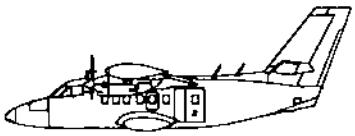
Aircraft Industries



MANDATORY BULLETIN

MB No.: L410UVP-E/143a Revision 1

Concerns: L410UVP-E20 aircraft from S/N 2904 operated by Khabarovsk Avia.

Subject: Inspection and adjustment of engine push/pull control rod and Beta switch
Revision 1 Specifies performance of the bulletin.

To be carried out at the latest by:	Immediately after the bulletin receipt.
To be carried out by:	Organization certified for periodic maintenance of L410UVP-E20 airplanes.
Costs to be covered by:	Operator.
Necessary material to be delivered by:	Not required.
Bull. becomes effective:	On the day of release.
Total No. of pages:	3

Bulletin L410UVP-E/143a Revision 1 supersedes previous bulletin L410UVP-E/143a.

.....
Released: Pavel Jurák
Head of airworthiness dept.

The technical content of this document is approved under the authority of DOA ref. EASA. 21J.119.

Date of issue: 12.02.2018

PERFORMANCE: mandatory

1. INSTRUCTIONS FOR PLANNING

A. CONCERNS

1. Aircraft type
L410UVP-E20

2. Version / S/N
From S/N 2904 operated by Khabarovsk Avia.

3. Qualifications for implementation
No special requirements.

4. New equipment
Not required.

B. REASON

Inspection and adjustment of engine push/pull control rod and Beta switch

C. DESCRIPTION

- Inspection and adjustment of engine push/pull control P/N M601-76.3.
- Adjustment of Beta switch.

D. APPROVAL

On the basis of approved data of engine and propeller manufacturers

E. MATERIAL – AVAILABILITY

1. New equipment
Not required.

2. Installation parts
Not required.

3. Costs
To be covered by the operator.

F. SPECIAL TOOLS

Not required.

G. WEIGHT AND BALANCE

Without influence.

H. USED DOCUMENTATION

- TECHNICAL REPORT - INSPECTION AND ADJUSTMENT OF ENGINE PUSH-PULL CONTROL PN M601-76.3 No. TR-000361/04
- H80 ENGINE MAINTENANCE MANUAL No. 0983402
- OPERATION AND INSTALLATION MANUAL- HYDRAULIC CONSTANT SPEED GOVERNOR FOR TURBOPROP ENGINES P-W( )( )-( ) No. E-1707 Revision 7
- AIRPLANE FLIGHT MANUAL
- AIRPLANE MAINTENANCE MANUAL

I. AMENDED DOCUMENTATION

AFM not affected.
MS not affected.
MM not affected.
WM not affected.

2. INSTRUCTION FOR IMPLEMENTATION

A. PROCEDURE

1) Carry out Inspection and adjustment of engine push/pull control according to TECHNICAL REPORT - INSPECTION AND ADJUSTMENT OF ENGINE PUSH-PULL CONTROL PN M601-76.3 No. TR-000361/04.
2) Carry out Check of the engine control kinematics adjustment according to AIRPLANE MAINTENANCE MANUAL, chapter 076.00.00.
3) Carry out adjustment of Beta switch according to OPERATION AND INSTALLATION MANUAL- HYDRAULIC CONSTANT SPEED GOVERNOR FOR TURBOPROP ENGINES P-W( )( )-( ) No. E-1707 Revision 7.

B. TESTS

- Carry out the check on Maximum take-off power and Maximum reverse power according to AIRPLANE FLIGHT MANUAL.

3. NECESSARY MATERIAL

A. INSTALLATION PARTS DELIVERED BY THE AIRPLANE MANUFACTURER

Not required.

B. NEW EQUIPMENT

Not required.

4. RECORD IN THE AIRPLANE LOGBOOK

Record of performance of MB L410UVP-E/143a Revision 1.

Date: ..... Performed by: .....
(legible signature of verification engineer)

Elaborated by: Zdeněk Klofáč

Checked by: Pavel Ulrich

TECHNICAL REPORT

INSPECTION AND ADJUSTMENT OF ENGINE PUSH-PULL CONTROL PN M601-76.3

APPROVALS		
SUBMISSION		
	Smýkal, Michal	12-Feb-2018
REVIEW		
APPROVAL		
	Jirásek, Vojtěch	12-Feb-2018
ROLE	**NAME**	**DATE**

TP100029/6

Project No.	[Project number]
Technical Report showing compliance with CVE verification	☐ Check the box if yes

Note: For technical report showing compliance the Statement of Compliance signed by the CVE should be added as Attachment 1 to this technical report.

This document was approved and issued via the GE Aviation Turboprop Document Workflow Process

The technical content of this document is approved under the authority of DOA ref. EASA.21J.300.

RECORD OF REVISIONS		
Revision No.	**Affected pages**	**Description**
00	All	Initial issue
01	All	Update
02	All	Update
03	8 & 9	Update, new point xii, point xix, and new picture No. 8., No. 9
04	8	Update, point xi and xvii, and new picture No. 10

CONTENTS

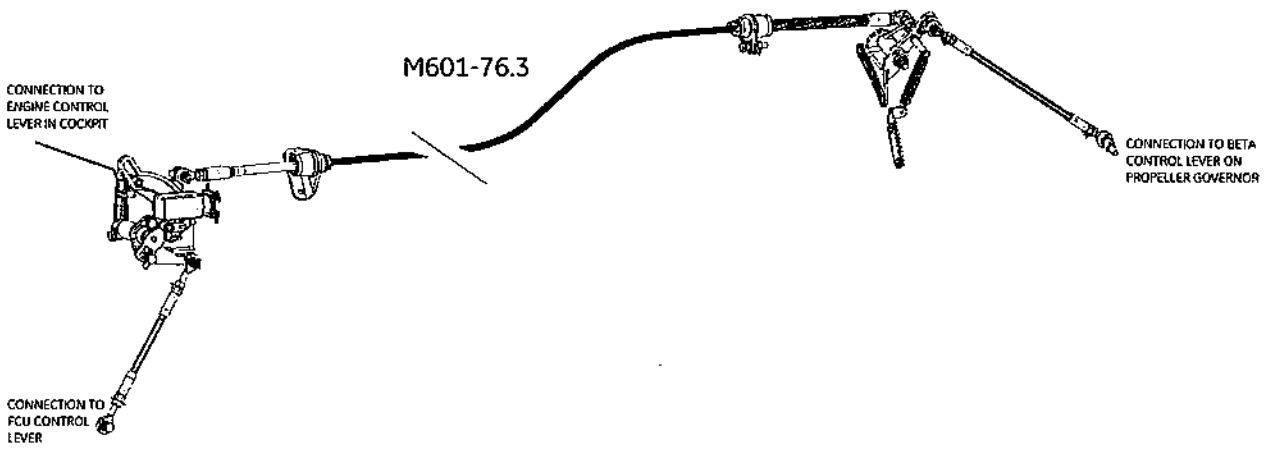
KONTROLA A SEŘÍZENÍ TÁHEL ŘÍZENÍ MOTORU P/N M601-76.3/ INSPECTION AND ADJUSTMENT OF ENGINE PUSH/PULL CONTROL P/N M601-76.3

1 DŮVOD/ REASON

V rámci Fleet Leader programu sbíráme data a provádíme kontrolu seřízení táhel v extrémních chladných povětrnostních podmínek k ověření stability systému řízení motoru pomocí táhel. Procedura reflektuje standardní nastavení motoru ze závodu.	In terms of the Fleet leader program we will collect data and perform an inspection of the set up in an extreme cold environment, to check the stability of the engine push/pull control. The procedure reflects standard factory set up.

2 DEFINICE/DEFITIONS:

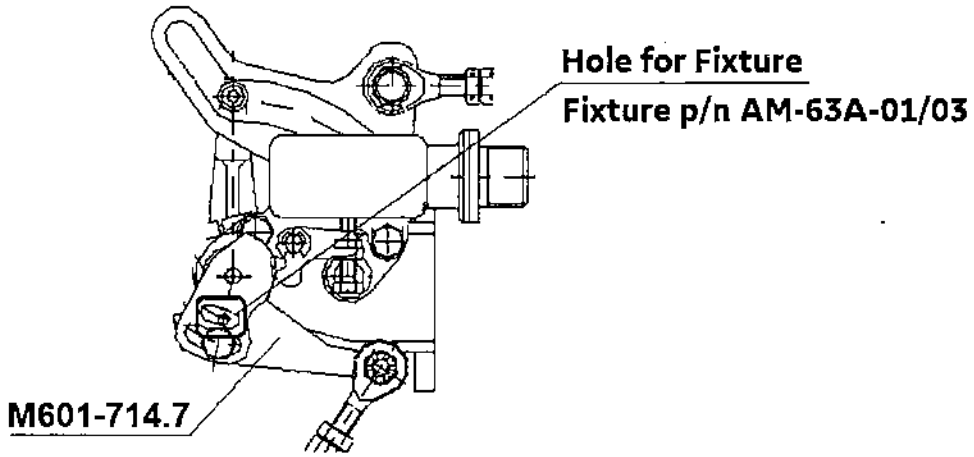
Táhlo řízení motoru p/n M601-76.3 – ref. Obr.1 je kompletní sestava táhel pro: i. ovládání generátoru otáček v dopředeném tahu ii. ovládání generátoru otáček a vrtule v beta/reversu	Engine Control p/n M601-76.3 ref. Fig.1 is the assembly of push/pull controls: i. used for gas generator condition setting in forward mode ii. used for gas generator condition setting as well as propeller speed setting in BETA reverse mode



