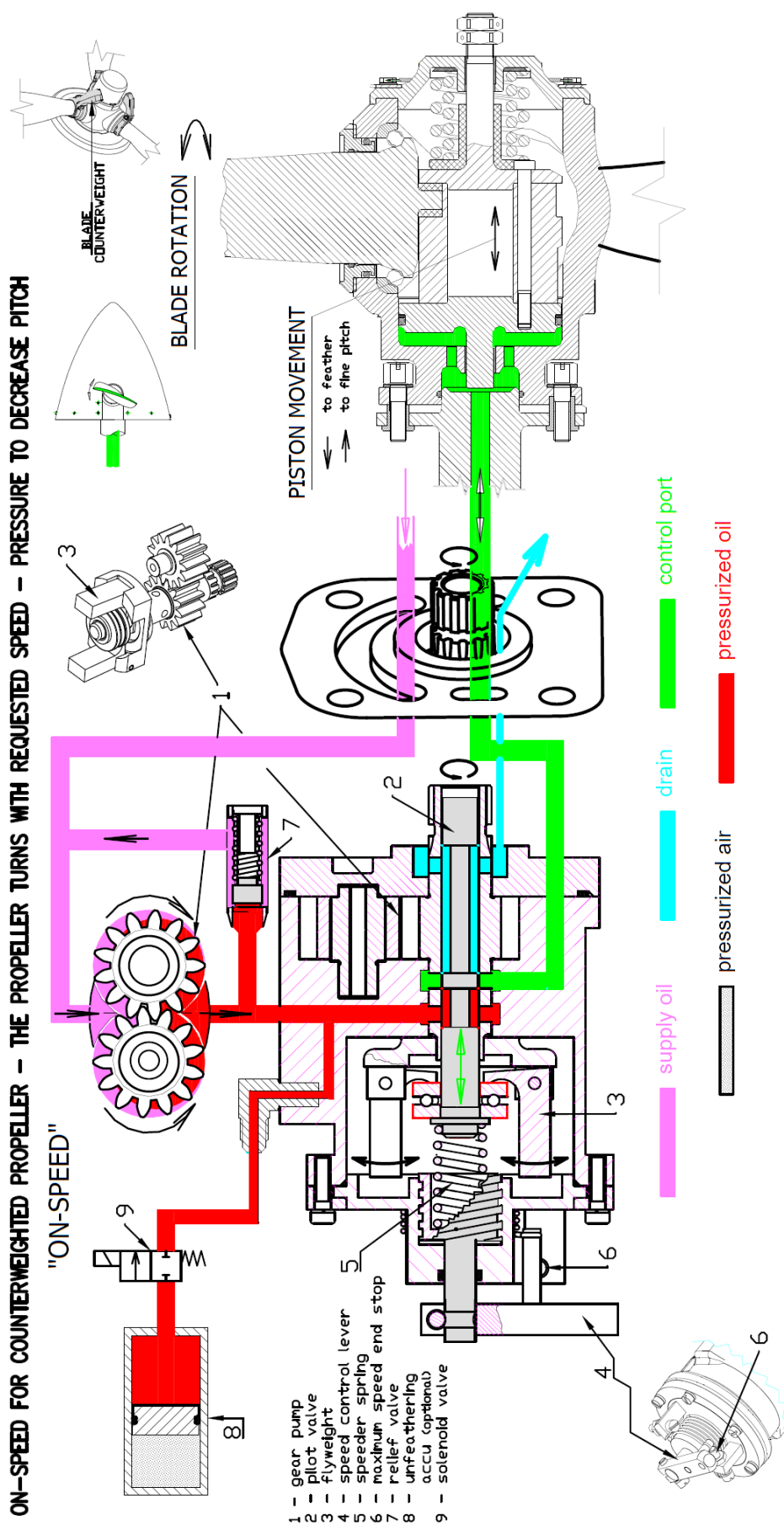


Figure 8

Hydraulic Diagram for Onspeed Condition of Counterweighted Propeller



4.3 UNDERSPEED

An underspeed condition occurs when the airspeed or horsepower is decreased and engine / propeller rpm falls below the setting of the speed adjusting control lever. The decrease of the centrifugal force on the rotating flyweights and the preload of the speeder spring opens the port to the propeller servo.

On **Non-Counterweighted Propellers**, using oil pressure to increase pitch (see Figure 7) pilot valve plunger is moved down, uncovering the ports in the drive gear shaft to permit servo oil pressure to drop and open the return line from the propeller pitch change mechanism. This allows the propeller blades to turn to a lower pitch.

On **Counterweighted Propellers**, using oil pressure to decrease pitch, (see Figure 8) the pilot valve plunger is moved down, uncovering the ports in the drive gear shaft to permit servo oil pressure to increase and change the propeller blades to a lower pitch.

4.4 FEATHERING

Some governors may have feathering capability by using a lift rod which manually blocks the pilot valve plunger and opens the return port of servo oil from the propeller for feathering, once the pilot selected this via the propeller control. Spring(s) push the blades into feathering position.

4.5 UNFEATHERING ACCUMULATORS:

Some governors may have ports to connect unfeathering accumulators which store servo oil during feathering activation and release the servo oil to unfeather the propeller by an electromagnetic valve on the accumulator.

