PRZEDSIĘBIORSTWO DOŚWIADCZALNO-PRODUKCYJNE SZYBOWNICTWA

"PZL-BIELSKO"

BIELSKO-BIAŁA

TECHNICAL SERVICE MANUAL

OF

"PUCHACZ" SZD-50-3 GLIDER

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Translated by Polish Authority approved interpreter :

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SECTION 0

0. GENERAL

0.1 Record of revisions

Any revision of the present manual must be recorded in the following table.

The new or amended text will be indicated by a black vertical line in the left hand margin, and the Revision No and the date will be shown on the bottom left hand of the page.

Rev. No	Affected Section	Affected Pages	Date of Insertion	Signature

Rev. No	Affected Section	Affected Pages	Date of Insertion	Signature

0.2 List of effective pages

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0.3 Contents

0.4 List of drawings contained in the text

SECTION 1

1. DESCRIPTION AND TECHNICAL DATA OF GLIDER

1.1 Description of glider

The two-seater SZD-50-3 "Puchacz" glider is designed for initial schooling and training.
Completing the schooling on the glider of this type is the step towards solo flying on modern performance-training sailplanes.

Wing - in two panels of trapeze shape, Wortman's laminar airfoils. Glass-fibre / foam / glass-fibre sandwich coverings. Box spar with longerons of glass roving. The spas roots are fixed with central bolt of horizontal axis. In wing structure no ribs have been used.

Aileron - ranging 20% of chord. Sandwich structure suspended on six hinges, actuated in one point.

Air brakes - with single plates extended on upper and lower wing surface. The plates are equipped with adjustable glass-fibre caps loaded with springs.

Fuselage - of glass-fibre structure, made integrally with fin. The central part consists of two plywood frames connected by main under-carriage plywood spars and by upper and bottom floor.

Undercarriage - two wheeled single track. The main shock-absorbed ϕ350x135 (13.79x5.319 [in]) wheel with the disk brake. The front ϕ255x110 (10.047x4.334 [in]) fixed wheel is not braked. The fuselage is equipped with tail skid, which has been replaced with a tail wheel ϕ200x60 (7.874x4.33 [in]) beginning with the glider fact. No B-2022 included.

Cockpit - in the tandem arrangement covered with a one-part canopy side-opened. The cockpit board is formed of the glass roving saturated with epoxy resin and has a core of Conticell foam.
The hinges are located on the R.H. board and fixed into fittings resined in the fuselage shell.
The emergency jettisoning device is situated on the canopy frame on the R.H. side.

Instrument panel - is located at front seat.
As the additional equipment the installation of instrument panel at rear seat (see Fig. 10/2) is provided.

The instrument panel at front and rear seats contains :

- airspeed indicator PR-250 S
- total energy variometer PR-03
- electric turn indicator EZS-4
- compass BS-1
- altimeter W-12 S

All the instruments of "PZL" production.

On request the instruments of other type or additional ones can be installed.

The position of pilots is a sitting one. The front back-rest is not adjustable. The rear seat pan is removable and adjustment on the ground provided (height and distance to pedals). The pedals at front seat are adjustable in flight. The pedals at rear seat are fixed.
The longitudinal trim by means of trimming-tab.
Both seats are equipped with the additional back cushion not fixed to the back-rest. It is used, if necessary, depending on pilot's choice.

Tailplane - consists of two panels and is situated on the fin.
Glass-fibre / foam / glass-fibre sandwich structure.
The elevator of glass-fibre structure is canvas covered.

Rudder - glass-fibre structure, canvas covered.

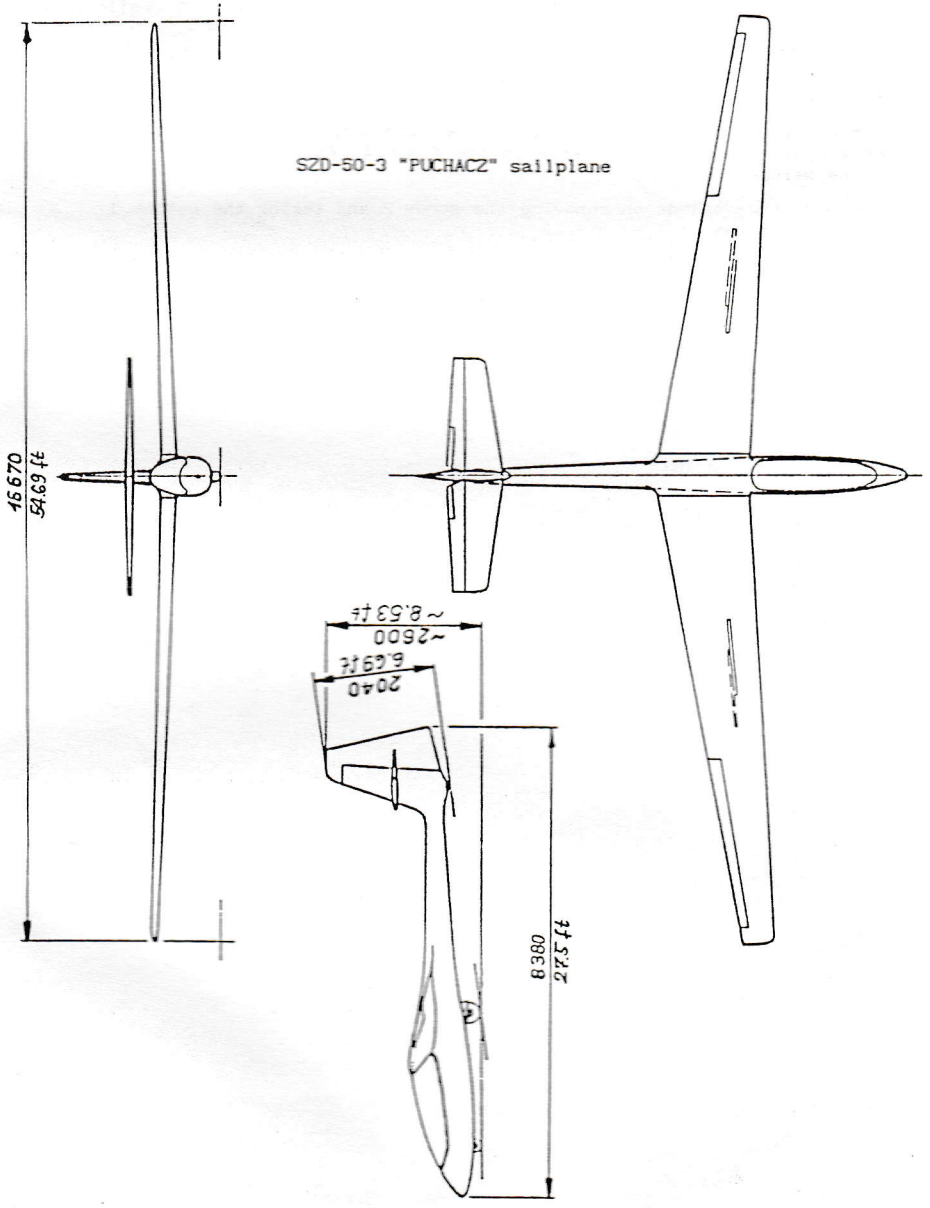
The connection of aileron and air brake control systems is automatic one during wing-to-fuselage rigging.
The connection of elevator and trimming-tab are automatic too during tailplane-to-fuselage rigging.

The method of connection in both cases is the same.

1.2 Technical data of glider

Span	54.69 [ft]	16.67 [m]
Root chord	5.18 [ft]	1.58 [m]
Tip chord	1.8 [ft]	0.551 [m]
Mean Standard Chord	3.86 [ft]	1.178 [m]
Distance between Mean Standard Chord leading edge and root chord leading edge	0.6 [ft]	0.158 [m]
Aspect ratio	15.3	
Length	27.49 [ft]	8.38 [m]
Height	6.69 [ft]	2.04 [m]
Tailplane span	13.78 [ft]	4.2 [m]
Wing area	195 [sqft]	18.16 [m^2]
Max. mass of empty glider with the standard equipment instrument panel at front seat only, equipped with board instrument set, 2 towing hooks, 2 harness sets, 2 seat pillow sets, without the balancing weights item 1 Fig. 2/1, with connector for total and static pressure ducts at rear seat, as well as with the first-aid kit, the assembling wrench and the end for filling the tyre-tube with air)	704.7 to 818.0 [lbs] 360 to 370 [kg] (valid from Fact. No B-1385)	
All-up mass	1256.8 [lbs]	570 [kg]
Min. wing mass (both : left and panels)	379.7 [lbs]	172 [kg]

Fig. 1/1 Three view drawing



Balancing of glider's crew - Fig. 2/1

For balancing of the crew according to the glider loading plan two detachable balancing weights 1, each of mass of 13.9 [lb] (6.3 [kg]) are provided.
Each of the weights painted red is fixed to the glider structure by means of the screw 2. The weights are situated on the floor 4 directly before the front pilot's seat.

Assembling of the balancing weight is performed by tightening full the screw 2 into the nest 3 visible in the floor 4. The screw 2 is fixed in the weight 1.

Disassembling depends on removing the screw 2 and taking the weight 1 out of the glider.

Legend for Fig. 2/1

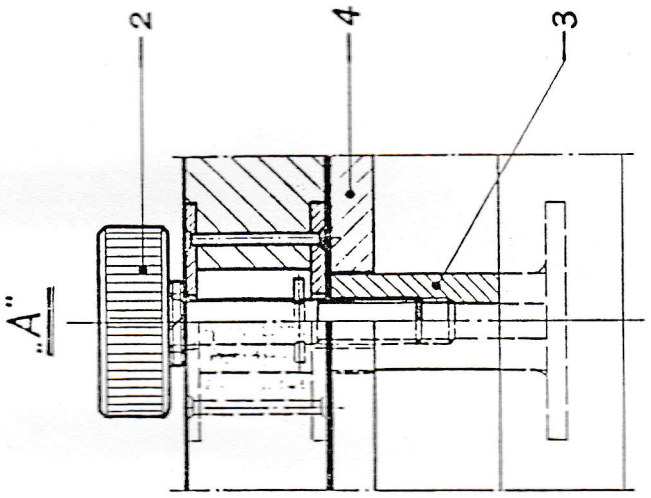
1 - Balancing weight

2 - Screw

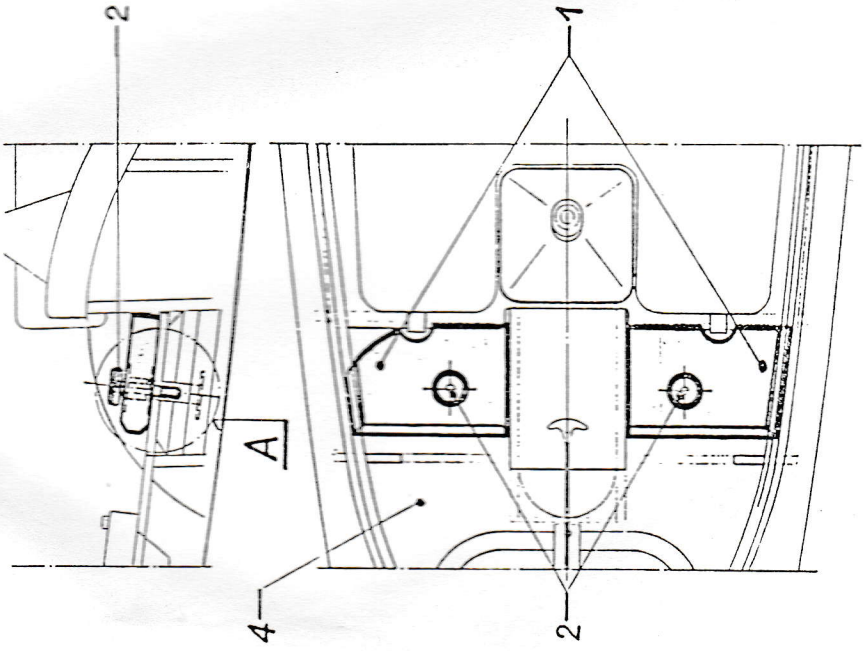
3 - Nest

4 - Floor

Fig. 2/1 Balancing weights assembling



SZD-50-3„PUCHACZ"



SECTION 2

2. RIGGING AND DE-RIGGING OF GLIDER AND ITS COMPONENTS

2.1 Rigging and de-rigging of wings

2.1.1 Description of connection

Wing to fuselage connection (see Fig. 1/2)

The wings are interconnected by overlapping spar roots. Each of roots 1 is engaged in a ball nest 2 fixed in root rib of opposite wing.
The spar roots are secured with central bolt 10.
The fuselage is connected to the wings by means of four pivots 3 being the ends of main frame fittings.
These pivots are inserted into ball nests 4 of root ribs.

2.1.2 Description of wing rigging and de-rigging

Wing rigging - Fig. 1/2

- Insert the spar roots into the fuselage when directing their pivots 1 and main fuselage frame fitting pivots 3 into the root rib ball nests 2, 4. At the same time insert the torsional tube ends of the aileron 5 and the air brake 6 control system to the drive pivots with dogs 7, 8 fixed on bearings in the wing ribs.
- Tighten the spar roots by means of special assembling wrench 9, connect then with the bolt 10 and after inserting the bolt driver into floor hole of the upper central portion secure it with safety-pin 11 and with rotation-shifted pin fixed on the main bolt end (see Fig. 1/2).

De-rigging of wings

- De-rigging requires the reverse sequence.

In order to take out the main bolt 10 move the wing tips up and down.

Connection of control systems in wing-fuselage section (Fig. 1/2) follows automatically.

The torsional tube ends of the aileron 5 and air brake 6 control system are directed, during assembling of wings with fuselage, to appropriate rotational control system elements with dogs 7, 8, fitted in bearings in wing root ribs.
Connection of wings with main bolt 10 makes simultaneously proper securing of control system against disconnection.