Obr.1/Fig.1

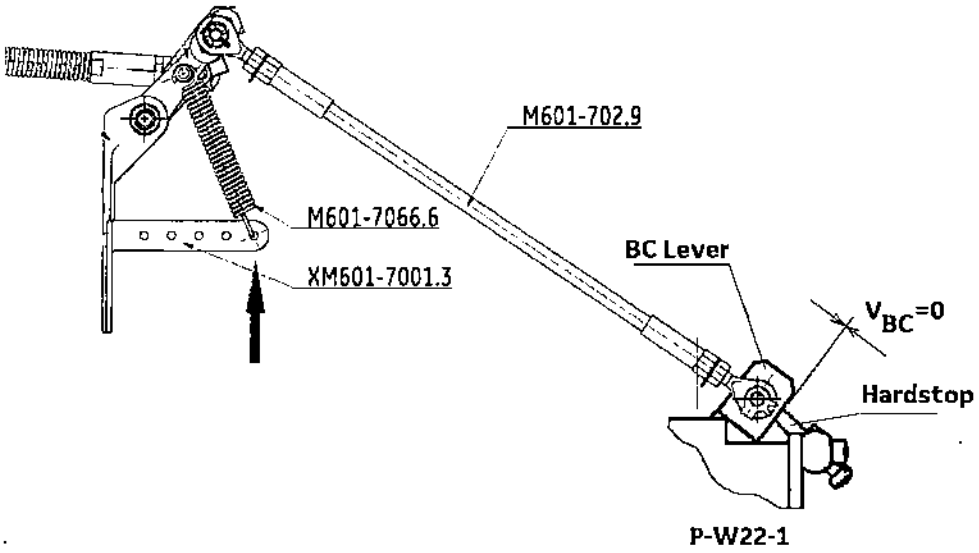
3 POSTUP/PROCEDURE:

i. Odpojit BETA páku z regulátoru P-W22-1.	i. Disconnect BETA lever from propeller governor p/n P-W22-1
ii. Za aretovat páku M601-714.7 přípravkem AM-63A-01/03– viz obrázek 2	ii. Secure lever p/n M601-714.7 by fixture p/n AM-63A-01/03– ref. Fig.2



Obr.2/Fig.2

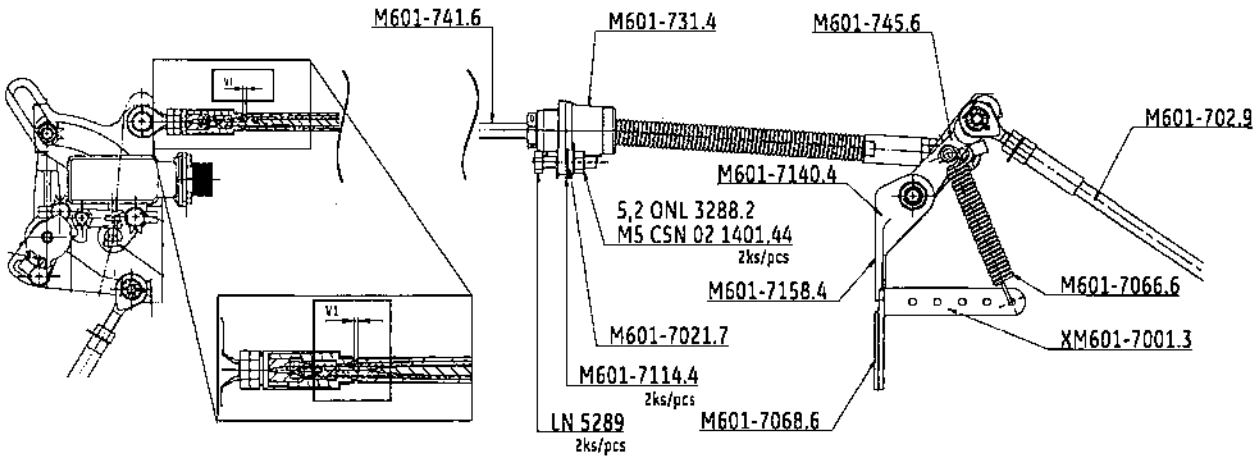
iii. Provést kontrolu seřízení BC páky na regulátoru otáček vrtule P-W22-1. – viz obrázek 3. Vůle mezi BC pákou a dorazem musí být V_{BC}=0mm	iii. Check clearance V_{BC} between BC Lever and Hardstop. Clearance shall be 0 mm – ref. Fig. 3
iv. Zkontrolujte uchycení pružiny M601-7066.6 v konzole XM601-7001.3 – viz obrázek 3 (přesuňte ji do otvoru nejblíže k vrtuli).	iv. Check Spring p/n M601-7066.6 mounting in Bracket p/n XM601-7001.3. Spring eye shall be inserted in the last hole as shown in the figure – ref. Fig 3.



Obr.3 / Fig.3

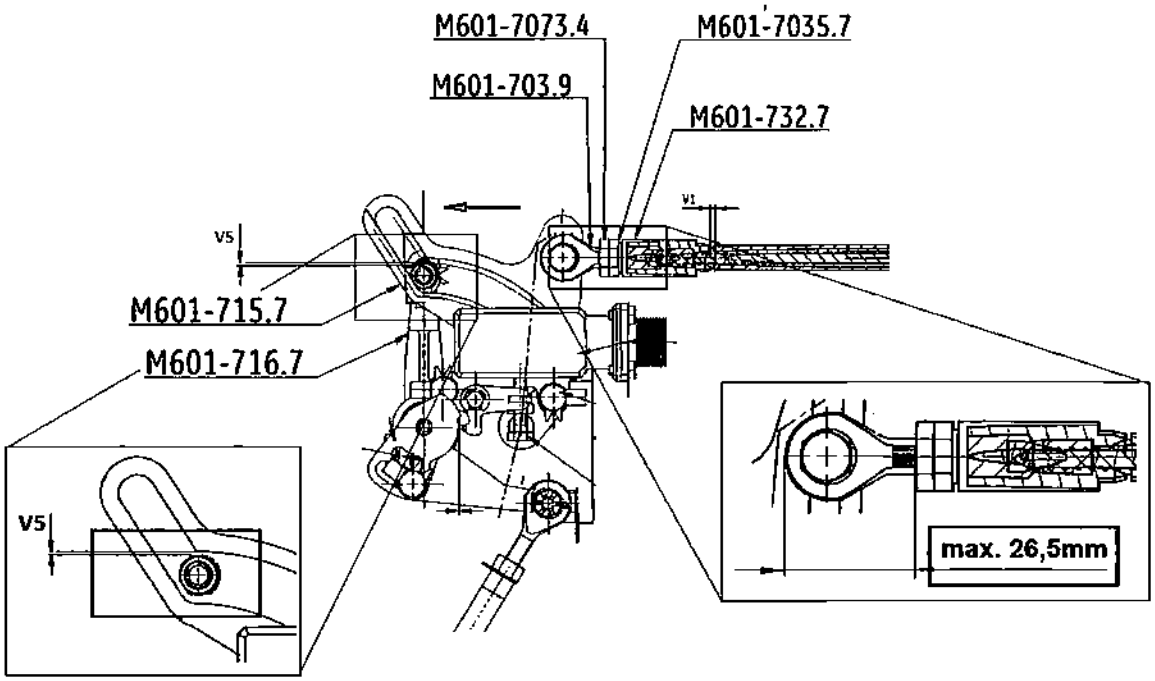
v. Zkontrolujte vůli V1=1mm na AGB -viz obr.4. Kontrolu proveďte při plně smontovaném táhle ovládání motoru p/n M601-76.3 (viz Definice – kapitola 2)	v. Check clearance V1. When fully assembled, the configuration of Engine Push/Pull Control p/n M601-76.3, clearance V1 shall be 1mm – ref. Fig 4 (ref Definition, section 2)

AGB **RGB**



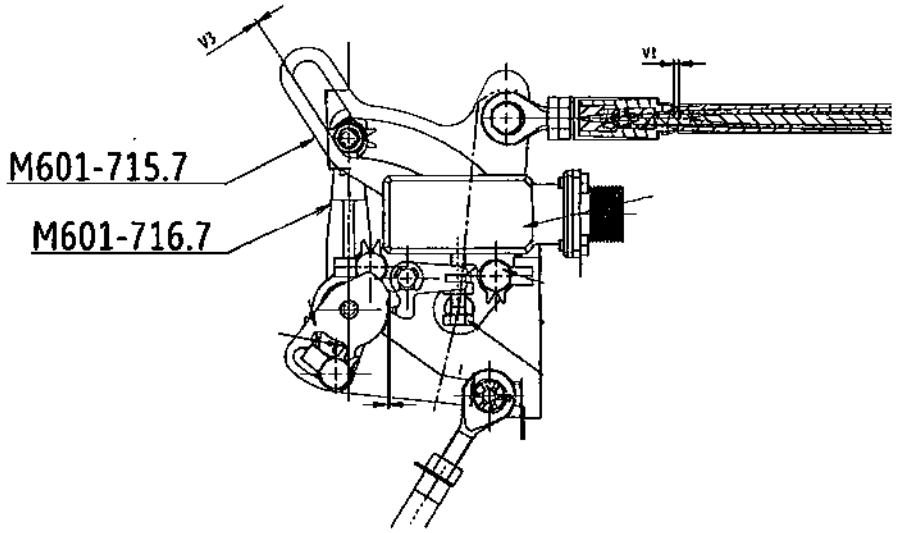
Obr.4/Fig.4

vi. Nastavte vůli V5=0,5-0,1 (vložit měrku 0,5) mezi ložiskem na páce M601-716.7 a pákou/vačka M601-715.7 viz obr.5. Postup: 1. Odpojit oko M601-703.9 od páky M601-715.7 2. Uvolnit matici M601-7073.4 3. Natáčením oka M601-703.9 nastavit vůli V5 při současném zachování všech vůlí popsaných v bodě (ii až vi) a rozměru vysunutí oka M601-703.9, které musí být v tolerance max. 26,5mm 4. Připojit oko M601-703.9 k páce M601-715.7 5. Dotáhnout matici M601-7073.4 a spoj zajistit pojistnou podložkou 6,2 ONL 3288.2. 6. Vyjmout měrku (pro měření vůle V5)	vi. Set clearance V5=0,5-0,1mm (insert 0,5mm feeler gauge) between bearing (lever p/n M601-716.7) and lever/cam p/n M601-715.7. – ref. Fig 5. Set up procedure: 1. Disconnect Rod End Bearing p/n M601-703.9 from lever/cam p/n M601-715.7 2. Release nut p/n M601-7073.4 3. Set clearance V5 by turning Rod End Bearing p/n M601-703.9 whilst maintaining clearance referenced in steps from ii) to vi) and dimension (Rod End Bearing Extension) shall not exceed 26,5mm. 4. Connect Rod End Bearing p/n M601-703.9 with lever/cam p/n M601-715.7 5. Tighten nut p/n M601-7073.4 and secure by lock washer p/n 6,2 ONL 3288.2. 6. Remove V5 feeler gauge (used for setting V5)