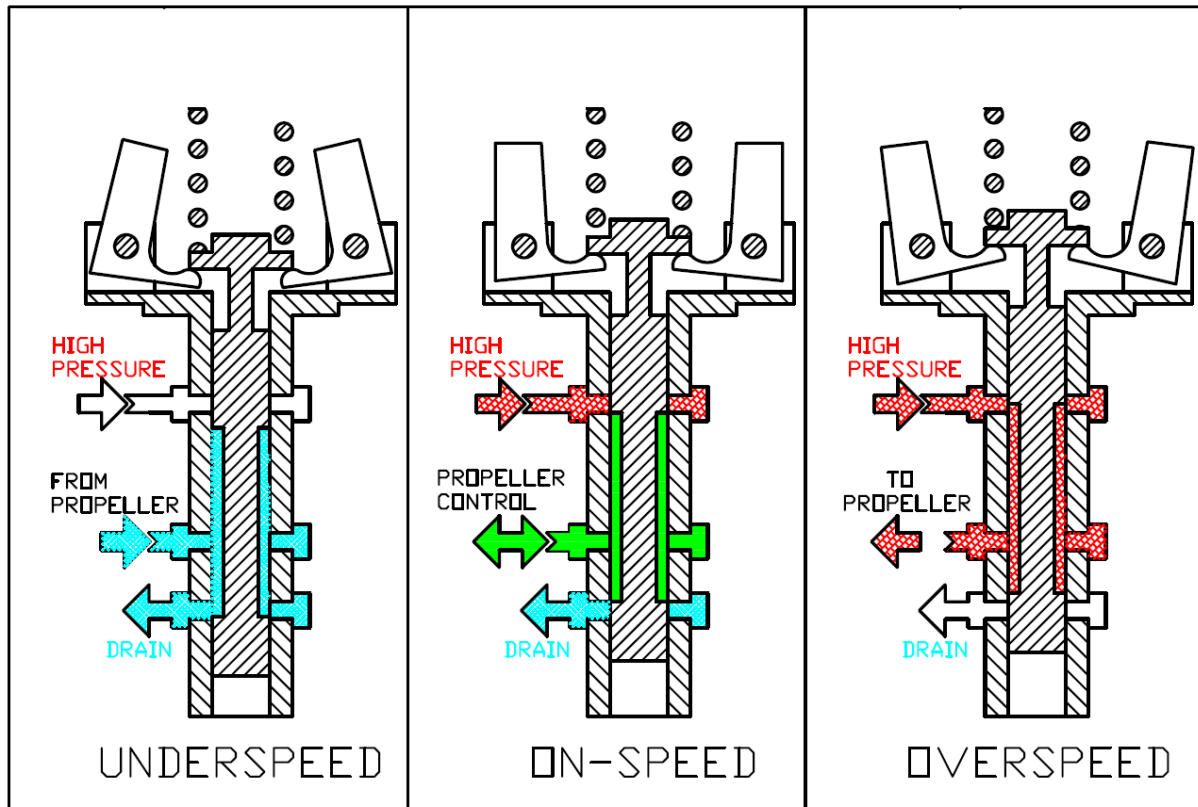


Figure 9
Pressure to Increase Pitch Type Pilot Valve

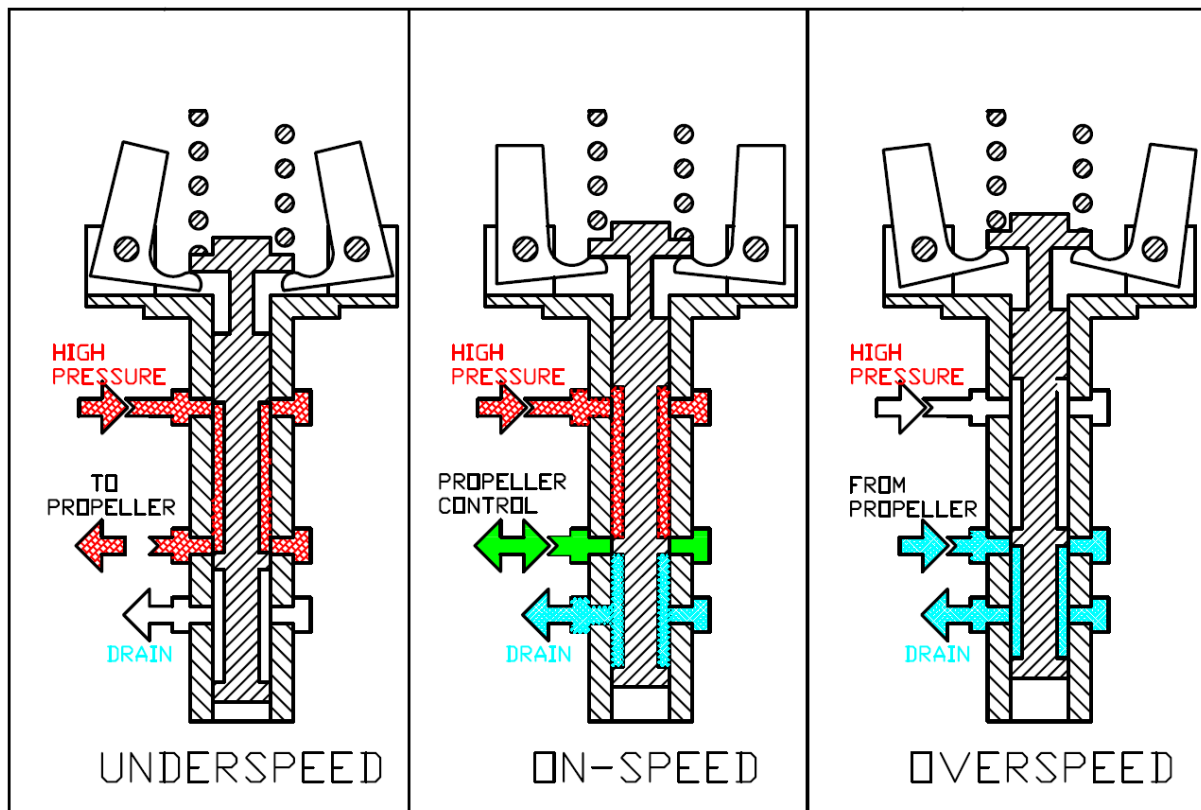


Figure 10
Pressure to Decrease Pitch Type Pilot Valve



5. INSTALLATION AND OPERATION INSTRUCTION

5.1 BEFORE INSTALLATION OF A NEW GOVERNOR – TURN THE GOVERNOR DRIVE BY HAND TO CHECK FOR FREE AND EASY ROTATION!

5.1.1 If applicable: Remove old governor per aircraft service instructions.

5.1.2 If applicable: Remove push-pull linkage bracket from original governor.

5.1.3 If applicable: Remove required top cover screws from new governor and install push pull linkage bracket to top of governor and torque screws 2-3 Nm (18-24 inlbs)

Prepare new mounting gasket, **P/N B-20024 or P/N MS9144-01**
Coat the gasket with engine oil or equivalent before installation.

5.1.4 Check that mounting studs project a minimum of 31.75 mm (1.250 in) from face of engine pad.

5.1.5 Clean engine pad, studs and mounting hardware before installing new mounting gasket. Insure governor drive spline mate correctly with engine accessory drive spline.

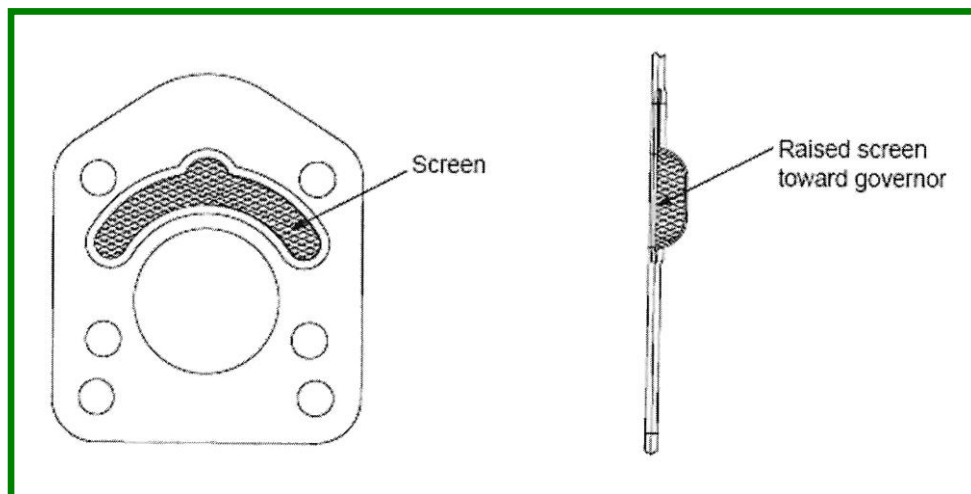


Figure 11
Governor Gasket



Valid for all Lycoming four- and six-cylinder dual magneto engines with rear mounted propeller governor drive (dual magneto engines can be identified by the last digit "D", e.g. IO-360-A3B6D):

Additionally, to the gasket shown in Fig. 11 the plate B-592 and the gasket P/N 72053 from Lycoming needs to be installed between engine and governor to prevent excessive oil leakage, see figure 11-1.