Legend for Fig. 1/2

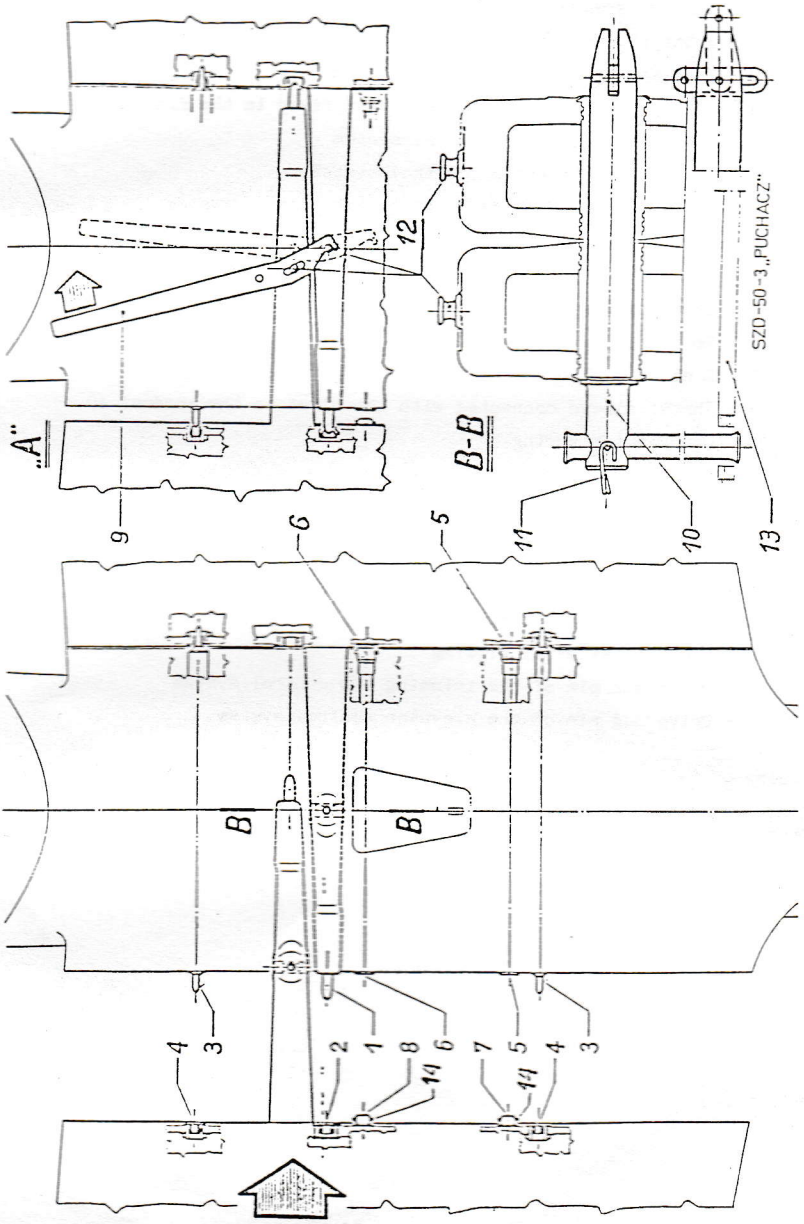
1 - Pivot of spar root
2 - Ball nest
3 - Main frame fitting pivot
4 - Ball nest
5 - Aileron control system torsional tube end
6 - Air brake control system torsional tube end
7 - Aileron control system spherical pivot with dogs
8 - Air brake control system spherical pivot with dogs
9 - Assembling lever
10 - Main bolt (from Fact. No B-1862 - version II (with lock))
11 - Aircraft safety-pin
12 - Fitting pivots
13 - Upper floor in fuselage central portion
14 - Dog pin

Note : Section B-B shows the situation after tightening the spar roots, connected with main bolt and secured.

2.2 De-rigging and rigging of tailplane

Two panel tailplane is connected to fin by means of the tubular spar 1 and front pins 2 inserted into proper nests : 3, 4 of fin.
Connection of tailplane to fin is secured by the mandrel 10, its end is inserted into the hole in the tubular spar, as shown on the view "A".
In the secured position the neck of connector 17 painted red is hidden in the fin nose.
To avoid the mandrel 10 to come out of the tubular spar 1 the spring 14, which presses the mandrel down to the elevator fitting 19 through the spacing bus 13, is installed.
For disassembling of tailplane it is necessary to remove the mandrel 10 end out of the hole in the tubular spar and to keep it in this position.
The above is possible owing to the bolt 15 and the bush 13 with flange cut on both sides (visible on view "A").
In order to remove the mandrel 10 out of the fin a rigid piece of wire or a pin (being a tool in glider service equipment), should be inserted into the hole 18 ϕ 0.0985 [in] (ϕ 2.5 [mm]) dia, pulled forward until the neck 17 appears and turned 90°.
As a result of this the bush 13 flange rests against the bolt head 15, and does not permit for return movement of the mandrel 10.

Fig. 1/2 Wing/fuselage rigging



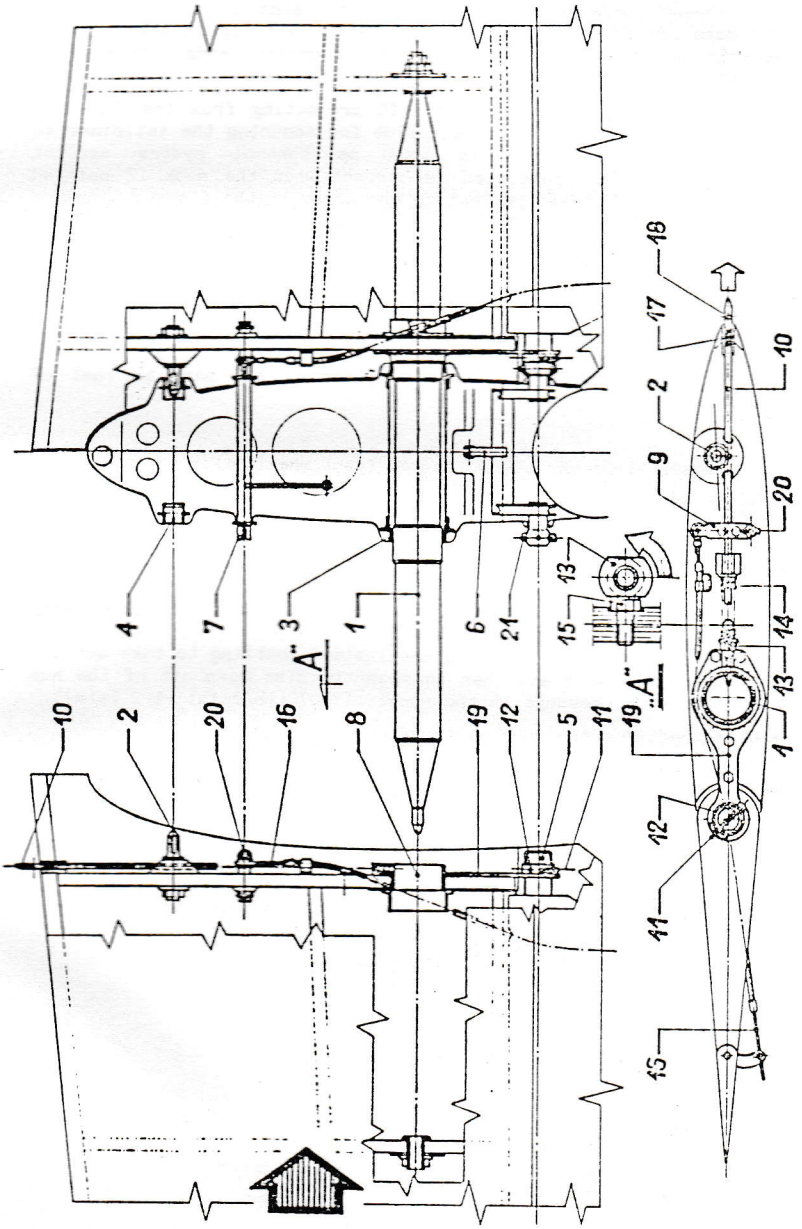
Legend for Fig. 2/2

1 - Tubular spar of the stabilizer
2 - Front fitting pin of the stabilizer
3 - Tubular spar nest fixed in the fin
4 - Stabilizer front fitting pin nest fixed in the fin
5 - End of the elevator control system
6 - Lever of the elevator control system
7 - Torsional tube of the trimming tab control system
8 - Tubular spar nest fixed in the stabilizer rib
9 - Trimming tab control lever
10 - Securing mandrel
11 - Split pin
12 - Ring
13 - Thrust sleeve connected with the rivet to the mandrel 10
14 - Compression spring
15 - Hex. head bolt
16 - Tension member of the trimming tab control system
17 - Securing mandrel neck 10 painted red
18 - Hole 0.0987 [in] (2.5 [mm]) dia inserting the tommy-bar enabling to turn and shift the mandrel 10. Tommy-bar belongs to the glider equipment.
19 - Elevator external fitting
20 - Drive dog pin of the trimming tab control system
21 - Drive dog pin of the elevator control system

Rigging of tailplane on fin - Fig. 2/2

- Insert the projecting tubular spar 1 of tailplane R.H. part and the front fitting pin 2 into proper fin nests 3, 4

Fig. 2/2 Tailplane rigging



- Put the tailplane L.H. part on the projecting tubular spar 1 when inserting at the same time the front fitting pin 2 in the nest 4.

  Simultaneously rig on the elevator control ends 5 on the ball ends with dogs of the elevator control lever 6, and rig on the trimming tab control torsional tube 7 ends on the control ends with dogs 20 of trimming tab control lever 9.

- Turn by 90° the securing mandrel 10 projecting from the fin L.H. half nose, to allow it to sink inside for securing the tailplane to the fuselage connection as well as control system against disconnection. The protection is correct when the neck 17 painted red of the securing pin projecting end sinks in the fin.

Connection of control system in: "elevator-fuselage" and "trimming tab-fuselage" sections.

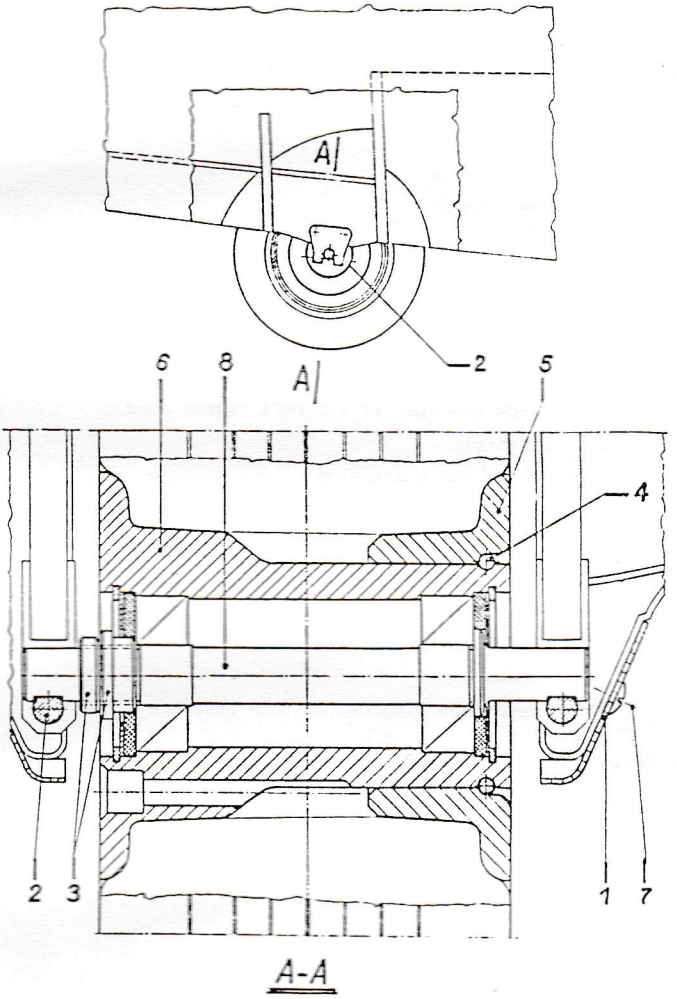
Both control systems are connected automatically when assembling the tailplane on fuselage.
The connection principle of control system is the same as that of wing-fuselage.

2.3 Disassembling and assembling of front wheel - Fig. 3/2 (Page 2.7)

Disassembling of the front wheel is performed after removal of the shield covers 1 fixed by means of screws 7, removing the nuts of pins 2 and knocking them out.
Reduction of the axial play on bearings is obtained using the nuts 3 when the wheel is removed.
Removal of the tyre is possible after deflating the inner tube, when pressing axially on the hub disk 5.
This pressure shifts the disc "to the inside" enabling to take out the spring retainer ring 4 and then to push the disc down out of the hub body. The working pressure in the wheel: 17.07 [lb/sqin] (1.2 [atm]).

Assembling requires the reverse sequence.

Fig. 3/2 Front wheel hub and assembling



1 - Shield cover
2 - Fixing pin
3 - Nuts
4 - Fitting ring
5 - Hub disc
6 - Hub body
7 - Screw fixing the cover 1
8 - Axle

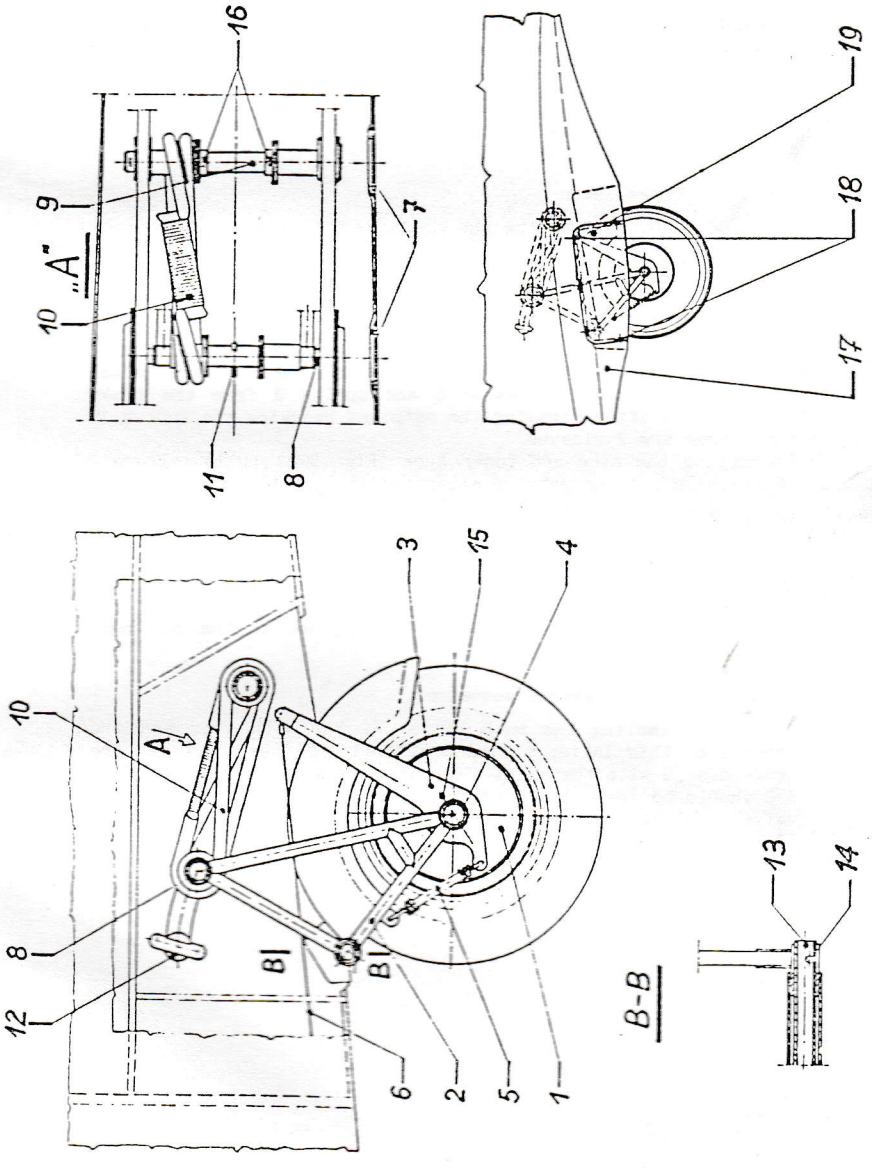
2.4 Disassembling and assembling of main wheel - see Figs 4/2 and 5/2

Legend for Fig. 4/2

1 - Wheel hub
2 - Rocker arm
3 - Brake lever
4 - Wheel axle
5 - Return spring
6 - Air brake tension member
7 - Fixed inspection window
8 - Tube
9 - Axle
10 - Shock absorber of aircraft rubber cord
11 - Split pin
12 - Rubber shock absorber
13 - Rocker arm axle
14 - Bolt
15 - Screw
16 - Split pin
17 - Undercarriage fairing
18 - Screws
19 - Inspection windows (on both fuselage sides)

Note : Fixed inspection-windows 7 are fitted in the R.H. fuselage shell and opposite to the tube 8 and axle 9.
Shell section at this location is shown in "A" view.