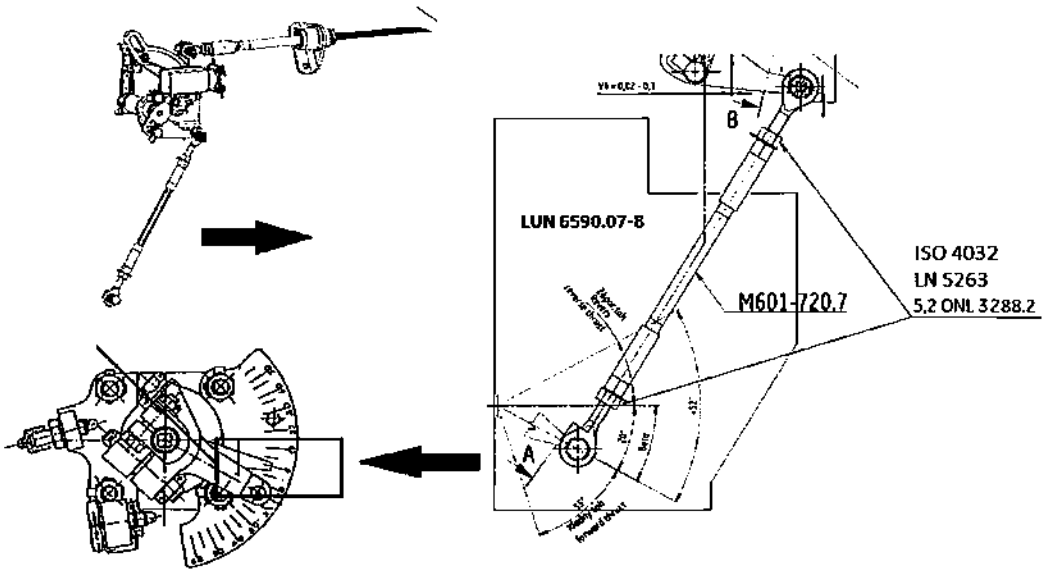
Obr.5 / Fig. 5

vii. Zkontrolujte veškerá pojištění po provedeném seřízeni táhla ovládání motoru p/n M601-76.3. (viz body v ii až vi)	vii. After completion of steps ii) to vi), check proper securing of all nut/bolt joints of Engine Push/Pull Control p/n M601-76.3
viii. Od aretovat páku M601-714.7 vyjmutím přípravku AM-63A-01/03 – viz. Obr 2	viii. Unsecure lever p/n M601-714.7 by removal of fixture p/n AM-63A-01/03– ref. Fig.2
ix. Nastavte vůli V3=0,5+0,2 (vložit měrku) mezi ložiskem na páce M601-716.7 a pákou M601-715.7, postup viz obr.6. Vůli V3 nastavte úpravou délky drakového táhla.	ix. Set clearance V3=0,5+0,2mm (insert 0,5mm feeler gauge) between bearing (lever p/n M601-716.7) and lever/cam p/n M601-715.7. – ref. Fig 6. Clearance V3 shall be set by adjustment of a/c push pull control.



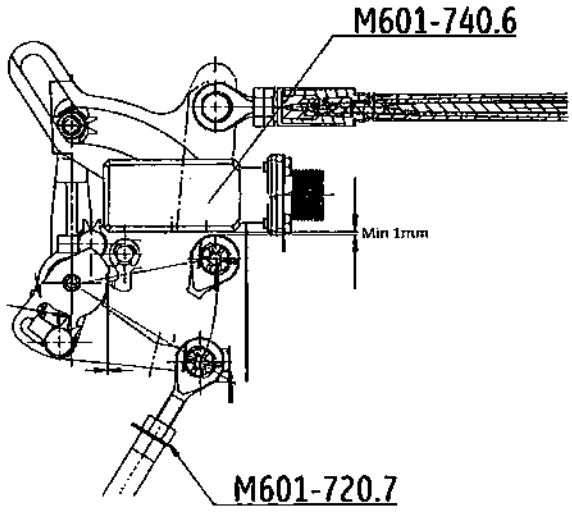
Obr.6 / Fig.6

x. Proveďte přenastavení páky na palivovém regulátoru LUN 6590.XX-8 tak aby ryska byla na nule při současném zachování vůle V3=0,5+0,2mm. Postup viz obr.7: 1. Uvolnit matici ISO 4032 a LN5263 2. Provést korekci táhla M601-720.7 tak aby ryska na LUN 6590.XX-8 byla na 0 3. Dotáhnout matici ISO 4032 a LN5263 4. Zajistit matice pojistnými podložkami 5,2 ONL 3288.2 5. Vyjmout měrku (pro měření vůle V3)	x. Readjust FCU LUN 6590.XX-8 Control lever so that FCU flapper aligns at 0°. When adjustment, V3 shall be V3=0,5+0,2mm. – ref. Fig 7. Set up procedure: 1. Release nut p/n ISO 4032 and LN5263 2. Adjust control M601-720.7 so that FCU LUN 6590.XX-8 flapper aligns at 0°. 3. Tighten nut p/n ISO 4032 and LN5263 4. Secure nuts by lock washer p/n 5,2 ONL 3288.2. 5. Remove feeler gauge (used for setting V3)



Obr.7/Fig.7

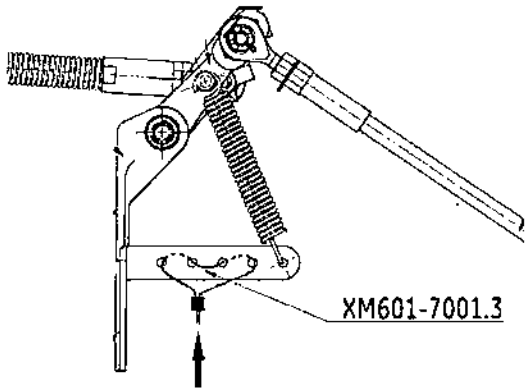
xi. Vysuňte páku OPM do plného reversu a zkontrolujte vůli mezi okem páky M601-720.7 a mezi spínačem M601-740.6 – viz. Obr.8. Minimální vůle by měla být 1mm. .V případě menší vůle, proveďte korekci přenastavením vůle V3 na hodnotu 0,7mm – viz. Kapitola ix	xi. Move engine control lever to full reverse position and check the clearance between Rod End Bearing p/n M601-720.7 and switch p/n M601-740.6 – ref. fig 8, The clearance shall be min 1mm. If the clearance is less than 1mm, readjust clearance V3 to value 0,7mm



Obr.8/Fig.8

xii. Provést znovu kontrolu všech vůlí V_{BC}, V1, V3, V4, V5	xii. Check all clearances V_{BC}, V1, V3, V4, V5

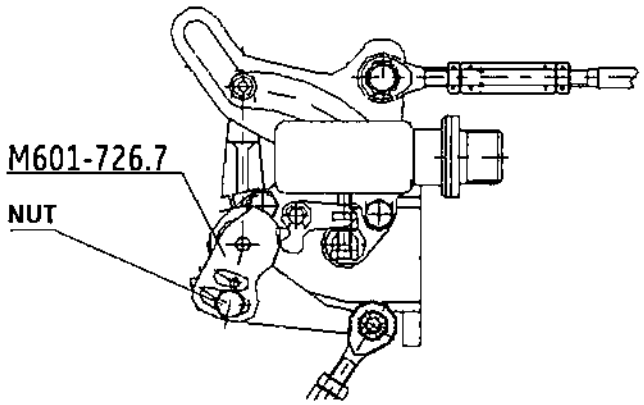
xiii. Zkontrolovat chod ložiska a páky M601-716.7 v páce/vačce M601-715.7 v dopředném tahu a v reverzu. Chod musí být plynulý	xiii. Check smooth movement of bearing and lever p/n M601-716.7 in lever/cam p/n M601-715.7. both in forward and reverse position – ref. Fig 4. Movement shall be smooth; no seizing is allowed.
xiv. Zkontrolujte veškerá pojištění po provedeném seřízení táhla ovládání motoru p/n M601-76.3.	xiv. Check proper securing of all nut/bolt joints of Engine Push/Pull Control p/n M601-76.3
xv. Připojit BETA páku na regulátor P-W22-1.	xv. Connect BETA lever on propeller governor p/n P-W22-1
xvi. Zaplombujte díry na konzole XM601-7001.3 viz obr.9	xvi. Seal holes on bracket p/n XM601-7001 as shown on Fig. 9



Obr.9/Fig.9

xvii. Proveďte seřízení spínací charakteristiky spínače M601-740.6 podle následujícícho postupu 1. Spusťte motor. Po prohřátí zvyšujte plynule otáčky generátoru, dokud se nerozsvítí kontrolka „AUTO FEATHER". 2. Snižujte otáčky, dokud kontrolka „AUTO FEATHER" nezhasne. Otáčky při zhasnutí signalizace „AUTO FEATHER" musí být: o Min NG = 87 % při atmosférických teplotách -20 až +50 °C (letní provoz) o Min NG = 83 % při atmosférických teplotách +20 až -50 °C (zimní provoz) POZNÁMKA: Pro dosažení hodnoty vypnutí spínače režimů M601-740.6 je možno využít celé povolené tolerance pro sepnutí. Jinak je nutno spínač režimů vyměnit.	xvii. Readjust switch OFF/ON setpoint of switch p/n M601-740.6 as follows: 1. Start both engines. After warming up, slow acceleration till the status light „AUTO FEATHER " is on. 2. Slow deceleration, indicate NG speed at which status light „AUTO FEATHER " is off. Status light shall be off at speed: o Min NG=87 % at OAT within the range from -20 °C to +50 °C - summer season o Min NG=83 % at OAT within the range from +20 °C to -50 °C - winter season NOTE: In order to achieve „switch off" setpoint tolerances of switch M601-740.6 can be assumed to achieve.

