CHAPTER

61

PROPELLER

CONTENT

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GENERAL

The MTV-9-B/195-45a propeller is the constant-speed, three-blade, hydraulic-controlled propeller. The propeller speed is controlled by propeller control system.

PROPELLER

DESCRIPTION AND OPERATION

The MTV-9-B/195-45a propeller is the constant-speed, three-blade, hydraulic-controlled propeller. The propeller blades are made from laminated wood. In the root area the blades are made from hardened wood while remaining blade parts are made from lightwood. Each blade is covered with a layer of laminate and protected by acrylic varnish. The blade leading edge is protected with stainless steel sheet.

The range of propeller pitch setting is limited by mechanical stops. The blades are set in case of oil pressure loss to fine pitch. The oil pressure resets generally the propeller to higher pitch angle white the smaller pitch angles are obtained by action of aerodynamic forces acting upon blades in run. The propeller blades are not provided with counterweights.

Specification:

- Number of blades	3
- Propeller diameter	1950 mm
- Direction of rotation	right

The detailed description and operation is described in accompanying documentation of propeller manufacturer.

MAINTENANCE

REMOVAL / INSTALLATION

REMOVAL OF PROPELLER

Preparatory works

a) Remove fwd engine cowling (section 71-10-00, REMOVAL / INSTALLATION).

Removal of propeller

CAUTION

THE PROPELLER SHOULD BE HELD DURING REMOVAL PROPELY TO PREVENT ITS FALLING.

a) Unscrew screws (Fig. 61-1, item 7) and remove propeller spinner (6).

b) Unlock and gradually unscrew nuts (2) with bolts (1).

NOTE

The nuts (2) are joined with bolts (1) by means of elastic pins (3).

c) Remove the propeller suspended upon crane (12) from the flange (11) of the engine.

INSTALLATION OF PROPELLER

NOTE

Maintain instructions for propeller installation issued in accompanying documentation of propeller manufacturer.

a) Check fitting surfaces of propeller and engine (11) flanges, remove sharp edges and clean and degrease the fitting surfaces.

b) Hoist the propeller by crane (12) and install it to engine flange (11) such a way that the propeller blade marked at the spinner carrier (4) by number **1** is opposite to number **0** upon the engine flange.

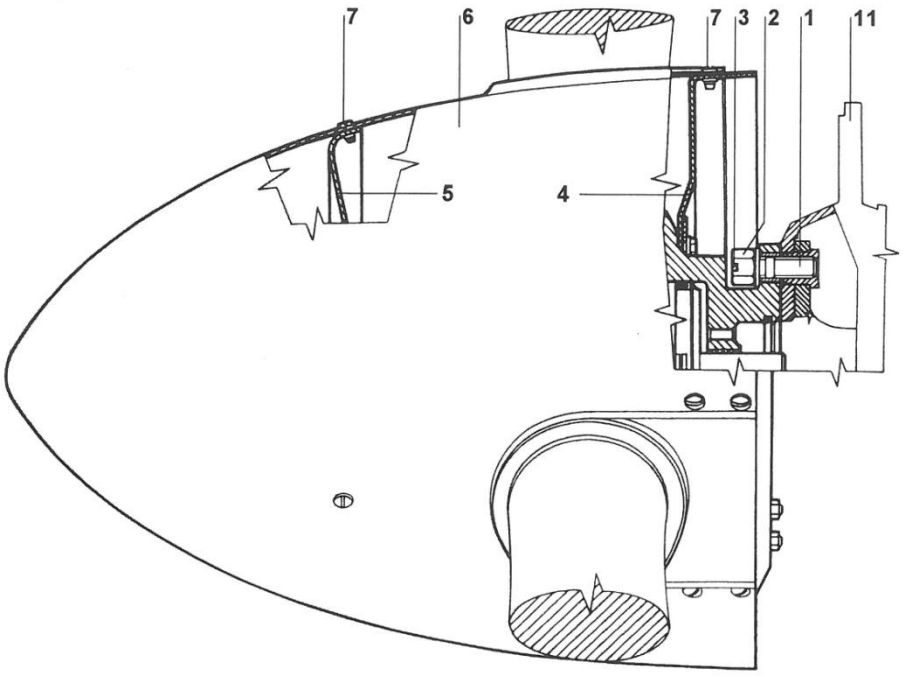
c) Screw the nuts (2) with bolts (1) crosswise gradually in. Tighten them with 85 to 90 Nm (63 to 66 lbft) torque. The torque moment is apply only for dry and clean thread.

d) Having tightened the nuts lock pairs of neighboring nuts with stainless steel safety wire.

