

PRZEDSIĘBIORSTWO DOŚWIADCZALNO-PRODUKCYJNE SZYBOWNICTWA

"PZL-BIELSKO"

BIELSKO-BIAŁA

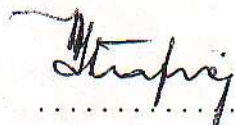
TECHNICAL DESCRIPTION  
TECHNICAL SERVICE MANUAL  
PERIODIC WORKS  
SZD - 55 - 1

Issue IV, August 1991

Factory No	.....
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This is the translation of original Polish text  
approved by C.A.C.A.

Translated by :

  
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W. Stafiej, D.Sc.

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## 0. LIST OF REVISIONS

The place where the text has been revised is marked with the vertical line on the right side of the text and with the number of revision.

No of rev.	Page	Revision	Date	Signature
1.	Pages : 1, 48, 49, have been replaced as appropriate with pages 1a, 48a, 49a. 63	In Placard 2 delete the column for the pilot of 121,3 lb mass	7.04.94	<i>Harby</i>
2.	Pages : 1a, 13, 16, 23, 48a and 49a have been replaced with pages:	1b, 13a, 16a, 23a, 48b and 49b.	25.05.95	<i>Harby</i>
3.	Pages: 3 and 23a have been replaced with pages 3a and 23b.	APPENDIX No 1 has been added.	19.12.96	<i>Harby</i>

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## 1. TECHNICAL DESCRIPTION

## 1.1. Technical data.

**Wing**

Span	15 m	49,2 ft
Area	9,6 m <sup>2</sup>	103 sq ft
Aspect ratio	23,44	23,44
Dihedral	3°	3°
Root chord	0,84 m	2 ft 9,07 in
Mean Standard Chord	0,6874 m	2 ft 3,06 in
Aileron span	2,5 m	8 ft 2,42 in
Aileron area	0,2625 m <sup>2</sup>	2,825 sq ft
Area of one airbrake plate	0,1888 m <sup>2</sup>	2,032 sq ft

**Tailplane**

Span	2,5 m	8 ft 2,42 in
Area	1,017 m <sup>2</sup>	10,947 sq ft
Elevator area	0,259 m <sup>2</sup>	2,787 sq ft
Incidence in respect to wing chord	-3,5°	-3,5°

**Fin & rudder**

Height	1,25 m	4 ft 1,21 in
Area	1,094 m <sup>2</sup>	11,77 sq ft
Rudder area	0,328 m <sup>2</sup>	3,53 sq ft

**Fuselage**

Length	6,85 m	22 ft 5,70 in
Width	0,605 m	1 ft 11,82 in
Cockpit height	0,81 m	2 ft 7,90 in

**Masses**

Empty sailplane with the standard equipment	205 ÷ 230 kg	452 ÷ 507,2 lb
Loading in the sailplane	acc. to Flight Manual	
Ballast in the wing	195 kg	430 lb
Ballast in the fin	9,6 kg	21,2 lb

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All-up mass without ballast	350 kg	771,7 lb
All-up mass with ballast	500 kg	1102,5 lb
Wing loading max.	52 kg/m <sup>2</sup>	10,66 lb/sq ft
Wing mass min.	102 kg	224,9 lb

Three-view drawing, main dimensions and control surface deflections on Fig. 1.

### 1.2. Description of sailplane.

SZD-55-1 is the monoplace high performance glider of Standard Class in the mid-wing and "T" tail arrangement.

The primary structure is of glass/epoxy composite.

Two panels wing of trapez contour with the slender outer part of elliptical chord distribution.

Wing profile : NN-27..

Monospar wing design with sandwich covering. The front wing box constitutes the integral ballast water tank.

Double-T spar with the wall of the solid composite. The spar connection of fork type with two horizontal bolts.

The wing is connected with the fuselage by means of 4 pivots fixed in the tubes of fuselage central portion.

The aileron of about 20 % suspended on 5 hinges, actuated in one point.

Airbrake extended on the upper wing surface only, double-plate type of metal sheet with composite caps fitted to the wing contour by means of springs.

Fuselage integral with fin, produced of solid composite shells. The pilot's cockpit is of double-shell design.

The cockpit internal covering, specially shaped, produced as an integral element, protects the pilot in the emergency conditions.

The correct pilot's position in cockpit is ensured by the in-flight adjustable pedals and on-ground adjustable back-rest.

One piece canopy, opened "upwards-forwards" by means of two handles on the canopy frame.

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In the nose portion of fuselage the coupled air-conditioning intake and total pressure head are installed.

The instrument panel of column type is easily removable out of the column.

The mechanism of the retractable main wheel ( $\phi$  350) is fitted into the tight housing glued up to the fuselage shell.

Tail wheel  $\phi$  200.

The rear portion of fuselage shell is stiffened with frames and semiframes.

The integral tail water ballast tank of about 9,6 l (21,2 lb) capacity is located under the fin.

In the fin shell the transceiver aerial with the cable passing to the instrument panel column is installed.

The stabilizer of sandwich structure.

The composite elevator and ailerons are filled with the foam full.

The sandwich rudder mass-balanced.

The towing hook can be fixed either on the main undercarriage arm or, on the fuselage nose portion or in both locations simultaneously.

The control systems of aileron, airbrake and elevator - push-rod type with automatic connection during the sailplane rigging .

The spring type trimming device with the lever on the control stick.

The control systems of rudder, towing hook and wheel brake - of cable type.

The tailplane-to-fin is fitted by means of horizontal bolt automatically secured.

The container for the battery of 65 x 95 x 150 (2,56 in x 3,74 in x 5,91 in) size is installed in the lower portion of the fin.



## 2. TECHNICAL SERVICE MANUAL

### 2.1. Assembling and disassembling of the sailplane.

For assembling and disassembling of the sailplane 3 persons are necessary, or 2 persons providing the special supports are in disposition. Before the assembling all the working surfaces of assembled sets should be cleaned with a clean rag and greased.

#### 2.1.1. Assembling of the wing Fig. 2.

The cockpit handle of airbrake and water ballast tanks control should be put onto the "closed" location.

Retract the airbrake plates in the wing.

Insert the fork of left wing spar (1) into the fuselage so that its lower surface slides parallel on the cavity of luggage compartment floor.

Moving the wing tip fit the nests (2) on the pivots (3) and obtain the connection of the aileron airbrake and water ballast tank valve control systems.

The same procedure concerns the right wing (4).

With the small motions of wing tips fit the horizontal holes (5) of spar connection and insert the bolts (shorter left bolt (6) and longer right bolt with slot (7)).

Secure the bolts with the safety pin (8) on the pin (9).

Disassembling requires the inverted procedure.

#### 2.1.2. Assembling of the tailplane Fig. 3.

Put the control stick in the position near neutrum by means of trimming lever.

Put the tailplane (1) on the fin (2)

In case of trouble move the control stick to enable the lever (7) to engage the guide (8). Connect the tailplane (3) and fin (4) fittings with the bolt (5) with the assembling handwheel (9) screwed in.

Screw off the handwheel - check in the last phase of screwing off 2 threads the efficiency of securing the bolt against the shifting off.

Additionally, through the opening in the fin leading edge, check, by eye, that the claws of securing (6) locked the bolt.

Disassembling requires the inverted procedure.

**2.1.3. Disassembling and assembling of the rudder Fig. 4.**

Disconnect the rudder control cables (1) taking out the split-pins (2) washers (3) and bolts (4).

Take the safety pin (5) out the pivot (6) of the lower rudder hinge.

Press the pivot upwards (by means of finger or bar) simultaneously pulling slightly the rudder lower portion (7) backwards. When the pivot leaves the guide disconnect the rudder out of the fin moving it downwards.

Assembling requires the inverted procedure.

**2.1.4. Disassembling and assembling of the elevator Fig. 5.**

The disassembling is performed on the tailplane removed out of the fin..

Remove the counter nut (1) of the securing pin (2).

Screw in the pin so that the segment (5) is unlocked and the axial movement of the elevator (3) is possible.

Deflect the elevator down and take it out of the bracket pivots (4).

Assembling requires the inverted procedure.

**2.1.5. Disassembling and assembling of the aileron Fig. 6.**

Remove the screw (3) and the inspection cover (4).

Remove the safety pin (5) and securing washer (6).

Deflect the aileron down and remove it out of the bracket pivots.

Remove the screw (1) locking the control bolt (2).

Remove the control bolt.

Assembling requires the inverted procedure.

**NOTE** - BEFORE THE ASSEMBLING AND AFTER THE ASSEMBLING CHECK BY EYE THROUGH THE OPENING IN THE REAR WALL AND BY EAR THAT THE STONE (7) OF LEVER (8) IS CORRECTLY POSITIONED IN THE GUIDE (9).



## 2.2. Control systems and their adjustment.

### 2.2.1. General

The control systems of elevator, aileron and air brake are of push-rod type.

The control systems of rudder, towing hook(s), wheel brake and trimming device are of cable type.

The control systems of water ballast valves and under-carriage are of combined push-rod/tension member type.

The access for the adjusting of control systems ensure : shiftable instrument panel, disassemblable instrument panel column, control column housing, derigible diaphragm of the central fuselage portion and the specially designed openings.

The adjustment should be carried on in case the excessive deviations of deflections of controls and devices in respect to the values given on Fig.1 have been found.

The arrows and "R" signs on Figs 7, 8 and 9 mark the push-rod ends, turnbuckles and the other adjusting elements used for the adjustment of control systems and the neutral lever locations (detail "A", "B", "C" on Fig. 7 and detail "A" on Fig. 8).

In case of turnbuckles it is not allowed that the thread end is visible.

When adjusting the push-rod ends pay attention that the checking hole is closed by the end thread.

After the adjustment secure the adjusted elements.

### 2.2.2. Control systems of elevator and aileron (in fuselage) Fig. 7.

The deflections of elevator are adjusted by means of screw stops (1) on the control column bracket and by means of push-rod ends.

The deflections of aileron are adjusted by means of screw stops (2) on the control stick and by means of push-rod ends.

The adjustment of spring trimming device depends on the dislocation of Bowden's block (3) locked with the screws (5) on the cover of control column housing and on such a positioning of spring locks (4) retained with screws (6) that the force on the stick handle when the stick is trimmed in neutral position ranges :

- for the stick completely pulled  $4,0^{+0,1}$  daN  
( $8,8^{+0,2}$  lb)
- for the stick completely pushed  $2,1^{+0,1}$  daN  
( $4,6^{+0,2}$  lb)

### 2.2.3. Control system of the rudder Fig. 8.

The rudder deflections are adjusted by means of screw stops (1) on the pedals (2) and cable turn-buckles (3).

The required cable tension of  $12^{+2}$  daN ( $26,5^{+4}$  lbs) should be measured between the pedals and cable anchoring point on the floor (pedals in rear limit position).

### 2.2.4. Control system of the airbrake Fig. 8.

The correct location of airbrake plates is adjusted by means of push-rod ends (4). The plate caps fitting to the wing contour is adjusted by increasing or decreasing of the pressing springs (5) tension.

### 2.2.5. Undercarriage control system Fig. 9.

The undercarriage control system is adjusted by means of push-rod ends (13). The retracted position locking is adjusted with the Bowden's cable end (14).

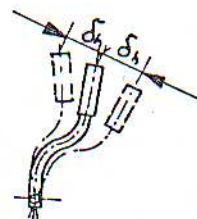
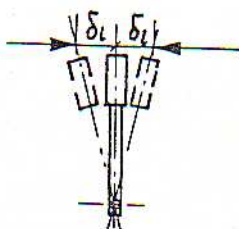
Wheel brake control system is adjusted with the threaded torsion member end (15) and with the rotation of the hub adjusting nut (16).

Axial play of wheel bearings is adjusted by means of nut (22).

### 2.2.6. Permissible plays on the control stick.

The permissible play measured on the control stick :

- for the fixed elevator the permissible play on the end of the stick is  $\delta_h = \pm 3$  mm ( $\pm 0,118$  in)
- for the fixed aileron the permissible play on the end of the stick (same as in elevator case) is  $\delta_1 = \pm 3$  mm ( $\pm 0,118$  in).







### 2.3. Undercarriage

The undercarriage of the sailplane consists of the retractable main wheel and fixed tail wheel.

The mechanism of retractable main wheel Fig. 9 is fixed to the integral housing (1) transferring the loadings on the fuselage shell.

The main wheel (2) suspended on the front fork (3) is locked in the extended position with the dead point of the rear fork (4). The dead point is secured by means of the gas-spring (5).

The pressure of the main wheel tube is 0,2 MPa (28,45 lb/sq in) what corresponds to the tyre deflection of about 2,5 cm (0,98 in) for the empty sailplane.

The tube air intake valve is accessible on the left side. For filling the air the extension-unit should be used (see Special Tools).

#### **Disassembling and assembling of the main wheel.**

Disconnect the springs of undercarriage flaps.

Disconnect the spring (17) of wheel brake lever.

Remove the split pin (21) and screw (6) out of the wheel axle.

Remove the wheel axle (7) and the wheel itself out of the fork.

Disconnect the mechanism of brake disc (9).

Release the air out of the tube.

Remove the nuts (18) from three pins (10) joining the hub "halves" (11).

Disconnect the "halves" and remove the tyre and tube (12).

Assembling requires the inverted procedure.

**NOTE** - BEFORE ASSEMBLING BOTH HUB PARTS THE TUBE SHOULD BE SLIGHTLY FILLED WITH AIR.

The tail wheel  $\phi$  200 x 50 has the integral hub.

Tail wheel pressure of 0,15 MPa (21,33 lb/sq in) corresponds to the tyre deflection of 1,0 ÷ 1,5 cm (0,39 ÷ 0,59 in).

## 2.4. Equipment of the sailplane.

### 2.4.1. Instrument panel.

The glider is equipped with the column type instrument panel Fig. 10, consisting of the panel itself (1) and column (17). The panel allows for installation of five instruments  $\phi$  80 or four instruments  $\phi$  80 and two  $\phi$  60. The panel is fixed to the column by means of screw (9) located on the bottom panel part.

The producer recommends to equip the panel with the following instruments :

- 2 | - LUN 1107-8 airspeed indicator (2) with the electro-acoustic stall warning monitor (20) and supply switch (21) or PR-400S airspeed indicator with stall warning monitor SP 3.
- W-10S or W-12S altimeter (3).
- WRs-5D variometer (4) with KWEC-2 compensator (15).
- WRs-30C variometer (5).
- EZS-4 turn indicator (6) with supply switch (7).

KI-13A compass (8), is fixed on the instrument panel cover or canopy perspex.

**NOTE** - FOR FLYING THE REQUIREMENTS CALL FOR AT LEAST :  
AIRSPEED INDICATOR, ALTIMETER AND STALL  
WARNING DEVICE.

### 2.4.2. Pressure heads.

The sailplane is equipped with the following pressure heads :

- static (10) on the fuselage front portion with the drainage unit (11) under the instrument panel column (airspeed indicator, altimeter pressure variometer)
- total (12) in fuselage nose with the drainage unit (13) under the instrument panel column (airspeed indicator, variometer compensator)
- stall warning control (22) on the lower surface of fuselage nose
- static (23) in the rear fuselage portion (electrical variometer, computer)
- $\phi$  8 mm nest (16) for pressure head in upper part of fin leading edge.

**NOTE** - GREASE THE PRESSURE HEAD WITH THE TECHNICAL VASE-LINE BEFORE INSERTING IT INTO THE NEST (16).  
- JETTISONING OF WATER BALLAST AT THE FREEZING TEMPERATURES CAN CAUSE THE STATIC PRESSURE HEADS (23) TO BE FROZEN.

The pressure head ducts (except of stall warning control) are connected to the four-way connector (14) in the instrument panel column.

The connector is colour marked :

- red, static pressure from the heads in front fuselage part,



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- black, total pressure from the head in fuselage "nose",
- yellow, pressure from the fin nest,
- white, static pressure from the head in the fuselage rear part.

**NOTE** - AFTER THE FLIGHT IN RAIN OR THE PNEUMATIC DUCTS ARE SUSPECTED TO GET WET THE DUCTS SHALL BE DISCONNECTED OUT OF THE INSTRUMENTS AND BLOWN WITH AIR.

#### 2.4.3. Cockpit equipment.

The pilot's cockpit is equipped with :

- four pieces pilot's belts Fig. 13
- J5.10.00 - abdomen belts (1)
- J5.70.00 - back belts (2)
- seat upholstery
- side pocket
- rubber pear of sanitary installation (below the seat pan).

#### 2.4.4. Hooks.

The sailplane is factory adopted for assembling the TOST towing hook installed on the undercarriage fork (type G) or in fuselage front part (type E).

#### 2.4.5. Energy source.

The battery of PANASONIC Vds 12V 6,5 P type of 2,2 kg (4,85 lb) mass (25 on Fig. 10) located in the fin is the main energy source.

#### 2.4.6. Additional equipment.

On the customers order the sailplane can be equipped with :

- pneumatic adjusted head rest
- sheepskin cockpit upholstery
- coloured canopy perspex
- front or c.g. hook of other than TOST type
- tail skid.