3. Od tohoto režimu postupně zvyšujte otáčky o 1 % s prodlevou 6 až 8 s Zkontrolujte otáčky generátoru, při kterých se rozsvítí kontrolka „AUTO FEATHER Požadované otáčky mají být: o nG = 92 % při atmosférických teplotách -20 až +50 °C (letní provoz) o nG = 88 ∣1 % při atmosférických teplotách +20 až -50 °C (zimní provoz)	3. From Ng speeds – ref. section 2, perform slow acceleration by step Ng=1% followed by dwell min 6s to 8 s . Check NG speed at which status light „AUTO FEATHER " is on. Status light shall be off at speed: o NG=92±1 % at OAT within the range from -20 °C to +40 °C - summer season o NG=88±1 % at OAT within the range from +20 °C to -50 °C - winter season
4. Pokud není dosaženo těchto hodnot, zastavte motor. Odečtěte na stupnici regulátoru paliva úhel, při kterém dojde podle sluchu k sepnutí spínače.	4. Should the above value not be achieved, shut off the engine. On FCU p/n LUN 6590.07-8 identify angular position at which the switch is closed (by „click" sound)
5. Pro seřízení spínací charakteristiky a. klíčem s = 8 mm povolte zajišťovací šroub vačky viz. Obr.10 b. natočte vačku M601-726.7 příslušným směrem. Změna úhlu na stupnici regulátoru paliva o 1° znamená změnu otáček generátoru asi o 1 %.	5. To adjust switching point characteristics a. loose Nut – ref Fig.10, use spanner S=8mm b. Turn the Cam p/n M601-726.7 in required direction to achieve switching point characteristics. One degree to at the LUN 6590.07-8 FCU Scale corresponds to approximately 1 % of the gas generator speed.



Obr.10/Fig.10

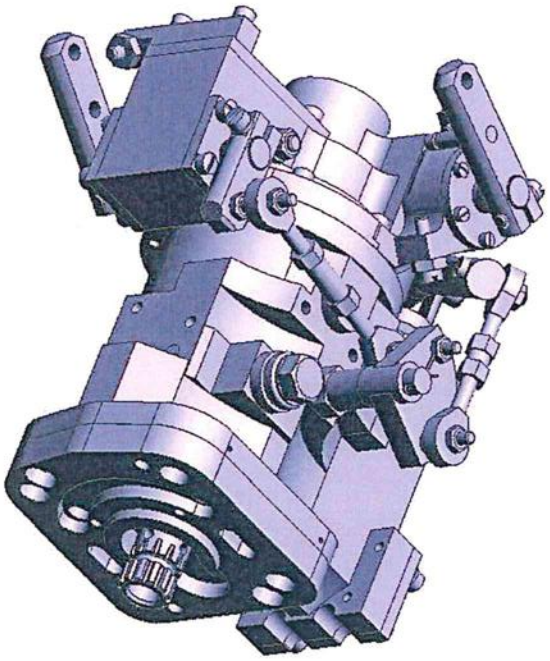
ATA 61-20-07

(E-1707)

Operation and Installation Manual

Hydraulic
Constant Speed Governor for Turboprop Engines

P-W( )( )-( )



Issue 3: June 28th , 2012

Revision 7: February 9, 2018

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.

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 an Avia Propeller governor.
Properly maintained it will give you many years of reliable service.

Your Avia Propeller technical support team

Table of contents **Page**

List of Inserted Revisions

Revision No.		Date of Issue	Revised Pages	Remark
1	-	2011-06-22	all	Initial Issue
2	-	2011-08-05	all	New Reprocessing - Issue 2
3	-	2012-06-28	all	New Re-edition - Issue 3
4	R-131/17	2017-12-12	Cover, 1, 2, 13, 13a	Added alternative procedure of P-S-2 Beta Switch adjustment.
5	R-8/18	2018-01-26	Cover, 2, 13, 13a	Revised alternative procedure of P-S-2 Beta Switch adjustment.
6	R-14/18	2018-02-05	Cover, 2, 13, 13a, 13b	Revised procedures of P-S-2 Beta Switch adjustment.
7	R-16/18	2018-02-09	Cover,1, 2, 2a 11, 13, 13a	• Revised *Table of Contents*. • *List of Effective Pages* on page 2a. • Revised section *Carbon Block Installation/Exchange*. • Added section *P-S-2A Beta Switch Adjustment*. • Some text from page 13a is on page 13.

List of Effective Pages

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19	2012-06-28

1.0 GENERAL

The P-W( )( )-( ) hydraulic propeller governors are single or dual acting governors developed for hydraulically variable pitch propellers with feathering and reversing capabilities, optional pitch lock and synchrophasing, produced by AVIA Propeller.

1.0.1 Statement of purpose

This publication provides operation, installation and line maintenance information for the Avia Propeller governors.

Installation, removal, operation and trouble shooting 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 at www.aviapropeller.cz

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 governors P-W( ) ( )-( ).

2.0 MODEL DESIGNATION

P - W 1 0 - 1

1 2 3 4 5

Legend:

1 P = Propeller Governor
2 W = Manufactured by AVIA Propeller, for GE turboprop engines
3 1 = Pressure to decrease pitch, single acting version.
2 = Pressure to decrease pitch, dual acting version.
4 = Special arrangements
0 = feathering, mechanical control
1 = 0 + speed sensor
2 = 0 + pitch lock
3 = 0 + synchrophasing coil
4 = 0 + speed sensor + pitch lock
5 = 0 + pitch lock + synchrophasing
5 = Application Number, Settings of Control Lever and Relief Valve Pressure etc.

S/No. 10 G 003 A
a b c d

a = Year of Manufacture
b = Governor
c = Consecutive Number
d = Modification

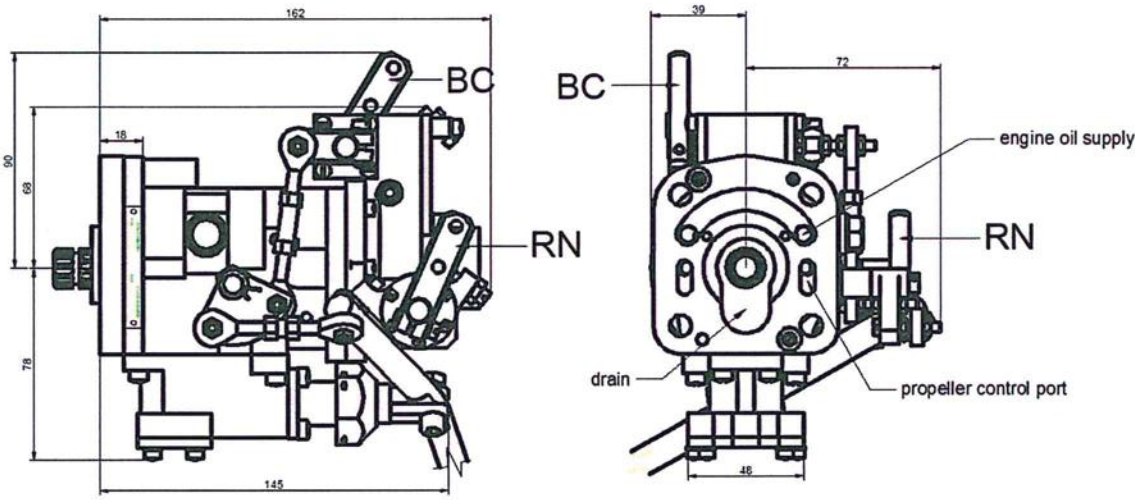
3.0 PERFORMANCE DATA

Range of acceptable operation temperature from -20°C (-4.4°F) to +150°C(+302°F)

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

The torque required at 220 psi and 2700 rpm is 1 Nm (8 inch lbs)

3.1 Dimensions



Weight =2 kg (4,15 lbs) in basic configuration

Fig. 1 – Basic governor dimensions

4.0 DESIGN AND OPERATION INFORMATION

The **Avia Propeller** aircraft governors **P-W( )( )-( )** are base mounted centrifugal governors for use with hydraulic constant speed propellers on single or twin turboprop engine aircraft.

They regulate propeller speed by continually varying the pitch of the propeller blade to match propeller torque (and, hence, engine load) to engine developed torque as changes occur in flight conditions. The governors are single-acting or dual-acting, using oil pressure to decrease pitch. Pitch change in the opposite direction is accomplished by the force of the propeller blade counterweights twisting moment and servo spring plus hydraulic pressure in dual-acting configuration at overspeed condition.

The principal parts of each governor are a gear-type oil pump with pressure relief valve, flyweights pivoted on a rotating flyweight head, a spring-loaded pilot valve positioned by the flyweights, an external control lever that varies the spring load on the pilot valve, and beta valve to control blade pitch in beta mode of operation.
The body, cover and base are made of aluminum. The body contains the necessary passages to channel oil to the propeller pitch changing mechanism, and the base is designed to fit the standard AND20010 engine pad.
The governor can be equipped with optional pitch lock valve, which prevents propeller going into uncommanded reverse by closing control port. The valve is solenoid actuated and the solenoid is activated when propeller is reaching beta switch activation set point without movement engine control lever into beta mode of operation.

The sensing element of the governor is a set of pivoted flyweights mounted on a rotating flyweight head and linked mechanically to the engine gears, through a hollow drive gear shaft.

The flyweights, actuated by the centrifugal force developed by the speed of the rotation, position a pilot valve so as to cover or uncover ports in the drive gear shaft and control the flow of oil to and from the pitch changing mechanism of the propeller. The centrifugal force exerted by the flyweights is opposed by the force of an adjustable speeder spring. The load exerted by the speeder spring determines the engine rpm required to develop sufficient centrifugal force in the flyweights to center the pilot valve. Oil to operate the propeller's pitch changing mechanism is supplied by a gear-type oil pump at a pressure value limited by a relief valve.

ON SPEED:

In this condition the forces action on the engine-governor-propeller combination are in a state of balance. The speed adjusting control lever has been set by the pilot to obtain the desired engine rpm. The propeller blades are at the correct pitch to absorb the power developed by the engine. The centrifugal force of the rotating flyweights exactly balances the force of the speeder spring. The pilot valve is located in the drive-gear shaft, so that the control ports between the oil pump and the propeller pitch changing servo are covered. Pressure oil from the gear pump is circulated through open governor relief valve back to the inlet side of the pump.

Fig. 2 shows single-acting system at on-speed condition, Fig. 3 shows dual-acting system at on-speed condition.

OVERSPEED:

This condition occurs when airspeed or horsepower is increased and engine rpm increases above the onspeed value - set by the speed adjusting control lever. The rotating flyweights pivot outward as their increase centrifugal force overcomes force exerted by the speeder spring.

Fig. 4 shows counterweighted propeller single-acting system and dual-acting system.

The flyweight toes raise the pilot valve plunger, uncovering ports in the driver gear shaft that permit pressure oil to flow from the propeller pitch changing mechanism. For dual-acting control system, the valve opens also high pitch channel for pressurized oil. This allows propeller counterweights and pressurized oil in dual-acting systems to take the propeller blades toward a higher pitch. The load on the engine is increased and engine speed is reduced.