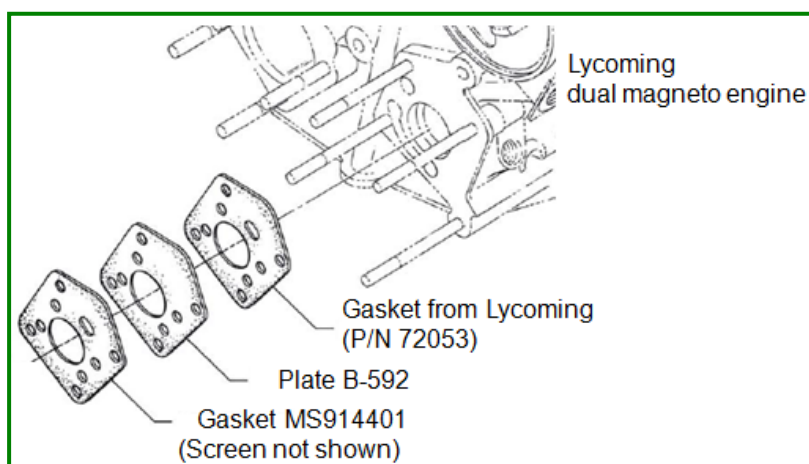


Figure 11-1

- Verify that the plate and the two different gaskets are positioned in the correct order.

Attention:

If the sub-assembly is not installed correctly an excessive oil leak might occur resulting in engine failure and forced landing.

- After complete installation of the governor perform an engine run and check that no oil leakage has occurred.

For further information see Lycoming Service Instruction 1438A and FAA Special Airworthiness Information Bulletin NE-06-08.



- 5.1.6** Attach mounting hardware and torque the (4) mounting nuts to 20-24 Nm (180-220 inlbs).
- 5.1.7** Connect push-pull control to outermost hole on governor control lever and adjust linkage per aircraft service instructions. Make sure the linkage is arranged as shown below.

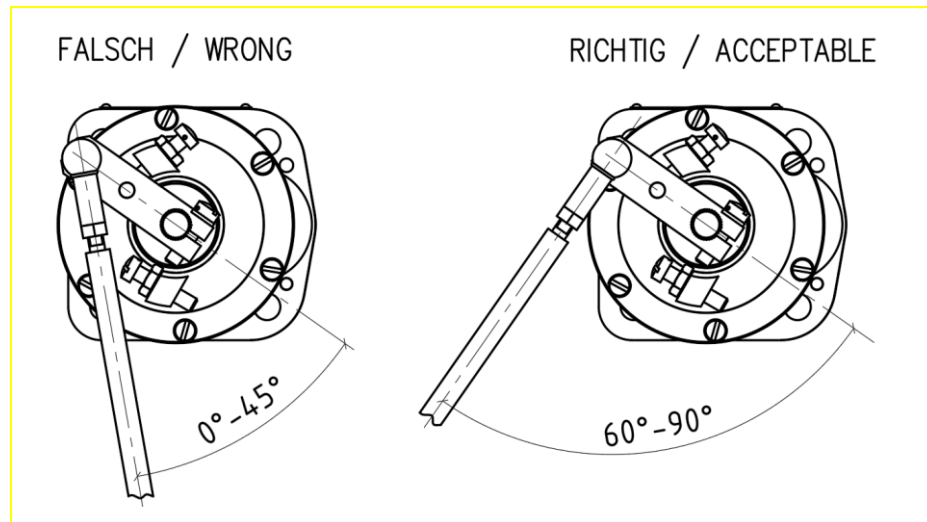


Figure 11 A

- 5.1.8** If an accumulator is connected to the governor, make sure the supply line to the accumulator is positioned properly.

NOTE:

IF THE ACCUMULATOR IS INCORRECTLY POSITIONED, THE LINE MAY VIBRATE AND CRACK, CAUSING AN EXCESSIVE OIL LEAK.

- 5.1.9** Ground- and Flight Check is required for proper rpm setting.

Correct as required.

Tests should be done in smooth air.

NOTE:

EXCESSIVE LEAKAGE IN THE ENGINE OIL TRANSFER SYSTEM MAY RESULT IN A CHANGED SPEED SETTING.

- 5.1.10** If adjustment is required, remove cowling, adjust according to point 5.6.2 (mechanical) or point 6.3 (electric) chapter.
- 5.1.11** Also check for oil leaks - none permitted!



5.2 FEATHERING CHECK

During static run-up, check also feathering on feathering governors in accordance with aircraft service instructions.

5.3 PERFORM STATIC RUN-UP

Attention: Perform the static run up on a clean area in order not to damage the propeller blades due to stones etc!!

- Lock aircraft brakes.
- Place cockpit propeller RPM lever in MAX RPM position.
- Advance throttle slowly to maximum permitted engine manifold pressure limits.
- Record propeller rpm.
- If local wind conditions are over 2.5 m/s (5 kts) repeat check with aircraft pointed to opposite direction and average the results.
- **For standard applications, cycle the propeller 3 to 5 times to bleed the system and remove the air.**
For single lever controlled applications this is not required.
- As a general rule, the propeller should limit the static rpm to 25-100 below the red line.
- In order to find out, whether propeller or governor is limiting static rpm, pull rpm control back (out). If rpm drops immediately, the governor is limiting rpm. If control can be moved without immediate rpm change, propeller is limiting rpm.

5.4 PERFORM FLIGHT TEST

During takeoff acceleration, record maximum propeller rpm.

When sufficient altitude is reached, level out aircraft, leaving propeller control in MAX rpm position.

Maintain this setting for 3 to 5 minutes while monitoring propeller rpm.

Following this check, two conditions may exist which require adjustment:

5.4.1 Overspeed

If the propeller RPM is exceeding the red line limit, reduce it to the redline using propeller control. Leaving propeller at this redline RPM setting, land aircraft and shutdown.

Remove cowling and adjust governor high rpm screw clockwise (**in**) until it touches the stop on governor control arm. This will ensure that the arm position for governor redline rpm setting is correct.



5.4.2 Underspeed

If the propeller is below red line limit with max rpm setting on the propeller cockpit control, note RPM and land. Remove engine cowling and adjust the governor high rpm screw counterclockwise (**out**) to increase rpm. One turn is approximately 25 rpm.

Perform another flight to confirm the adjustment was correct.

5.4.3 Check for oil leaks, not any permitted.

Make a record in the maintenance documents.

Caution: **Do not permit the propeller to overspeed for a longer period because a significant damage to the engine may result!**

5.5 GENERAL

Static Run Up

There has been some confusion in the field concerning propeller low blade angle setting, the governor setting and how it relates to static run-up and take-off rpm.

As a general rule, engine redline rpm cannot be reached during a full power static run-up.

Contrary to popular belief, the governor is not controlling the propeller at this time, the propeller is against its low pitch stop.

Attempting to increase propeller static run-up rpm by adjusting the governor high rpm screw will have no effect and will probably result in a propeller overspeed during the following take-off.

5.6 GOVERNOR HEAD / CONTROL LEVER AND RPM ADJUSTMENT

5.6.1 Governor Head (see Figure 12)

It is possible to locate to governor head in any position, see Figure 12.

To do so, remove the safety wire from the six screws (1), loosen the screws enough to rotate the head to the desired location, tighten the six screws with 2.0-2.5 Nm (18 - 22 inlb) and re-safety wired them in place.



When relocating the governor head and to avoid a possible oil leak, be extremely careful not to damage the O-ring between the governor head and governor body.