#### 2.4.7. Other equipment.

Apart of the equipment listed in items 2.4.1. to 2.4.6. it is possible to install :

- electrical variometer
- board computer
- transceiver
- additional battery
- oxygen equipment.

**NOTE** - THE INSTALLATION OF THE EQUIPMENT LISTED IN ITEM 2.4.7. SHALL BE ACCEPTED BY THE AUTHORITY.

## 2.5. Stall warning installation Fig.10

The installation consists of :

- LUN 1107-8 airspeed indicator (2)
- controlling pressure head (22) in the fuselage nose
- supply switch (21) in the instrument panel
- acoustic monitor (20) in the instrument panel.

The installation is supplied with the current of 12 V.

The installation is worthy when switched on the ground gives the modulated warning signal (ti-ta-ti-ta...).

The installation is little sensitive towards the voltage decrement and works correctly up to about 9 V.

At the further voltage decrement the broken signal appears (ti-ti-ti...).

The LUN 1107-8 airspeed indicator needs no maintenance in the operation. After every 600 flying hours the correct indications should be checked (by an authorized person).

- 1) Errors of the airspeed indicator at  $+20^{\circ}\text{C} \pm 5^{\circ}\text{C}$  should be checked in the following way :
  - connect the end marked with letter "D" into the pressure source
  - increase the pressure in the instrument to the values of : 100 160 200 250 300 350 400 km/h  
(37,2 62,0 99,2 124,0 155,0 186,0 217,0 248,0 mph ;  
32,4 54,0 86,4 108,0 135,0 162,0 189,0 216,0 knots)  
on the airspeed indicator dial
  - at every checked airspeed the pressure shall be retained at least 30 seconds and then the error stated by the comparison of data on the tested airspeed indicator and the pattern one or approved manometer.  
Find the errors for the above listed airspeeds at the increasing and decreasing of the pressure and compare them with the permissible error values of  
 $\pm 7$  km/h ( $\pm 4,3$  mph;  $\pm 3,8$  knots) for the dial values of 60 100 160 200 km/h (32,7 62,0 99,2 124,0 mph ;  
32,4 54,0 86,4 108,0 knots)  
and  $\pm 9$  km/h ( $\pm 5,6$  mph;  $\pm 4,9$  knots) for  
250 300 350 400 km/h (155,0 186,0 217,0 248,0 mph ;  
135,0 162,0 189,0 216,0 knots).
- 2) The data variation (hysteresis) is the difference of the instrument data for the airspeed values as given in item (1) for increasing of the airspeed. The calculated difference should not be greater than the allowed one in the item (1).
- 3) Tightness of the instrument static system shall be checked :
  - connect the ends marked with letters "S" and "M" to the source of pressure lower than atmospheric one (vacuum pump)



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- when the pressure lower than the atmospheric one is gained, what corresponds to 400 km/h (248 mph ; 216 knots) airspeed, close by means of the valve the source of pressure lower than the atmospheric one
  - check the pressure decrement on the monitoring water column. It should not exceed the value of 20 mm (0,8 in) of water column per 3 minutes.
- 4) The resistance of electric elements insulation should be checked by means of megohmmeter at the air relative humidity of  $30 \div 80$  %. One wire of the megohmmeter should be connected to the bridged fork of the plug end the second one to the plug housing. The insulation resistance should range minimum 20 Megohms.

The adjustment of the stall warning device should be made in two stages: - rough one on the ground  
- precise one in the flight.

Adjustment on ground :

- remove the securing cover out of the adjusting hand-wheel of LUN 1107-8 airspeed indicator
- insert it in inverted position on the hand-wheel axle
- into the dynamic pressure inlet (D) the pressure corresponding to 58 km/h (36mph; 31,3knots) of airspeed indicator reading should be introduced
- switch on the warning device
- turn the adjusting hand-wheel till the signal appears or disappears. Since the position of sensor contacts inside the instrument is adjusted by means of excentre the turning direction is arbitrary, but it is recommended to turn to right.

Adjustment in flight :

- perform the adjustment for the all-up mass of 300 kg (662 lb)
- find the stalling speed  $V_{S1}$  on the altitude about 1000 m (3300 ft) std in smooth air for the smooth configuration, air conditioning switched off
- increase the airspeed up to  $1,1 \times V_{S1}$  (allowed tolerance of  $\pm 1$  km/h ( $\pm 0,6$  mph;  $\pm 0,5$  knots))
- turn the airspeed indicator adjusting hand-wheel till the acoustic signal appears
- increase the airspeed till the signal disappears
- smoothly decrease the airspeed and check that the acoustic signal switches on at the airspeed of  $1,1 \times V_{S1}$ , if not repeat the adjusting procedure
- after the adjustment put on the securing cover on the adjusting hand-wheel and seal.

**NOTE** - IN CASE THE PR-400S AIRSPEED INDICATOR WITH SP-3 STALL WARNING MONITOR IS USED THE RELEVANT INFORMATION IS FURNISHED BY TECHNICAL SERVICE MANUAL OF THIS DEVICE, ENCLOSED.

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**2.6. Water ballast Fig. 11.**

The sailplane is equipped with the wing (1) and tail (2) ballast tanks.

The front torsion boxes of the wings are used as the water ballast tanks.

The jettisoning valves (3) are located in the lower wing skin near the root rib. The water valves of the right and left wings are controlled by means of the rotating tube (4) actuated with the push-rod (5) ended with the holder (6) placed on the right cockpit board. The tank venting duct outlet (7) is placed on the wing lower skin near the jettisoning valve.

Filling the tanks with water :

- put the glider in "level" position, without any bank (support the wing with a jack or hold by hand)
- open the valves
- insert the special funnel ends (8) to the wing jettisoning openings
- fill the tanks through the funnels till the water flow steady out the venting holes (use the clear water only)
- after filling the tanks close the valves what causes that the funnel ends are pushed out of the jettisoning holes
- remove the funnels out of the wing.

The tail tank (2) is located in the rear fuselage "tube" below the fin.

The jettisoning valve (9) is located in the lower fuselage skin before the tail wheel.

The jettisoning valve is controlled by means of tension member (10) coupled with the wing valves control system (3).

The valve is closed automatically when the hand-grip (6) is positioned onto closed location.



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Filling the tail tank with water takes place through the opening (11) in the left covering of the fin.

**NOTE** - IT IS PROHIBITED TO FILL THE TANKS WITH WATER IMMEDIATELY OF THE WATER SUPPLY UNDER THE PRESSURE WITHOUT USING THE FUNNEL.  
THE AMOUNT OF FILLED WATER IS TO BE ESTABLISHED ACC. TO THE FLIGHT MANUAL.

Checking of the tightness of water ballast tanks.

Wing tank :

- plug the venting opening
- plug the jettisoning opening with the plug equipped with the duct conducting the air into the measuring instrument or water manometer
- measure the vacuum by means of altimeter with the check vacuum corresponding to the altitude of 600 m (1970 ft)
- when the tightness is measured by means of water column the column height measured in respect to the wing upper covering should be about 700 mm (27,6 in)
- the tank is found to be tight when during 15 minutes no significant pressure or water column decrement appears.

The tail tank tightness is to be found by filling the tank with water full and checking the water amount decrement after 24 hours.

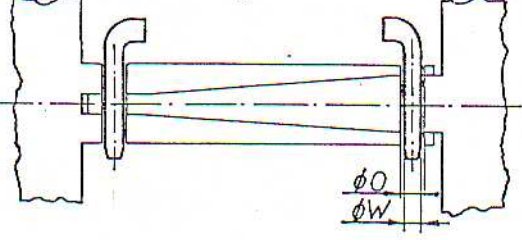
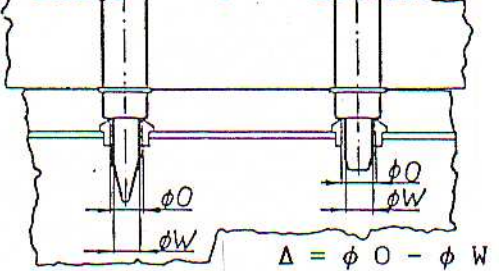
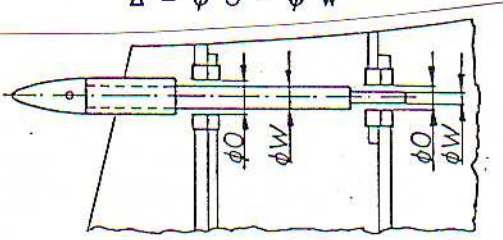
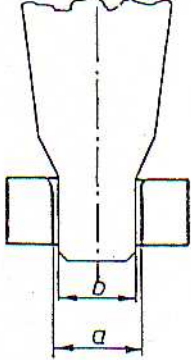
If the water decrement is not to be seen by the intake opening the tank is estimated to be tight.



**2.7. Permissible plays.**

During the operation the plays appear in the below listed connections.

The permissible play values are contained in the table.

Connection	Sketch of the connection	Permissible play $\Delta$
Wing spars	 <p style="text-align: center;"><math>\Delta = \phi O - \phi W</math></p>	<p>0,15 mm (0,006 in)</p>
Wing to fuselage	 <p style="text-align: center;"><math>\Delta = \phi O - \phi W</math></p>	<p>0,10 mm (0,004 in)</p>
On the bolt of tailplane to fin	<p style="text-align: center;"><math>\Delta = \phi O - \phi W</math></p> 	<p>0,10 mm (0,004 in)</p>
Tailplane extended member to fin nest	 <p style="text-align: right;"><math>\Delta = a - b</math></p>	<p>0,20 mm (0,008 in)</p>

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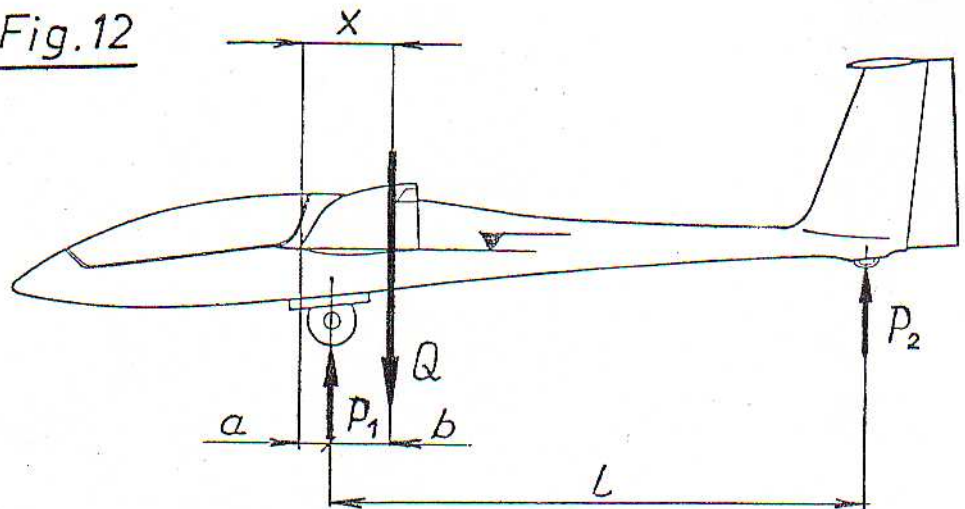
### 2.8. Weighing of the sailplane.

Use for the weighing two balance of  $\pm 0,2$  kg ( $\pm 0,45$  lb) accuracy.

Install the supports under the main and tail wheels Fig. 12.

The support height difference shall be adjusted so that the wing trailing and leading edges (nivelevation points) are level when the wing is arranged without any bank.

Fig.12



$$X = a + b$$

$$b = \frac{P_2 \cdot l}{P_1 + P_2}$$

when "a" and "l" should be measured

**NOTE** - PERFORM THE WEIGHING WITH THE BATTERY OR BALLAST OF 2,2 kg (4,85 lb) INSTALLED IN THE FIN.

THE INSTALLED BATTERY OR BALLAST SHOULD BE IMMOBILIZED BY MEANS OF HARD FOAM INSERTS.

The allowable c.g. locations of empty sailplane with the standard equipment (X) are given in the Flight Manual item 2.3.

In case the allowable empty glider c.g. location is exceed, the correct value can be achieved by means of the fixed ballast (F on Fig. 16) or dislocation of the battery from the housing in fin into the luggage compartment (D on Fig. 16).

**NOTE** - INSTALLATION OF THE BALLAST AND ITS MASS SHOULD BE NOTICED IN THE WEIGHING PROTOCOL.

### 2.9. Allowable loading conditions.

The total mass of: pilot and parachute, additional equipment and luggage cannot exceed the allowable loading mass given in the Flight Manual item 2.4.

The following maximum masses are allowed in the particular sailplane zones, Fig. 16 :

A. on the cockpit board - photo camera	1,0 kg	( 2,2 lb)
B. in the instrument panel - sum of equipment masses	5,0 kg	(11,0 lb)
C. in the luggage compartment before the spar	5,0 kg	(11,0 lb)
D. in the luggage compartment behind the spar	15,0 kg	(33,1 lb)
E. in the fin battery housing	2,5 kg	( 5,5 lb)
F. in the rear wall of the fin (fixed mass)	3,5 kg	( 7,7 lb)

The correct location of c.g. is ensured by the mass location acc. to the loading plan given in the Flight Manual.

### 2.10. C. g. and mass balance of the control surfaces Fig. 15.

The correct position of control surface c.g. is ensured by the formula :

- for aileron	$P \leq 0,267 G$
- for elevator	$P \leq 0,262 G$
- for rudder	$P = 0$ (c.g. in the axis of rotation ).

### 2.11. Towing cable safety link.

The towing cable safety link acc. to drawing 551.04 05 or other of 600 daN  $\pm$  50 daN (1325 lb  $\pm$  110 lb) damaging force shall be used.



### 3. P E R I O D I C   W O R K S

#### 3.1. P r e - f l i g h t   i n s p e c t i o n .

Before the flights it should be checked :

- validity of sailplane documents
- condition of the structure - specially the coverings and glue joints
- securing of the assembling elements and control systems joints
- operation of control systems and control surfaces
- operation of towing hooks
- undercarriage condition (main and tail wheel), wheel brake efficiency, air pressure in the tube, cleanliness of the undercarriage housings
- pilot's safety belts
- total and static pressure heads
- operation of board instruments
- battery or ballast in the battery housing installation in the fin (if applicable).

#### 3.2. P o s t - f l i g h t   i n s p e c t i o n .

After the flights perform the inspection same as before the flights.

Complete the inscriptions in the sailplane Log Book.

#### 3.3. M a i n t e n a n c a   w o r k s .

1. Check the condition of the sailplane structure. Pay the special attention on the elements heavy loaded during the take-off, flight and landing.
2. Check the condition of the surface of main fittings and bolts as well as the assembling plays.
3. Check the sure securing of the assembling elements of the sailplane main sets and control systems.
4. Check the sure locking and emergency jettisoning of the canopy.
5. Check the condition and correct operation of the towing hook using the section of the towing cable pulled with hand.
6. Check the condition of the surface and hinges of control surfaces and airbrake as well as the correct deflections.
7. Check the friction forces of the control systems and devices.

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- 2 |
8. Check the condition of the undercarriage of the main and tail wheels and the operation of the wheel brake.
  9. Check the condition and correct operation of the board instruments (stall warning monitor included).
  10. Check the condition of the protective coats on metal elements especially those imposed on mechanical damages and corrosion (cables, undercarriage elements).
  11. Clean and grease (with the proper grease) the bearings and assembling elements acc. to the Lubrication Plan Fig. 14.
  12. Check the tightness of the water ballast tanks (see item 2.6.).
  13. Check the deflection angles of the control surfaces Fig. 1.

### 3.4. Time schedule of the maintenance works.

Time of maintenance work	Kind of maintenance work
- On the beginning of flying season	1 ÷ 13
- After each 100 flying hours	1 ÷ 11
- After landing with the damage of undercarriage	1 ÷ 10
- After heavy landing	1,2,7,9
- Post flying season or before the prolonged hangaring	acc. to item 3.6
3   - On completing 1500 flying hours, periodic overhauls after every 500 hours or after 3 years, whichever comes first	acc. to Appendix No 1 to this Manual

### 3.5. Allowed sailplane life-time.

3 | Allowed (temporary) sailplane life-time is 3000 flying hours.

The above does not concern :

- towing hooks
- board instruments

having the life-time defined in their individual certificates.



### 3.6. Hangaring and transportation.

In case the prolonged break in sailplane operation is expected the disassembling of the sailplane sets is recommended.

Grease the fittings and metal elements.

Put the individual covers on the main sets.

It is recommended to put the fuselage into the supports under the undercarriage housing and under the fin. The wing should be supported on the leading edge at semi-span and under the spar root near the root rib, in vertical position.

Release the air pressure in the wheel tube.

#### NOTE - DO NOT STORE IN THE WET COVERS.

In case the sailplane is transported on a trailer the sets can be fixed on their external surfaces on the wide supports upholstered with a soft cloth or using the fabric strips.