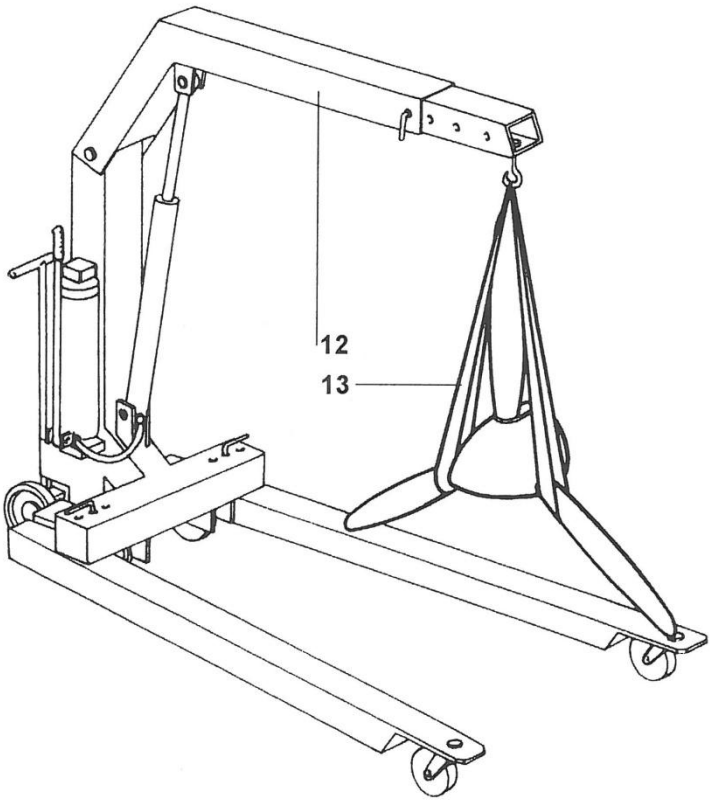
e) Fit the propeller spinner (6) to spinner support (5) and carrier (4) and fix it with screw (7) with washers.

Final works

a) Install fwd engine cowling (section 71-10-00, REMOVAL / INSTALLATION).



A



A ... propeller hoisting by crane

1 ... bolt
2 ... nut
3 ... elastic pin
4 ... propeller spinner carrier
5 ... support disk of propeller spinner
6 ... propeller spinner
7 ... screw

For information only:
11 ... engine flange
12 ... crane
13 ... sling

EFFECTIVITY: All

APPROVED REPAIRS

REPAIR OF PROPELLER

Fault	Remedy
1) Cracks in propeller hub, propeller flange, propeller spinner (Fig. 61-1), support disk (5) and propeller spinner carrier (4).	Replace all the parts exhibiting cracks.
2) Cracks in propeller blades.	Proceed according to instructions issued in propeller accompanying documentation.
3) Light defects of propeller blade surface.	Repair faults with commercial epoxy resin and polyurethane or acrylic varnish.
4) Play at the blade tips exceeding 3 mm (0.12 in). 5) Play in propeller pitch setting exceeding 2°.	These defects may be removed either by manufacturer or authorized repair shop.
6) Oil or grease leakage in the area of propeller hub or propeller blade roots.	Replace sealing or send propeller to be repaired.

PROPELLER CONTROL SYSTEM

POPIS A FUNKCE

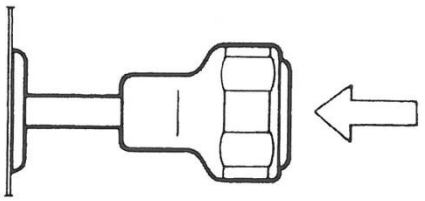
The propeller speed in controlled by the propeller controller (blue) (Fig. 61-2, item 1).

Z 143 L

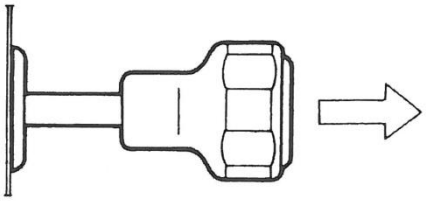
Pushing the controller increases the speed, pulling the controller decreases the speed.

The propeller controller position is locked when the controller is turned clockwise. In case of change of propeller setting, i.e. of change of propeller speed, it is necessary to turn propeller controller through 90° anti-clockwise and than set required propeller speed by controller pushing or pulling. The propeller controller as soon as released returns due to teleflex cable elasticity to locked position.