Fig. 4/2 Main undercarriage assembly



Legend for Fig. 5/2

1 - Connecting screw
2 - R.H. contact disc with the brake lever 7
3 - L.H. contact disc
4 - Axial play adjusting screw
5 - Pressure pad
6 - Screw
7 - Brake lever
8 - R.H. half of the hub
9 - L.H. half of the hub
10 - Friction ring

Disassembling and assembling of main wheel.

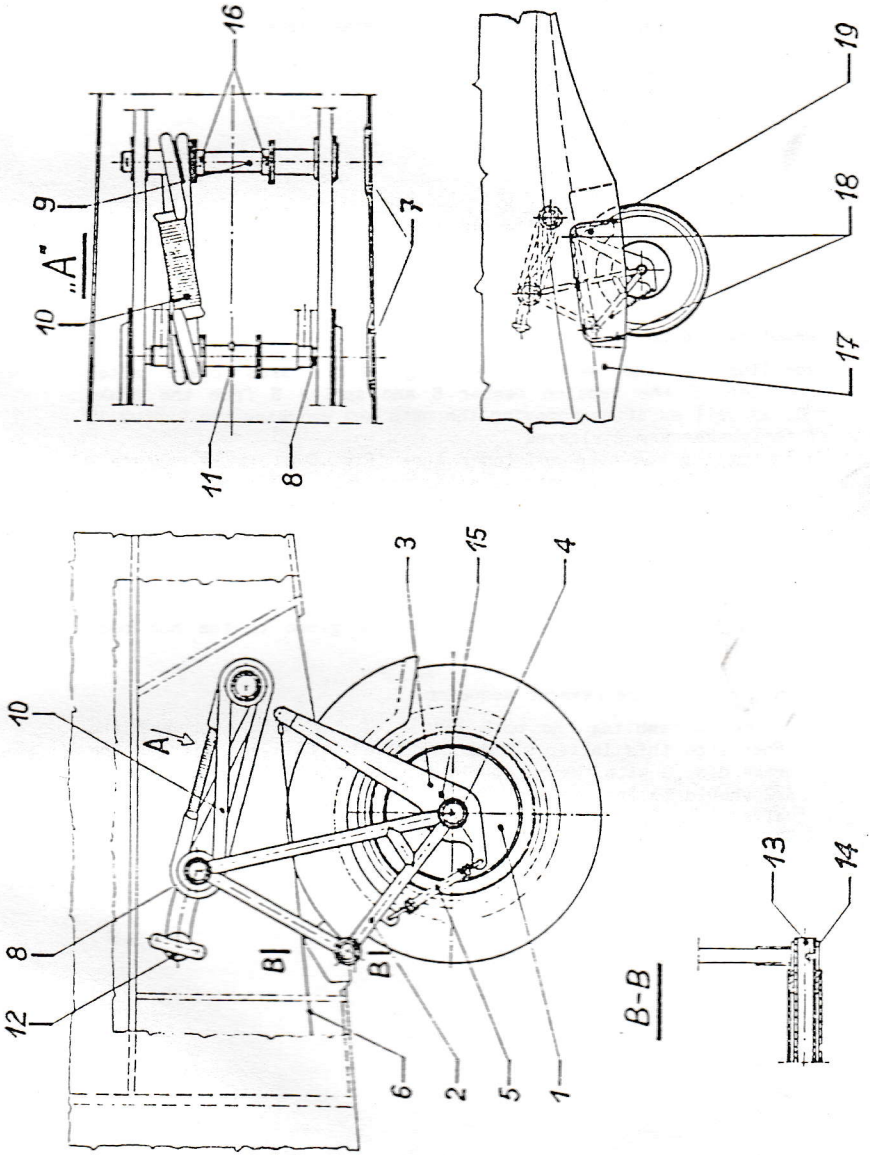
Disassembling of the main wheel (Fig. 4/2) takes place after disconnection of the tension member 6 and spring 5 from the brake lever 3, as well as after removing the nuts and knocking the screws 15 out of the rocker arm 2 sleeves.
For disassembling the tyre and inner tube (Fig. 5/2) it is necessary to remove the screws 1, accessible after removal of the press-discs 2,3.

Note : After removal of the wheel out of the rocker arm 2 - Fig. 4/2 the press-discs 2 and 3 - Fig. 5/2 become the loose elements. Disassembling of the brake lever - Fig. 5/2 follows after removing three countersunk screws.
Disassembling way of other parts can be seen in Fig. 5/2.
The frictional rings (Ferrodo) 10 are glued to the hub body with BWF 21 glue.

Assembling requires the reverse sequence.

Note : Before assembling the both halves of hub with tyre and the inner tube this latter should be filled with air a little. The brake disc 3 with the axial clearance adjustment screw 4 - Fig. 5/2 should be inserted on the hub on the side of the inner tube valve face. The working pressure in the wheel: 42.67 [lb/sqin] (3 [atm]).

Fig. 4/2 Main undercarriage assembly



Legend for Fig. 5/2

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3 - L.H. contact disc
4 - Axial play adjusting screw
5 - Pressure pad
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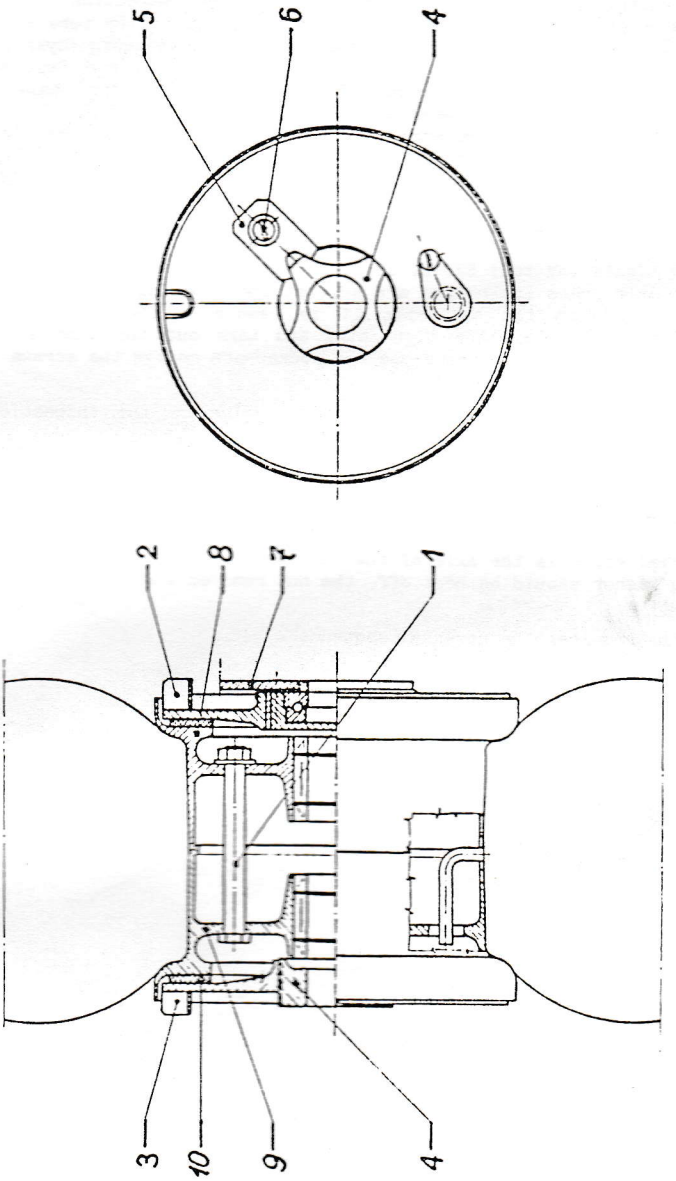
Fig. 5/2 Main wheel hub



2.5 Disassembling and assembling of main undercarriage set -

see Fig. 4/2, page 2.9

Disassembling is possible after removing the fixed inspection windows situated on the L.H. side of the fuselage, opposite to the tube 8 and axle 9. To take off the inspection window remove the lacquer layer and destroy the glue joint between the inspection window and fuselage shell. The position of inspection windows on the fuselage shell is marked with the painted borders.
Disconnect the elevator push-rod out of the rear control column. This allows it to fall down and to make access to the axle and tubes. Remove the canopy and put the fuselage into inverted position. Take off the wheel with the fender and axle. In the place of axle insert the steel rod of diameter same as this of axle (to avoid the damage of axle).
With the tightening tool SZD-CT.J3.10.00 clamping the tube and rod in place of axle press the rocker arm so,that the removing of the tube 8 is possible (when the split-pin 11 is removed). Then remove the split-pins 16, release the tightening and take out the tube 9 and shock-absorbers 10. To disassemble the rocker-arm remove the screws 14 and axle 13.

Assembling requires the reverse sequence (glue up the inspection windows).

NOTE: Tension tool SZD-CT.J3.10.00 shown on Fig. 1/4.

2.6 Disassembling and assembling of tail wheel.

The special screw is the axle of the tail wheel. For disassembling the securing washer should be bent off, the nut removed and the screw-axle taken out.

Assembling requires the reversal sequence.

2.7 Disassembling and assembling of canopy - see Fig. 6/2 page 2.15

The hinges 3 are located on the R.H. board and fixed into fittings resined in the fuselage shell.
The emergency jettisoning device is situated on the canopy frame on the R.H. side. It consists of levers 1 and 12 (at front and rear seats) connected by the push-rod 7, to assure the independent operation for both pilots.
Moreover, the levers 1 and 12 are connected by means of tension members of steel wire to the pins 2 joining the hinges 3 with fittings 13 attached to the canopy frame.
The lever 12 is also connected by tension member of steel wire 8 (housed in "bowden" tube on the canopy frame) to the pin 14 passed through spacer lugs 15 and through the winding set cable end 4 supporting the canopy in the opened position.
Above described connections of the emergency jettisoning system assure simultaneous disconnection of canopy from hinges 3 and cable 4 in consequence of shifting the levers 1 or 12 forwards.
In order to protect the emergency jettisoning system against unintended, too easy jettisoning, it was used connection of lever 12 to the canopy frame fitting with brazen mild wire 0.039 [in] (0.7 [mm]) dia.

The canopy closing set is mounted on the canopy board on the L.H. side. It comprises two holders 5 connected with a push-rod 16 and the nests 6 fixed to the fuselage shell.
Shifting of lever 5 forwards causes the opening of the canopy, closing requires the reverse shift direction.

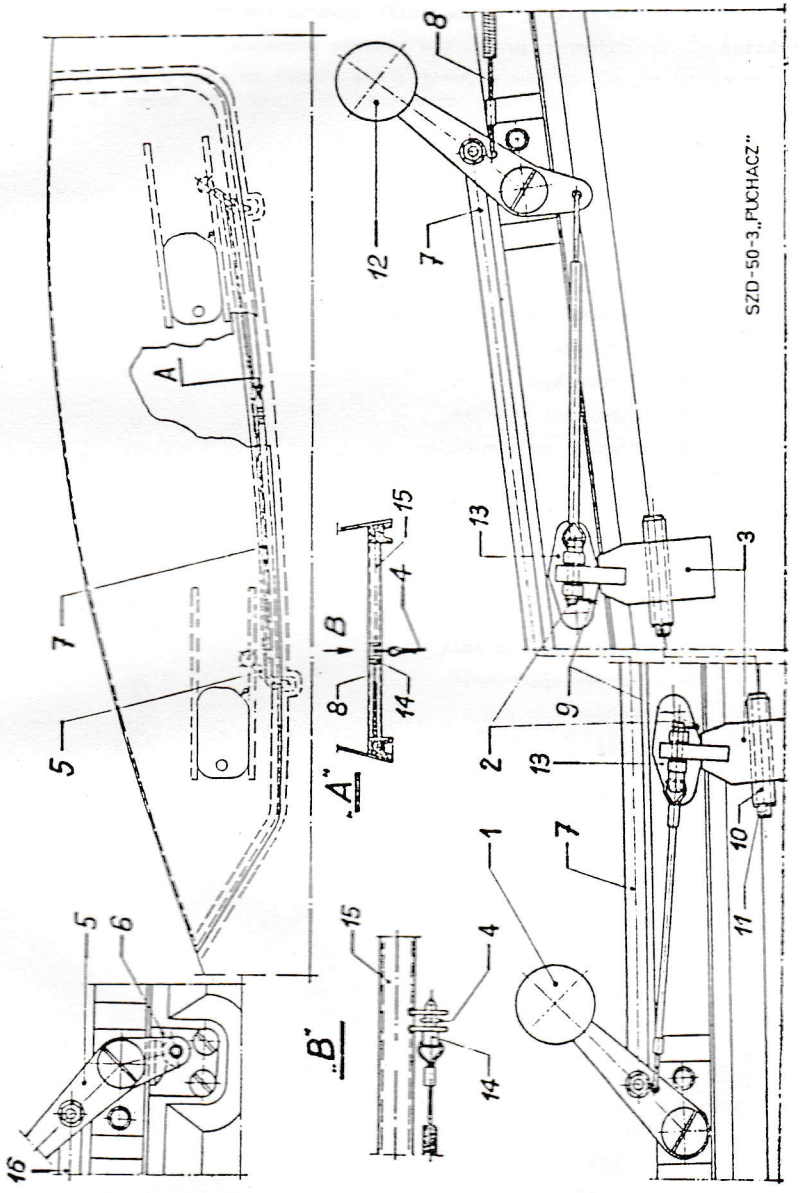
To remove the canopy out of the fuselage it is necessary to disconnect the total and static pressure ducts of the instrument panel at the rear seat (if the glider is equipped with it) out of the ends 3, 4 of the connector 17 - Fig. 11/2 resined on R.H. fuselage side. Then shift forward one of the emergency jettisoning levers (1 or 12) to disconnect the canopy out of the hinges 3 and to release the winding set cable 4.

Assembling requires the reverse sequence.

Legend for Fig. 6/2

1 - Emergency jettisoning lever
2 - Hinge pins
3 - Canopy hinges (fixed on the fuselage R.H. board)
4 - Cable of winding element (supporting canopy in the opened position)
5 - Canopy lock holder
6 - Lock nest (fixed on the fuselage L.H. board)
7 - Push-rod
8 - Tension member
9 - Soft brazen securing wire 0.0394 [in] (0.7 [mm]) dia
10 - Canopy hinge fitting
11 - Bolt
12 - Emergency jettisoning lever
13 - Fitting fixed to the canopy frame
14 - Bolt
15 - Spacer resined to the canopy frame
16 - Push-rod

Fig. 6/2 Canopy assembling



2.8 Disassembling and assembling of rudder - Fig. 7/2

For disassembling remove the self-locking nut 2 of the bolt 14 fixed in the rudder bottom fitting 11 and shift upwards the rudder.