The wing should be fixed on the spar roots and supported on the leading edge at the midspan.

The fuselage can be fixed on the undercarriage wheels and wing-to-fuselage connection pivots.

Fix the tailplane in the supports.

During the transportation the working surfaces of the fittings, inspection holes and bearings shall be protected against the dust and dirt.

Immobilize the control surfaces. Secure the canopy with the flannel cover.

In case the open trailer is used the external surfaces of the main sailplane sets should be protected with the individual covers and with the foil in case of rain.

For taxiing the sailplane on the ground it is recommended to push it "tail ahead".

It is not recommended to pull the sailplane with the wind tips.

For the motor-car transportation "nose ahead" a section of tow cable with the "to-hook-link" should be used.

Immobilize the control stick (with the pilot's safety belts).

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## 3.7. Lubrication plan Fig. 14.

Place of lubrication	Material
1 - Aileron hinges	grease for bearings*
2 - Body and lever of aileron control	grease for bearings*
3 - Fitting of airbrake plates	grease for bearings*
4 - Fitting of control column, bearings of push-rod and intermediate lever	grease for bearings*
5 - Hinges of stabilizer and elevator	grease for bearings*
6 - Hinges of rudder	grease for bearings*
7 - Connection of elevator control	grease for bearings*
8 - Bearings and axle of the wheel	grease for bearings*
9 - Fitting of the front and rear fork of the wheel	grease for bearings*
10 - Axle of undercarriage locking	grease for bearings*
11 - Hinges of undercarriage doors	grease for bearings*
12 - By-passes of the push-rods in the cockpit	machine oil** (wash with the clean saturated rag and wipe till to dry)
13 - Hinge and guide of pedals	grease for bearings*
14 - Front and rear lock of the canopy	grease for bearings*
15 - Front and c.g. towing hooks	grease for bearings*
16 - Tail wheel axle	grease for bearings*
17 - Connection of airbrake control	grease for bearings*
18 - Connection of aileron control	machine oil** (hole in the rib sleeve), grease for bearings*
19 - Water valve	SILPASTA A (protect the lacquered surfaces)
20 - Bolts and holes of spar connection	grease for bearings*
21 - Pivots and holes of wing-to-fuselage connection	grease for bearings*

\* Grease for bearings LT 43 - PN-72/C-96134

\*\* Low solidifying machine oil 16Z - PN-67/C-96071



### 3.8. Washing and maintenance of the sailplane.

When the external surfaces of the sailplane are dirtied (e.g. insects) wash them using the clear water with the addition of a mild detergent without the abrasive fillings. Wipe the washed surfaces with the flannel (or shammy). Wipe the wetted inside of the sailplane, (air-brake housings) check the drainage openings previousness.

The lifting surfaces should be time to time polished with the fatless paste, apply by the movements along the chord in a mechanical manner or by hand with a slat.

Wash the canopy with the clear water with the eventual addition of detergent for the perspex cleaning.

Protect the perspex against the dust and sunlight with the flannel cover.

### 3.9. Special tools and covers.

Each sailplane is equipped with the following special tools :

1. Extension-unit for filling the tube with the air.
2. Funnels for filling the water into the wing tanks.
3. Calibrated container for the ballast water.
4. Spanners for the adjustment of the main wheel hub-2 pcs.
5. Turning-member for the stabilizer assembling.

Additionally every glider can be equipped into the following covers :

1. Cover for the wing - 2 pcs.
2. Flannel cover for the canopy.
3. Cover for the fuselage.
4. Cover for the tailplane.



### 3.10. List of materials for the small repairs.

In case of the small structural damages having no influence on the strength properties, as local scratches, small indentations of covering surface, crumbles of edges etc. the user can make a repair himself.

Materials allowed for such the repairs are listed below :

1. Glass fabrics of INTERGLAS production.
2. Ep 53 resin + Z1 hardener.
3. Ep 52 resin + Z1 hardener.
4. L285 resin + H286 hardener.
5. Polyester lacquer SCHWABBELACK or VORGELAT T30 (T35) - on the external coverings.
6. Fillers - aerosil, cut roving etc.

### 3.11. Airfield equipment.

On the user's order the producer supplies the airfield equipment listed below.

1. Transportation tail wheel.
2. Transportation wheel under the wing.
3. Ground towing thill.

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**4. ILLUSTRATIONS**

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**Fig. 1. SZD-55-1 THREE-VIEW DRAWING**  
**- CONTROL SURFACES DEFLECTIONS**

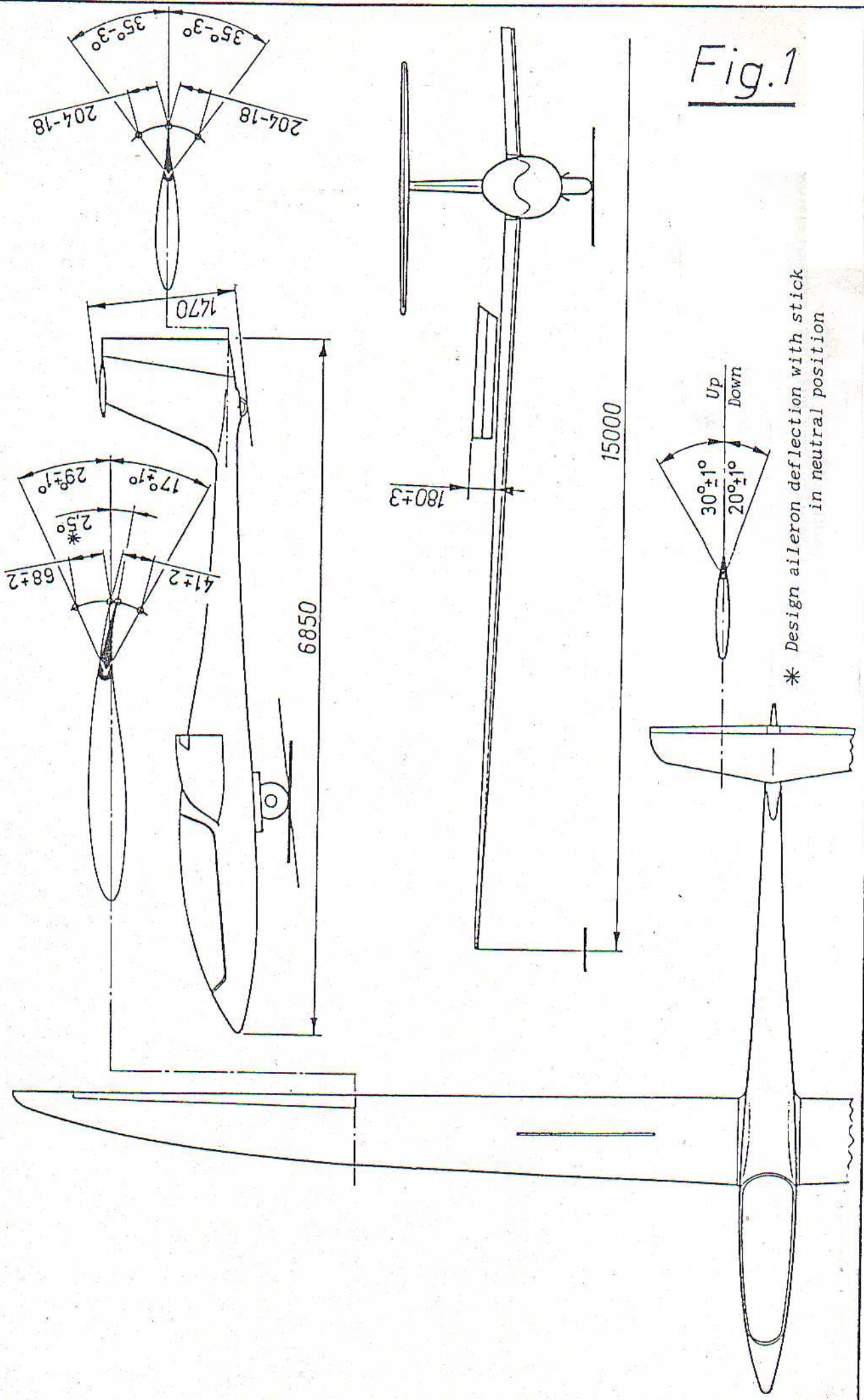


Fig.1

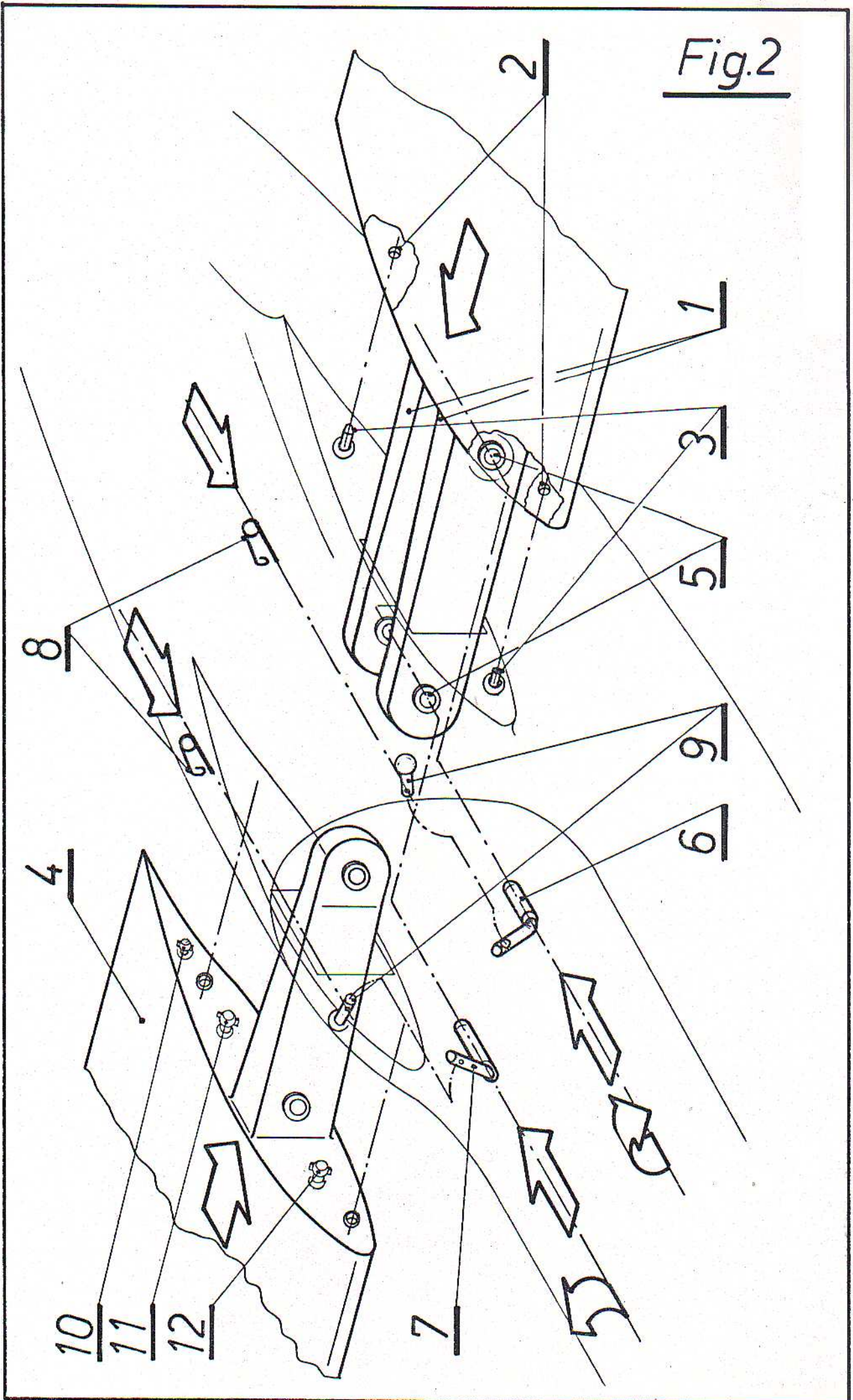
\* Design aileron deflection with stick in neutral position

**Fig. 2. ASSEMBLING OF THE WING**

1. Fork of left wing spar
2. Nests (in wing rib)
3. Pivots (in fuselage)
4. Right wing
5. Horizontal openings
6. Left shorter bolt
7. Right longer bolt with slot
8. Safety pins
9. Pivots (on fuselage) for locking the bolts
10. Aileron control joints
11. Air brake control joints
12. Ballast tank control valve joints



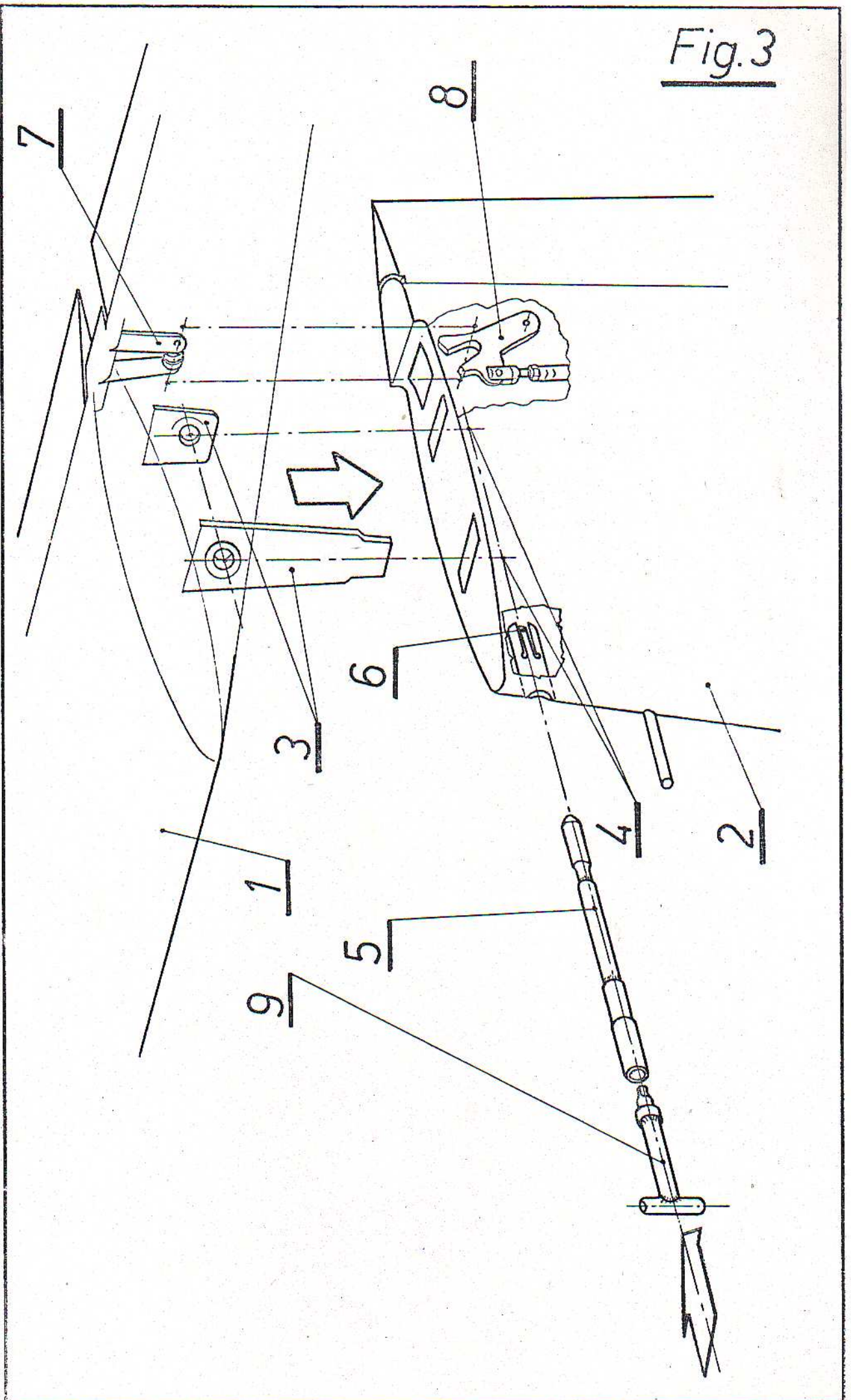
Fig.2



**Fig. 3. ASSEMBLING OF THE TAILPLANE**

1. Tailplane
2. Fin
3. Tailplane fittings
4. Fin and rudder fittings
5. Bolt
6. Click (securing)
7. Lever (of elevator)
8. Lever with guide
9. Tailplane assembling turn-member