This, in turn, reduces centrifugal force exerted by the flyweights in opposition to the force of the speeder spring. The flyweights return to an on-speed position and the pilot valve plunger covers ports in the driver gear shaft, blocking flow of pressure oil to or from the pitch changing mechanism of the propeller – return to on-speed condition.

UNDERSPEED:

An underspeed condition occurs when the airspeed or horsepower is decreased and engine rpm falls below the rate established by the setting of the speed adjusting control lever. The decrease in the centrifugal force of the rotating flyweights causes them to pivot inward under the force exerted by the speeder spring.

Fig. 4 shows counterweighted propeller single-acting system and dual-acting system.

The pilot valve plunger is forced down uncovering the ports in the drive gear shaft that allow pressure oil to flow to the pitch changing mechanism or the propeller. This overcomes the force of the propeller counterweights and decreases the pitch of propeller blade.

This reduces the load on the engine, thereby increasing engine speed and the centrifugal force developed by the rotating flyweights. The flyweight toes lift the pilot valve plunger to cover the control ports. At this point the forces acting on the engine-governor-propeller combination are again balanced and the engine is back to the on-speed setting.

NOTE

LOSS OF OIL FROM THE PROPELLER PITCH CHANGING MECHANISM DUE TO ENGINE TRANSFER RING LEAKAGE WILL RESULT IN CHANGED SPEED SETTINGS.

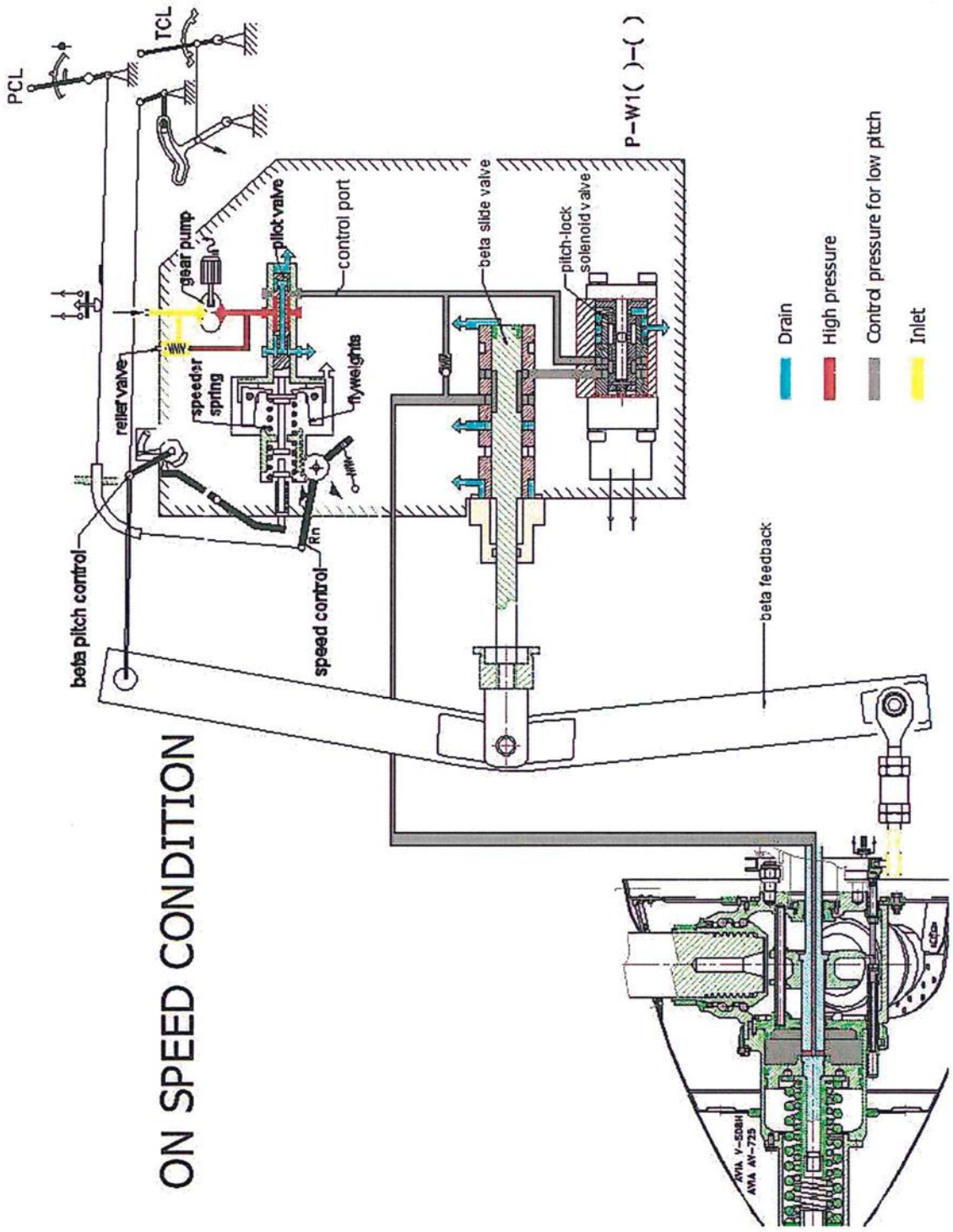


Fig. 2 – Single Acting Control System in On-speed Condition

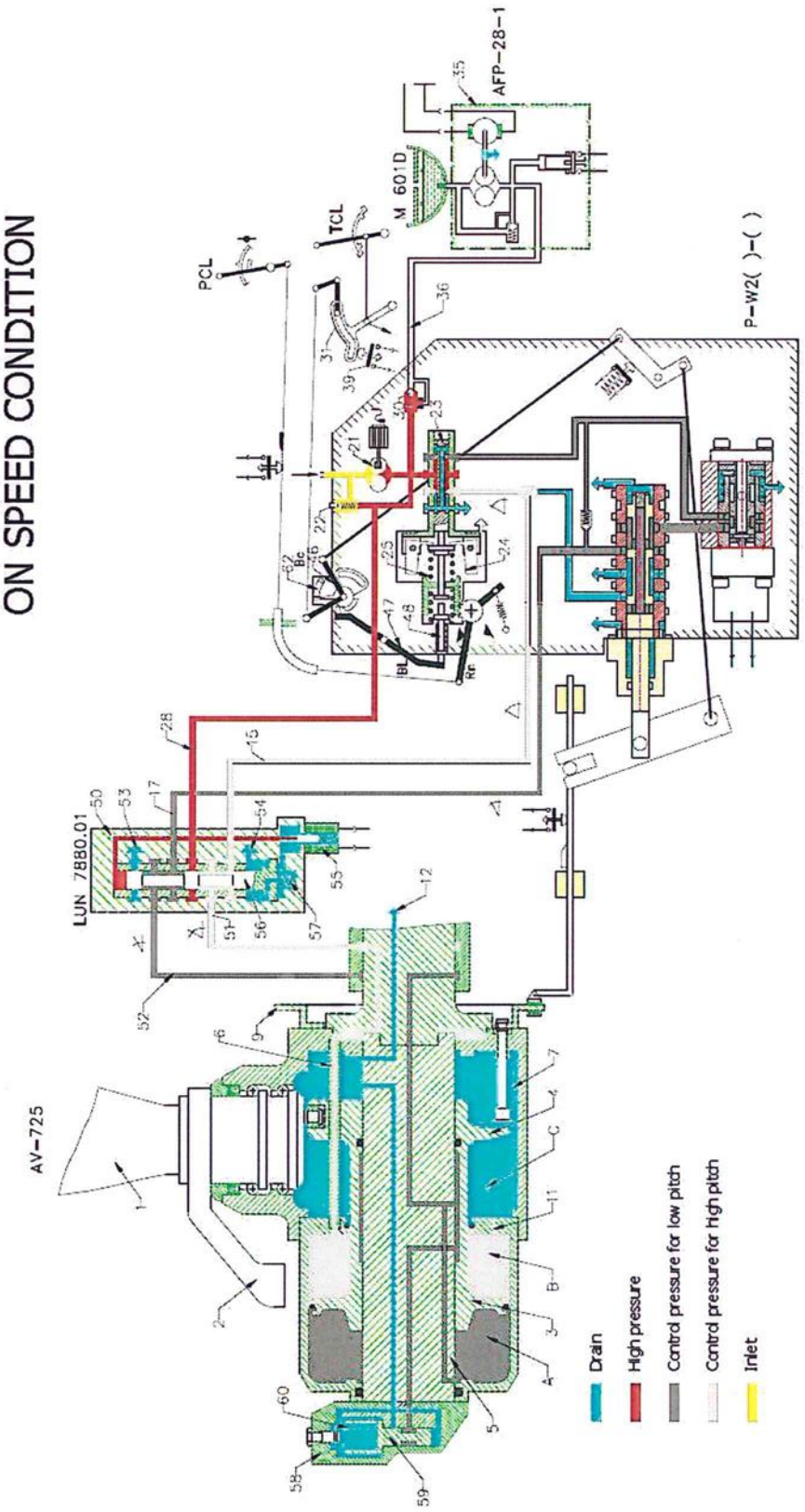
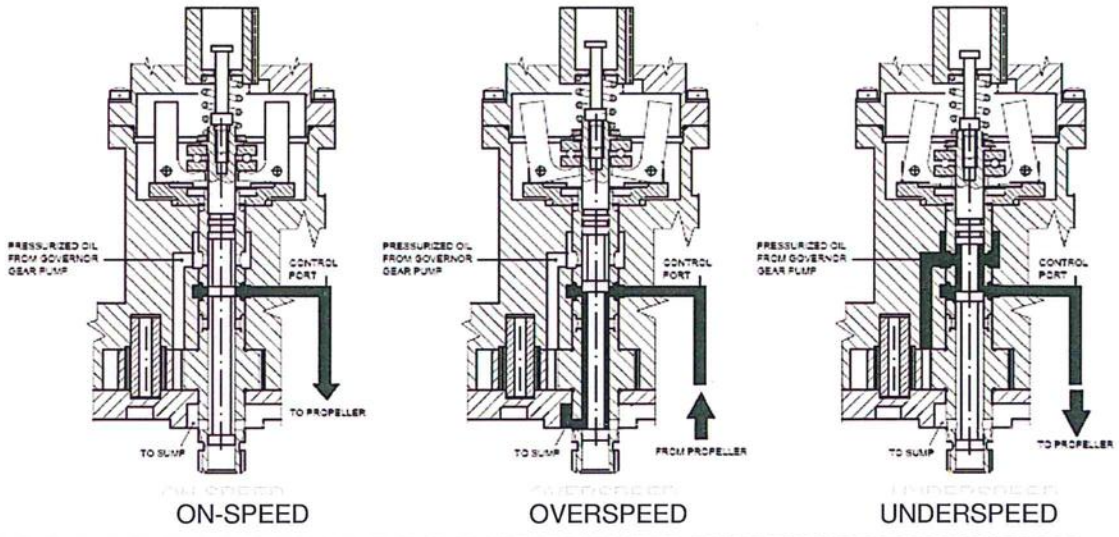