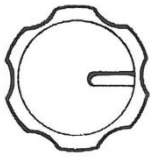
Positions of propeller controller:



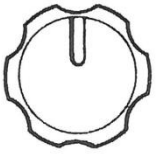
- propeller speed increases



- propeller speed decreases



- propeller controller is locked



- propeller controller is unlocked

EFFECTIVITY: All

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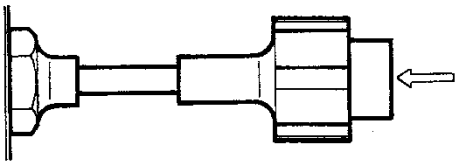
Pushing the controller increases the speed, pulling the controller decreases the speed.

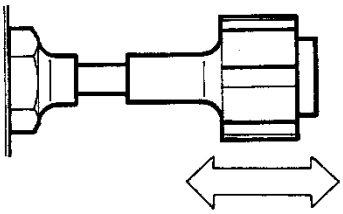
It is necessary to press and hold the button in the centre of the controller to be able to increase or decrease the propeller speed.

Fine-tuning of propeller speed is done by rotating the controller: rotating the controller clockwise increases the speed, rotating the controller anticlockwise decreases the speed.

Positions of propeller controller:

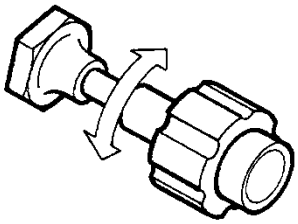


- control re-arrestement

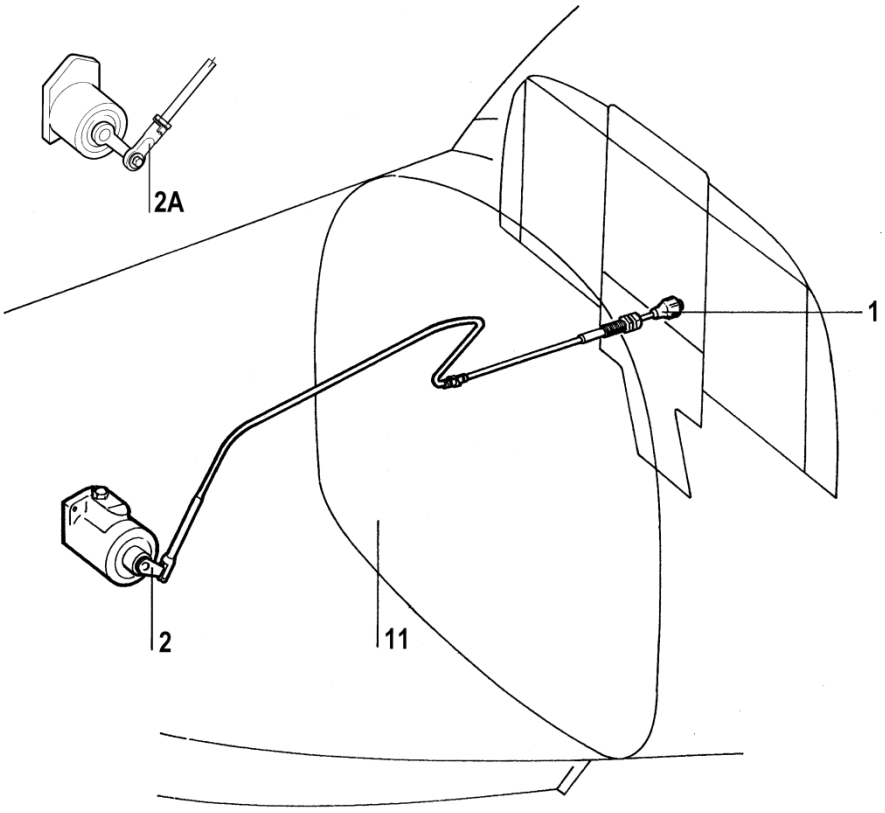


propeller speed increases

propeller speed decreases



- fine tuning engine speed adjusting



1 ….. propeller controller
2 ….. lever of propeller governor (WOODWARD)
2A … lever of propeller governor (AVIA)

For information only:
11 ... firewall

Fig. 61-2 Propeller control system

EFFECTIVITY: All

MAINTENANCE

REMOVAL / INSTALLATION

REMOVAL OF PROPELLER CONTROL WITH GOVERNOR WOODWARD (Fig. 61-3)

Preparatory works

a) Open side engine cowlings (Fig. 71-1, item 4).

b) Set fwd seats to their rear position.

Removal of propeller control teleflex cable with tubes

a) Push the propeller controller (Fig. 61-3, item 4) to console.

b) Uncouple the fork (5) from the propeller governor lever after removing the cotter pin, washer and pin (6) from the suspension.

c) Unlock and unscrew the fork (5) from the guide (7) and remove guide from the front pipe (2).