Fig. 3

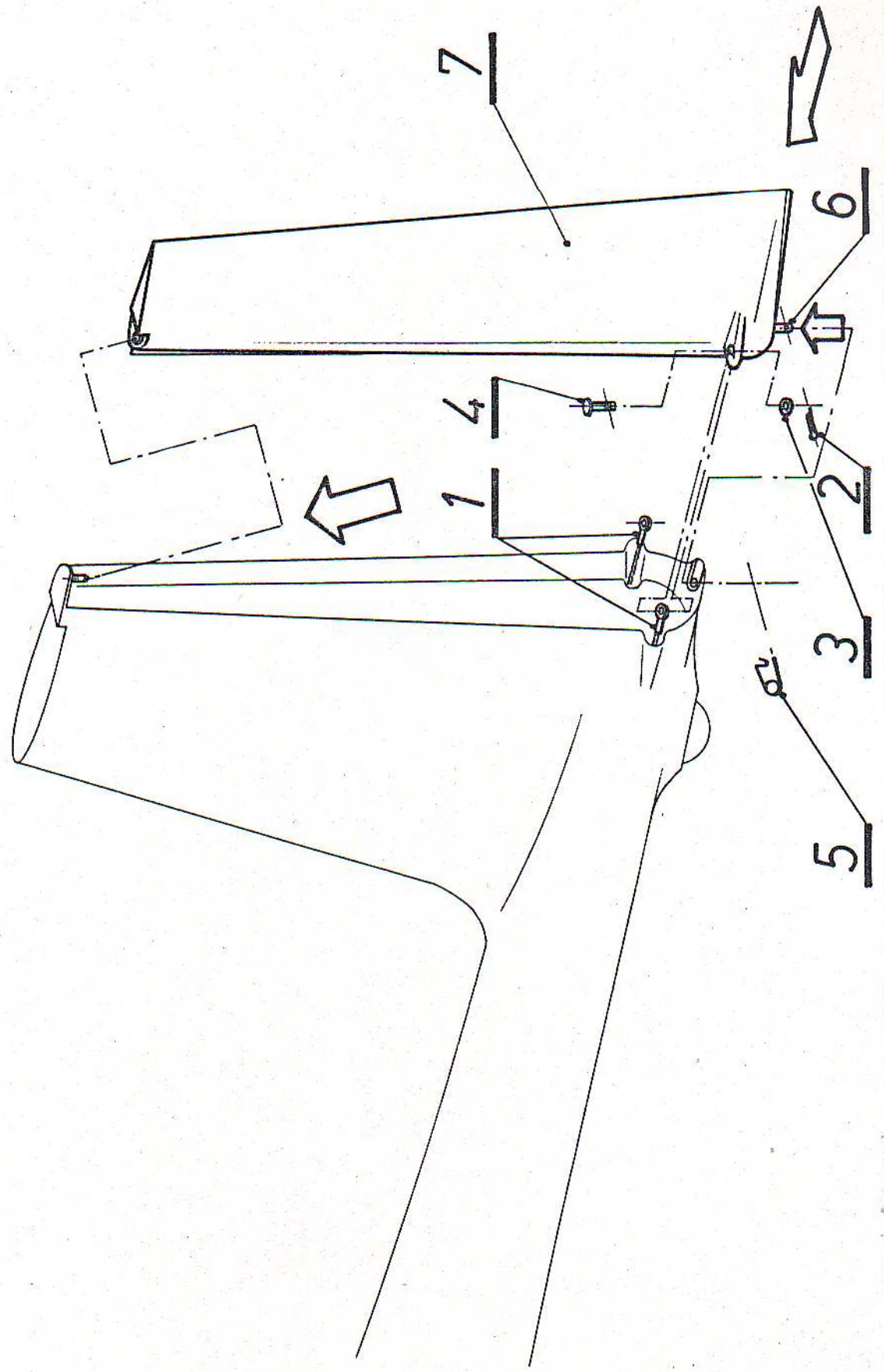




**Fig. 4. ASSEMBLING OF THE RUDDER**

1. Rudder control cables
2. Split pin
3. Washer
4. Bolt
5. Safety pin
6. Pivot (in the rudder)
7. Rudder

Fig. 4

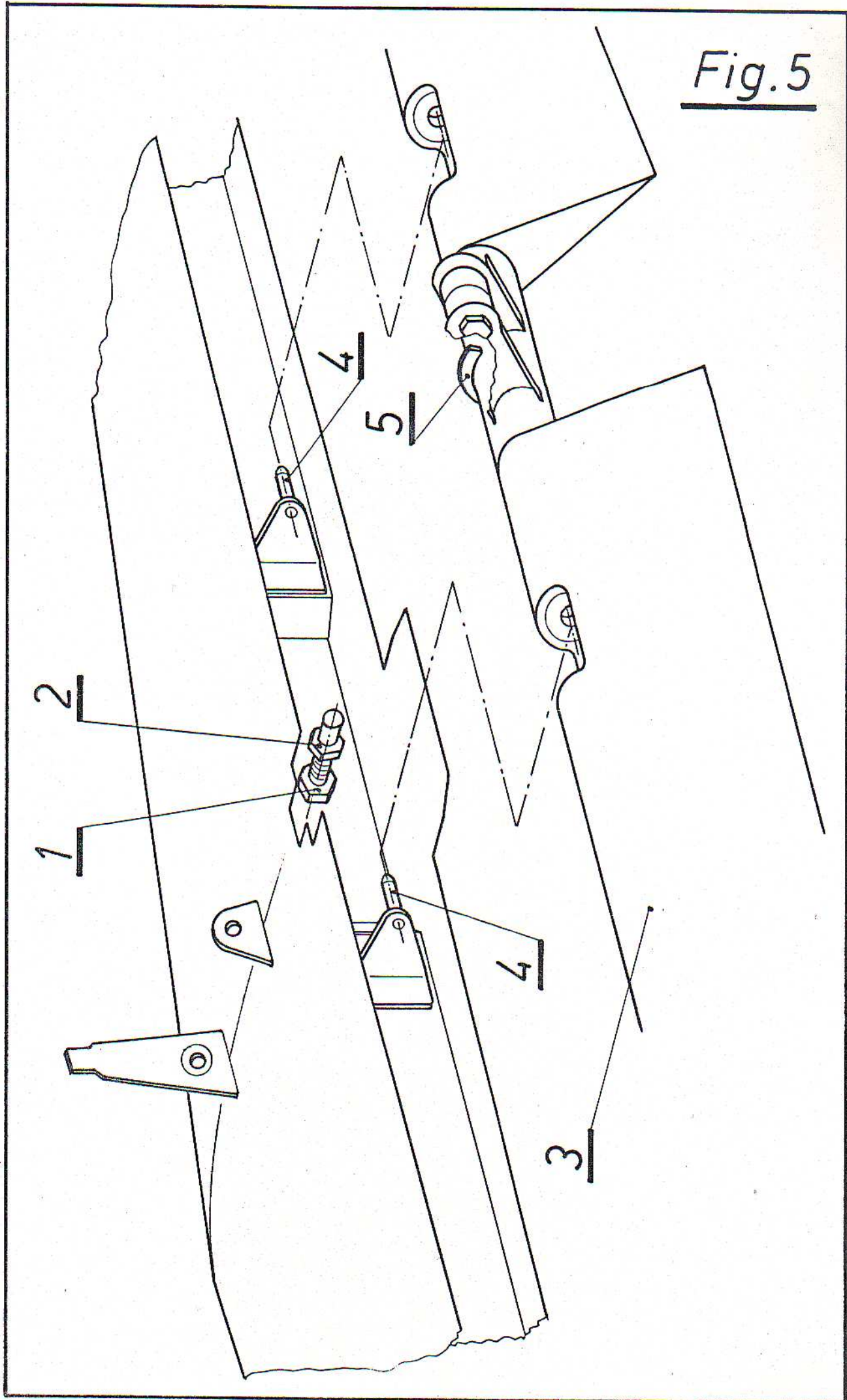


**Fig. 5. ASSEMBLING OF THE ELEVATOR**

1. Counter-nut
2. Securing pin (elevator against the axial movement)
3. Elevator
4. Bracket pivot (elevator hinge)
5. Segment (locking the elevator axial movement)



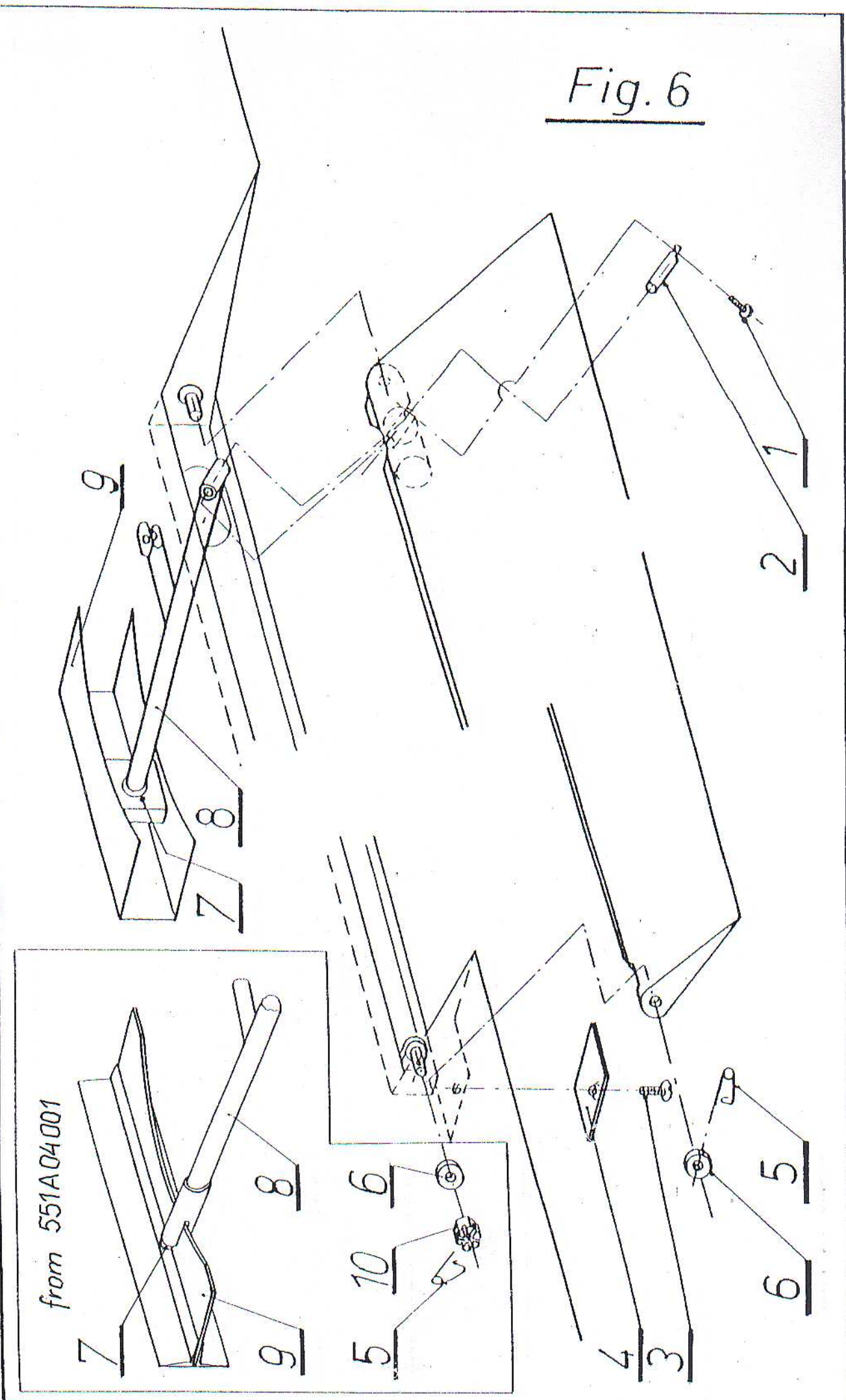
Fig. 5



**Fig. 6. ASSEMBLING OF THE AILERON**

1. Screw
2. Controlling bolt (aileron)
3. Screw
4. Inspection hole
5. Safety pin
6. Securing washer
7. Stone
8. Control lever
9. Guide

Fig. 6

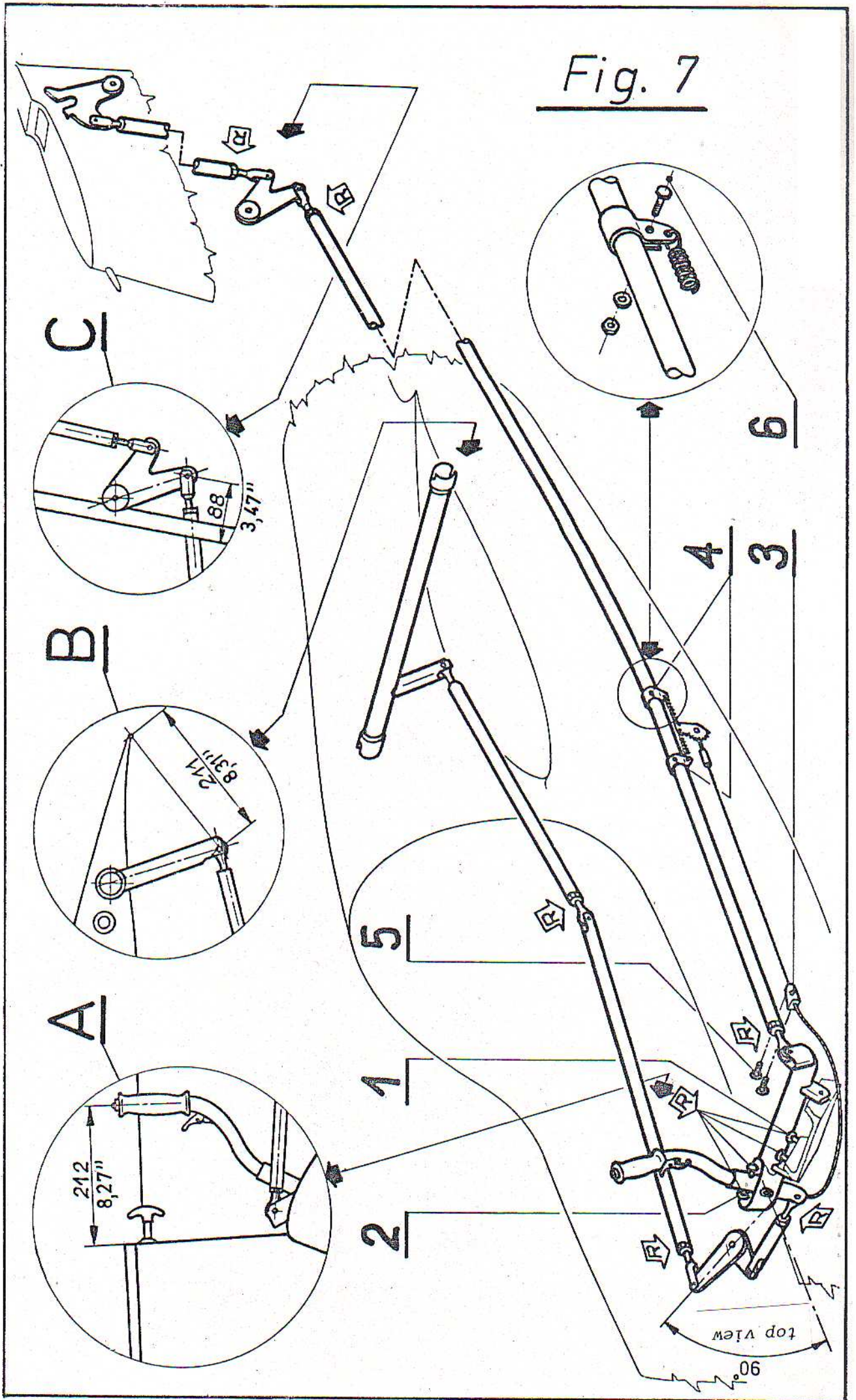




**Fig. 7. CONTROL SYSTEM OF ELEVATOR AND  
AILERON IN THE FUSELAGE**

1. Screw-stop on the control column bracket
2. Screw-stop on the control stick
3. Block of Bowden's cable locking
4. Hitches of springs
5. Screw
6. Screw