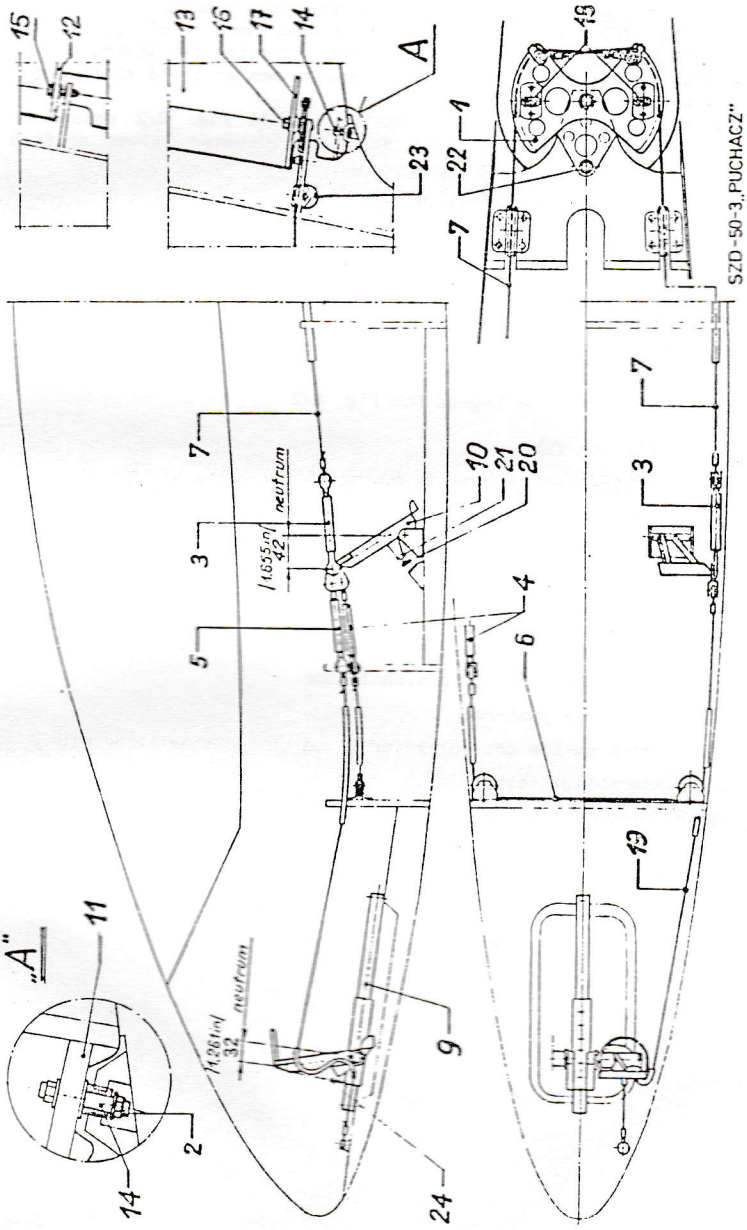
Assembling of the rudder requires the reverse sequence.

It is necessary to adjust the segment 1 and rudder in such a way, that the dog pins 16 fixed in the rudder nose 17 enter the holes 18 of segment seats 1.

Legend for Fig. 7/2

1 - Rudder control system segment
2 - Self-locking nut
3 - Turnbuckle
4 - Turnbuckle
5 - Turnbuckle
6 - Circulation cable
7 - Control system cable
9 - Pedals adjustable in flight at front seat
10 - Fixed pedals with adjustable buffer at rear seat
11 - Rudder bottom fitting
12 - Rudder upper fitting
13 - Rudder
14 - Rudder bottom bolt
15 - Rudder upper bolt
16 - Rudder dog pin
17 - Nose
18 - Longitudinal holes in the nests of dog pins
19 - Control system cable
20 - Adjusting screw
21 - Locknut
22 - Segment buffer
23 - Roller
24 - Spring

Fig. 7/2 Rudder control system



2.9 Disassembling and assembling of elevator - Fig. 2/2 page 2.5, and Fig. 8/2

For disassembling the elevator disconnect the trimming tabs control system 1 Fig. 8/2. It is necessary to release the nut of bolt fixing the control tension member 2 to the both trimming tab levers 3 (see A-A section Fig. 8/2), to enable the tension member to be shifted out during removal of elevator.
Next on both the elevators the split pins 11 Fig. 2/2 should be removed, the rings 12 taken out and both elevator halves shifted "outside".

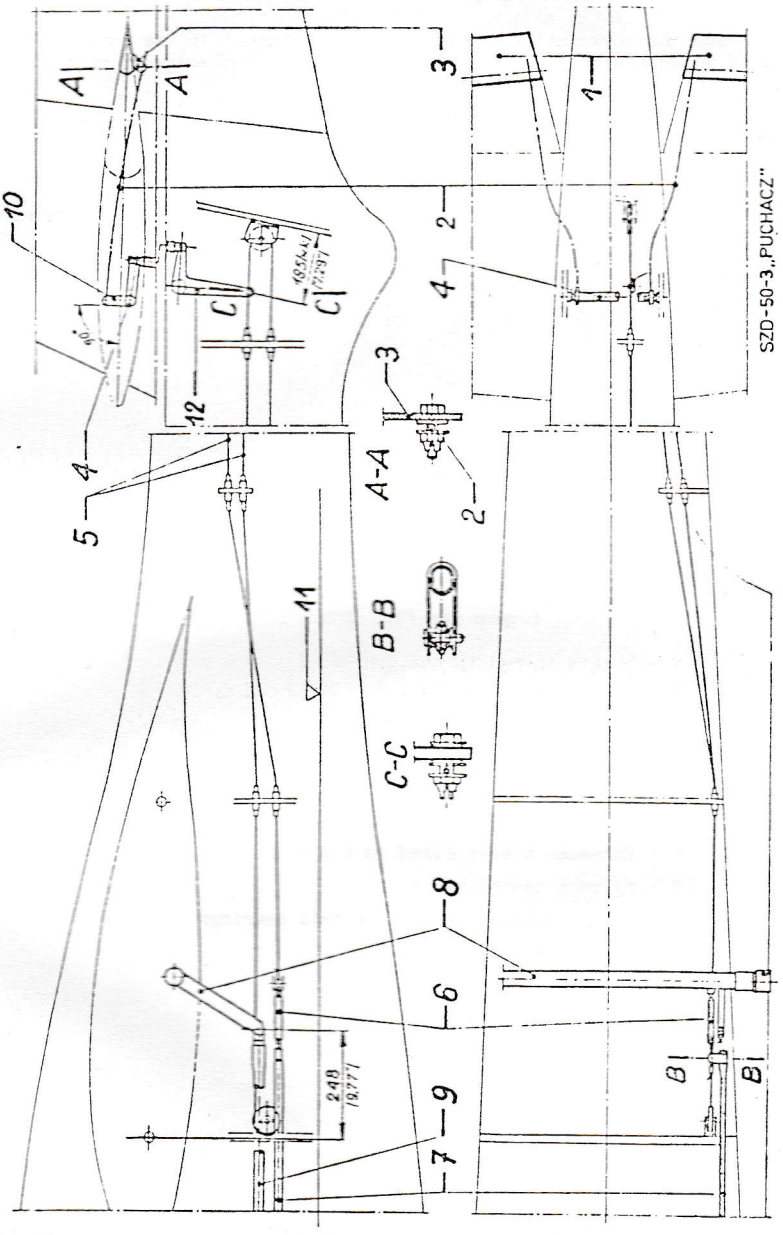
Assembling requires the reverse sequence.

After each assembling or disassembling of the elevator, the trimming-tab should be adjusted see Fig. 1/6).

Legend for Fig. 8/2

1 - Trimming tab
2 - Control system tension member of the trimming tab
3 - Trimming tab control lever
4 - Trimming tab torsional control tube
5 - Circulation cable
6 - Turnbuckle
7 - Trimming tab control push-rod
8 - Air brake control torsional tube
9 - Air brake push-rod
10 - Trimming-tab control lever fixed on the stabilizer rib
11 - Assembling lever line
12 - Intermediate lever fixed in the fin

Fig. 8/2 Control system of trimming-tab and air brake in fuselage



2.10 Disassembling and assembling of aileron - Fig. 9/2

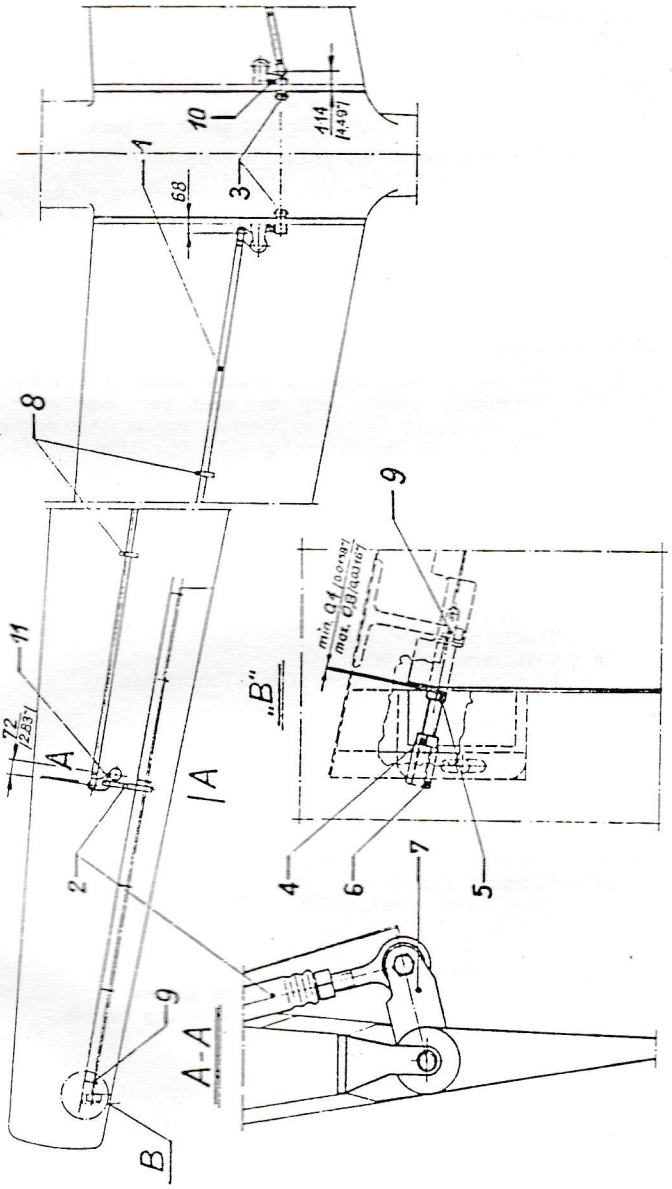
The aileron can be disassembled when the push-rod 2 end has been disconnected out of the aileron control lever 7.
Then release the lock-nut 4 and screw up the screw 5 in the threaded sleeve 6 to such a depth that permits to shift the aileron out of the hinges towards the wing end.

Assembling requires the reverse sequence.

Legend for Fig. 9/2

1 - Long push-rod in the L.H. wing
2 - Push-rod
3 - Aileron control pivots with the dogs
4 - Locknut
5 - Adjusting screw of the aileron fitting longitudinal play
6 - Threaded sleeve fixed in the wing
7 - Aileron control lever
8 - Push-rod pass-by with the ball bearings
9 - Aileron hinge
10 - Push-rod
11 - Intermediate lever

Fig. 9/2 Aileron control system in wing



2.11 Disassembling and assembling of instrument panel at front seat - Fig. 10/2

Disassembling sequence is the following :

a) Remove the cover 2 of instrument panel 1.

It is necessary to release latch locks 3 located on both sides at the bottom of cover on the cockpit boards.
Then slightly raise up the cover front and shift it back.

b) Disconnect the static 4 and total pressure 5 ducts.

c) Disconnect the air-conditioning control tension member 6 out of the pass-by 9, by means of releasing the nut 7, what permits to draw freely the tension member out of the lever hole when removing the instrument panel (see A-A section).

d) Finally take off four knurled nuts 8 and remove the panel out of the fittings.

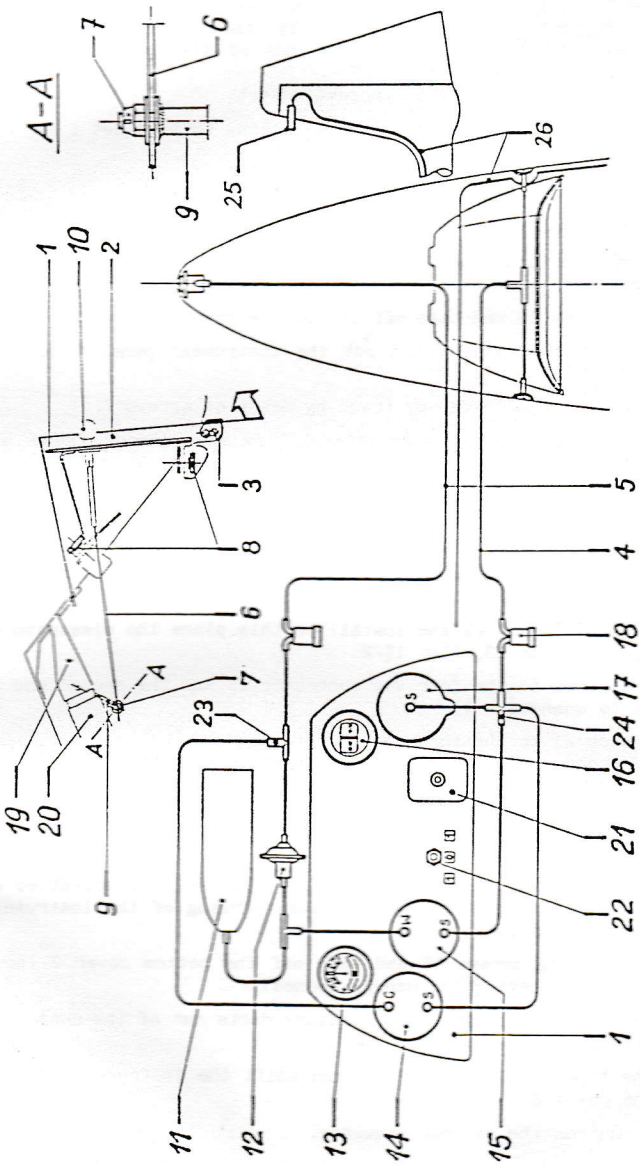
Assembling requires the reverse sequence.

The duct 26 of the additional total pressure head (K-1 tube) 25 passing to the instrument panel, may be used for supplying the additional instruments only. It is not allowed to connect the airspeed indicator 14, variometer 15 and altimeter 17 into this additional total pressure system.

Legend for Fig. 10/2

1 - Instrument panel
2 - Instrument panel cover
3 - Latch lock
4 - Static pressure duct
5 - Total pressure duct
6 - Air-conditioning control tension member
7 - Nut
8 - Knurled nut
9 - Channel diaphragm lever
10 - Holder of the air-conditioning diaphragm tension member
11 - Bottle
12 - Compensator of the total energy variometer
13 - Electric turn indicator
14 - Airspeed indicator
15 - Total energy variometer
16 - Compass
17 - Altimeter
18 - Drainage unit
19 - Orifice of the air-conditioning system
20 - Flexible duct of the air-conditioning system
22 - Turn indicator switch
23 - Three-way connector
24 - Four-way connector
25 - K-1 tube
26 - K-1 tube duct

Fig. 10/2 Board instrument panel installation at front seat



2.12 Assembling and disassembling of instrument panel at rear seat - Fig.11/2

The instrument panel installation at the rear seat belongs to the additional equipment and is supplied by the producer as a set including the instrument panel 1 with ends of static 3 and total 4 pressure ducts and the covers 6 and 2.
These elements have a form of the assembled set.