Fig. 3 – Dual Acting Control System in On-speed Condition

Pressure to decrease pitch Type Pilot Valve – Single Acting



Pilot Valve – Dual Acting

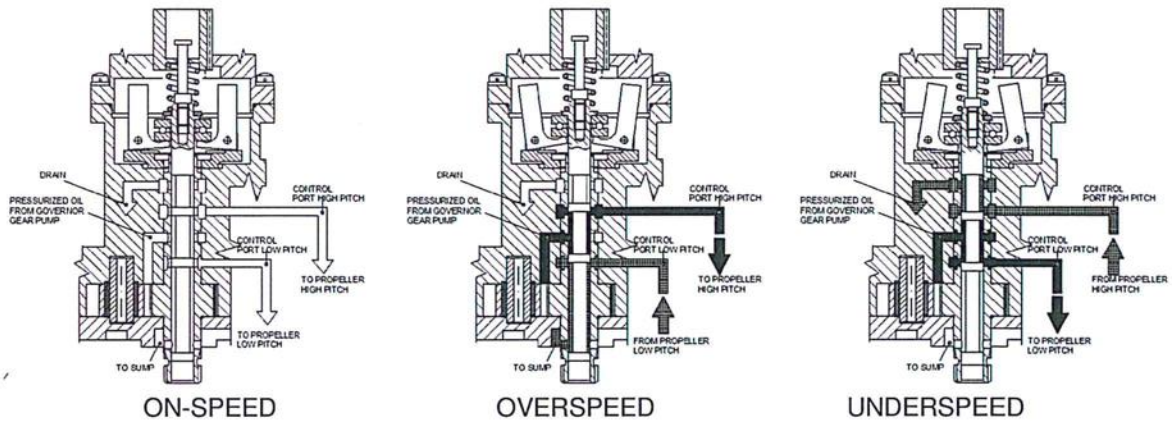


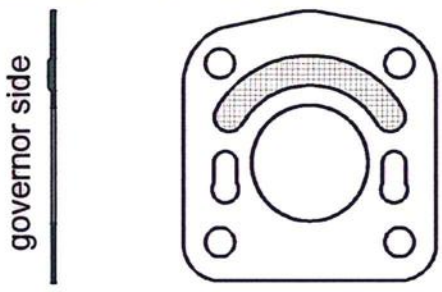
Fig. 4 – Constant Speed Mode of Operation

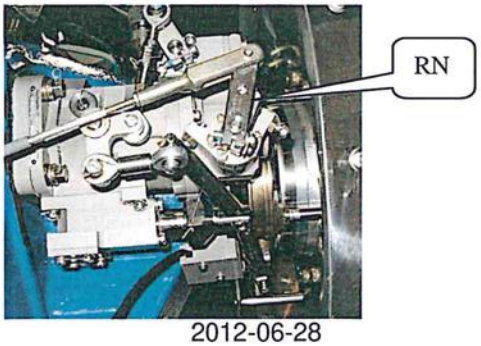
5.0 INSTALLATION AND OPERATION INSTRUCTION

5.1 Propeller Governor Installation

a) If applicable: Remove old governor per aircraft service instructions (or chapter 5.10).

b) Prepare new mounting gasket, **P/N 222-0163. Coat gasket with engine oil or equivalent before installation.**



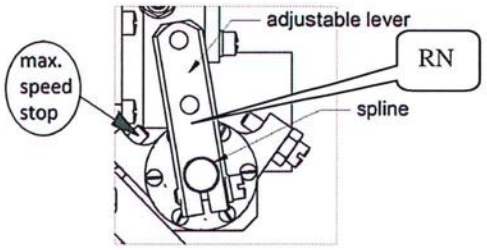


c) Clean engine pad, studs and mounting hardware before installing new mounting gasket. Insure governor drive spline mate correctly with engine accessory drive spline. Place the governor to its position.

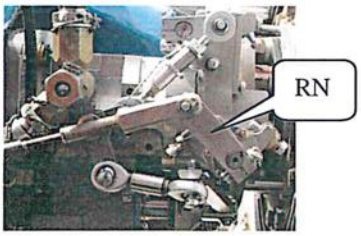
d) Attach mounting hardware and torque 4 mounting screws to 20-24 Nm (180-220 inlbs).

e) Reconnect push-pull control to outermost hole on governor control lever and adjust linkage per aircraft service information – also see chapter 5.4.

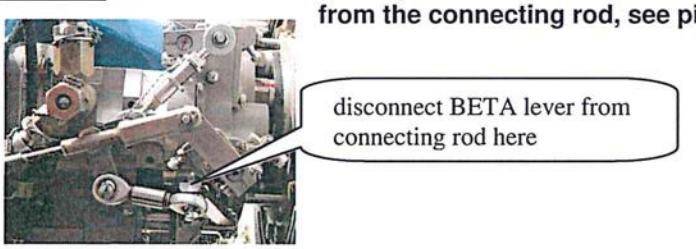
NOTE: The speed control lever (RN) can be adopted for push-pull control linkage by positioning on spline shaft end – see picture. Simply remove the "long" adjustable lever from the shaft, place in requested position and lockwire again.

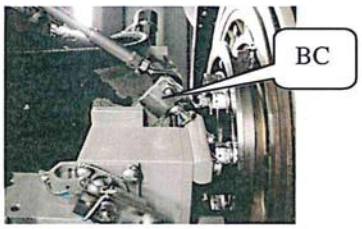


CAUTION: Mechanical lock between FEATHER and BETA prevents moving the BETA lever (BC) to beta mode of operation when the speed control lever is in feather position and vice versa it prevents the speed control lever to feather position when the BETA lever is in beta mode of operation. ALLWAYS keep the speed control lever (RN) in maximum speed position when manipulating with BETA lever! ALLWAYS keep the beta control lever (BC) at stop screw when manipulating with RN lever!



ATTENTION: To move with BC lever, disconnect BETA feedback lever from the connecting rod, see picture.

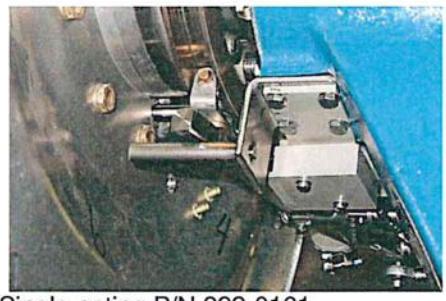




f) In case a feathering pump is connected, make sure that the tube to the pump is fixed correctly.

5.2 Beta Lever Support and Beta Switch Installation

a) Install the beta lever support together with beta switch – see picture below. If the carbon block for dual-acting propeller (P/N 222-0192) is installed, ensure the minimum clearance between the carbon block and the beta ring of 0,15 mm.



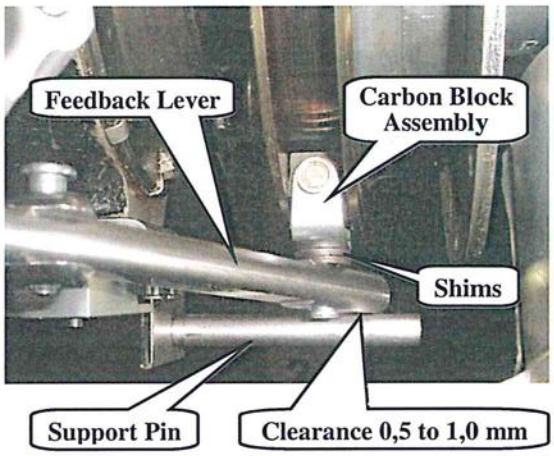
Single-acting P/N 222-0161

Dual-acting P/N 222-0161-2

b) Secure installation hardware

5.2a Carbon Block Installation / Exchange (propellers with U-Type beta ring)

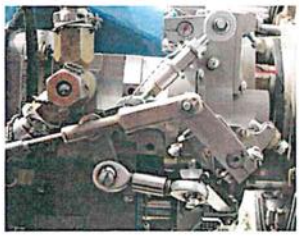
a) Check the clearance between the carbon block and the beta ring. Refer to appropriate Propeller Operation and Installation Manual for required clearance.
b) Release the feedback lever from the connecting rod.
c) Release and remove feedback lever pivoting pin and remove the feedback lever.
d) Install carbon block assembly on the feedback lever and into the beta ring. Move the feedback lever with carbon block toward the beta ring and measure the clearance between the feedback lever and the support pin. Use the shims to establish the clearance 0,5 to 1,0 mm between the feedback lever and the support pin.
e) Install the pivoting pin, secure with a cotter pin.
f) Connect the feedback lever with the connecting rod.



5.3 Beta Valve Feedback Adjustment

a) If applicable, install a propeller.
b) Propeller beta ring has to be fully protruded for single-acting system or intruded for dual-acting system.
c) Install a carbon block and secure with supporting assembly.
d) Adjust beta valve position such a way, that the face of the beta valve cover matches with recess in the fork, see picture below.
e) Lockwire the adjusting element.

CAUTION: Mechanical lock between FEATHER and BETA prevents moving the BETA lever (BC) to beta mode of operation when the speed control lever is in feather position and vice versa it prevents the speed control lever to feather position when the BETA lever is in beta mode of operation. ALLWAYS keep the speed control lever (RN) in maximum speed position when manipulating with BETA lever!!!



ATTENTION: Adjusting element has left and right thread, left thread nut is lockwired. USE correct wire orientation for left thread – see fig. 5a.