Fig. 7

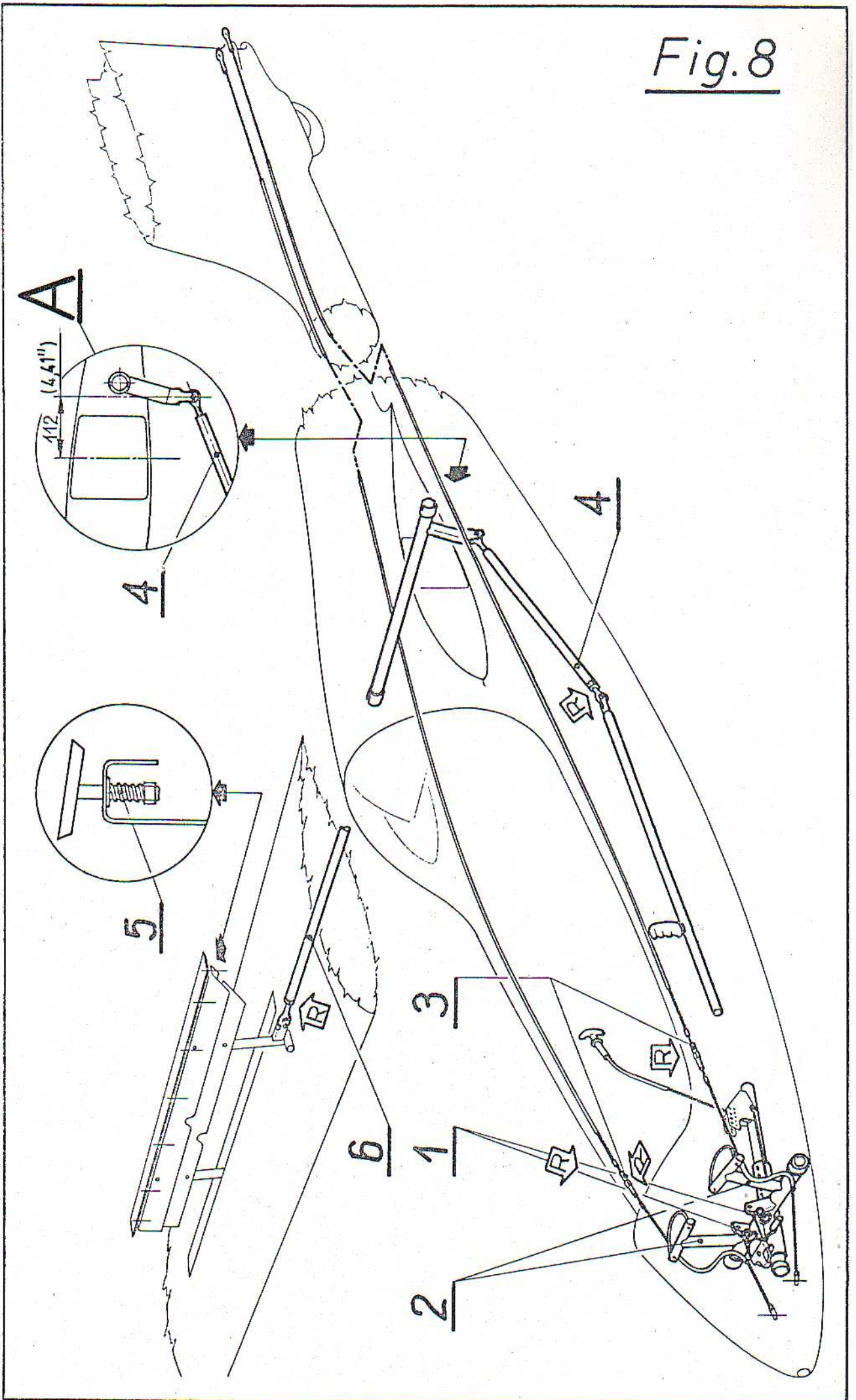


**Fig. 8. CONTROL SYSTEM OF RUDDER AND AIR BRAKE**

1. Screw-stops (on pedals)
2. Pedals
3. Cable turnbuckle
4. Push-rod (intermediate in the fuselage)
5. Spring
6. Push-rod (in the wing)



Fig. 8

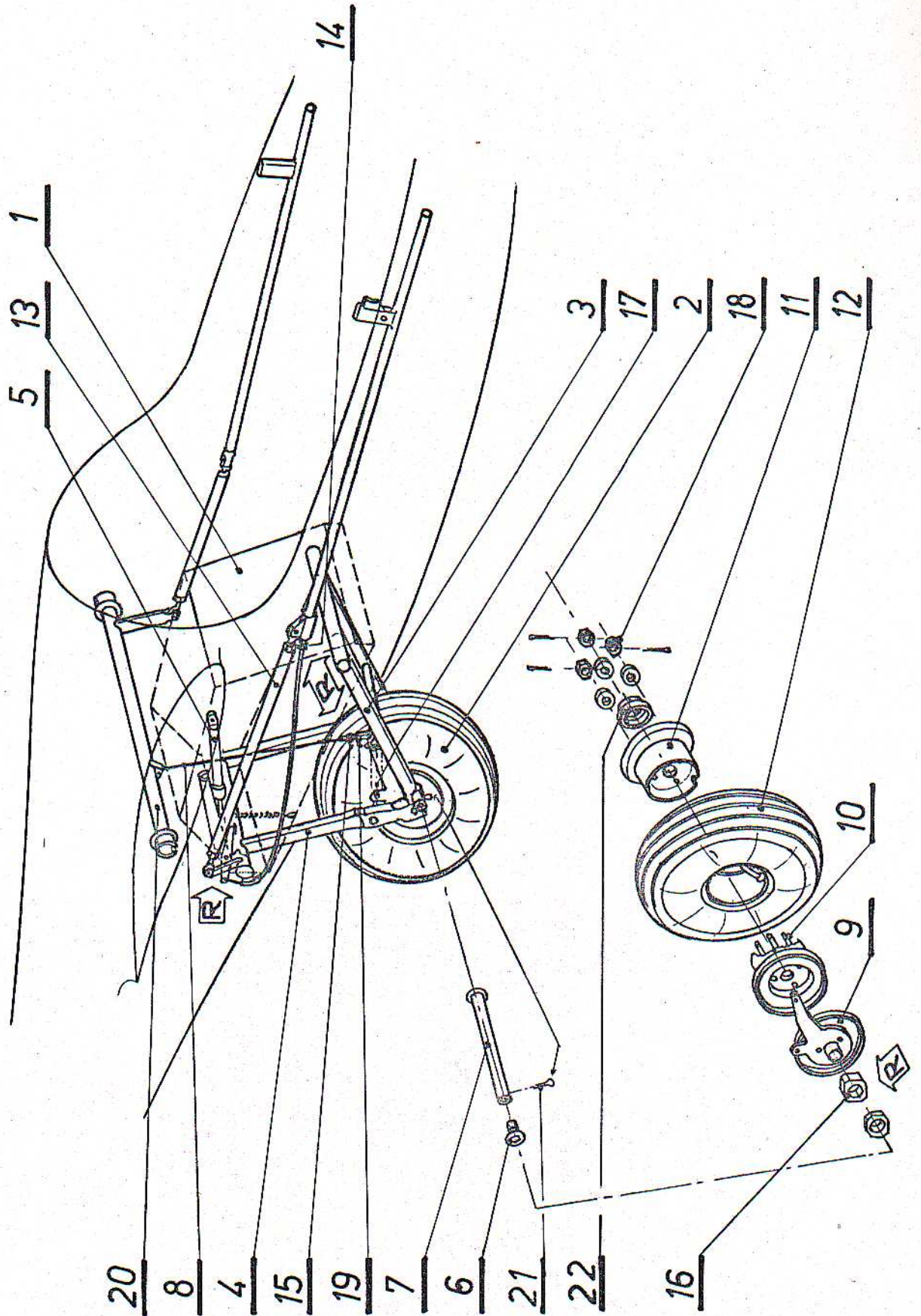


**Fig. 9. CONTROL SYSTEM OF UNDERCARRIAGE**

1. Housing (undercarriage)
2. Main wheel
3. Front fork
4. Rear fork
5. Gas spring
6. Screw
7. Wheel axle
8. Tension member of wheel brake
9. Mechanism of brake disc
10. Threaded pin
11. Hub "half"
12. Tyre and tube
13. Push-rod
14. Adjustable end of Bowden's cable  
(undercarriage locking)
15. Adjustable end of wheel brake tension member
16. Adjusting nut of hub
17. Spring
18. Castellated nut M8
19. Spring of tension member
20. Airbrake torque tube
21. Split pin
22. Regulation nut



Fig. 9





**Fig. 10. INSTALLATIONS OF BOARD INSTRUMENTS**

1. Instrument panel
- 2 | 2. LUN-1107-8 airspeed indicator or PR-400S one
3. W-10S or W-12S altimeter
4. WRs-5D variometer
5. WRs-30C variometer
6. EZS-4 turn indicator
7. Switch of turn indicator supply
8. KI-13A compass
9. Screw (panel locking)
10. Static pressure heads in the fuselage front part
11. Drainage unit (static pressure installation)
12. Total pressure head
13. Drainage unit (total pressure installation)
14. Pneumatic ducts connector
15. KWEC-2 compensator
16. Nest of pressure head for special instruments
17. Column (instrument panel)
18. TM-420C compensating bottle
19. Board supply source
- 2 | 20. Electroacoustic stall warning device. In case of PR-400S airspeed indicator the SP 3 one
21. Switch of stall warning device supply
22. Pressure head of stall warning device
23. Static pressure heads in the rear fuselage portion
24. Transceiver aerial with the cable
25. Battery in the with the power cable
- 1 | 26. Fuse 0,5 to 0,7 A

Fig.10

LUN

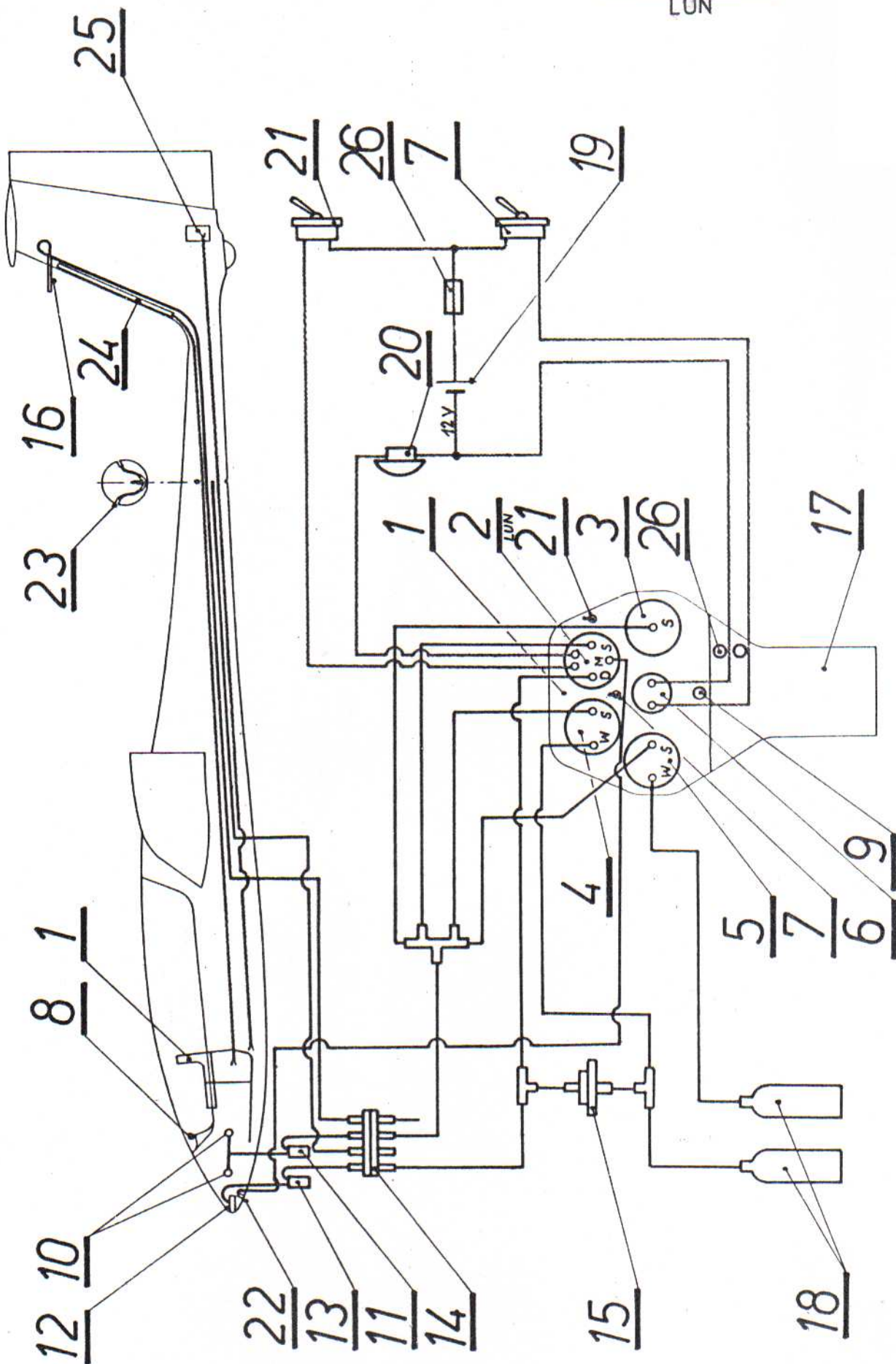
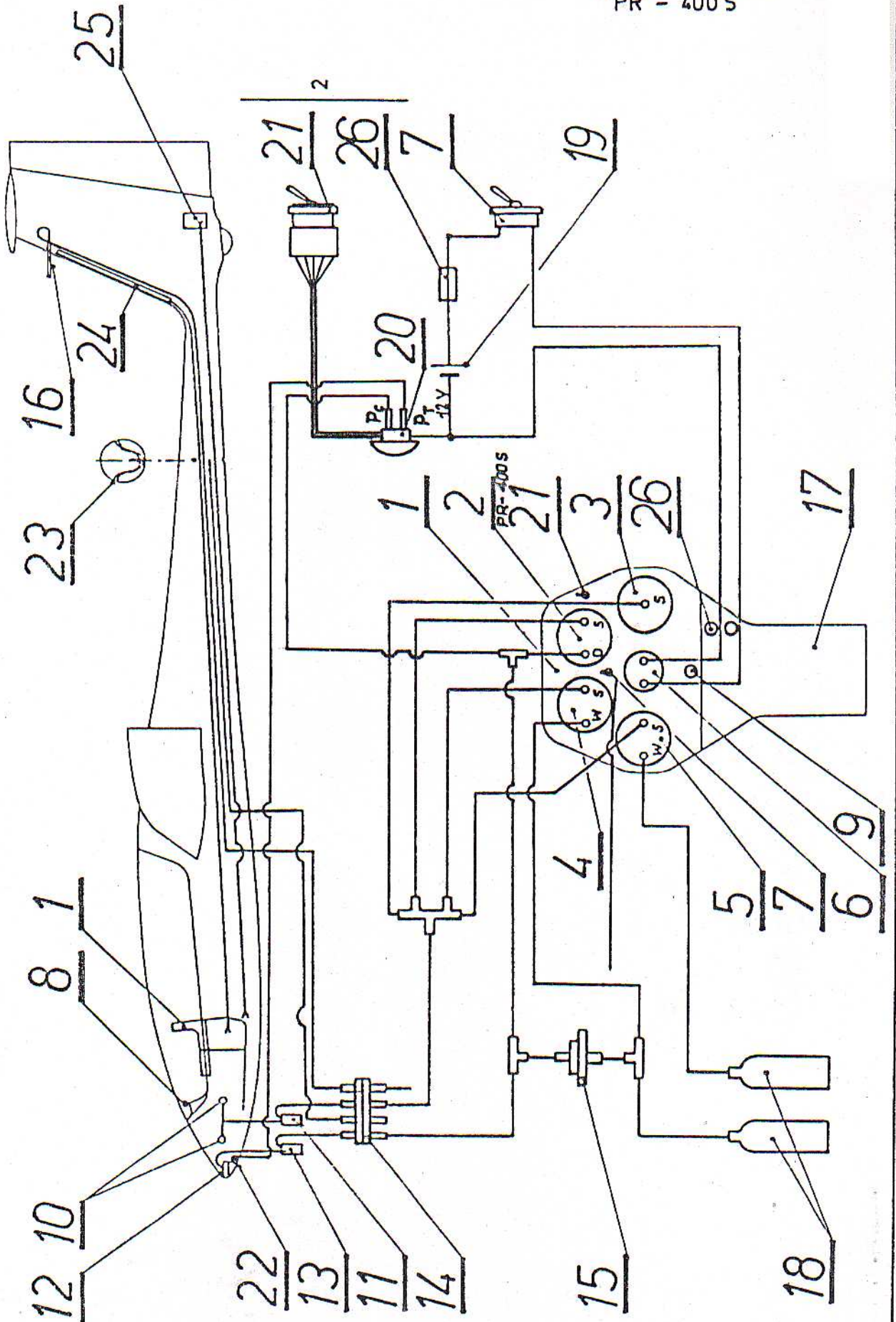