Moreover, the following separate elements belong to this set :

- four-way connector 19
- static pressure duct 20
- total pressure duct 21

Assembling of the instrument panel into the glider requires the following sequence :

a) Remove the screw 18 and take off the bottom cover 2.

b) Remove the knurled nuts 5 and put the instrument panel 1 out the cover 6.

c) Fix the cover 6 to the canopy frame by means of screws 7.

Note : Four threaded nests for screws 7 in the canopy frame are provided.

d) Insert the instrument panel 1 into cover 6 and fix it by means of nuts 5.

e) Disconnect the three way connector 23 Fig. 10/2 out of static pressure ducts when installing on this place the four-way connector 19, Fig. 11/2.

f) Cut the duct 5 Fig. 10/2 and install on this place the disassembled three-way connector 23, Fig. 11/2.

g) Join the duct 20 to the four way connector 19 and the second end of this duct to connector 17.

h) Join the duct 21 to the three-way connector 22.
Join the second end of this duct to connector ends 17.

i) Join the instrument panel ends 3, 4 to the connector ends 17.

Disassembling of instrument panel installation at the rear seat requires the reverse sequence.

If the instrument panel installation at the rear seat is assembled on the glider as the integral equipment, disassembling of the instrument panel must be made as follows :

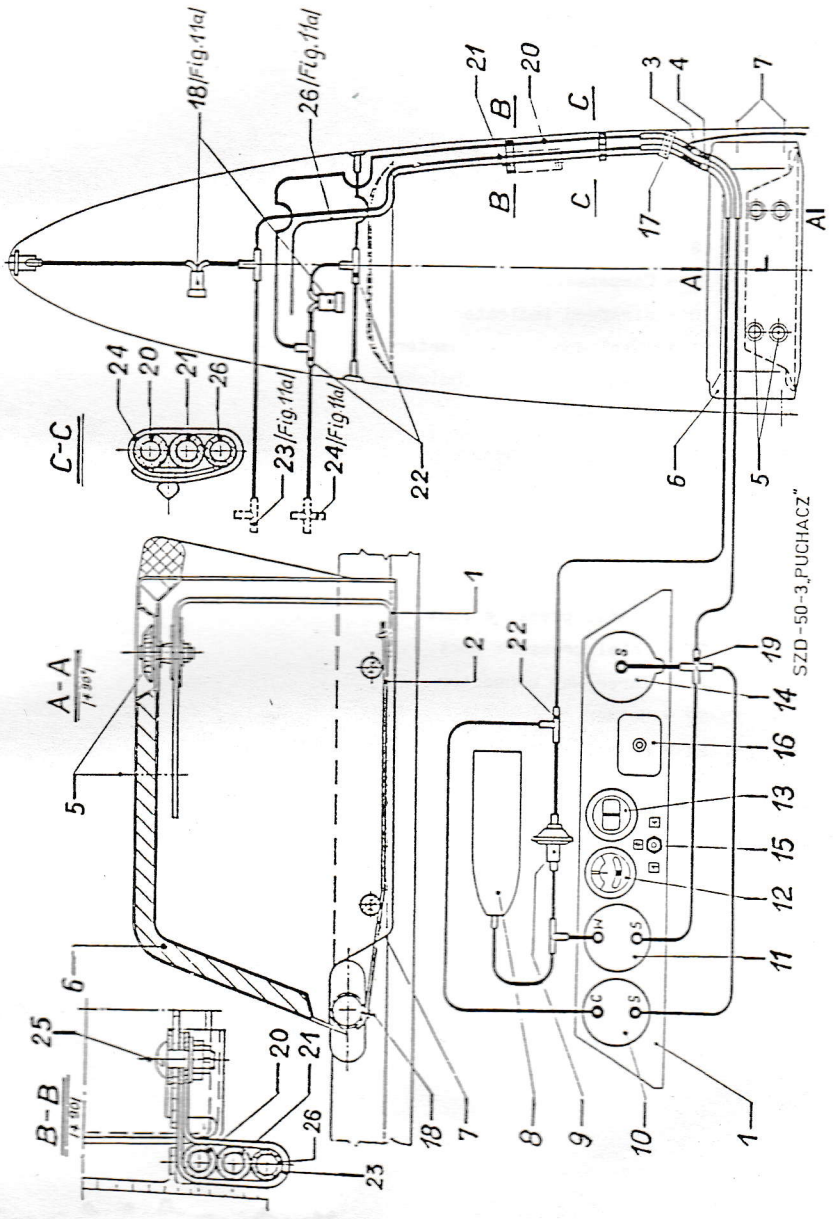
a) Remove the fixing screws 18 and take off the bottom cover 2 (easy accessible after having the canopy opened).

b) Disconnect the static and total pressure ducts out of the connector ends 17 fixed in the fuselage.

c) Remove the tapered knurled nut 5 and shift the instrument panel 1 out of the cover 6.

Assembling requires the reverse sequence.

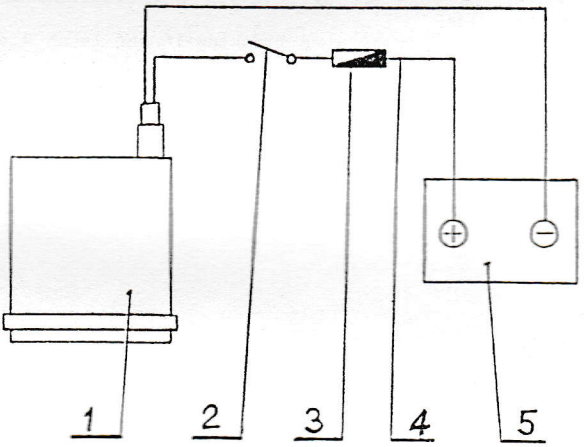
Fig. 11/2 Board instrument panel installation at rear seat



Legend for Fig. 11/2

1 - Instrument panel
2 - Bottom cover
3 - Static pressure duct end
4 - Total pressure duct end
5 - Knurled nuts
6 - Instrument panel cover
7 - Screws fixing the shield 6 to the canopy frame
8 - Bottle
9 - Compensator of total energy variometer
10 - Airspeed indicator
11 - Total energy variometer
12 - Electrical turn indicator
13 - Compass
14 - Altimeter
15 - Turn indicator switch
17 - Pressure duct connector
18 - Screw
19 - Four-way connector
20 - Static pressure duct
21 - Total pressure duct
22 - Three-way connector
23 - Holder
24 - Flexible band with clamp
25 - Screw fixing the loudspeaker bracket to seat pan at the front seat

Fig. 12/2 Electric turn indicator installation



Legend for Fig. 12/2

1 - EZS-4 turn indicator (of PZL production)
2 - Switch
3 - Fuse 0.5 to 0.7 [A]
4 - Insulated spliced copper wire 1x0.75
5 - 12V battery (e.g. PANASONIC Vds-6.5 [Ah])

2.13 Removing and assembling of rear seat pan - Fig. 13/2

To remove the seat 1 push the pilot's belts through their slots in the seat so to rest them on the cockpit bottom, untie and release the cord of control stick sack and through the inspection hole 2 located under wing on the fuselage L.H/ side, remove the seat pan fixing tube 3.
To remove the mounting tube it should be dissecured by means of pressing the lever 9 in the direction marked with an arrow and holding it for a moment in this position.
Then the tube accessible through the opening of seat pan rest should be removed out of the fuselage by rotation and simultaneous axial pressure towards outside.
The inspection hole cover opens when pressing-in the latch 4 visible in the L.H. cavity of the wing-fuselage fairing at the cockpit side.
Then shift the seat pan forwards to allow the fixing tube 5 to reach place "W" of guides 7.
In this positions the seat pan slightly turned and shifted more forwards allows the tube 5 to go out of the guides 7.
Then the pan can be easy removed out of the fuselage.

Assembling requires the reverse sequence.

Legend for Fig. 13/2

1 - Seat pan

2 - Inspection hole

3 - Fitting tube

4 - Inspection hole cover lock

5 - Front tube

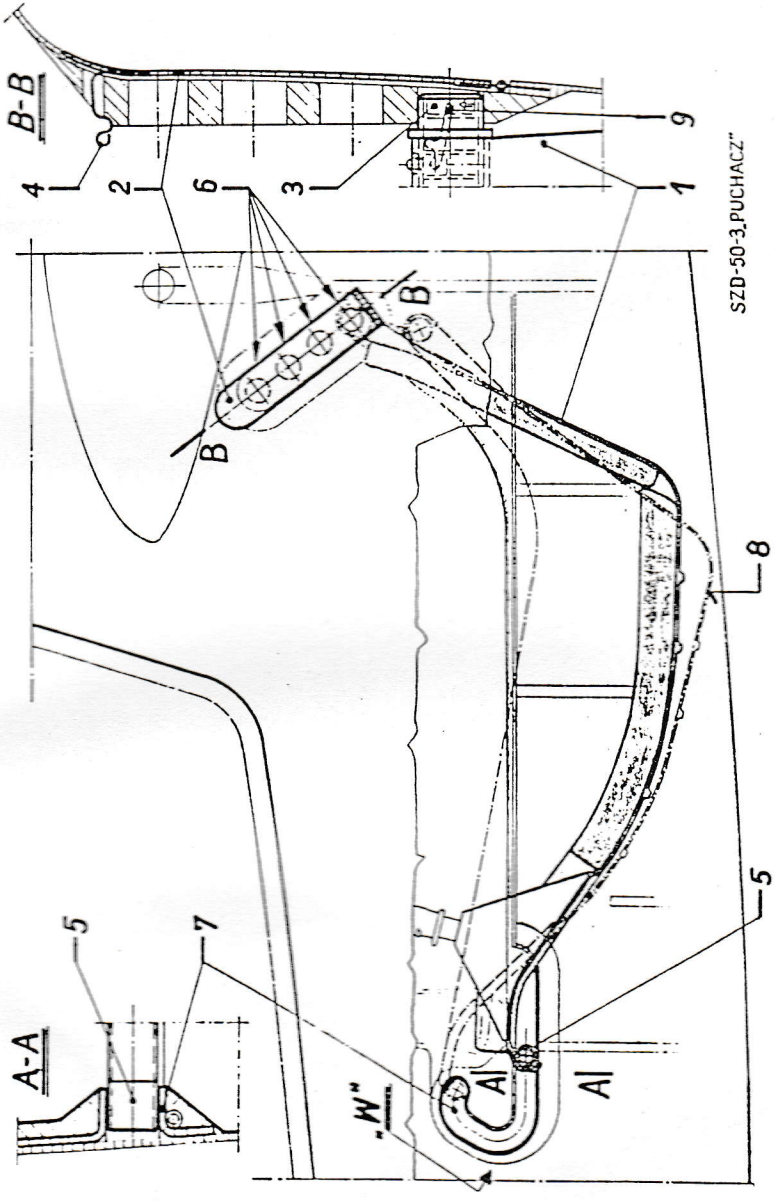
6 - Adjustment holes enabling to adjust the seat pan position

7 - Guides

8 - Seat pan position giving a free access into the luggage compartment

9 - Locking mechanism lever

Fig. 13/2 Rear seat pan assembly



SECTION 3

3. TECHNICAL PARAMETERS, TOLERANCES AND ADJUSTMENT

3.1 Technical parameters

3.1.1 Pressure in undercarriage wheels

Pressure in undercarriage wheels :

- Front wheel : 0.15 [MPa] (1.2 [atm])
- Main wheel : 0.30 [MPa] (3.0 [atm])
- Tail wheel : 0.15 [MPa] (1.5 [atm])

3.1.2 Tension in rudder circulating cable

(Fig. 7/2, page 2.17 - item 6)

Tension should be 44±4 [lb] (20±2 [daN]).

3.1.3 Tension in trimming tab control cable

(Fig. 8/2, page 2.19 - item 5)

Tension should be 22±2 [lb] (10±1 [daN]).

3.1.4 Drag forces of controls in cockpit

Forces measured on the center of handle (pedal foot) in neutral location :

Aileron control	2.2 [lb]	(1.0 [daN]).
Elevator control	7.7 [lb]	(3.5 [daN]) - in pulling.
Rudder control	17.6 [lb]	(8.0 [daN]) - on upper foot of pedal.
Air brake control	44 [lb]	(20 [daN]).
Trimming-tab control	33 [lb]	(15 [daN]).
Wheel brake control	44 [lb]	(20 [daN]).
Canopy emergency jettison lever at front and rear seat	44 [lb]	(20 [daN]).
Canopy lock lever lever at front and rear seat	22 [lb]	(10 [daN]).
Allowed hook release force without tension of towing cable at front and rear seat	22 [lb]	(10 [daN]).

3.2 Allowable plays and tolerances in assembling joints and control systems of glider

3.2.1 Maximum allowable play on the control stick

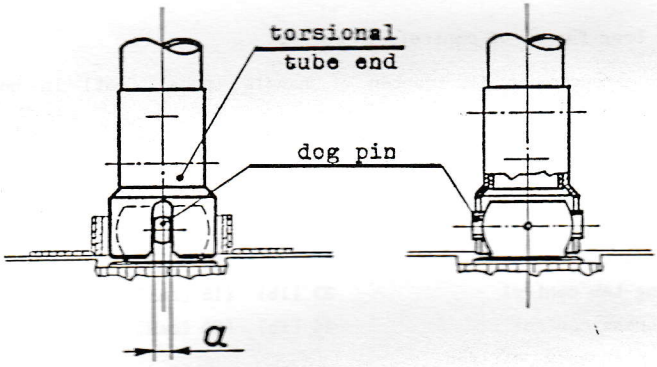
Maximum allowable play on the control stick measured on the stick end for control surfaces fixed is :

- for elevator control ±0.08 [in] (±2 [mm]),
- for aileron ±0.08 [in] (±2 [mm]).

In case of discovering that the ball bearing causes the play in the control system, it should be replaced together with the part in which it is fixed.

Plays on dog connections of torque tubes in aileron, air brake, elevator and trimming-tab control.

Fig. 1/3 Scheme of dog connection



In case a play appears on the connections of dog torsional tube of aileron, air brake, elevator and trimming tab control systems the dog pins shall be replaced and eventually the gaps in ends torsional tubes shall be grinded for the maximum dimensions as follows :

a) In ends of aileron control torsional tube item 5 (Fig. 1/2, page 2.3) and of air brake item 6 (Fig. 1/2),
$a = 0.256^{+0.002}$ [in] $(6.5^{+0.05}$ [mm]).
On dog pins item 14 (Fig. 1/2), $a = 0.256^{+0.0016}$ [in] $(6.5^{+0.04}$ [mm]).

b) In ends of elevators control item 5, (Fig. 2/2, page 2.5),
$a = 0.256^{+0.002}$ [in] $(6.5^{+0.05}$ [mm]).
On dog pins item 21 (Fig. 2/2), $a = 0.256^{+0.0016}$ [in] $(6.5^{+0.04}$ [mm]).

c) In end of trimming-tab control torsional item 7, (Fig. 2/2),
$a = 0.173^{+0.0016}$ [in] $(4.4^{+0.04}$ [mm]).
On dog pins item 20 (Fig. 2/2), $a = 0.173^{+0.0016}$ [in] $(4.4^{+0.04}$ [mm]).