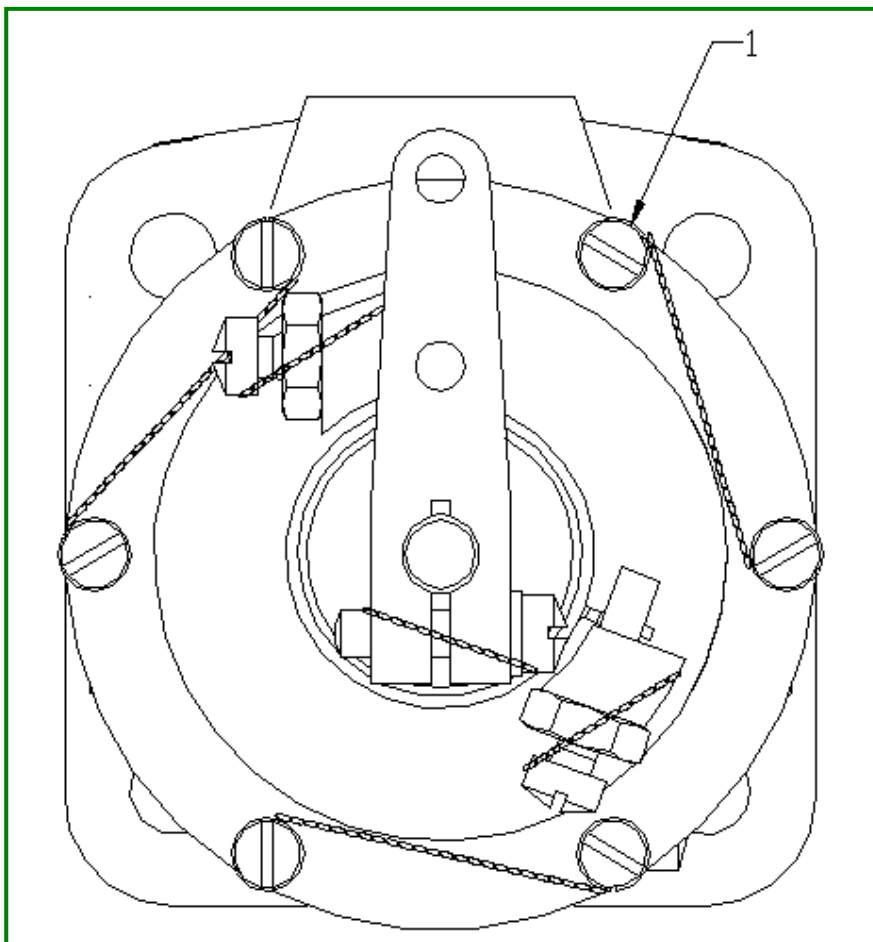


Figure 12



5.6.2 Governor Lever Adjustment (see Figure 14 + 15)
Maximum rpm Stop Screws on NON-Electrically Controlled Governors

Limited mechanical adjustment of the maximum propeller rpm setting may be accomplished in the field. First make sure that the control lever on the governor is in contact with the stop screw. If not, adjust the control.

5.6.2.1 Remove the safety wire from the speed adjustment screw position 1 (see Figure 14) and loosen the nut to allow movement of the stop screw.

5.6.2.2 For increasing the maximum rpm, one full turn clockwise (**in**) will decrease the rpm by approximately 25 rpm. One full turn counterclockwise (**out**) will increase the rpm by approximately 25 rpm,

5.6.2.3 Screw 1 is for max rpm, screw 3 is for min rpm.
Re-apply the safety wire to all stop screws.

5.6.3 Max RPM stop screw adjustment of P-860-161 governor (see Figure 16)

Limited mechanical adjustment of the maximum propeller rpm setting may be accomplished in the field.

5.6.3.1 Use 1/4" wrench and 3/32 hex key to loosen the nut (2) to adjust the max RPM stop screw (1).

5.6.3.2 For adjusting the maximum rpm turn the max RPM stop screw (1):

- 1/4 turn clockwise (**in**) to increase the rpm by approximately 50 rpm.
- 1/8 turn clockwise (**in**) to increase the rpm by approximately 25 rpm.
- 1/4 turn counterclockwise (**out**) to decrease the rpm by approximately 50 rpm.
- 1/8 turn counterclockwise (**out**) to decrease the rpm by approximately 25 rpm.

5.6.3.3 Tighten the nut (2) with 3-5 Nm (25-45 in.lbs).

5.6.4 Repositioning of Lever on Control Shaft (see Figure 13)

If the desired rpm is not attainable by moving the adjustment screws, it will be necessary to relocate the position of the lever on the speeder spring control shaft. This process should be accomplished by an approved governor repair facility, using a test stand to complete the adjustments.

Following the adjustment processes, it is essential that the speeder spring adjusting shaft is not turned in beyond the governor cover housing, exposing the O-ring. If this should happen an oil leak will occur. See Figure 13 for detailed information!