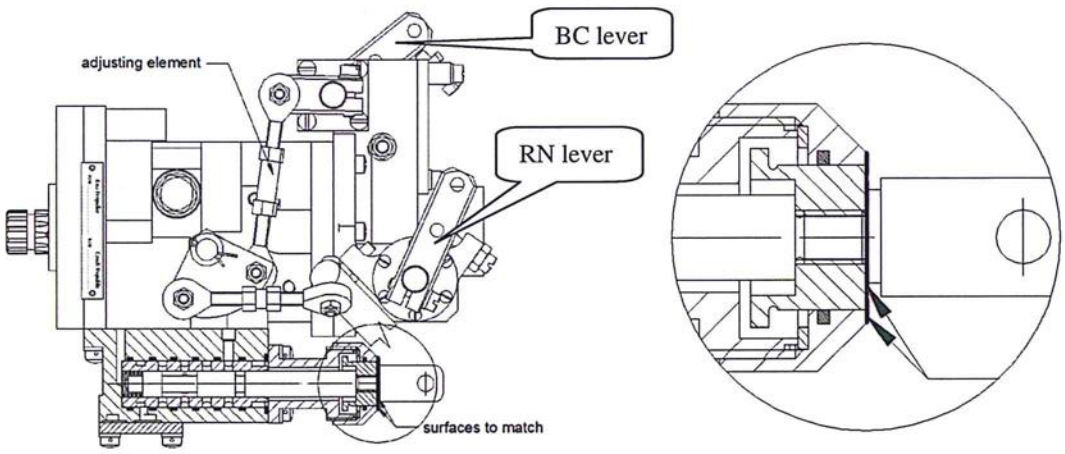


Fig. 5 – Beta Valve Adjustment by Matching of Surfaces

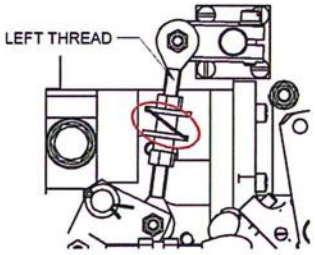


Fig. 5a – Correct Left Thread Lockwiring

5.3.1 Beta Ring Travel Check for Dual-acting System with Feathering Pump

For dual-acting system with feathering pump, it is possible to check beta ring movement. To do this, see following procedure:

- disconnect feathering valve (LUN 7880)
- move speed control lever (RN) to maximum speed position (touching stop screw)
- release Beta control lever (BC) from push-pull control

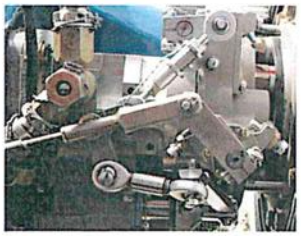
- switch on the feathering pump; when propeller blades reached minimum angle, switch the pump off
- check minimum blade position if necessary
- switch the pump on and move BETA lever towards reverse up to maximum reverse position is reached and switch the pump off
- check position of the beta ring and feedback carbon block, which has to be free
- switch on the pump and move the BETA lever to the stop; switch off the pump as soon as the blades reach minimum angle.

CAUTION: When using feathering pump this way, ALLWAYS follow instructions in engine handbook – cold engine start (without ignition) could be necessary!

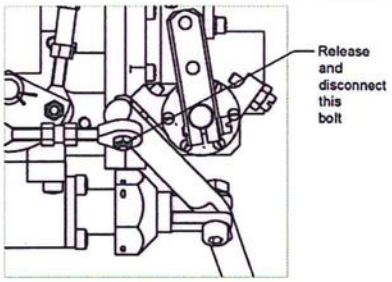
- reconnect BETA lever to push-pull control
- connect feathering valve and lockwire.

5.4 Maximum Reverse Setting

CAUTION: Mechanical lock between FEATHER and BETA prevents moving the BETA lever (BC) to beta mode of operation when the speed control lever is in feather position and vice versa it prevents the speed control lever to feather position when the BETA lever is in beta mode of operation. ALLWAYS keep the speed control lever (RN) in maximum speed position when manipulating with BETA lever!!!



ATTENTION: To have possibility to move with BC lever, disconnect beta feedback lever from the control rod – see picture.



Beta control lever (BC) position scale has a guideline for defined beta-ring movement. This guideline corresponds with standard reverse travel of 20mm when the lever is placed in the position shown on the *figure 6*. Particular installation can require different lever setting. Then the edge of the lever will be placed defined distance from the guideline.

Place the lever edge 2 to 6 mm behind the guideline – see *figure 6a*. As higher value it is, as faster blades move into reverse.

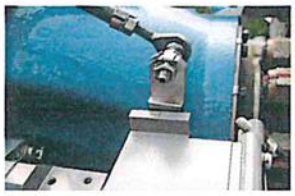


Fig. 6a – BC lever position at maximum reverse

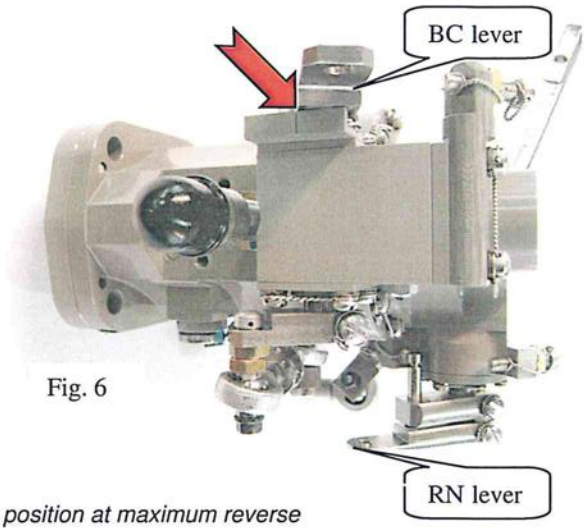
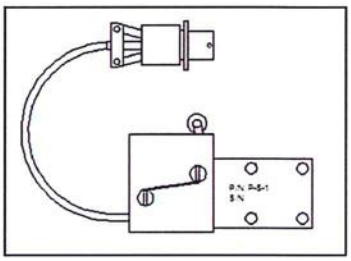


Fig. 6

5.5 P-S-1 Beta Switch Adjustment

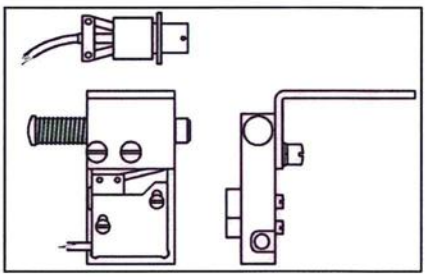
When propeller governor is installed, move beta ring 2 mm behind minimum flight angle. Loose two adjusting screws on the beta switch and move with beta switch body towards feedback lever up to switching on beta lamp or hearing click from the switch and then back when the beta lamp is off, stop with movement. Tighten and lock wire the screws.



5.5.1 P-S-2 Beta Switch Adjustment

NOTE: The P-S-2 beta switch is used on Avia AV-( )-( )-E-C-F-**R(W)** propellers.

When propeller governor is installed, move beta ring 4,5 mm behind minimum flight angle. Loose two adjusting screws on the beta switch and move with beta switch body towards feedback lever up to switching on beta lamp or hearing click from the switch and then back when the beta lamp is off, stop with movement. Tighten and lock wire the screws.



NOTE: Refer below for alternative procedure of P-S-2 beta switch adjustment.

5.5.1.1 P-S-2 Beta Switch Adjustment - Alternative Procedure

The P-S-2 beta switch can be adjusted by using gauge blocks inserted between beta switch cam and beta lever.

a) The propeller must be in feather position and BC lever is touching end stop, see *figure 6b.*

b) Disconnect beta switch connector.

c) Connect beta switch contact indicator P/N 300-488 or use pins "A" and "B" to measure ON/OFF position.

d) Use gauge block between the cam and beta feedback lever, see *figure 6c.*

1) When 4,8 mm gauge block is inserted between the cam and beta feedback lever, the switch must be OFF.

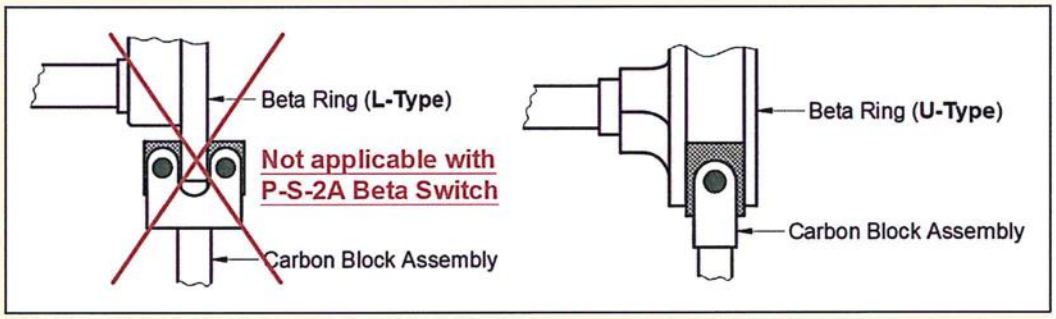
2) When 5,0 mm gauge block is inserted between the cam and beta feedback lever, the switch must be ON.

e) After adjustment, tighten and lock wire adjusting screws.

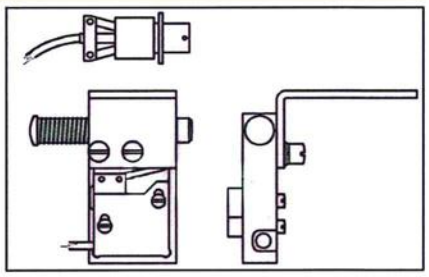
f) Re-connect the connector.

5.5.2 P-S-2A Beta Switch Adjustment

NOTE: The P-S-2A beta switch is used on Avia AV-( )-( )-E-C-F-**R(W)** propellers with **U-Type beta ring** only (see picture below).



When propeller governor is installed, move beta ring 2 mm behind minimum flight angle. Loose two adjusting screws on the beta switch and move with beta switch body towards feedback lever up to switching on beta lamp or hearing click from the switch and then back when the beta lamp is off, stop with movement. Tighten and lock wire the screws.



NOTE: Refer below for alternative procedure of P-S-2A beta switch adjustment.

5.5.2.1 P-S-2A Beta Switch Adjustment - Alternative Procedure

The P-S-2A beta switch can be adjusted by using gauge blocks inserted between beta switch cam and beta lever.

a) The propeller must be in feather position and BC lever is touching end stop, see *figure 6b.*

b) Disconnect beta switch connector.

c) Connect beta switch contact indicator P/N 300-488 or use pins "A" and "B" to measure ON/OFF position.

d) Use gauge block between the cam and beta feedback lever, see *figure 6c.*

1) When 3,4 mm gauge block is inserted between the cam and beta feedback lever, the switch must be OFF.