3.2.2 Maximum permissible plays on connections of main fittings of glider

Permissible plays between the shaft and the hole, or between the ball and the nest in wing-to-wing or wing-tO-fuselage connection are :

- for diameters up to 0.709 [in] (18 [mm]) including 0.004 [in] (0.1 [mm]),
- for diameters greater than 0.709 [in] (18 [mm]) 0.006 [in] (0.15[mm]).

3.2.3 Permissible play on stabilizer fitting

Permissible play on stabilizer fitting measured at the end of tailplane span is 0.158 [in] (4 [mm]) - check the both panels.

This play is perceptible when moving quickly the stabilizer tip up and down.

Note : Do not confuse the play on fittings with the elastic deflections of stabilizer and fin.

3.2.4 Maximum permissible radial play in elevator hinges

ranges :

- for hinges diameter
of ϕ 0.236 [in] (6 [mm]) : 0.004 [in] (0.10 [mm])
- for inboard hinges diameter
of ϕ 1.261 [in] (32 [mm]) : 0.006 [in] (0.15 [mm])

3.2.5 Maximum permissible radial play in rudder hinges

ranges : 0.004 [in] (0.1 [mm]).

3.2.6 Maximum permissible radial play in aileron hinges

ranges : 0.004 [in] (0.1 [mm]).

3.2.7 Allowable play (gap size) in wing-to-fuselage connection

- Fig. 2/3, page 3.5

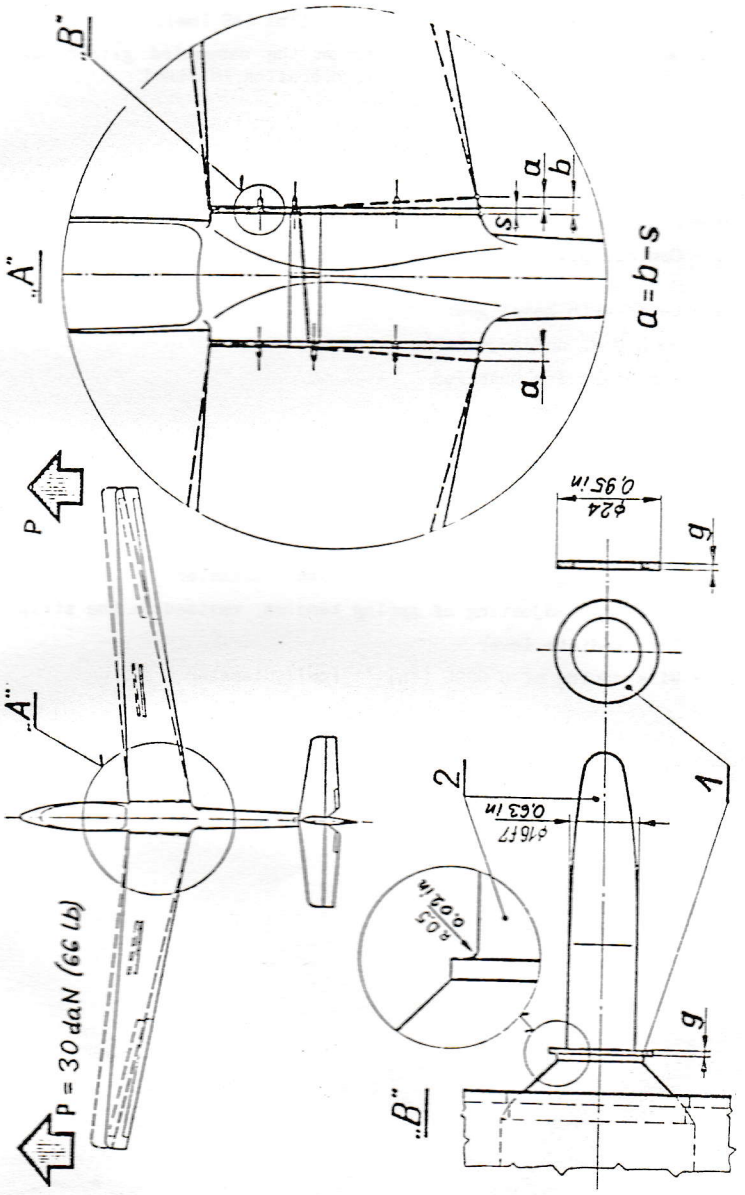
When the wing tips are pulled forwards (in horizontal plane) the characteristic wing elasticity can be impressed and the gap between wing and fuselage increases. Maximum in operation safe play "a" measured on trailing edge of R.H. or L.H. wing is 0.059 [in] (15 [mm]). This play should be measured between the wing trailing edge and fuselage fairing trailing edge when the wing tip is loaded with the force of 66.1 [lb] (30 [daN]) in horizontal plane (see Fig. 2/3) - then a = b - s.
For unloaded wings a = 0, b = s. It is recommended that the play "s" ranging 0.032 to 0.047 [in] (8 to 12 [mm]) should be corrected to value of 0.015 to 0.020 [in] (4 to 5 [mm]) using the tightly inserted steel washers 1 on the pins 2 of front fuselage main frame. The washer should be made by the user himself using the steel 20 or of similar properties. The thickness "g" of the washer should be selected on the base of measured play.

Legend for Fig. 2/3

1 - Adjusting washer

2 - Front main frame fitting pin (the pin of the front fuselage fitting tube)

Fig. 2/3 Allowable gap size in wing-to-fuselage connection



3.2.8 Allowable play - travel of upper air brake plate in vertical direction - Fig. 3/3

The travel "h" should not exceed 1.77 [in] (45 [mm]),

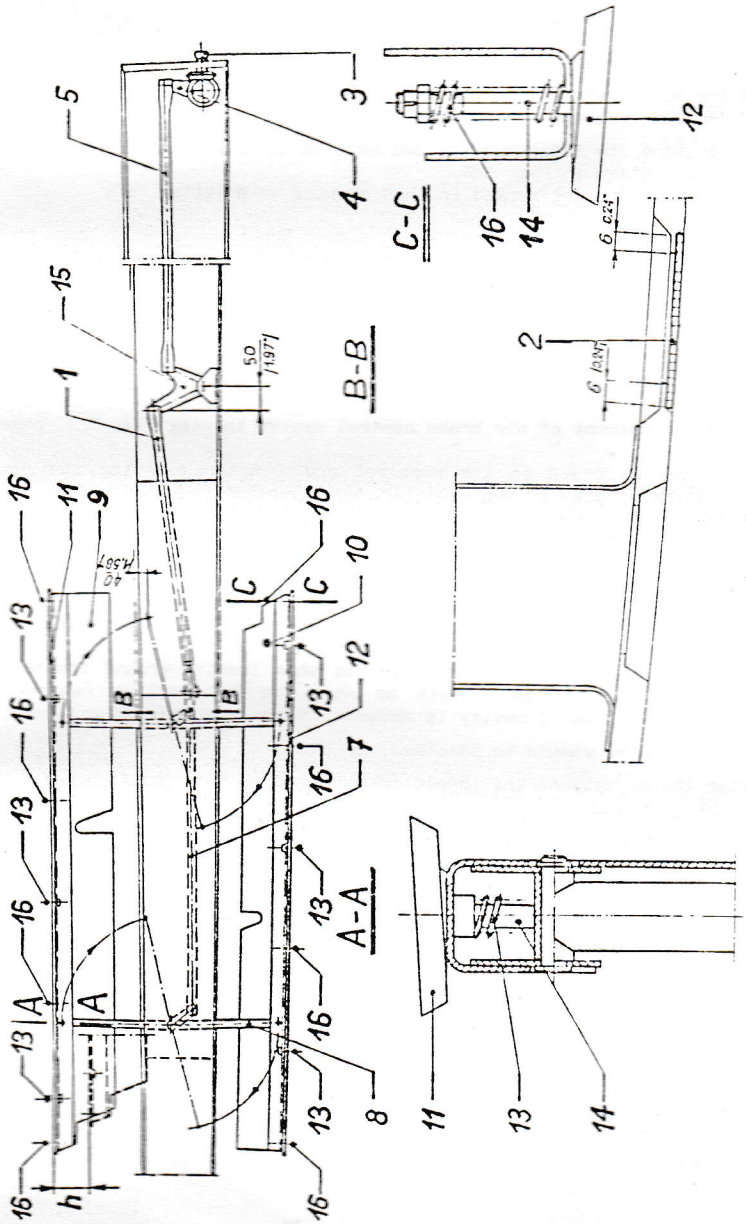
$$h_{max} = 1.77 \text{ [in]} (45 \text{ [mm]}).$$

This movement should be measured on the assembled glider when the cockpit control lever of air brake operation is fixed.

Legend for Fig. 3/3

1 - Adjustable push-rod
2 - Fixed inspection hole
3 - Control pivot of the air brake control system with dog and bevel gear
4 - Lever with bevel gear
5 - Push-rod, not adjustable
7 - Air brake arm push-rod
8 - Air brake arm
9 - Upper air brake plate
10 - Lower air brake plate
11 - Upper cap
12 - Lower cap
13 - Wire spring of 0.032 [in] (0.8 [mm]) diameter
14 - Screw for adjusting of spring tension, resined in the strip
15 - Intermediate lever
16 - Wire spring of 0.0395 [in] (1 [mm]) diameter

Fig. 3/3 Air brake control in wing



3.3 Adjustment of control systems and glider sets

3.3.1 General notes

At the adjustment of the turnbuckles the threads must not be visible.

At the adjustment of the push-rod ends it should be checked that the inspection openings are closed by the thread.

Deflections and tolerances of deflections of control surfaces and air brake are given in Fig. 1/6.
Leveling points are marked in this drawing with letter "S".

3.3.2 Adjustment of aileron control system in wing Fig. 9/2, page 2.21

Is to be performed on the push-rod end 2, and eventually on the push-rod end 1 through the hole in the root rib.

Note : On the R.H. wing it is necessary to disassemble the push-rod 3.

3.3.3 Adjustment of air brake control system in wing Fig. 3/3, page 3.7

Is to be performed on the push-rod end 1 after removing the fixed inspection-window 2, when the lacquer layer has been removed and the glue joint between the inspection-window and wing covering destroyed.

The position of the inspection-window is marked with the border painted on the bottom wing covering.

On the wing not yet subjected to the adjustment of brake control system, the inspection-window 2 is mounted in the cavity without an accessing hole to the push-rod 1 end.
In such a case the hole should be cut when leaving-around the border of 0.236 [in] (6 [mm]) width as shown on B-B section (where the inspection-window 2 cavity is shown with the hole already cut out).

The hole edges should be smoothed.

After the adjustment the inspection-window shall be glued up again.

3.3.4 Adjustment of aileron control system in fuselage

Fig. 4/3, page 3.11

Is carried out :

- on ends of push-rod 1, 2 11 and 24 well as on end of push-rod 3,
- on front 8 and rear 9 control column having the buffers limiting the deflections of aileron.

The limit stick travel to left is obtained by means of the bolts with locknuts 22, the travel to right is limited by means of the bolt head 23 (with washers) fixing the control column and by means of the bolt head 25 (with washers) fixing the front control column.

Adjustment of this buffers depends on the amount of washers.

Note : The adjustment shall be carried on the rigged glider, with ailerons in the neutral position.

3.3.5 Adjustment of elevator control system in fuselage

Fig. 4/3, page 3.11

Is carried out :

- on ends of push-rod 4 and 5,
- on ends of push-rod 6 and 7.

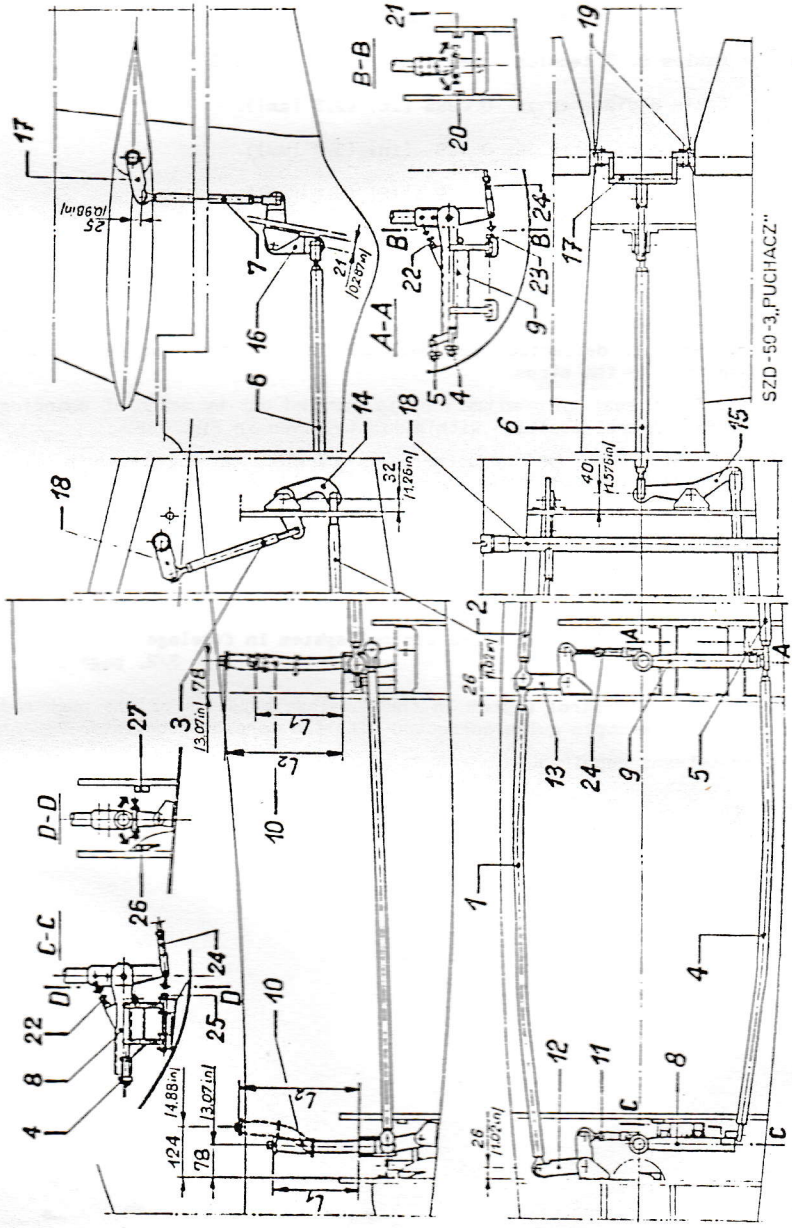
The adjustment of elevator deflections is carried out by means of screws with locknuts located on the control columns at the front and rear seat (see sections -B and D-D).

Movement limitations are obtained by means of buffers 20, 21, 26 and 27.