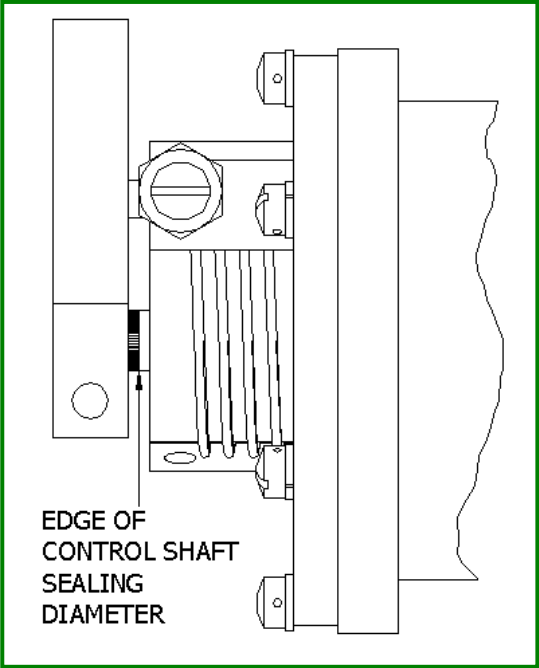


Figure 13

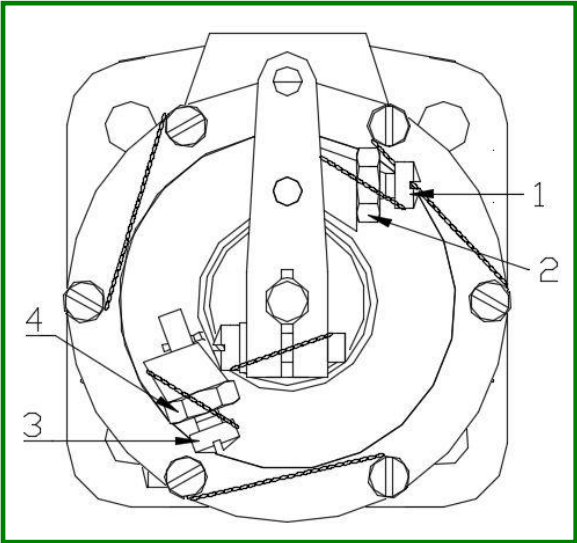


Figure 14
Standard Head

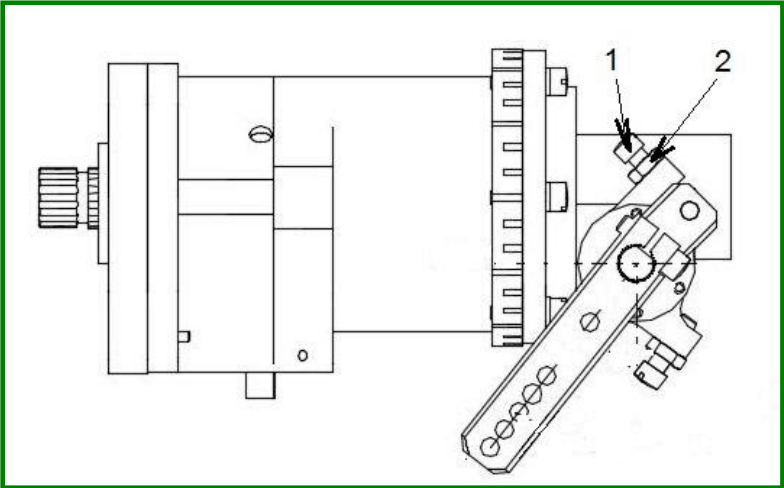


Figure 15
Pulley Head

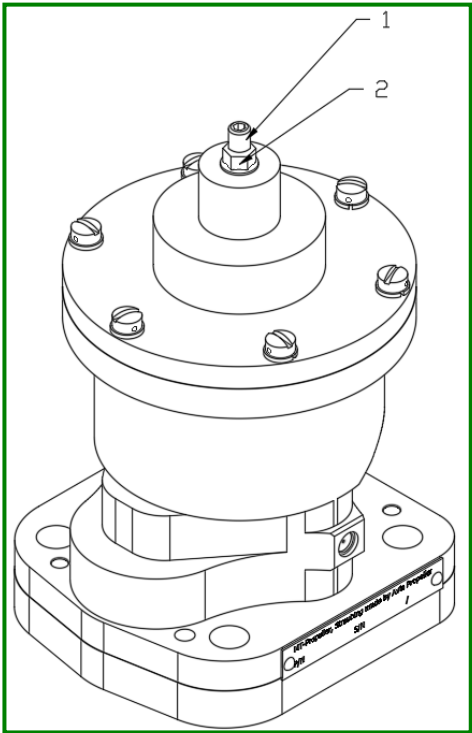


Figure 16
P-860-161 Governor



6. ADJUSTMENT OF MAXIMUM RPM STOP SCREWS ON THE P-8()3/7 ELECTRICALLY CONTROLLED PROPELLER GOVERNOR

6.1 GENERAL

The electrically controlled governors use control heads - see Figure 17 below – which uses electric input for changing speeder spring preload (and thus requested speed).

Electric input drives electric motor (with gear box) and rotation is transferred to linear movement by motion screw and motion nut.

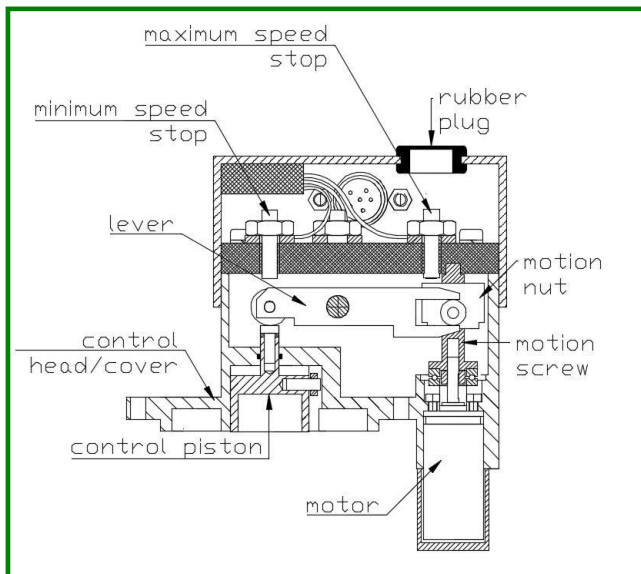


Figure 17a
Electric non-isolated head
(2 screws for RPM stop)

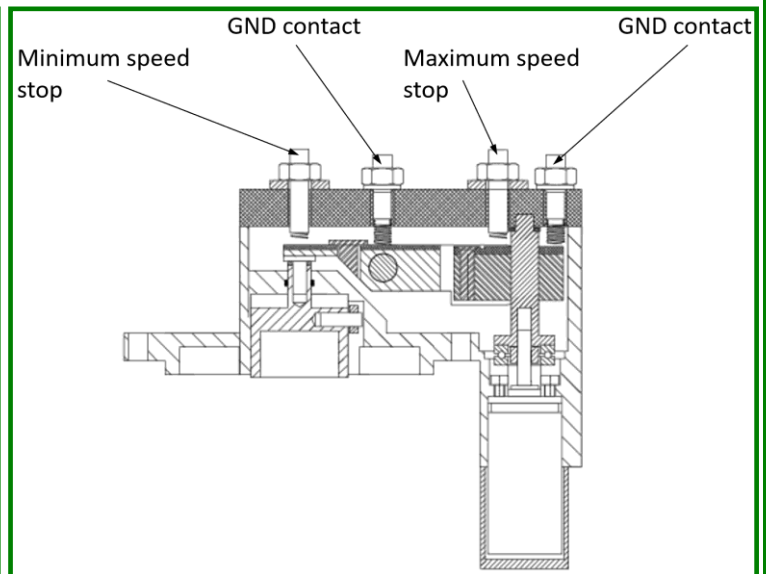


Figure 17b
Electric isolated ground head
(4 screws, 2 for RPM stop, 2 for ground contact)

Linear movement acts on the rpm control lever and sets the control piston in motion, which changes speeder spring preload.

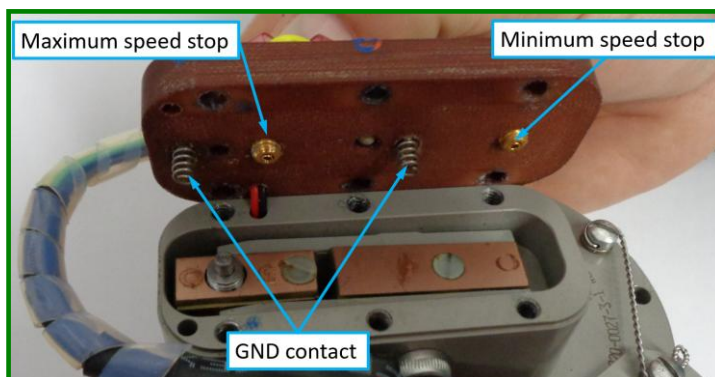


Figure 17c
Electric isolated ground head
(4 screws, 2 for RPM stop, 2 for ground contact)

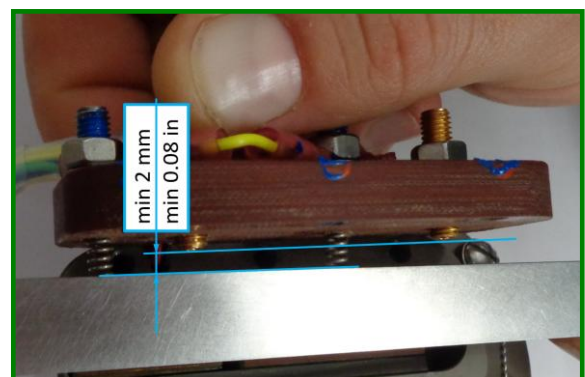


Figure 17d
Minimum 2 mm (0.08 in) distance between speed stop screw and ground contact spring.