Fig.10

PR - 400 S

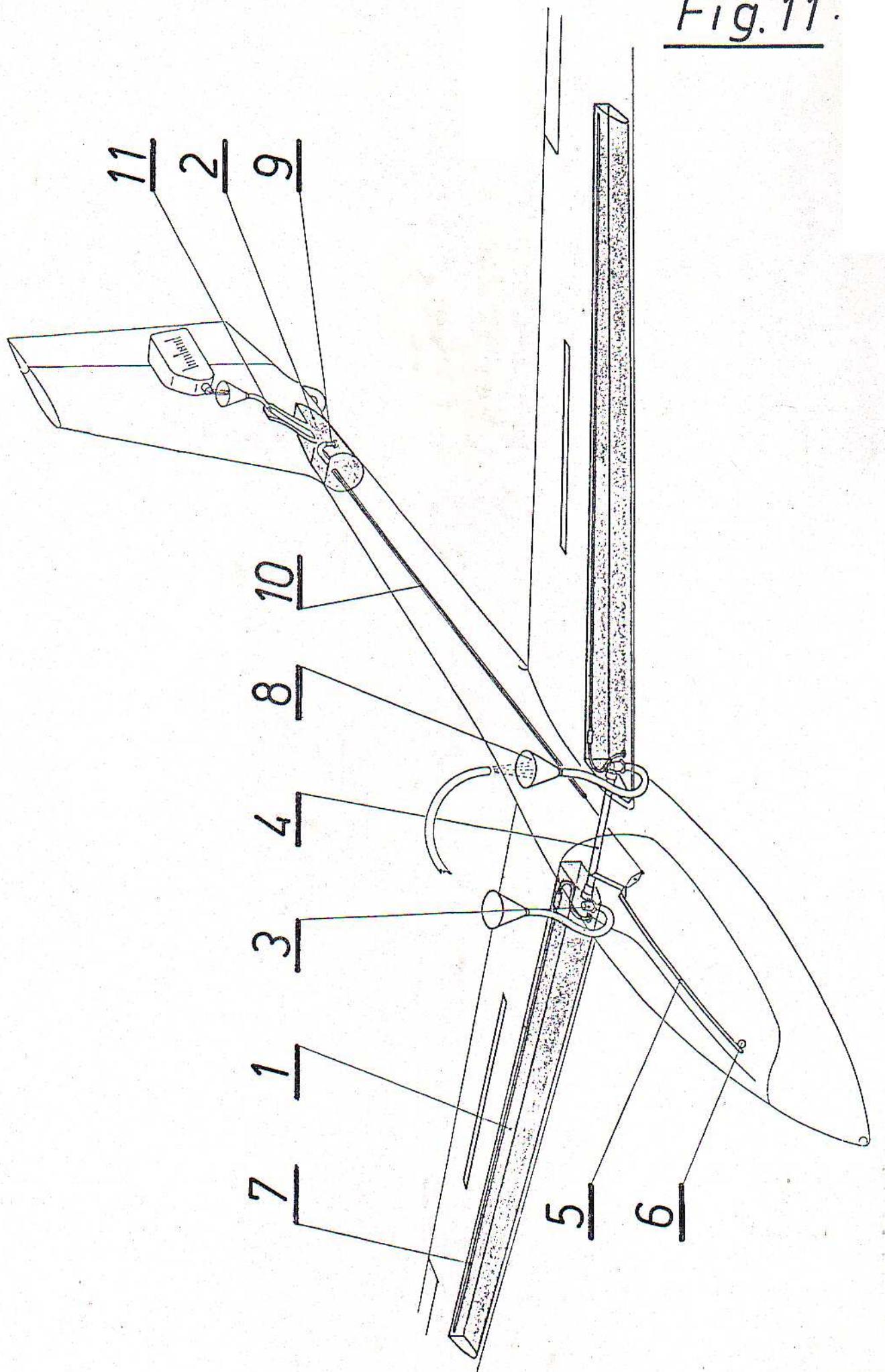




**Fig. 11. WATER BALLAST INSTALLATION**

1. Wing tank
2. Tail tank
3. Jettisoning valve (wing tank)
4. Torsion tube (valve control)
5. Push-rod (valve control)
6. Holder (ballast water valve control)
7. Venting duct (outlet on the wing lower surface near the valves)
8. Funnels (for filling the wing tanks)
9. Jettisoning valve (tail tank)
10. Tension member
11. Intake hole for filling the tail tank

Fig. 11.



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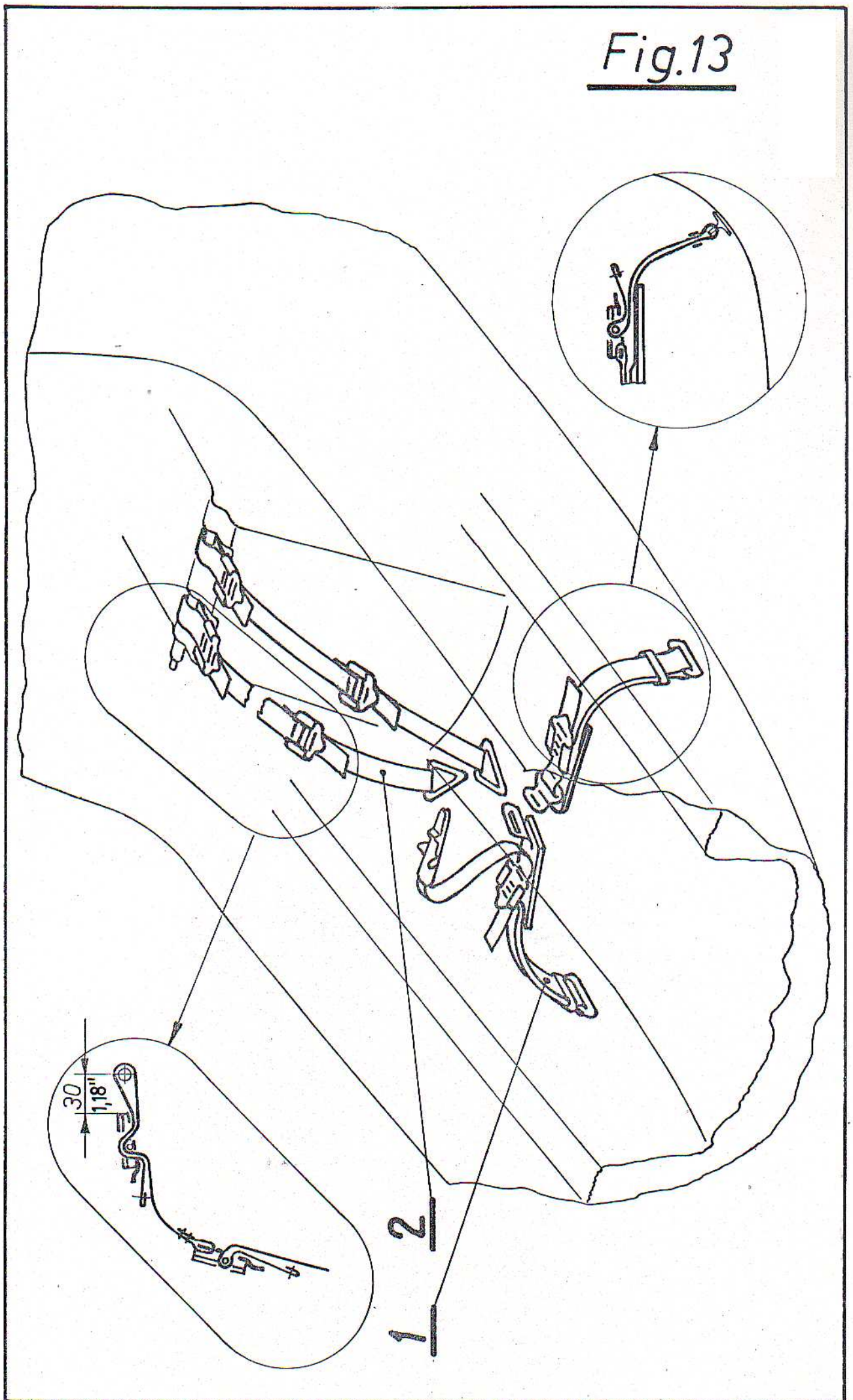
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**Fig. 13. PILOT'S SAFETY BELTS**

1. Abdomen belt of J5.10.00L type
2. Back belt of J5.70.00L type



Fig.13

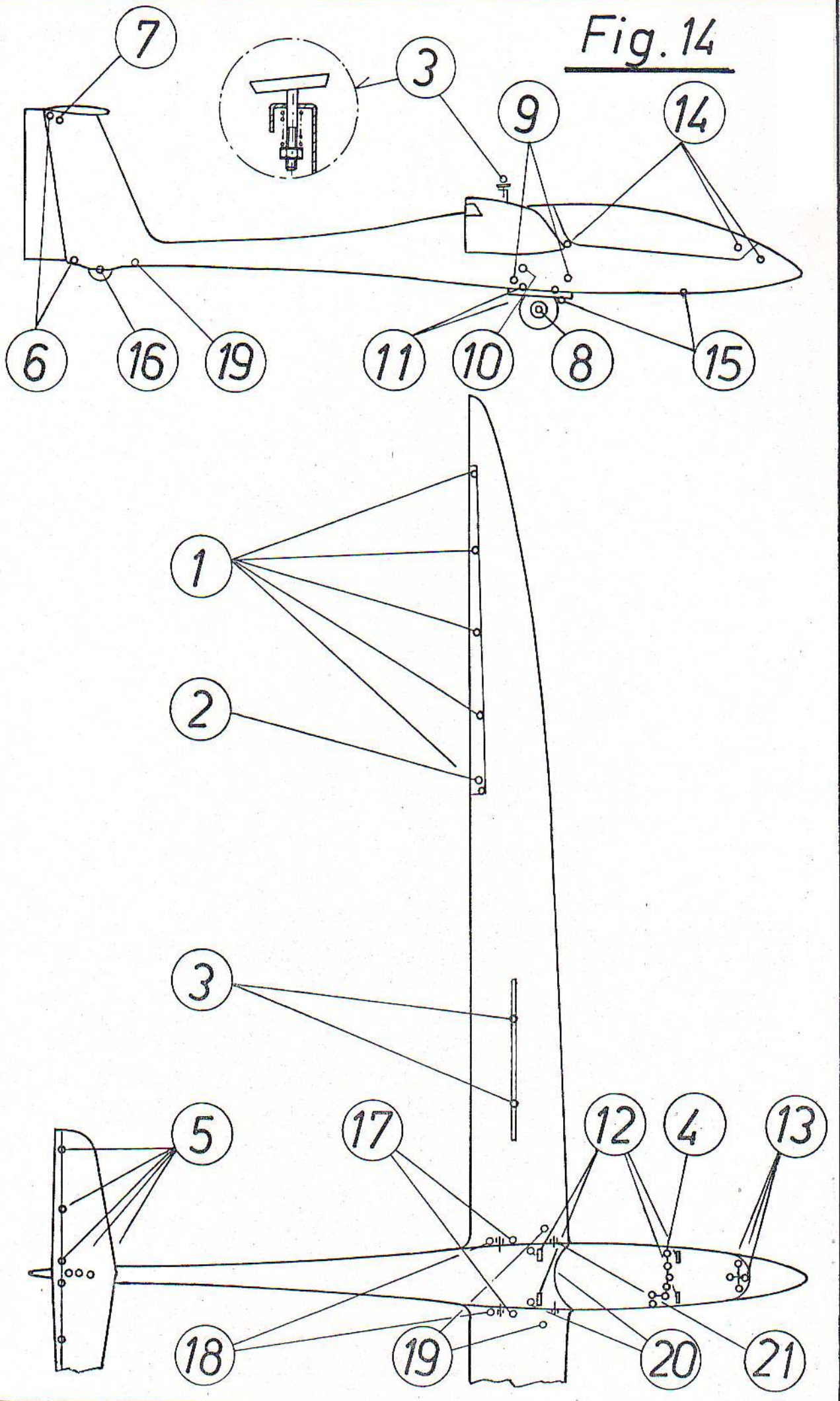


**Fig. 14. LUBRICATION PLAN**

1. Aileron hinges
2. Aileron control body and lever
3. Air brake plate fittings
4. Control column, push-rod and intermediate lever bearings
5. Stabilizer fittings and elevator hinges
6. Rudder hinges
7. Elevator control connection
8. Wheel bearings and axle
9. Front and rear wheel fork hinges
10. Undercarriage locking axle
11. Undercarriage door hinges
12. Push-rod by-passes in cockpit
13. Pedals fitting end guide
14. Canopy front and rear locks
15. Front and c.g. towing hooks
16. Tail wheel axle
17. Air brake control connection
18. Aileron control connection
19. Water valves
20. Spar connection bolts and holes
21. Wing-to-fuselage connection pivots and holes



Fig. 14





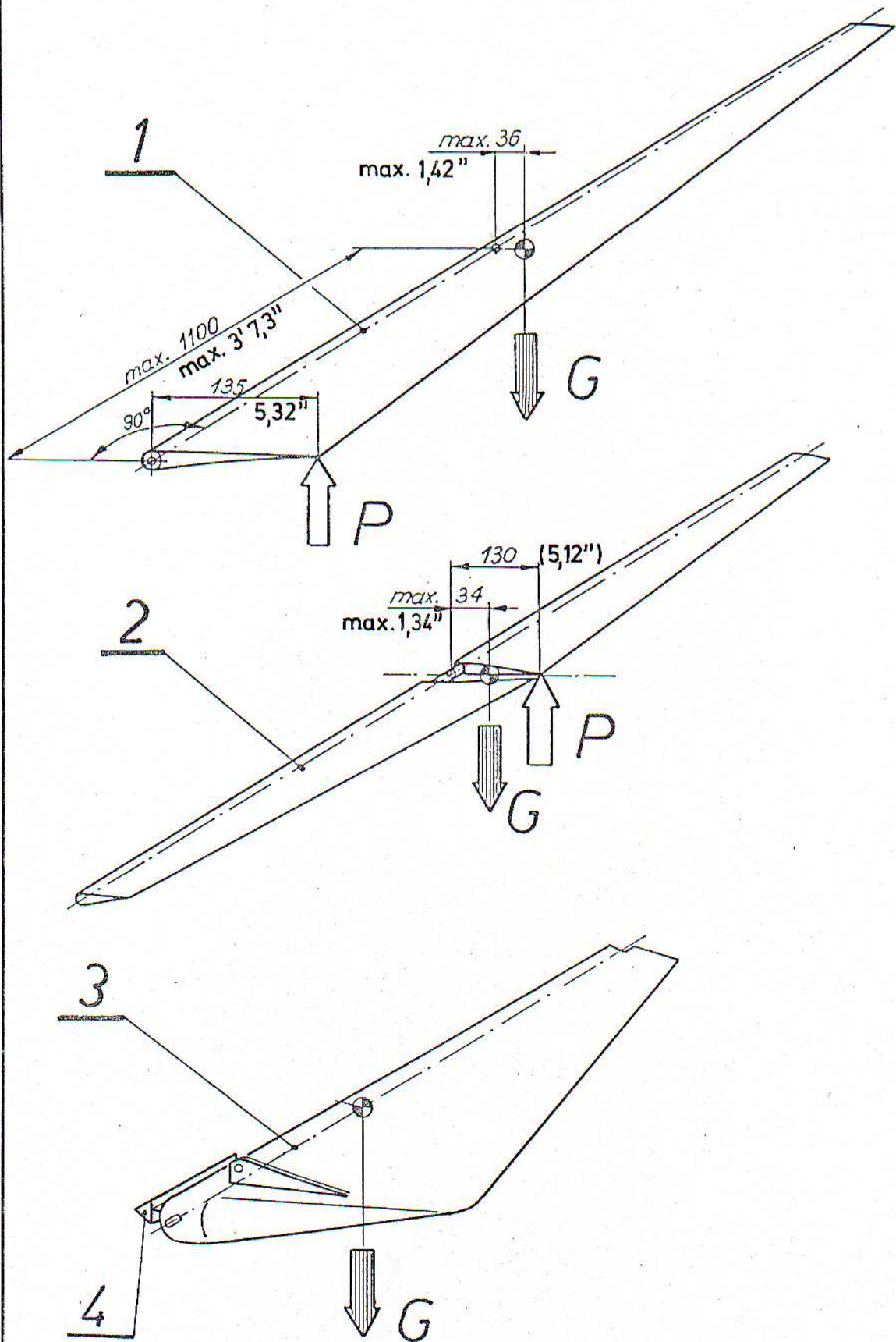
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**Fig. 15. C.G. AND MASS-BALANCING OF CONTROL SURFACES**