Legend for Fig. 4/3

1 - Push-rod of the aileron system at front seat
2 - Push-rod of the aileron system at rear seat
3 - Push-rod of the aileron system
4 - Push-rod of the elevator control system at front seat
5 - Push-rod of the elevator control system at rear seat
6 - Push-rod of the elevator control system
7 - Push-rod of the elevator control system
8 - Front control column
9 - Rear control column
10 - Control stick
11 - Special push-rod
12 - Lever of the aileron control system at front seat
13 - Lever of the aileron control system at rear seat
14 - Lever of the aileron control system
15 - Lever of the elevator control system
16 - Lever of the elevator control system
17 - Lever of the elevator control system with dogs
18 - Torsional tube of the aileron control system
19 - Ends of the elevator control system
20 - Front buffer of the control column at rear seat
21 - Rear buffer of the control column at rear seat
22 - L.H. buffer
23 - R.H. buffer of the rear control column
24 - Special push-rod
25 - R.H. buffer of the front control column
26 - Front buffer of the control column at front seat
27 - Rear buffer of the control column at rear seat

Fig. 4/3 Control system of aileron and elevator in fuselage



3.3.6 Adjustment of rudder control system cable tension

Fig. 7/2, page 2.17

Is carried out by means of the turnbuckles 3, 4, 5.

Cables 6, 7 tension - see item 3.1.2, page 3.2.

Cable 6 diameter is 0.0985 [in] (2.5 [mm]).

Cable 7 diameter is 0.119 [in] (3.0 [mm]).

Cable 19 diameter is 0.119 [in] (3.0 [mm]).

Pedals at the front seat have the fixed stops of rudder deflection with rubber straps.

Pedals at the rear seat have adjusted stops.

The adjustment of rudder deflections is carried out at the pedal stops. At rudder full deflection the both pedals, at front and rear seats, should rest on the stops.

At the front seat this adjustment is carried out by means of changing the pedal neutral position within limits given in Fig. 7/2.

At the rear seat the adjustment is carried out by means of the adjusting screw 20 with the locknut 21.

The rudder has the fixed buffer 22.

For the full travel of L.H. or R.H. pedal the gap between buffer 22 and segment should be minimum 0.02 [in] (0.5 [mm]).

3.3.7 Adjustment of air brake control system in fuselage

Fig. 8/2, page 2.19

The air brake control system in the fuselage consists of the push-rod 9 with a telescopic guide connected with the torsion tube lever 8.

No adjustment required.

3.3.8 Adjustment of trimming tab control system Fig. 8/2, page 2.19

The adjustment of cable tension and thus that of friction in the control system is carried out by means of the turnbuckle 6.

The cable tension should be adjusted so, that the trimming-tab control system becomes self-locking i.e. the controlling hand-grip in the cockpit should not move when the force of 4.4 [lb] (2 [daN]) directed up and down is applied simultaneously on the trailing edge of each tab.
The adjustment of the trimming tab1 is carried out on the disassembled tailplane with the tab in the neutral position and the lever 10 at angle of 90^{o} to the tailplane chord, as shown in Fig. 8/2.

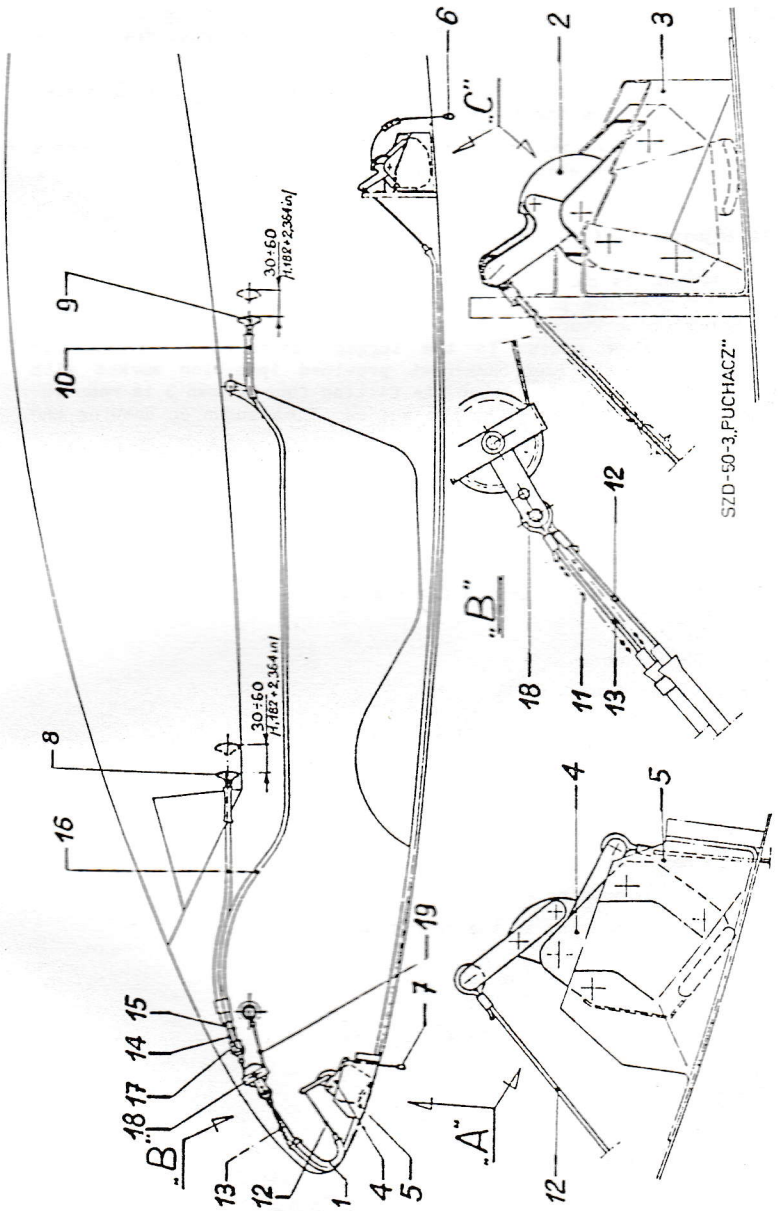
3.3.9 Adjustment of hook control system Fig. 5/3, page 3.15

The glider is equipped with the front and bottom hooks both of SZD-III A-56 or TOST type. The cable of SZD-III A-56 control system requires no adjustment. When replacing the cables 12, 13 pay attention that the idle movement of hook releasing grip is within the limits 1.8 to 2.36 [in] (30 to 60 [mm]).
When both the hooks of TOST type (or SZD-III A-56 front hook and TOST bottom one) have been installed, the adjustment shall be performed on the turnbuckle connected to the bottom hook lever, shown in Fig. 5/3 with dotted line.

Legend for Fig. 5/3

1 - Cable guide
2 - SZD-III A-56 bottom hook
3 - Glass-fibre housing of the bottom hook
4 - SZD-III A-56 front hook
5 - Glass-fibre housing of the front hook
6 - Tension member for locking the bottom hook
7 - Tension member for locking the front hook
8 - Releasing knob at the front seat
9 - Releasing knob at the rear seat
10 - Flexible fitting of hook releasing knob at the rear seat
11 - Spring
12 - Front hook cable
13 - Bottom hook cable
14 - Cable
15 - Cable
16 - Cable housing
17 - Connector
18 - Roller
19 - Cable

Fig. 5/3 Towing hooks control



3.3.10 Adjustment of wheel brake Fig. 6/3, and Fig. 5/2, page 2.11

The cable wheel brake control system requires no adjustment. The adjustment of wheel brake, Fig. 5/2 depends on removing the wheel axial play by means of the adjusting screw 4 in the brake disc at the fuselage R.H. side.

To remove the play release the screw 6 and release the pressing member 5 than turn the adjusting screw 4.

The adjusting screw shall be locked again. The axial play influences on the change of the wheel brake lever movement angle.

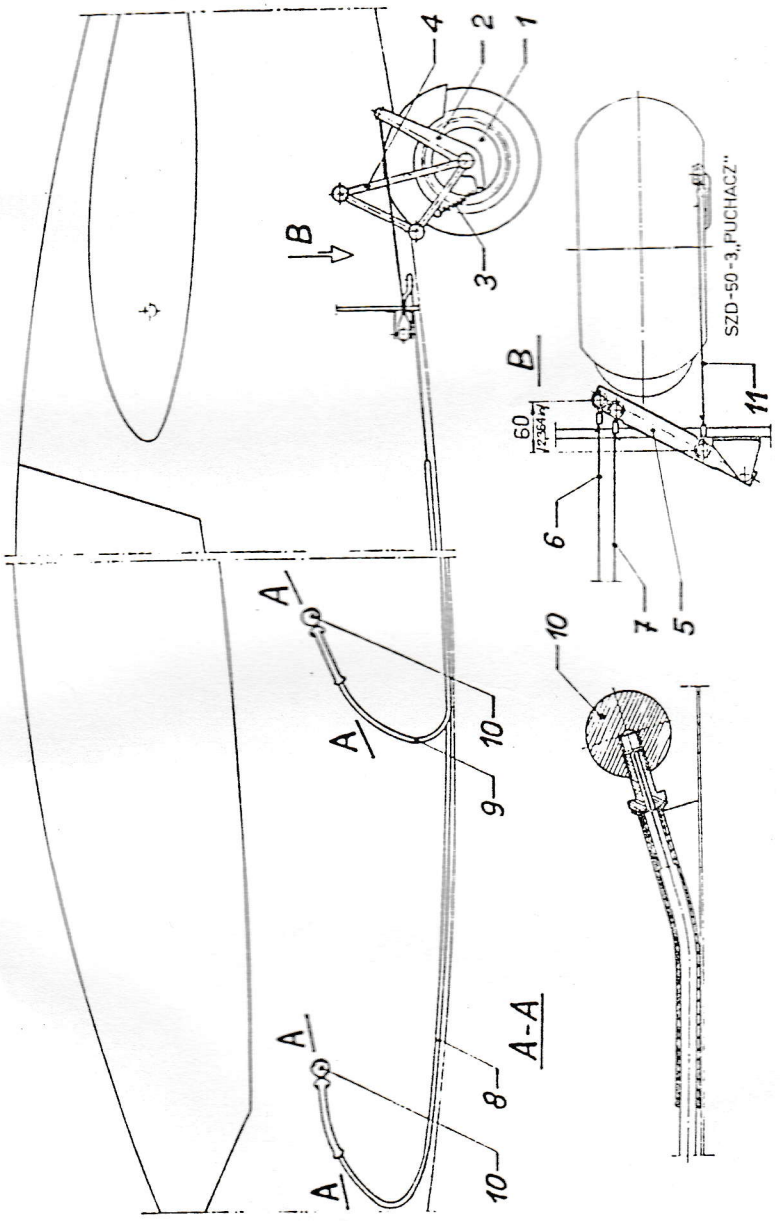
3.3.11 Adjustment of rear seat pan position Fig. 13/2, page 2.29

This adjustment is carried out by inserting the pan fixing tube 3 in one of four possible positions, when shifting simultaneously the seat pan forwards or backwards.
To allow the free access to the luggage compartment the maximum folding down of the pan back-rest provided (position marked with figure 8). This is obtained when the fitting tube of pan 3 is removed. This position is controlled by the guides 7 as shown on drawing and retained automatically.

Legend for Fig. 6/3

1 - Main wheel hub
2 - Wheel brake lever
3 - Lever return spring
4 - Rocker arm
5 - Lever
6 - Brake cable at the front seat
7 - Brake cable at the rear seat
8 - Brake cable housing at the front seat
9 - Brake cable housing at the rear seat
10 - Brake operating knob

Fig. 6/3 Wheel brake control



SECTION 4

4. LIST OF SPECIAL TOOLS

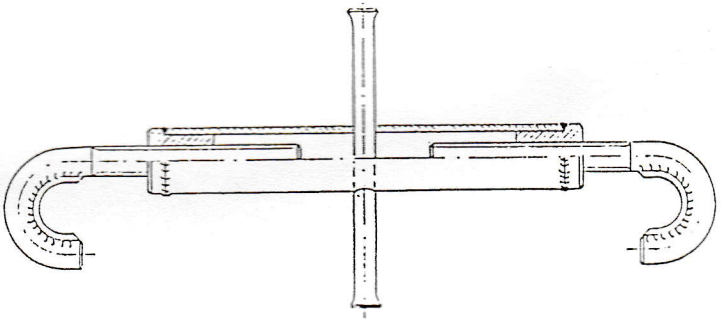
4.1 Assembling lever - Cat. No A6-6

This lever is shown on Fig. 1/2, page 2.3 - item 9 (see also Spar Parts Catalogue of SZD-50-3 "PUCHACZ" glider).

4.2 Tension device SZD-CT J3.10.00 Fig. 1/4

Used for assembling and disassembling of undercarriage set (see also p. 2.5, page 2.9).

Fig. 1/4 Tension device SZD-CT J3.10.00



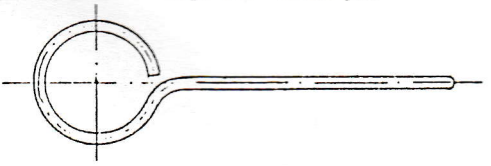
4.3 End for filling the tube with air Fig. 2/4

Fig. 2/4 End for filling the tube with air

4.4 Cross-pin Fig. 3/4

Cross-pin is used for assembling or disassembling of tailplane. It is inserted into hole, Fig. 2/2 to rotate the securing bolt 10, Fig. 2/2.

Fig. 3/4 Cross-pin



SECTION 5

5. LUBRICATION INSTRUCTION

5.1 General

All the ball and slide bearings, assembling elements and cables in Bowden's housing are subjected to lubrication.
Lubrication scheme is shown on Fig 1/5, page 5.3.

5.1.1 Lubrication of ball and slide bearings

The ball and slide bearing should be lubricated with general application grease for ball bearings ŁT 43 PN-72/C-96-134.

The substitutive are the US greases :

- Alvania G2, Alvania R2, Shell product,
- Mobi Lux 2, Mobil product,
- Beacon 2, Esso product.

Note : All these greases can be mixed with ŁT 43, so before using them the ŁT 43 grease should not be removed.

5.1.2 Lubrication of assembling elements

The assembling elements should be lubricated with technical vaseline TW meltable in high temperature PN-69/C-96120.

This is the product of oil rafining. Its kinematic viscosity at $100^{o}C$ temperature should be less than 5 mm^2/s. Neutral reaction.

5.1.3 Lubrication of cables in Bowden's housing

The cables in Bowden's housing should be lubricated with machine oil low temperature coagulable 40Z PN-88/C-96071.

Its kinematic viscosity is 52.8 to 63.5 mm^2/s.
Acid number lower than 0.20 mgKOH/g.

5.2 Non-lubrication elements

Tarnamide bearings and control cables housed in polyamide tubes do not require the lubrication.

Note : The lubrication frequency for particular sets and elements is specified in Section 15 "Periodic works".