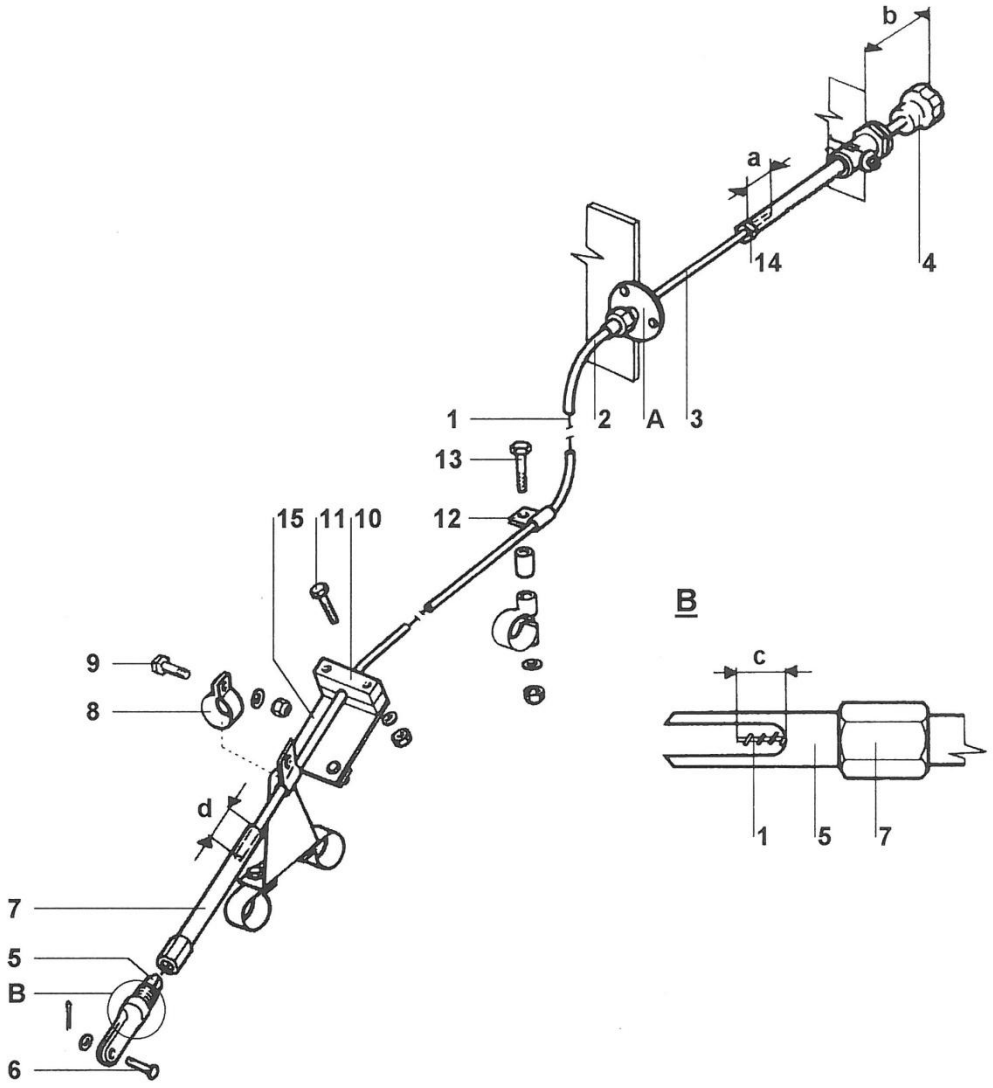
d) Remove front tube (2) from the hold as follows:
- remove screw (13) from the clip (12)
- remove screw (11) from the support (10)
- remove screw (9) with clip (8).

e) Unlock and unscrew the cap nut on the firewall.

f) Unlock and release nut (Fig. 61-3, item 14) – the pushrod of propeller controller is provided with milled flat planes for wrench. Unscrew the thread provided part of teleflex cable (1) from the pushrod of propeller controller.

g) Pull the teleflex cable (1) from the tube to the cockpit.

h) Remove fwd (2) and rear (3) tubes from the bushing (A) in firewall to the engine compartment.