1. Aileron
2. Elevator
3. Rudder

Fig. 15



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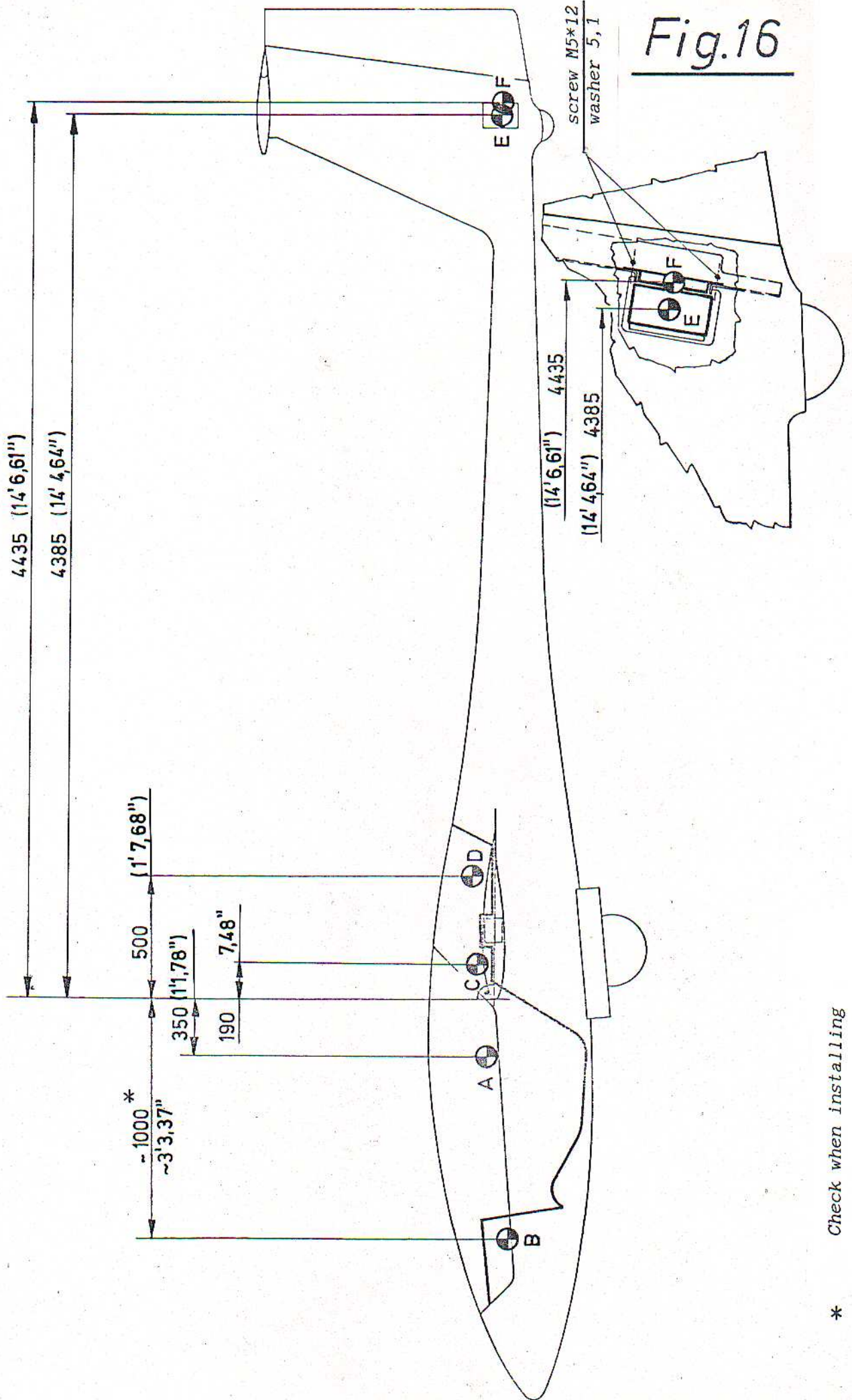
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**Fig. 16. LOCATION OF THE LUGGAGE AND BALLASTS**

- A. On the cockpit (canopy frame)  
- photo camera
- B. In the instrument panel
- C. In the luggage compartment before the spar
- D. In the luggage compartment behind the spar
- E. In the fin battery container
- F. On the fin rear wall (fixed ballast)



Fig.16



\* Check when installing

---

**INFORMATION PLACARDS**

1. Canopy emergency jettisoning - on the hand-grip at the instrument panel upper edge.
2. Adjustment of pedals - on the hand-grip at the instrument panel upper right corner.
3. Towing cable releasing - on the hand-grip at the instrument panel upper left corner.
4. Air brake extending - on the airbrake control hand-grip at the left side of seat pan.
5. Undercarriage extending - on the hand-grip of undercarriage control at the right side of seat pan.
6. Canopy opening; left side - on the hand-grip at the left side of canopy frame.
7. Canopy opening; right side - on the hand-grip at the right side of canopy frame.
8. Opening of water ballast valves - on the hand-grip at the right board.
9. Air conditioning - on the hand-grip at the left side of instrument panel column.
10. Supply switching on and off of :
  - turn indicator - on the instrument panel above the indicator
  - stall warning - on the instrument panel at the right side of airspeed indicator.

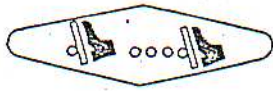
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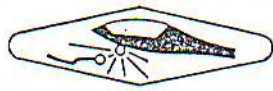
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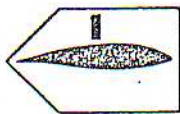
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4



9



5



10





**OPERATION PLACARDS**

1. OPERATION LIMITATIONS - on the right board.
2. MAXIMUM WING WATER BALLAST - on the left board.
3. MAXIMUM FLIGHT ALTITUDE WITH WATER BALLAST - on the  
right board.
4. PRE-FLIGHT PROCEDURES - on the right board.
5. Sailplane factory placard - on the inner side of root  
rib nose.
6. STALL WARNING - on the instrument panel under the  
supply switch.
7. DON'T RETRACT UNDERCARRIAGE WHEN TOWED - on the  
instrument panel above or on side of the towing cable  
releasing hand-grip.
8. TAIL WATER BALLAST VERSUS WING BALLAST - on the left board.



Placard 1

OPERATION LIMITATIONS				
MASSES	lb	IAS AIRSPEEDS	mph	kts
MAX. ALL-UP WITH BALLAST	1102.5	V <sub>NE</sub>	158.1	137.7
MAX. ALL-UP WITHOUT BALLAST	771.7	V <sub>RA</sub>	120.9	105.3
MAX. PILOT IN COCKPIT	242.5	V <sub>A</sub>	120.9	105.3
MIN. PILOT IN COCKPIT	132.3	V <sub>T</sub>	96.1	83.7
		V <sub>W</sub>	89.9	78.3

Placard 2

MAX. WATER BALLAST IN WINGS /lb/											
EMPTY MASS /lb/	PILOT'S MASS /lb/										
	132.3	143.3	154.3	165.4	176.4	187.4	198.5	209.5	220.5	231.5	242.5
452	430	430	430	430	430	430	430	430	430	419	408
463	430	430	430	430	430	430	430	430	419	408	397
474	430	430	430	430	430	430	430	419	408	397	386
485	430	430	430	430	430	430	419	408	397	386	375
496	430	430	430	430	430	419	408	397	386	375	364
507	430	430	430	430	419	408	397	386	375	364	353

Placard 3

MAX. FLIGHT ALTITUDE WITH WATER BALLAST					
MIN. TEMPERATUR ON GROUND °F	56.5	69.6	81.0	90.3	96.0
MAX. FLIGHT ALTITUDE ft	5000	8000	11000	14000	17000

Placard 4

BEFORE THE FLIGHT	
BALLAST	- venting ? - lateral balance ?
BACK-REST	- adjust
PARACHUTE	- put on
TAKE PLACE	- pedals , belts , instrument panel ?
MOVEABLE THINGS ?	
CANOPY	- close
FULL DEFLECTIONS of controls	
AIR BRAKE	- retract
ALTIMETER	- adjust „0”
STALL WARNING	- check
TOWING CABLE	- connect , check
TRANSCIVER	- report „ready”

Placard 5



PRZEDS. DOSWIADCZALNO-  
PRODUKCYJNE SZYBOW.

PZL - BIELSKO

ODDZIAŁ

MADE IN POLAND

NR ROZPOZN.

SERIA  KONTROLA

NR FABR.

ROK BUD.

Placard 6

STALL WARNING  
switch ON  
BEFORE  
TAKE-OFF!

Placard 7

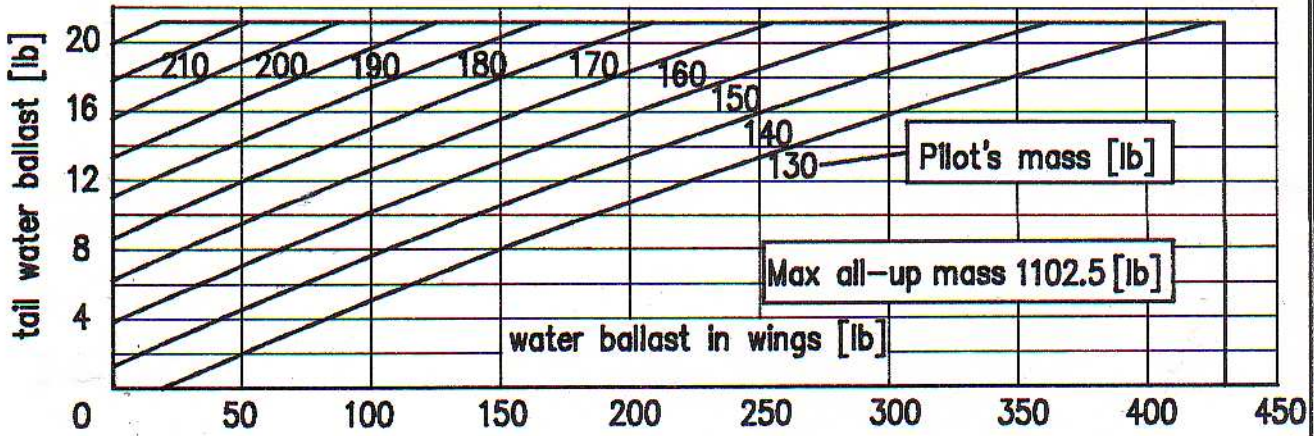
DON'T RETRACT  
UNDERCARRIAGE  
WHEN TOWED



Placard 8

ISS. IV

# TAIL WATER BALLAST vs. WING BALLAST





Placard 1

OPERATION LIMITATIONS			
MASSES	kg	IAS AIRSPEEDS	kts
MAX. ALL-UP WITH BALLAST	500	V <sub>NE</sub>	137.7
MAX. ALL-UP WITHOUT BALLAST	350	V <sub>RA</sub>	105.3
MAX. PILOT IN COCKPIT	110	V <sub>A</sub>	105.3
MIN. PILOT IN COCKPIT	60	V <sub>T</sub>	83.7
		V <sub>W</sub>	78.3

Placard 2

MAX. WATER BALLAST IN WINGS /kg/											
EMPTY MASS /kg/	PILOT'S MASS /kg/										
	60	65	70	75	80	85	90	95	100	105	110
205	195	195	195	195	195	195	195	195	195	190	185
210	195	195	195	195	195	195	195	195	190	185	180
215	195	195	195	195	195	195	195	190	185	180	175
220	195	195	195	195	195	195	190	185	180	175	170
225	195	195	195	195	195	190	185	180	175	170	165
230	195	195	195	195	190	185	180	175	170	165	160

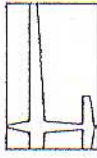
Placard 3

MAX. FLIGHT ALTITUDE WITH WATER BALLAST						
MIN. TEMPERATUR ON GROUND	C	13,5	17,5	24	31	38
MAX. FLIGHT ALTITUDE	m	1500	2000	3000	4000	5000

Placard 4

BEFORE THE FLIGHT	
BALLAST	- venting ? - lateral balance ?
BACK-REST	- adjust
PARACHUTE	- put on
TAKE PLACE	- pedals , belts , instrument panel ?
MOVEABLE THINGS ?	
CANOPY	- close
FULL DEFLECTIONS of controls	
AIR BRAKE	- retract
ALTIMETER	- adjust „0”
STALL WARNING	- check
TOWING CABLE	- connect , check
TRANSCEIVER	- report „ready”

Placard 5

	PRZEDS. DOŚWIADCZALNO- PRODUKCYJNE SZYBOW.	
	PZL — BIELSKO	
	ODDZIAŁ	<input type="text"/>
	MADE IN POLAND	
NR ROZPOZN.	<input type="text"/>	
SERIA	<input type="text"/>	KONTROLA
NR FABR.	<input type="text"/>	<input type="text"/>
ROK BUD.	<input type="text"/>	<input type="text"/>

Placard 6

STALL WARNING switch ON BEFORE TAKE-OFF!
---

Placard 7

DON'T RETRACT UNDERCARRIAGE WHEN TOWED
--



Placard 1

OPERATION LIMITATIONS			
MASSES	kg	IAS AIRSPEEDS	km/h
MAX.ALL-UP WITH BALLAST	500	V <sub>NE</sub>	255
MAX.ALL-UP WITHOUT BALLAST	350	V <sub>RA</sub>	195
MAX. PILOT IN COCKPIT	110	V <sub>A</sub>	195
MIN. PILOT IN COCKPIT	60	V <sub>T</sub>	155
		V <sub>W</sub>	145

Placard 2

MAX. WATER BALLAST IN WINGS /kg/											
EMPTY MASS /kg/	PILOT'S MASS /kg/										
	60	65	70	75	80	85	90	95	100	105	110
205	195	195	195	195	195	195	195	195	195	190	185
210	195	195	195	195	195	195	195	195	190	185	180
215	195	195	195	195	195	195	195	190	185	180	175
220	195	195	195	195	195	195	190	185	180	175	170
225	195	195	195	195	195	190	185	180	175	170	165
230	195	195	195	195	190	185	180	175	170	165	160

Placard 3

MAX. FLIGHT ALTITUDE WITH WATER BALLAST						
MIN. TEMPERATUR ON GROUND	C	13,5	17,5	24	31	38
MAX. FLIGHT ALTITUDE	m	1500	2000	3000	4000	5000

Placard 4

BEFORE THE FLIGHT	
BALLAST	- venting ? - lateral balance ?
BACK-REST	- adjust
PARACHUTE	- put on
TAKE PLACE	- pedals , belts , instrument panel ?
MOVEABLE THINGS ?	
CANOPY	- close
FULL DEFLECTIONS of controls	
AIR BRAKE	- retract
ALTIMETER	- adjust „0”
STALL WARNING	- check
TOWING CABLE	- connect , check
TRANSCIVER	- report „ready”

Placard 5

	PRZEDS. DOŚWIADCZALNO- PRODUKCYJNE SZYBOW.	
	PZL - BIELSKO	
	ODDZIAŁ	<input type="text"/>
	MADE IN POLAND	
NR ROZPOZN.	<input type="text"/>	
SERIA	<input type="text"/>	KONTROLA
NR FABR.	<input type="text"/>	<input type="text"/>
ROK BUD.	<input type="text"/>	<input type="text"/>

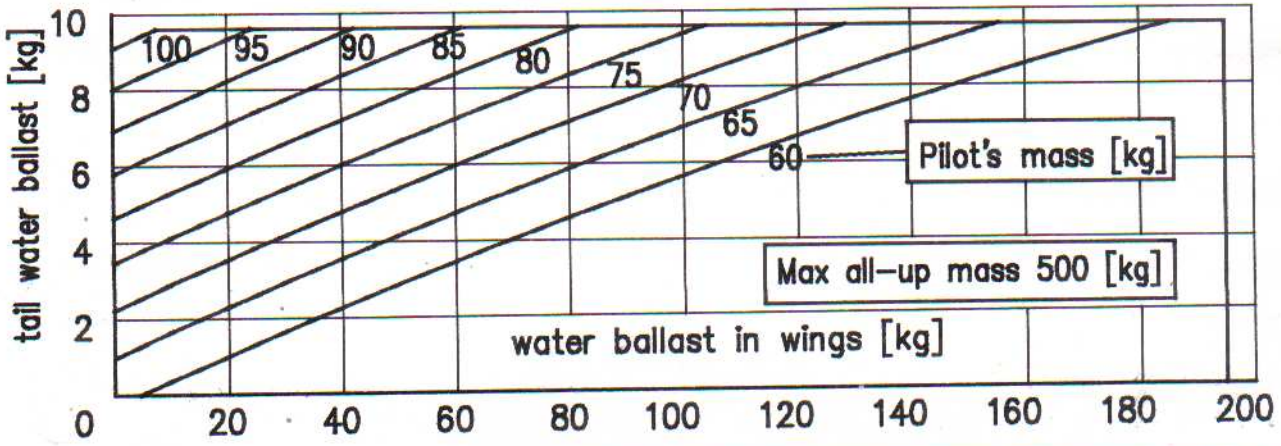
Placard 6

STALL WARNING switch ON BEFORE TAKE-OFF!
---

Placard 7

DON'T RETRACT UNDERCARRIAGE WHEN TOWED
--

# TAIL WATER BALLAST vs. WING BALLAST





**PROGRAM AND RESULTS OF PERIODIC INSPECTION***(SAMPLE)***CONTENTS**

0. SAILPLANE DATA
1. INTRODUCTION
2. GENERAL INSPECTION
3. DETAILED VERIFICATION OF WING
4. DETAILED VERIFICATION OF FUSELAGE
5. DETAILED VERIFICATION OF HORIZONTAL TAILPLANE
6. FINAL ASSEMBLY

**0. SAILPLANE DATA****SZD-55-1 SAILPLANE**

Fact. No .....

Registration No .....

Total flying time .....(hours)



Total number of landings .....