During pitch change movement the ground contact needs to make contact with the lever first allowing the pitch control unit to receive a feedback when a stop position is reached. Therefore, a clearance of 2 mm (0.08 in) from the end of the stop screws to the end of ground contact springs need to be ensured; see Figure 17d for detail.



6.2 TOOLS

Test Box T-719-A is to be used as a tool to adjust and / or verify the rpm setting(s) of the maximum mechanical internal rpm settings of the electrically controlled propeller governor.

T-720 wrench for adjusting the stops is to be used.

To access to the maximum speed adjusting stop screw, it will be necessary to remove the rubber cover on the top surface of the control head.

6.3 RPM ADJUSTMENTS

6.3.1 **Increase** maximum propeller rpm with non-isolated ground head (identifiable by 2 inner hexagonal set screws):

Increase of the maximum rpm setting requires a turn of the screw in the outward, CCW, direction. This adjustment is accomplished using the T-720 wrench.

Insert the T-720 wrench into the governor and loosen the locking nut, complete the adjustment by backing the speed adjustment screw outward, CCW. Following the adjustment of the speed adjusting screw, tighten the retaining nut.

A 1/8 turn on the screw in the outward, CCW, direction will increase the rpm approximately 40 rpm.

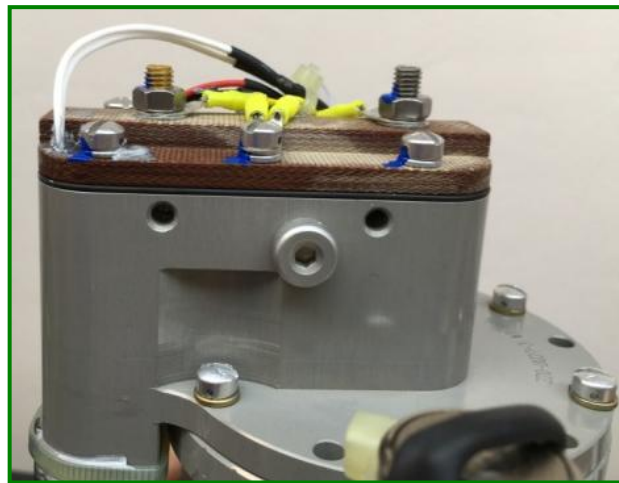


Figure 17e

6.3.2 **Decrease** maximum propeller rpm with non-isolated ground head (identifiable by 2 inner hexagonal set screws):

Decrease of the maximum setting requires a turn of the screw in the inward, CW, direction. This adjustment is accomplished using the T-720 wrench.

6.3.3 To ensure the mechanical stop is not in contact with the lever, it is necessary to activate the electric control motor with the T-719-A Test Box in order to move the stop away.



6.3.4 **Increase or decrease** maximum propeller rpm with isolated ground head (identifiable by 4 inner hexagonal set screws)

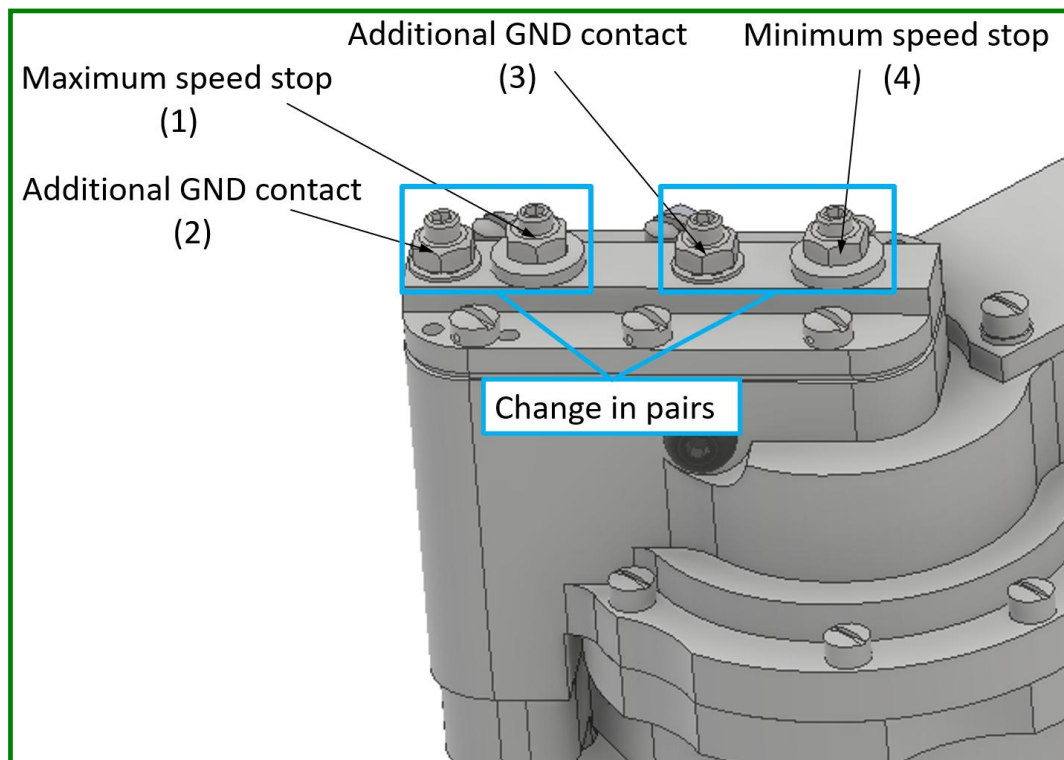


Figure 17f

The same procedure as described in 6.3.1 and 6.3.3 can be applied. Additional to the RPM modifications performed on the min and/or max speed stop screw, the associated ground contact screw needs to be turned accordingly, so both screws receive the same adjustment. See figure 17f for details

As example:

If the maximum speed stop (1) is turned $\frac{1}{4}$ rotations CW, then also the associated additional ground contact (2) needs to be turned $\frac{1}{4}$ rotation CW.



6.4 FUNCTIONALITY TEST

- 6.4.1** Initial check of the T-719-A Test Box:
Connect the T-719-A Test Box to the governor via the aircraft wiring access plug.
Turn the T-719-A Test Box power switch on.
If the red light appears, it indicates the governor internal control lever is against the maximum rpm stop screw.

- 6.4.2** Find the position of the rpm control lever:
Connect the T-719-A Test Box to the electric propeller governor
Switch the T-719-A Test Box on by using the POWER switch
Find the location of the rpm control lever
A red light indicates the rpm control lever is against the maximum rpm stop screw
A yellow light indicates the rpm control lever is against the minimum rpm stop screw
A green light indicates the rpm control lever is in a neutral position.