A … bushing in firewall
B … overhanging the teleflex cable to the fork

a … length of screwed in teleflex cable into the propeller controller pushrod; a = 12 mm (0,5 in)
b … distance between face of propeller controller and console; b = 47,5 mm (1,9 in)
c … overhanging the teleflex cable to the fork; c = 10 mm (0,4 in)
d … insertion of fwd tube into the guide; d = 35 mm (1,4 in)

1 … teleflex cable
2 … fwd tube
3 … rear tube
4 … propeller controller
5 … fork
6 … pin
7 … guide
8 … clip
9 … screw
10 … support
11 … screw
12 … clip
13 … screw
14 … nut
15 … falt springs

Fig. 61-3 Guidance of propeller control (governor WOODWARD)

EFFECTIVITY: Z 143 L

REMOVAL OF PROPELLER CONTROL WITH GOVERNOR WOODWARD (Fig. 61-3A)

Preparatory work

a) Open side engine cowlings (Fig. 71-1, item 4).

b) Set fwd seats to their rear position.

Removal of propeller control

c) Push the propeller controller (1) (Fig. 61-3A) to console.

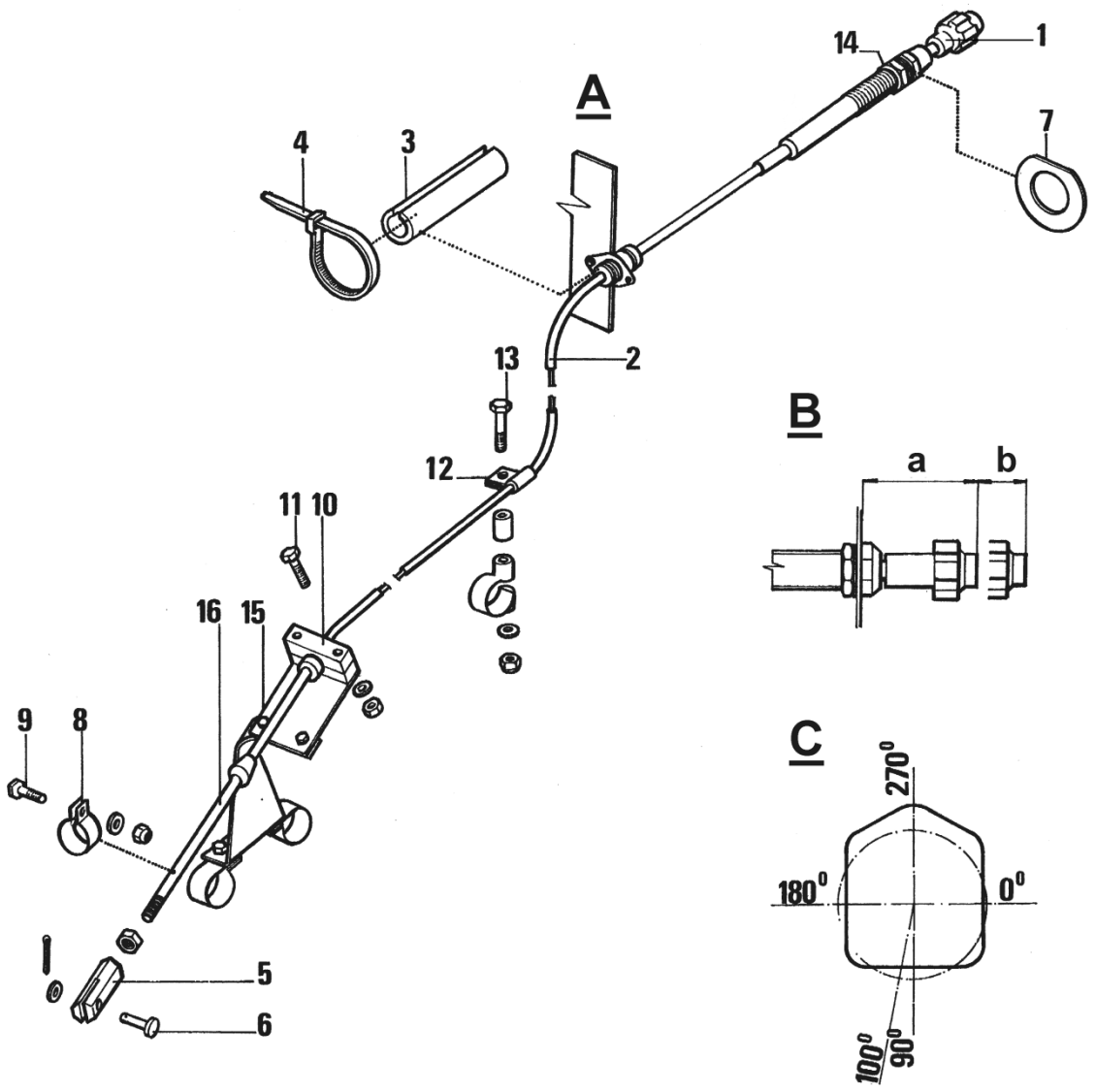
d) Uncouple the fork (5) from the propeller governor lever after removing the cotter pin, washer, and pin (6) from the suspension.

e) Unlock and unscrew the fork (5) from the connecting rod (16).

f) Remove bowden cable (2) from the hold as follows:
- remove screw (13) from the clip (12)
- remove screw (11) from the support (10)
- remove screw (9) with clips (8)
- remove the strip (4) from the hose (3) on the firewall and the strips on the airframe.
- remove the hose (3) from the bushing.

g) Loosen the nut (14).

h) Pull the propeller controller to the cockpit.