## PROGRAM AND RESULTS OF PERIODIC INSPECTION

Operation No	Operation specification, recommendations	Notes
1	2	3
1.	<b>INTRODUCTION</b>	
1.1.	To extend the sailplane service life up to 3000 flying hours, operator of SZD-55-1 sailplane, on reaching the total flying time of 1500 hours, shall perform the periodic inspection (every 500 hours or every 3 years of operation - whichever comes first) in accordance with the following program.	
1.2.	The inspection and verification can be accomplished by a appropriately skilled and authorised person, in agreement with responsible airworthiness Authority.	
1.3. 1.3.1. 1.3.2. 1.3.3. 1.3.4. 1.3.5. 1.3.6. 1.3.7. 1.3.8. 1.3.9. 1.3.10. 1.3.11.	List of necessary documents : Sailplane Log Book, Flight Manual, Technical Service Manual, Repair Manual, Certificate of origin, Protocol of flight test, Weighing report, Operation manual of towing hook, Certificates of board instruments and these of towing hook(s) Service Bulletins No : BE-3/55-1/90, BE-4/55-1/90, BE-5/55-1/90, BE-6/55-1/92, BE-7/55-1/94, BE-8/55-1/95, BE-9/55-1/95 (if applicable to the Factory No concerned). Instruction on the non-destructive method (e.g. penetrant, magnetic e.t.c.) for fittings inspection	

1	2	3
1.3.12.	Spare parts catalogue	
1.4.	The inspection room should ensure the temperature of 18°C through 25°C (64°F through 77°F), as well as good illumination.	
1.5. 1.5.1. 1.5.2. 1.5.3. 1.5.4. 1.5.5. 1.5.6. 1.5.7. 1.5.8. 1.5.9. 1.5.10. 1.5.11. 1.5.12.	List of tools and instruments necessary for inspection : Inside micrometer - set for diameter range of 5 through 30 mm (0.18 through 1.25 in), Micrometer for diameter range of 5 through 30 mm, Slide caliper 1~250 mm, Reading glass with magnifying power of 5, Gap gauge, Outrigger equipped lamp, to illuminate interior area, Lamp with long cable, Outrigger equipped mirror (small size), Dynamometer with measuring range up to 25.0 daN (55 lb), Steel rule 500 mm (20 in), Set of rigging tools (pliers, open ended and tubular spanners, screwdrivers, etc.), Other accessories, like black light source (fatigue cracks detection), cable tension gauge.	



1	2	3
2.	<b>GENERAL INSPECTION</b>	
2.1.	<p>Become acquainted with contents of documents specified under item 1.3. Special attention is to be paid to entries in sailplane Log Book on periodic maintenance works, on repairs and overhauls.</p> <p>In overhaul, it is advisable to make use of drawings enclosed in Spare Parts Catalogue</p>	
2.2.	<p>Check the sailplane against dampness.</p> <p>In case of excessive one - remove water and locate the sailplane in a dry, permeable to air place.</p> <p>Open all covers and housing doors (undercarriage, air brake, battery storage, access opening in wing rib).</p>	
2.3.	<p>Assemble the airframe - precede this with cleaning of sailplane sets and lubrication of all metal connectors.</p> <p>While assembling, the proper procedures should be observed including the procedures for control systems linking, as given under paragraph 2.1. of Technical Service Manual.</p>	
2.4.	<p>Check the correct locking of bolts in wing-fuselage connection, including the correct operation of pawl locking the axial movement of the longer bolt.</p> <p>Make qualitative estimation of plays in wing-fuselage connection.</p>	
2.5.	<p>Check the correct locking of bolt in tailplane-fin connection.</p> <p>locking claw</p> <p> correct</p> <p> incorrect</p> <p>Make qualitative estimation of plays in the tailplane-fin connection.</p>	

1	2	3
2.6.	Check the correct geometry in accordance with data in Fig. 1, page 31, of Technical Service Manual.	
2.7.	Measure with dynamometer the operation forces in the control systems of : aileron, elevator, rudder as well as in these of : air brake, landing gear, canopy emergency jettison, towing hook, canopy locking. Compare the measured values with data specified in para. 2.2.7. and 2.2.8. of Technical Service Manual.	
2.8.	Check the play values in aileron and elevator control systems, according to paragraph 2.2.6. of Technical Service Manual.	
2.9.	Make sure on the correct operation of landing gear retraction & locking mechanism, both in extended and in retracted position.	
2.10.	Check the correct operation of ballast tanks valve control system.	
2.11.	Check the correct operation of towing hook(s) control system following the „Operation manual of towing hook“.	
2.12.	Check the correct locking and emergency jettison of cockpit canopy.	
2.13.	Estimate the efficiency of wheel brake: (when braked, this should withstand force of one person pulling at the front edge of cockpit cut-out).	
2.14.	Disassemble the sailplane - attention is to be paid to the proper sequence of operations.	



1	2	3
3.	<b>DETAILED VERIFICATION OF WING</b>	
3.1.	Check the tightness of ballast tanks, following the procedure of para. 2.6. of Technical Service Manual.	
3.2.	Inspection of fittings and structure of spar root.	
3.2.1.	Inspect, by eye as well as with aid of reading glass, the glue joint between main fitting plates and spar webs. Check against possible white spots in composite structure.	
3.2.2.	Check the plates of main fittings against cracks, on the way of available non-destructive inspection method (e.g. penetrant or magnetic).	
3.2.3.	Check the bolts of spar connection, pay attention to cracks, surface condition (scratch), wear degree - ovalization. Find the plays between bolt and corresponding openings in spar root fittings. Compare the results found with data given in paragraph 2.7. of Technical Service Manual.	
3.2.4.	Check the reliability of the longer bolt, i.e. of this one in the root of right hand spar, locking against the axial forces. Check the condition of spring ring, one pressing down the locking block.	
3.2.5.	Check the condition of composite structure of spar root, pay attention to possible white spots as well as to mechanical damages to composite. Check the connection between spar root and wing root rib - neither white spots nor other damages allowed.	



1.	2.	3.
	NOTE: white spots can indicate the damages to the composite resin matrix	
3.3.	Inspection of fittings and structure of root rib.	
3.3.1.	Check condition and wear out degree of pivot sleeves at wing / fuselage connection. Find the dimensions of openings, as well as ovalization of these, with reference to corresponding fuselage pivot dimensions, compare these with the allowed values specified under paragraph 2.7. of Technical Service Manual.	
3.3.2.	Check condition of the rib, as well as condition of glue joint between the rib and wing shell.	
3.3.3.	Check condition of wing skin. Pay attention to lacquer cracks, especially at the corners of air brake housing, in the area of aileron cut-out, as well as at wing tip and at leading and trailing edges	
3.3.4.	Disassemble the aileron, following procedure of paragraph 2.1.5. of Technical Service Manual - check the condition of skin and of glue joints. Prior to the disassembly, check if aileron drops under gravity (with wing level). Check condition of rear web in the wing, as well as of its glue joint, especially of this with the wing upper shell.	
3.3.5.	Check condition of bearings at aileron wing hinges.	
3.3.6.	Check the axial play of aileron actuating lever in aileron case - max. allowed value 0.15 mm (0.006 in).	

1.	2.	3.
3.3.7.	<p>Check condition of the aileron lever guide and block (see item 7 and 9 in Fig. 6 of Technical Service Manual). The active face of a guide should be polished, and the block - rotate easily on the lever pin.</p>	
3.3.8.	<p>Moving with the aileron lever, check the smooth movements of push rod in its guides.</p>	
3.3.9.	<p>Clean and lubricate the fasteners of aileron and aileron lever following the procedure of paragraph 3.7., Fig. 14 of Technical Service Manual. Install the aileron on the wing, pay attention to insert the lever into its guide correctly. Check the axial play of aileron, max. allowed value 0.4 mm (0.016 in), apply the appropriate correcting washer, if necessary.</p>	
3.3.10.	<p>Check condition of air brake plates, caps and cap loading springs, as well as caps matching in retracted position.</p>	
3.3.11.	<p>Dismount the air brake plates, disconnect the push rod and check the plays at air brake arms and frictional resistance in arm rotation (arm should sink under gravity, and play measured at arm tip, in flight direction, should not exceed 1 mm (0.04 in)).</p>	
3.3.12.	<p>Clean and lubricate the disassembled elements of air brake. Assemble the air brake again.</p>	



1.	2.	3.
4.	<b>DETAILED VERIFICATION OF FUSELAGE</b>	
4.1.	Check the tightness of tail ballast tank following paragraph 2.6. of Technical Service Manual.	
4.2.	Disassemble the rudder according to paragraph 2.1.3. of Technical Service Manual. Check the condition of skin, fittings and find the play at the fittings.	
4.3.	Check the condition of fuselage skin, pay attention to cracks of lacquer coat (as these may indicate the damages to structure), especially at the areas listed under items 4.3.1 through 4.3.6.	
4.3.1.	Cockpit side boards, especially at the rear points of canopy locking	
4.3.2.	Edges of main wheel well.	
4.3.3.	Fuselage skin in front of nose hook housing.	
4.3.4.	Fuselage skin aft of wing trailing edge.	
4.3.5.	Joint between fuselage shells on top and bottom surfaces.	



1.	2.	3.
4.3.6.	<p>Make sure the drainage openings are clear.</p> <p>NOTE: fuselage bottom surface is to be checked in upside-down position (shore at cockpit boards and at fin - remove the canopy first)</p>	
4.4.	<p>Check the glue joint between the internal structure and skin. Pay special attention to the areas specified under items 4.4.1. through 4.4.8.</p>	
4.4.1.	<p>Joint between fin rear web and skin, as well as the condition of rudder hinges installation.</p>	
4.4.2.	<p>By available means (lightning, mirror, magnifying glass) check the installation of horizontal tailplane fastening fittings in the fin (white spots in glue layer may indicate the joint failure).</p>	
4.4.3.	<p>Check the condition of joints between wing attachment tubings and fuselage structure (cracks in lacquer coat around flange at fuselage rib may indicate the damage to the tubing/shell joint).</p>	
4.4.4.	<p>Check the condition of glue joint between the floor of baggage compartment and the fuselage shell. Check if the floor has not been damaged by a wheel housing at the site of wing spar contact (heavy landing).</p>	
4.4.5.	<p>Check the condition of main wheel well, pay attention to points of landing gear mounting.</p>	

1.	2.	3.
4.4.6.	Check the condition of wheel housing doors, and of door loading springs.	
4.4.7.	Check the condition of cockpit inner shell, pay attention to areas of fitting installation, especially to these of control system, of pilot safety harness, mounting of instrument panel, canopy and pilot back rest.  NOTE: remove the cover of control column	
4.4.8.	Check the condition of pilot back rest and points of its mounting, pay attention to wear-out degree of locking pins in landing gear housing.	
4.5.	Inspection of control systems.  Refer to Fig. 7 and 8 of Technical Service Manual.  Pay attention to play size and wear-out degree, especially at connections and at accessible push rod passes	
4.5.1.	Check the elevator control system - find the plays at control column, at accessible push rod passes (in the fuselage central portion), at angular lever in the fin, as well as in automatic coupling between the elevator lever and inlet lever in the fin.	
4.5.2.	Check the correct operation, and condition of the trimming device - clean and lubricate the slide of locking mechanism.	
4.5.3.	Check the aileron control system - find the play in articulated bearings of control stick and at angular lever (in the control column well).	



1.	2.	3.
4.5.3. - continued	Check the play in Teflon push rod pass positioned on the inner shell of cockpit right hand side (accessible on removing the upholstery rear panel), maximum allowed value 0.4 mm (0.016 in).	
4.5.4.	<p>Check the rudder control system.</p> <p>Disconnect the pedal cables from floor and turnbuckle, check condition and wear-out degree of these.</p> <p>Pull the main cable out from the polyamide sheath - check its condition against evidence of corrosion and other failures. Evidence of wear-out, corrosion, break of even one wire exclude the concerned cable from further operation, must be replaced with a new one.</p> <p>Favourable result of inspection allows for extension of the cable service life, till the next inspection.</p> <p>NOTE: On replacing the cable set with new ones, the inspection of these after 1500 hours of operation is required.</p> <p>Record the cable exchange in the glider Log Book.</p>	
4.5.5.	<p>Check the control systems of towing hooks, canopy emergency jettison, wheel brake. In necessity dismount the control cable.</p> <p>Criteria for estimation of cable condition- see item 4.5.4.</p> <p>NOTE: In case of towing hooks control system, use the Operation Manual of Towing Hook.</p>	
4.5.6.	<p>Check the ballast tank valve control system, attention is to be paid to cable and spring in tail ballast tank control system. Dismount the cable, check its condition especially at the cable ends. Dismount the valves of ballast tanks, clean and lubricate these following recommendations of paragraph 3.7, item 19 of Technical Service Manual.</p>	



1.	2.	3.
4.5.6.- continued	Replace the used elements (e.g. O-ring sealing). Mount the valves again, check correct operation of the whole system.	
4.6.	Check operation and condition of landing gear.	
4.6.1.	Find play value at points of mounting the retraction mechanism of landing gear.	
4.6.2.	Check the reliability of main wheel locking in retracted position (deflect or dismount the wheel housing doors). In case of excessive play, check the condition as well as wear-out degree of polyamide sleeve on gas spring. Play between the locking element and the sleeve should be approx. 1 mm (0.04 in). The used sleeve is to be replaced - item „406“ of Spare Parts Catalogue.	
4.6.3.	Check the condition of main wheel tyre and, on dismounting the wheel, also this one of wheel brake friction lining.	
4.6.4.	Check the condition of tail wheel, tyre and bearings included.	
4.7.	Check the pressure system (of board instruments).	
4.7.1.	Replace the insert of drainage unit - see items 11 and 13 in Fig. 10, pg. 49 of Technical Service Manual.	

1.	2.	3.
4.7.2.	Blow through the pressure ducts, disconnecting them first from board instruments, to remove the possible contamination and condensation water.	
4.7.3.	Check the tightness of particular branches of pressure system.	
4.8.	Favourable result of inspection, with following removal of defects encountered, allows for extension of the elastic ducts service life, till the next inspection	
4.8.1.	Safety harness  Pilot safety harness, below 7 years of operation are to be verified as follows: - condition of harness belts, check against damages, fouling, stains - condition of fittings, check against corrosion, cracks, deformation, - correct functioning of locking spring (this should adhere to the latch)	

1.	2.	3.
4.8.1. - continued	<p>Permanent failure of belt excludes this from further operation.</p> <p>Stains and fouling allow for further operation (on cleaning these).</p> <p>Damages to fittings, which do not affect their strength and correct functioning, are not an obstruction for further operation.</p> <p>Correct operation of harness is to be checked on the way of lock release force measurements. This force should range at 14.5 through 50 daN (321 through 1101 lb), when measured with firmly tightened belts.</p> <p>Check the cleanness and the legibility of information placards, as well as these of letter markings (L, R).</p> <p>Favourable result of inspection, followed with removal of defects found, extends the harness service life, till the next inspection.</p>	
4.8.2.	<p>The harness service life has been set up with the BE-006/93/15.00.00 Bulletin, at 15 years of operation.</p> <p>Further operation of the harness may be allowed after the regeneration of these, at the producer.</p>	
4.9.	<p>Fuselage assembly, after the verification procedure - on removing the defects found.</p> <p>When assembling, the correct sequence of operation is to be observed - the necessity of lubricating the connecting metal elements is to be remembered, in accordance with „Lubrication plan“, pg 25 of Technical Service Manual.</p>	



1.	2.	3.
5.	<p><b>DETAILED VERIFICATION OF HORIZONTAL TAILPLANE</b></p>	
5.1.	<p>Disassemble the elevator, in this operation check the reliability of locking the securing bolt.</p>	
5.2.	<p>Verification of stabilizer.</p>	
5.2.1.	<p>Verify the condition of stabilizer/fin fittings, as well as this of elevator hinges.                      Measure the play value between openings and assembly bolt in stabilizer/fin fittings.                      Compare the plays found with values allowed according to paragraph 2.7. of Technical Service Manual.</p>	
5.2.2.	<p>Check the condition of fittings installation in composite structure of stabilizer, attention is to be paid to lacquer cracks in the vicinity of main fittings.                      White spots in composite, under the lacquer coat, can indicate the structure failure.</p>	
5.2.3.	<p>Check the condition of:                      - stabilizer skin                      - joint between rear web and skin                      - installation of elevator hinges in the stabilizer web</p>	
5.3.	<p>Verify the condition of elevator, with special attention paid to:                      - elevator skin                      - joint of upper/lower shell, at leading and trailing edge                      - installation of elevator actuating lever and hinge fittings in composite structure</p>	

1.	2.	3.
5.4.	On removing the defects, stabilizer and elevator are to be assembled again (lubricate fittings), the correct assembling procedure should be observed.	
6.	<b>FINAL ASSEMBLY</b>	
6.1.	On removing all defects in fuselage, wing and in tailplanes, complete the lubrication at remaining, specified under „Lubrication plan“ items - in accordance with paragraph 3.7. of Technical Service Manual.	
6.2.	Complete the final assembly, with attention paid to correct and reliable locking of main joints (following the recommendations of paragraph 2 of Technical Service Manual).	
6.3.	Complete the levelling procedure.  When deviations are found, from data specified in Fig. 1 (pg 3) of Technical Service Manual, the correction of control surface deflections should be performed.	
	NOTE: In doubtful cases contact sailplane producer for explanation.	