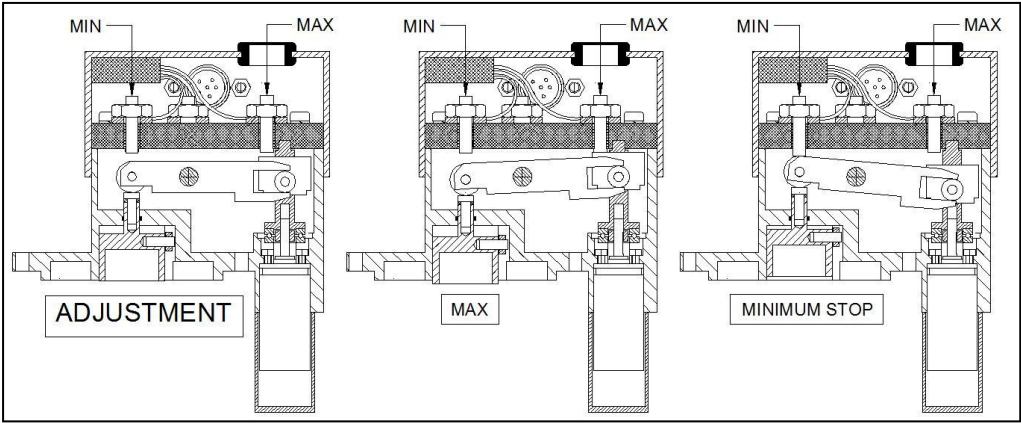
- 6.4.3** Test the function of the governor as follows:
Push the motor toggle switch **UP** will produce a Yellow to Green to Red sequence of lights, indicating the stop have been reached.
Push the motor toggle switch **DOWN** will produce a Red to Green to Yellow sequence of lights, indicating the stop have been reached.
There are no other sequences possible when the T-719-A Test Box operates properly.
Any malfunction will lead to incorrect sequences.

NOTE:

DETERMINATION OF THE LOCATION OF THE RPM CONTROL LEVER POSITION IS ESSENTIAL IN ORDER TO AVOID ANY DAMAGE TO THE CONTROL SYSTEM (JAMMING). ADJUSTMENTS OF THE STOPS SHOULD BE MADE ONLY IF THE GREEN LIGHT IS ON.

- 6.4.4** Following the initial check of the indicator light display, showing the position of the rpm control lever, select the applicable step per the diagram below, if adjustments are required.
- A **Red** light indicates mechanical max. rpm stop is reached; a **Yellow** light indicates mechanical min. rpm stop is reached. A **Green** light indicates a position in between (to be used for rpm adjustments). Some audible sound can be heard if the electric motor is turning to change the rpm control lever to any position.

6.5 **COMPLETE ALL THREE (3) STEPS OF THESE SEQUENCES TO ASSURE ALL FUNCTIONS OF THE GOVERNOR ARE WORKING CORRECTLY.**



No.	Indication	Toggle switch to position	Indication must change to:	go to
I	red 	DOWN	green 	II
II	green 	DOWN	yellow 	III
III	yellow 	UP	green 	IV
IV	green 	UP	red 	I

Figure 18



7. ECU FAILURE 7 = GOVERNOR JAM WARNING (AUSTRO ENGINE APPLICATION ONLY)

- 7.1 IF THE ELECTRICAL CONTROL UNIT STOPS OPERATING BECAUSE OF A JAMMING RESULTING OF A TOO HIGH POWER CONSUMPTION OR IF THE GOVERNOR MECHANICAL FUNCTIONS ARE RESTRICTED PERFORM THE FOLLOWING, USING THE T-719-A TEST BOX.**

WARNING:

**NOT FOLLOWING THESE PROCEDURES MAY DAMAGE THE ELECTRICAL/MECHANICAL SYSTEM IN THE GOVERNOR.
SEE ALSO ITEM 7 OF THIS MANUAL.**

- 7.2 FOLLOW THIS INSTRUCTION TO IDENTIFY OR TO CORRECT THE FAILURE WITH THE GOVERNOR STILL INSTALLED ON THE ENGINE:**

- Remove the connector between the governor and the Engine Control Unit.
- Connect the T-719-A Test Box to the governor.



Figure 19
T-719-A Governor Test Box



Figure 20
T-720 Wrench, Governor Adjusting

- Change the governor to low rpm (full batteries in the Test Box required).
- If the governor is freely moving with the Test Box, change it back to high (max) rpm.
- With the governor at the max rpm stop remove the T-719-A Test Box.
- Reinstall the connector from the ECU to the governor.
- Check the ECU.



If the governor cannot be changed from the max rpm stop with the T-719-A Test Box, remove the rubber plug on the governor head as shown in Figure 21.

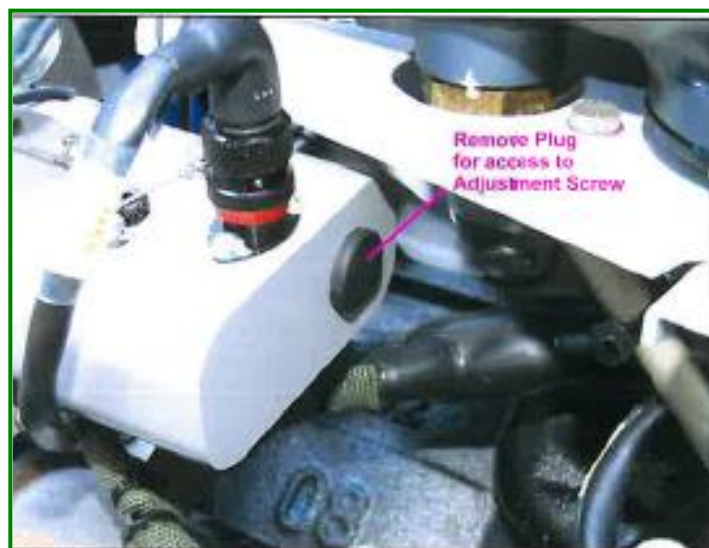


Figure 21
Plug, RPM Stop

Use T-720 wrench to turn the max rpm stop screw **OUT** (CCW) a half turn to loosen the jammed rpm control lever.

See Figure 22 how to use tool T-720 wrench.

Remove T-720 wrench in order to avoid damage while using the T-719-A Test Box.



Figure 22
Using T-720 wrench



Use the T-719-A Test Box to move the governor motor between the max (yellow light) and min (red light) rpm stop. Stop the motor in the middle position (green light).

Use T-720 wrench and reposition the max rpm stop screw back **IN** (CW) a half turn and torque nut to establish the initial position.

Use T-719-A Test Box to check if the governor motor is freely moving between the stops and change it to the max rpm stop (Red light).

Reinstall the rubber plug, connect the governor to the ECU and check it.

8. ADJUSTING RELIEF VALVE PRESSURE

The relief valve pressure can be adjusted only by an authorized Service Center because a test bench is needed.

9. ADJUSTING OF FEATHERING

Feathering rpm can be adjusted by trained and competent aircraft mechanic by turning the lift rod **out** (increasing feather rpm) or **in** (decreasing feather rpm) in small increments.

10. DIRECTION OF ROTATION CHANGE

The direction of rotation cannot be changed in the field, because a test bench is needed.

11. REMOVAL OF GOVERNOR

Remove and disconnect the control linkage from the governor lever, record any special linkage arrangements prior to removing the connection between the governor and the aircraft/engine.

Remove the four governor mounting nuts and washers.

Remove the governor from the engine mounting pad, as the governor may adhere to the engine a plastic hammer can be used to move it.

Remove and discard the governor mounting gasket.

Inspect the governor mounting pad for any metal chips or other foreign matter.

Clean and properly cover the governor mounting pad to avoid any contamination.

Place the governor in a plastic bag in preparation for storage or further maintenance.