A … bushing on the firewall
B … description of the controller
C ... governor position – maximum speed
a ... distance between the propeller controller face and the panel (max. speed); a = 66 mm
b ... distance between the propeller controller face and the panel (min. speed) = a+b; b=28 mm

1 … Vernier controller
2 … bowden cable
3 … hose
4 … strip
5 … fork
6 … pin
7 … washer
8 … clip
9 … screw
10 … supporting part
11 … screw
12 … clip
13 … screw
14 … nut
15 … flat springs
16 ... connecting rod

Fig. 61-3A Guidance of propeller control (governor WOODWARD)

INSTALLATION OF PROPELLER CONTROL WITH GOVERNOR WOODWARD

(Fig. 61-3)

a) Insert from front side rear insertion piece and rear tube (3) into the bushing body.

b) Insert teleflex cable (1) greased with Aero Shell Grease 22 + 3% MOLYKOTE grease into the rear tube (3) so that the threaded end is directed to propeller controller.

c) Provide bushing body (4) from fwd side with ring (8), fwd tube (2) and fwd insertion piece (7). Tighten the cap nut (5) with 20 Nm (15 lbft) torque.

d) Check setting of tubes (2, 3) according to center punches (9) upon the tubes that should be 5 to 7 mm (0,2 to 0,3 in) (dimension a) from the faces of insertion pieces (6, 7).

e) Lock the cap nut (5) with safety wire (A).

f) Join teleflex cable (Fig. 61-3, item 1) with propeller controller (4) as follows:
- screw nut (14) upon the threaded side of teleflex cable (1) and insert lock washer
- screw at least 12 mm (0,5 in) of threaded part of teleflex cable into the pushrod of propeller controller (4)
- tighten the nut (14) with 6 to 7,2 Nm (4,4 to 5,3 lbft) torque to the propeller controller and lock it with safety washer.

g) Join fwd tube (2):

- to the sleeve upon engine mount structure
  - provide fwd tube with clip (12) and screw (13). Insert tube into clip (12) with screw and fix the clip to the sleeve upon the engine mount structure by screw, washer and nut
- to the console upon the engine
  - provide fwd tube with support (10) and join it by means of screws (11) with washers and nuts to two flat springs.

h) Provide fwd tube (2) with clip (8) with screw (9), washer and nut.

NOTE

The clip (8) creates stop for setting the minimum propeller speed at engine take-off power setting. Its position is adjusted after installation finishing.

i) Set the propeller controller (4) to position when the distance of face plane of propeller controller from the propeller controller console is 47,5 mm (1,9 in) (dimension b).

j) Provide fwd tube (2) with guide (7) and teleflex cable (1) with fork (5).

k) Join the fork (5) by pin (6) to the lever of propeller governor set to „TAKE-OFF SPEED“ position (fine blade angle of attack). Provide pin with washer and lock it with stainless steel cotter pin.

l) Screw the guide (7) upon the fork (5) and lock it after tightening with safety wire.

NOTE

The teleflex cable should overhang to the fork (5) for about 10 mm (dimension c). The fwd tube (2) should be inserted into the guide (7) for about 35 mm (1,4 in) (dimension d).

Final works

a) Adjust propeller control after engine warming at take-off power

- Maximum speed 2350 + 50 RPM:
  - push the propeller controller to the stop (maximum speed)
  - adjust the speed if necessary by setting the stop of propeller governor lever.
- Minimum speed 1600 RPM:
  - set the prescribed speed by propeller controller
  - cut off the engine and adjust the clip (Fig. 61-3, item 8) to lean on guide (7) at the set position of propeller controller. Fix the clip.

b) Start up the engine and check setting of propeller controller.

c) Shut the side engine cowlings (Fig. 71-1, item 4).

INSTALLATION OF PROPELLER CONTROL WITH GOVERNOR WOODWARD

(Fig. 61-3)

a) Grease the contact surfaces with Aero Shell Grease 22 with 3 % MOLYKOTE.

b) Thread the propeller control through the hole in the console under the instrument panel and put on the washer (7) and the nut (14).

c) Thread the control assembly through the bushing in the firewall.

d) Tighten the nut (14) so that the distance of the propeller controller from the instrument panel at maximum speed position is 66 mm, and at minimum speed position + 28 mm (detail B). Secure the nut with paint (threadlocker) (C 2001/8140).