2) When 3,8 mm gauge block is inserted between the cam and beta feedback lever, the switch must be ON.

e) After adjustment, tighten and lock wire adjusting screws.

f) Re-connect the connector.

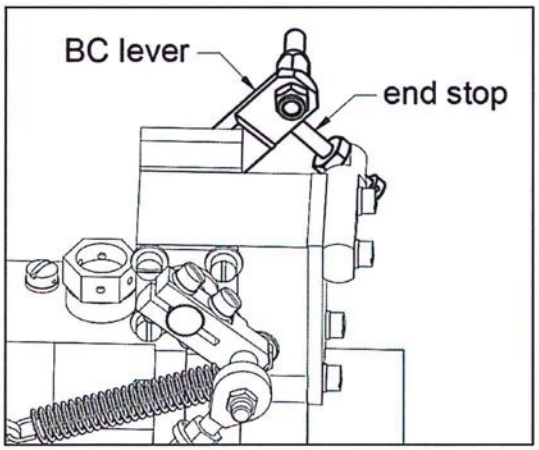


Fig. 6b – BC lever is touching end stop

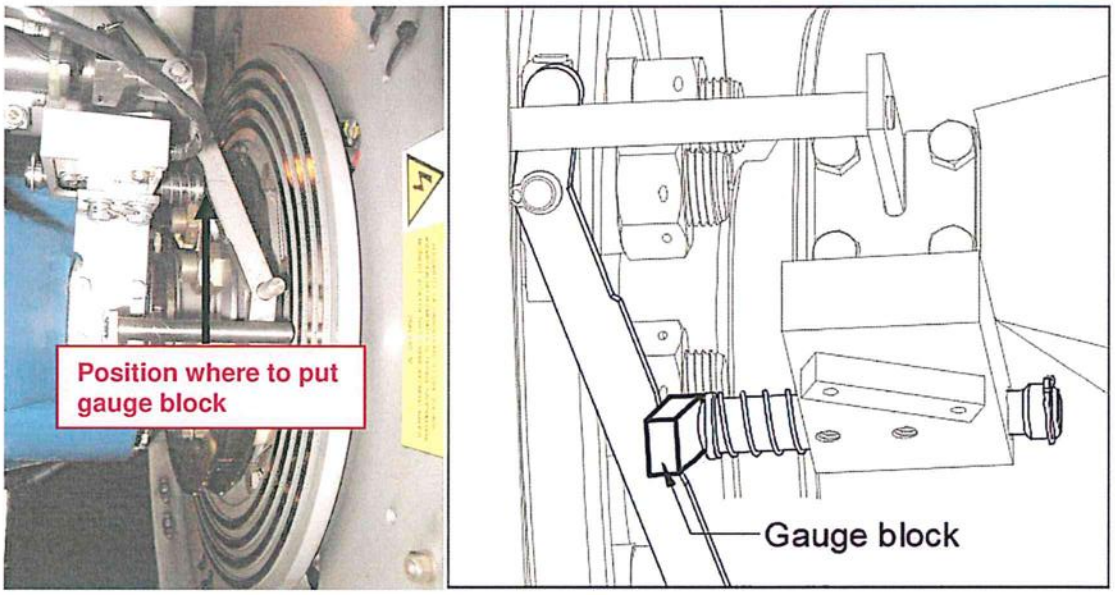


Fig. 6c – Adjustment of beta switch P-S-2 and P-S-2A by using gauge blocks

5.6. Maximum Propeller Speed Adjustment (*see Fig. 7*)

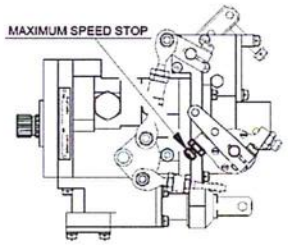


Fig. 7 – Maximum Propeller Speed Adjusting Stop

Note:
It is possible to set maximum rpm with the described procedure only in a limited range. This is a normal maintenance procedure and fully authorized.

When it is found during static run (chapter 5.7) or flight check (chapter 5.8) it is necessary to adjust maximum speed, follow this procedure.
Remove lock wire from the stop screw, *fig. 7* and loose the lock nut of the screw.

Set maximal propeller's RPM by turning the stop screw. One quarter turn clockwise will reduce RPM by approximately 25 RPM. One quarter turn counterclockwise will increase RPM by approximately 25 RPM.

Lock the stop screw at maximal RPM stop and torque the nut with 2.5 Nm (22 in. Lbs).

Lockwire the stop screw at maximal RPM stop with safety wire.

5.7 Static Run-up :

ATTENTION: PERFORM THE STATIC RUN UP ON A CLEAN AREA , TO NOT DAMAGE THE PROPELLER BLADES DUE TO STONES ETC.

Lock aircraft brakes. Start the engine. Place cockpit propeller RPM lever in MAX RPM position.

PULL BACK THE PROPELLER LEVER 3 TO 5 TIMES TO SPILL THE SYSTEM AND REMOVE THE AIR IN THE SYSTEM.

Advance throttle lever slowly to maximum permitted engine power. Record propeller RPM. As a general rule, propeller could be 25-100 RPM below the red line limit during check.

Record propeller speed at idle.

Check beta range up to maximum reverse. **DO NOT EXCEED 1980 PROPELLER RPM.**

Check for oil leakage. Check oil leakage immediately after engine stop.
Check oil leakage at governor's surface and at mounting pad.

Make a record in engine/governor log book.

5.8 Flight Test

Tests should be done in smooth air. 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:

5.8.a If the propeller RPM is exceeding the redline limit, reduce it to the redline using propeller control. Leaving propeller at this redline RPM setting, land aircraft and shutdown. Remove cowling and note position of control arm and governor. Adjust governor high RPM screw (see chapter 5.6) clockwise so it just touches stop on governor control arm; this will ensure that the correct arm position for governor redline RPM setting cannot be exceeded.

5.8.b If the propeller is bellow 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 stop (see chapter 5.6) counterclockwise to increase of approximately 25 RPM. Perform another flight to confirm the adjustment was sufficient.

5.9 Relief Valve Pressure Adjustment (*see Fig. 8*)

ALLWAYS discuss the change of the relief valve setting with the propeller manufacturer.
Remove the governor in accordance with section 5.10.

Set required relief valve pressure by turning the adjusting screw. One full turn clockwise will increase the relief valve pressure by approximately 36 psi. One full turn Counterclockwise will reduce the relief valve pressure by approximately 36 psi.

Lock the setting screw by locking paint.

Install the governor in accordance with section 5.1.

ATTENTION: **THE RELIEF VALVE PRESSURE IS NORMALLY SET TO 380 PSI ± 10 PSI. A HIGHER INCREASE OF THE PRESSURE CAN RESULT IN A DAMAGE OF THE PITCH CHANGE MECHANISM OF THE PROPELLER.**

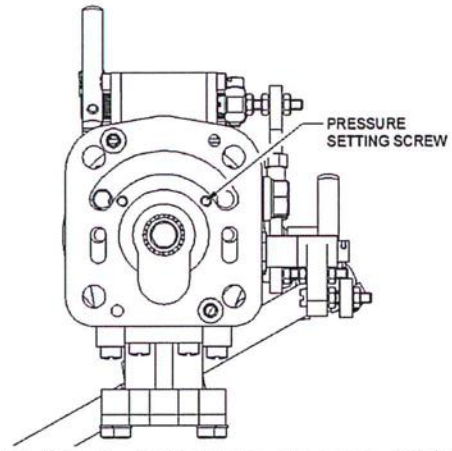


Fig No. 8 – Relief Valve Pressure Setting

5.10 Governor removal

Remove carbon block supporting assembly.

Remove push-pull linkage in accordance with aircraft service instructions.

Remove mounting nuts and washers.

Pat on the governor to release it if necessary and then remove governor from engine pad.

Governor drive and engine pad must be without impurities (metal chips etc.)

If it is necessary, clean governor drive and engine pad by appropriate means.

Apply the gasket and transport cover to governor base.

Record the removal in engine/governor logbook.

Perform preservation in accordance with section 8.0 to prepare for long- term storage.

6.0 INSPECTIONS

Check for oil leakage.
Check oil leakage immediately after engine stop.
Check oil leakage at governor's surface and at mounting pad.

If oil leakage is detected, check stop nuts at the governor housing and the mounting nuts. Torque if necessary. If oil leakage is detected repeatedly contact service center or governor's manufacturer.

WARNING: NO OIL LEAKAGE IS PERMITTED

7.0 TROUBLE SHOOTING

Propeller Surging or "Wandering" - Possible Causes:

7.1 EXCESSIVE 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.

7.2 MALFUNCTIONING fuel control unit

7.3 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.

7.4 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.

7.5 EXCESSIVE PROPELLER FRICTION

(NOTE: This is rarely the cause of RPM malfunction.)
Propeller may be overly-resistant to pitch movement. This can be caused by either excessively tight shimming of the propeller blades, or internal corrosion or part failure, causing binding.

Solution: Check amount of blade "play" as defined below:

A total lack of blade "shake" may indicate excessively tight blade shims. If this is suspected, have the propeller checked by a qualified EASA/FAA-approved propeller repairman. Note that this check and any needed correction can usually be performed with the propeller installed on the aircraft.

8.0 SHIPPING AND STORAGE

Conservation

Inner conservation is automatically done by engine oil. Attach cover cap.

After installing the governor the conservation is done together with engine in accordance with the instruction of the engine manufacturer.

Outside conservation isn't required.

Pack the governor in two layers of wax-cloth and put it in a plastic bag. The plastic bag should be vacuumed and after that welded.

Make a note in the governor's logbook.

Deconservation isn't needed.

Storage

Governors have to be packed in carton box with accessory documentation.

Store governors in temperature from +10°C (+50°F) to +30°C (+86 °F) and relative humidity from 40 % to 80 %. Keep stock room free of gases with deleterious effect.

9. GOVERNOR INSTALLATION RECORD

P/N: ..... S/N: .....

Note: .....

Date installed	Notes	Authorized Signature	Date Removed

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 Avia Propeller distributor of the area in which the governor is firstly operated or to Avia 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:

P	-	W			-			

S/N:

		G			

Date of purchase (day/monthlyear):__/__/__

Date of De-conservation (day/monthlyear):__/__/__

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:.....