Complete the required paper work indicating when the removal of the governor has taken place.



12. TROUBLE SHOOTING

12.1 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.

12.2 STATIC RPM TOO LOW

To find out whether the governor or the propeller limit the rpm, proceed as follows:

Propeller control to max. rpm.

Power lever to max. power.

Pull propeller control back until rpm drops approx. 25 rpm.

If there is a long way necessary to get the rpm drop, the pitch of the propeller will limit the static rpm.

Remedy:

Reduce pitch with the check nuts on the piston guide. Turning loose nut by $\frac{1}{4}$ turn will increase rpm by approx. 100 rpm. This is only applicable for non-counterweighted propellers!

Low pitch of counterweighted or feathering propellers can be changed only by opening of the pitch change mechanism (in the factory). The checknuts will change coarse pitch only.

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

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

Remedy:

Increase governor rpm unscrewing the max. rpm 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 screw.

Secure stop screw with check nut and safety wire.



12.3 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 with prop control and after landing turn the stop screw in until it hits the governor lever.

Important: **Do not change position of the prop control during final approach.**
Secure stop screw with check nut and safety wire.

12.4 SLUGGISH RPM CHANGE

Cause:

1. Oil is cold
2. Excessive friction

Remedy:

1. Run the engine until the Green light 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!

12.5 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 Service Center).
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.



12.6 RPM VARIATIONS BETWEEN ASCEND, CRUISE AND DESCEND ALTHOUGH HAVING IDENTICAL PROPELLER SETTING

Up to ± 50 rpm normal condition. If more:

Cause:

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

Remedy:

1. Contact manufacturer.
2. Contact manufacturer.
3. Replace/repair instrument.

12.7 RPM INCREASE 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 on a non-counterweighted propeller system, move power lever back until the rpm will decrease. In this condition the propeller goes back to the low pitch stop automatically and no oil pressure is needed. Adjust the propeller control for take off position. Apply power again, no more than required to remain about 100 rpm below take off rpm.

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



12.8 RPM DECREASE DURING NORMAL OPERATION WITHOUT CHANGE OF PROPELLER LEVER POSITION

Cause:

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

Remedy:

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

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

12.9 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.

**12.10 OIL LEAKAGE (VISIBLE OUTSIDE OR HIDDEN INSIDE)****Cause:**

Damaged gasket

Remedy:

Replace gaskets or repair propeller.

12.11 PROPELLERS WITH COUNTERWEIGHTS OR FEATHERING

Propellers with counterweights on the blade roots use oil pressure to decrease pitch. Therefore the information in chapter 12.7 has to be converted as a result of the changed direction of oil pressure.

12.12 SLOW FEATHERING

If more than 10 sec. are needed for full feathering, there is one of the following problems:

1. Sticking blades or pitch change mechanism;
2. Control too long or wrong adjusted governor;
3. If no discrepancies are found during inspection, readjustment of the liftrod is required.
Turn out lift rod only in steps of $\frac{1}{4}$ turn.
If the lift rod is turned too far out, early feathering is possible and must be corrected.

12.13 UNFEATHERING ACCUMULATOR**Cause:**

No function of accumulator!

Remedy:

Increase or refill air at the accumulator to 125 ± 5 or 150 ± 5 psi (depending on the application)!

Repair leaking check valve of the governor (Woodward, McCauley)!

Replace accumulator if air pressure valve is leaking or magnetic valve is not working!

Remark:

The air pressure in the unfeathering accumulator should be, depending on the application, 125 ± 5 or 150 ± 5 psi with the blades in the start-lock position (low pitch position) and the governor control in feathering position (oil side empty).

**12.14 EXCESSIVE ENGINE TRANSFER BEARING LEAKAGE**

Engines with excessive transfer bearing leakage can experience surging since the governor may not be able to get enough pressure to the propeller.

This causes a delay in propeller responsiveness and by the time the propeller responds to earlier governor inputs, they have changed, resulting in propeller "wandering".

Solution:

Perform a transfer bearing leakage test per engine manufacturer's instructions.

If test indicates a high rate of leakage (even though it may still be on the high side of "acceptable" tolerance), this maybe your cause.

Install the suspect governor on a known "good" aircraft, if problem disappears, engine work may be indicated.

12.15 DIRTY ENGINE OIL

Contaminants in dirty engine oil can cause blockage of close tolerance passages in governor, leading to erratic operation.

Solution:

Timely engine oil changes should eliminate this problem.

12.16 EXCESSIVE "PLAY" IN AIRCRAFT PROPELLER CONTROL LINKAGE

Excessive "play" in the linkage between the governor and the cockpit control often leads to erratic operation.

Specifically, if the propeller RPM is suddenly changing and holding a new setting on its own, this could indicate loose linkage.

Solution:

Trace linkage and locate unsecured sections and tighten-up as needed.

Please note that although linkage may appear to allow full governor control while the engine is off, it may not in the air.

Engine vibration and "stretch" of the mount during operation can often aggravate the condition. Therefore, it is important the entire length of linkage be properly secured, even if the ends alone are tight.



13. SHIPPING AND STORAGE

Preservation:

A governor which has been removed from an engine will have its internal parts coated with oil and therefore should not require any additional preservation for a short-term storage (max 6 months).

A governor which has been removed from a governor test stand will have its internal parts coated with oil and therefore should not require any additional preservation for a short-term storage (max. 6 months).

A governor that is to be placed in storage for a longer period of time should be protected with preservation oil and wrapped in either a protective paper or placed in a plastic bag in a clean and dry environment.

When a governor which has been on a long-term storage is to be installed on an engine. Remove the wrappings, clean any excessive oil from the exterior and be sure the drive gear rotates prior to installation.

When shipping a governor, the governor should be placed in a sealed plastic bag, tagged and properly padded for shipping.

[illegible]

[illegible]



15. WARRANTY REGISTRATION CARD

- 1) To be eligible for warranty, this registration card must be returned completed and signed by the end user to the authorized MT-Propeller distributor of the area in which the governor is firstly operated or to MT-Propeller itself within 30 days after date from starting operation.
- 2) No other warranties and/or guarantees than defined in the actual warranty conditions are made.
- 3) Governor Type:

--	--	--	--	--	--	--	--	--

S/N:

--	--	--	--	--	--

Date of purchase (day/month/year):

____/____/____

Date of De-conservation (day/month/year):

____/____/____

Owner's name:

Company:

Address:

City/State/Postal code

Country:

Telephone:

Telefax:

E-mail:

Sold by:

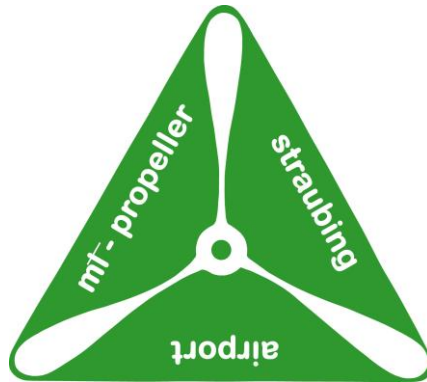
I have read and understood the Operator's Manual in its entirety and will observe the instructions therein.

Date:

Signature:



Kompetenz in Propellern



mt-propeller

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D-94348 Atting

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Internet: www.mt-propeller.com

Online service: Service Bulletins, Technical Data, Contacts

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