NOTE

Mount the washer (7) so that its chamfer plain is facing up.

e) Attachment of the bowden cable (2)
- insert the hose (3) into the firewall bushing and secure it with the strip (4).
- set the clip (12) and the screw (13) and attach them to the holder at the engine mounting.
- set the supporting part (10) into position and use screws (11), washers and nuts to attach it to both flat springs and the engine bracket.
- use the strips to attach bowden cable to the airframe.

f) Place the clip (8) with screw (9), washer and nut to the connecting rod (16).

NOTE

The clip (8) now works as a stop for setting the minimum propeller speed at max. throttle. The proper position of the stop is set during finishing work.

g) Screw the fork (5) on the connecting rod and use the pin (6) to attach it to the propeller governor lever, which is set to MAX. SPEED position (100° - detail C). Put the washer on the pin and secure it with a stainless cotter.

NOTE

Secure the stops on the propeller governor with a tie wire.

REMOVAL OF PROPELLER CONTROL WITH GOVERNOR AVIA (Fig. 61-3B)

Preparatory works

a) Open side engine cowlings (Fig. 71-1, item 4).

b) Set fwd seats to their rear position.

Removal of propeller control

a) Push the propeller controller (1) (Fig. 61-3) to console.

b) Uncouple the eye (5) from the propeller governor lever - remove the cotter pin, screw (6), nut, washers, and felt rings.

c) Unlock and unscrew the eye (5) from the connecting rod (16).

d) Remove bowden cable (2) from the hold as follows:
- remove screw (13) from the clip (12).
- remove screw (11) from the support (10).
- remove screws (9) with clip (8) and stop (17).
- remove the strip (4) from the insulating tube (3) in the firewall and the strips on the airframe.
- remove the insulating tube (3) from the cover.

e) Loosen the nut (14).

f) Pull the propeller controller to the cockpit.

INSTALLATION OF PROPELLER CONTROL WITH GOVERNOR AVIA (Fig. 61-3B)

a) Grease the contact surfaces with Aero Shell Grease 22 with 3 % MOLYKOTE.

b) Thread the propeller control through the hole in the console under the instrument panel and put on the washer (7) and the nut (14).

c) Thread the control assembly through the cover in the firewall.

d) Tighten the nut (14) so that the distance of the propeller controller from the instrument panel at maximum speed position is 66 mm and at minimum speed position + 28 mm (detail B). Secure the nut with paint (threadlocker) (C 2001/8140).

NOTE

Mount the washer (7) so that its chamfer plain is facing up.

e) Attachment of the bowden cable (2)
- insert the insulating tube (3) into the firewall cover and secure it with the strip (4)
- set the clip (12) and the screw (13) and attach them to the holder at the engine mounting
- set the supporting part (10) into position and attach to bracket by screws (11), washers and nuts
- use the strips to attach bowden cable to the airframe.

f) Place the clip (8) and stop (17) with screws (9), washer and nut to the connecting rod (16).

NOTE

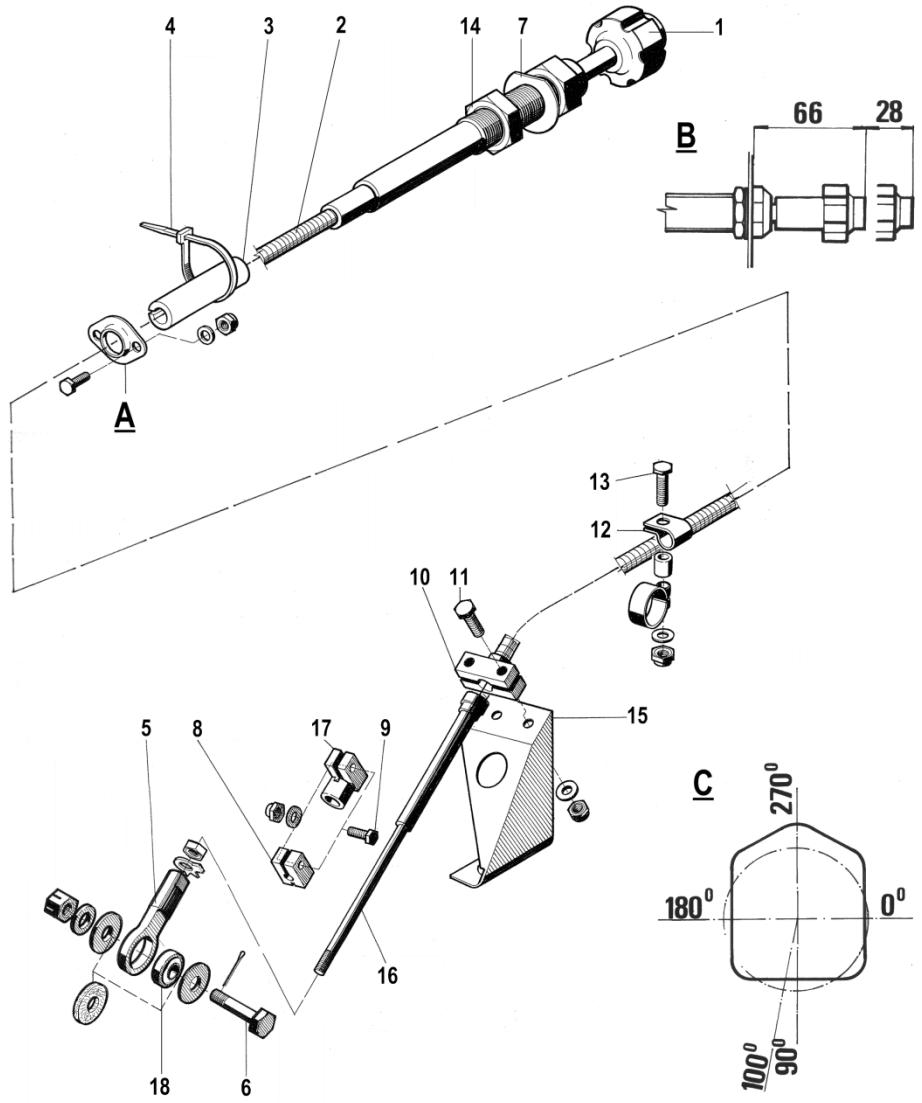
The clip (8) now works as a stop for setting the minimum propeller speed at max. throttle. The proper position of the stop is set during finishing work.

g) Screw the eye (5) on the connecting rod and use the screw (6) with washers and felt rings to attach it to the propeller governor lever, which is set to MAX. SPEED position (100° - Detail C). Secure it with a stainless cotter pin.

NOTE

Secure the stops on the propeller governor with a tie wire.

EFFECTIVITY: Z 143 LSi



A … cover in the firewall
B … description of the controller
C ... governor position - maximum speed
a ... distance between the propeller controller face and the panel (max.speed); a = 66 mm
b ... distance between the propeller controller face and the panel (min.speed)=a+b; b=28 mm

1 … Vernier controller
2 … bowden cable
3 … insulating tube
4 … strip
5 … eye
6 … screw
7 … washer
8 … clip
9 … screw
10 … supporting part
11 … screw
12 … clip
13 … screw
14 … nut
15 … console
16 ... connecting rod
17 … stop
18 … bearing

Fig. 61-3B Guidance of propeller control (governor AVIA)

Final works

a) Adjust propeller control after engine warming at take-off power.

- Maximum speed 2300 + 50 RPM:
  - push the propeller controller to the stop (maximum speed)
  - adjust the speed if necessary by setting the stop of propeller governor lever.
- Minimum speed 1600 RPM:
  - set the prescribed speed by propeller controller
  - Cut off the engine and adjust the clip (Fig. 61-3A; 61-3B, item 8) to lean on guide (16) at the set position of propeller controller. Fix the clip.

b) Start up the engine and check setting of propeller controller.

c) Shut the side engine cowlings (Fig. 71-1, item 4).

APPROVED REPAIRS

REPAIR OF PROPELLER CONTROL

Fault	Remedy
1) Faulty flat springs (Fig. 61-3, item 15): with cracks and deformations.	Replace faulty flat springs.
2) Some tube of propeller control is deformed or warned through in the fixing spots (Fig. 61-3, items 2, 3)	Replace faulty tube.
3) Fork (Fig. 61-3, item 5) with cracks, deformations, and/or dented holes.	Replace faulty fork.
4) Fork (Fig. 61-3A, item 5) with cracks, deformations, and/or dented holes.	
5) Eye (Fig. 61-3B, item 5) with cracks, deformations, and/or dented holes.	Replace faulty eye.
6) Cracks pin (Fig. 61-3, 3A, item 6)	Replace cracked pin.
7) Faulty bearing (Fig. 61-3B, item 18).	Replace faulty bearing
8) Faulty bowden cable (Fig. 61-3A; 61-3B, item 2)	Replace the propeller control
9) Increased distance center punches upon tubes of propeller control from the bushing.	Remove shifted tube, repair rolled end of tube or replace the faulty tube.

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EFFECTIVITY: All