Legend for Fig. 1/5

1 - Hinges and bearings of the aileron control lever

2 - Bearings of aileron control pivots in the wing root

3 - Bearings of the control columns and elements of aileron and elevator control system

4 - Elevator hinges

5 - Trimming-tab hinges

6 - Bearing of the trimming-tab control lever pivot on the root rib of L.H. stabilizer

7 - Rudder hinges

8 - Bearing of the elevator control segment

9 - Bearing of the air brake plates and arm

10 - Bearings of the air brake control pivots in the wing root rib

11 - Bearings and guide of the pedals at the front seat

12 - Bearings of the pedals at the rear seat

13 - Guide of the air brake push-rod

14 - Guide of the trimming-tab push-rod

15 - Hinges and locks of the canopy

16 - Bearings of the main wheel rocker arm

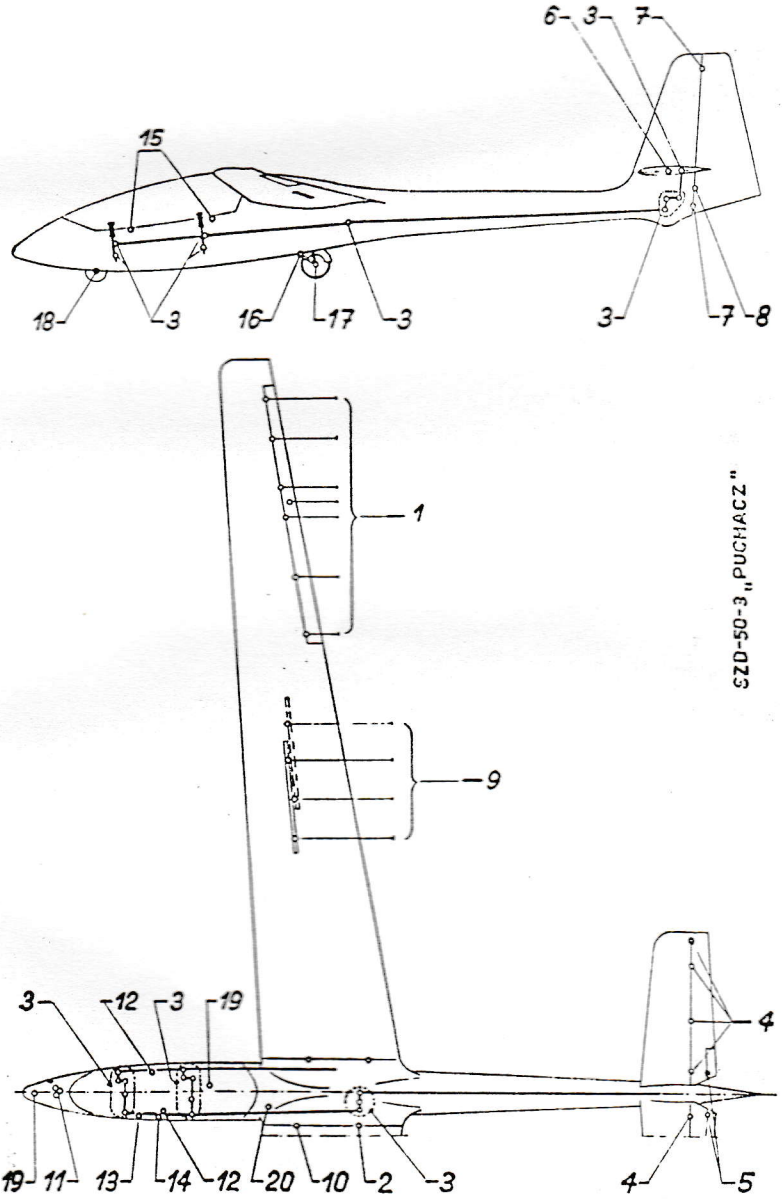
17 - Bearings of the main wheel

18 - Bearings of the front wheel

19 - Hooks

20 - Fitting and connections of the wheel brake control lever

Fig. 1/5 Lubrication scheme



SECTION 6

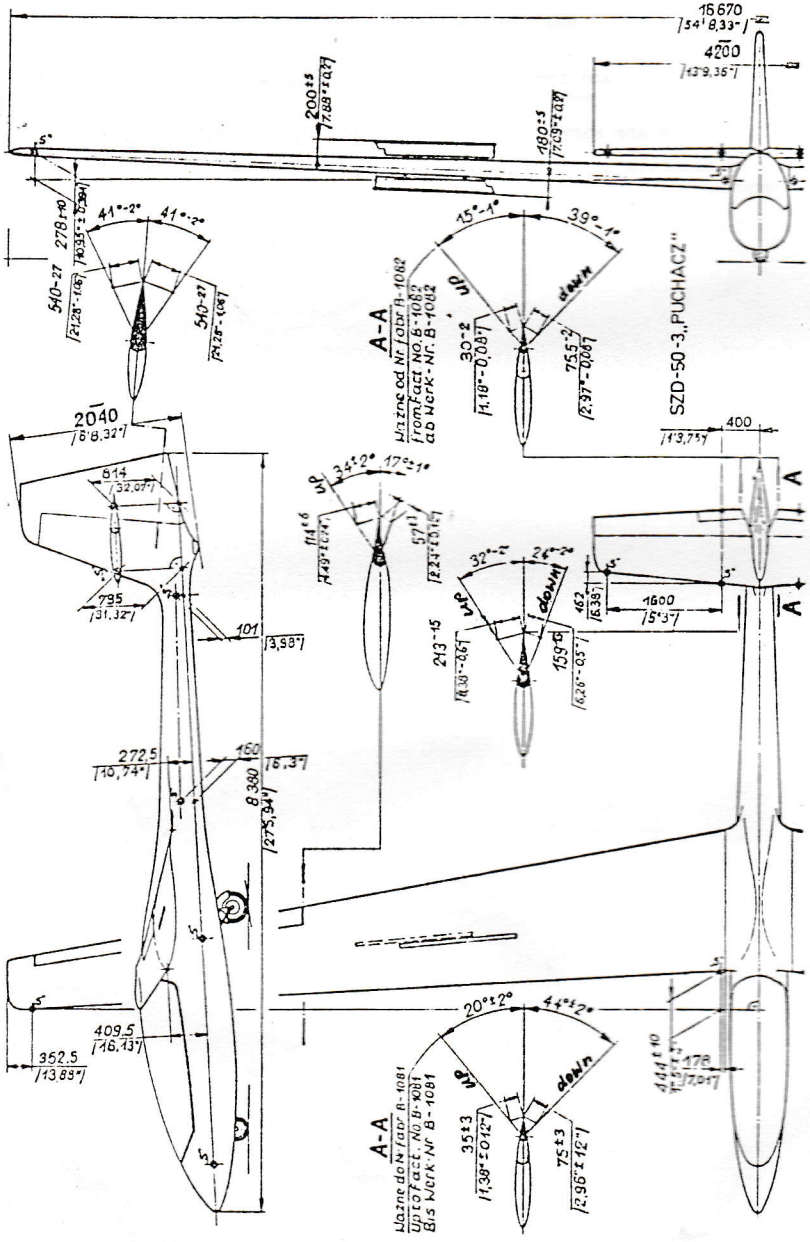
6. LEVELING OF GLIDER AND CHECKING OF CONTROL SURFACES DEFLECTIONS

The leveling of glider and checking of control surfaces deflections should be performed acc. to Fig. 1/6.

The leveling points are marked with letter "S".

The method of controls adjustment are specified in Section 3 item 3.3 of this Manual.

Fig. 1/6 Levelling of glider and checking of control surfaces deflections



SECTION 7

7. WEIGHING OF THE GLIDER

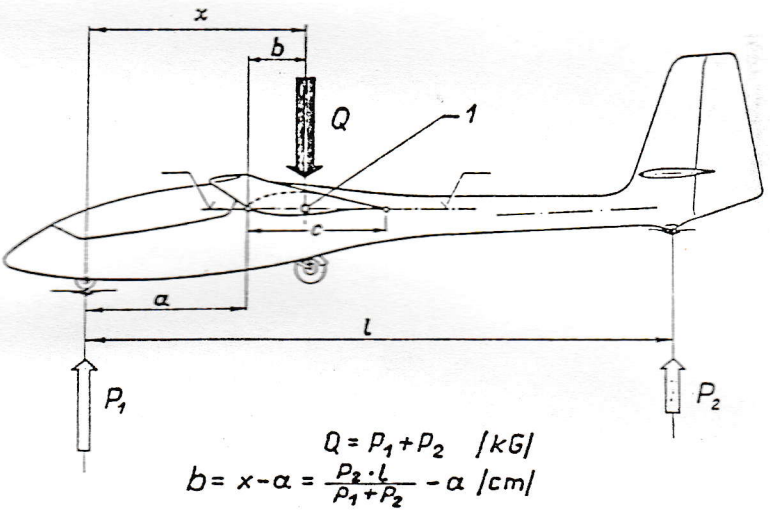
Weighing method is shown on Fig. 1/7.

Weighing should be carried on two decimal balances of measurement accuracy ±0.44 [lb] (±0.2 [daN]).

The supports should be placed under the front wheel and tail skid.

The supports height must be selected so, that the root rib is levelled. For checking use the elastic transparent pipe filled with liquid without air bubbles.

Fig. 1/7 Weighing of the glider



1 - C.G. of empty glider
c - root rib chord

The distance of the empty glider C.G. (glider with the standard equipment) measured aft of the root rib leading edge is from 24 [in] (61 [cm]) to 25 [in] (63.5 [cm]) (see Fig. 1/7).

For definition of empty glider mass with the standard equipment see page 1.2.

This distance should be calculated from the formula :

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

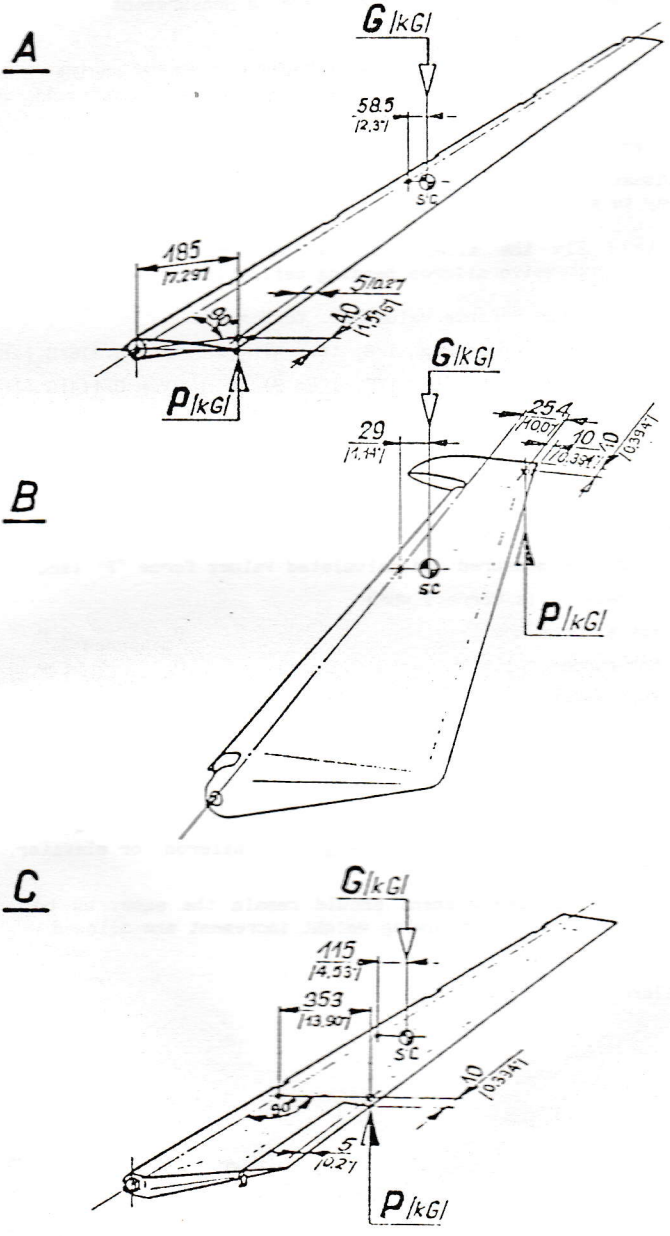
$Q = P_1 + P_2$ [lb] (see page 1.2)

The distances "a" and "l" are to be measured.

SECTION 8

8. INSPECTION OF CONTROL SURFACES MASS-BALANCING

Fig. 1/8 Inspection of the control surfaces mass-balancing



Legend for Fig. 1/8

A - Scheme of the aileron mass-balancing measurement

B - Scheme of the rudder mass-balancing measurement

C - Scheme of the elevator mass-balancing measurement

Inspection of aileron, elevator or rudder mass-balancing should be performed as follows (for each aileron, elevator and rudder separately) :

1. Weigh aileron, rudder or elevator and find the weight G [lb] ([daN]).
2. Disassembled aileron, rudder or elevator fix on both hinges in a way to minimize the frictional drag at deflection.

   Note : Fix the aileron on two arbitrary hinges provided the excessive aileron bending deflection is avoided.

3. Calculate the P-force value acc. to formula :
   - for aileron (see Fig. 1/8, item A) $P = 0.316 \cdot G$ [lb],
   - for rudder (see Fig. 1/8, item B) $P = 0.114 \cdot G$ [lb],
   - for elevator (see Fig. 1/8, item C) $P = 0.325 \cdot G$ [lb].
4. Find the point of application of force P acc. to dimensions showed on Fig. 1/8 items A, B, C.
5. Apply the force "P" by means of dynamometer as shown on drawing and read the force value. The chord should be leveled.
6. Compare the measured and calculated values force "P" (acc. to item 3).
7. Mass-balance is correct when :
   - for aileron $P_{measured} \leq P$,
   - for rudder (with balancing-weight) $P_{measured} \leq P$,
   - for elevator (with trimming tab) $P_{measured} \leq P$.

Repeated mass-balancing of control surface is necessary after performing any repairing works on it (structural repair or painting).

In such cases the procedure should be as follows:

- Before initiating the repair weigh the aileron or elevator, to be repaired
- Weight of repaired element should remain the same, as before the repair, whereas the following weight increment are allowed:
  - elevator: +0.11 [lb] (0.05 [kg])
  - aileron: +0.11 [lb] (0.05 [kg])

The rudder weight is given in "Protocol of weighing the glider", contained in glider operational documents.

The maximum allowed rudder weight increase is 0.22 [lb] (0.1 [kg]) . The rule of not adding the extra weight on rudder trailing portion in repair (ribs, webs, skin fabric, paint cover) should be observed.

Fabric covering and painting should be performed by experinced specialist.

In case, after the repair completed, the value of $P_{measured}$ does not fulfill the conditon given in item 7, page 8.2, the fabric cover on elevator or rudder should be replaced with new one and re-painted, while aileron should be polished, and re-painted as well.

SECTION 9

9. ALLOWED LIFE-TIME OF GLIDER

Allowed life-time of the glider is 6000 flying hours.

SECTION 10

10. LIST OF MAINTENANCE DOCUMENTS FOR PARTS AND SETS APPROVED INDEPENDENT OF A GLIDER

10.1 Instrument certificates

10.2 Towing hook certificates

Note : The above list concerns the glider with standard equipment.

SECTION 11

11. CLEANING AND MAINTENANCE

11.1 Canopy perspex

Wash the perspex with rich amount of hot (to 50°C) water, wipe a soft rag or spoon.

In case grease or oil spots on the perspex surface are present the small amount of detergent may be added to the water (e.g. for motor-cars) or a soap diluted in water may be used.

After washing rinse carefully with water and allow to dry.

11.2 Painted external surfaces

Wash the painted external surfaces using hot water with a detergent, rinse and wipe.

If on a painted surface hard dirts are present (insects, mud etc.) it may be wet sanded with fine grain paper of "800" to "1000" grade and then polished with a polish paste.

The washed and polished painted surface should be protected with wax or silicone paste what gives additionally the glass effect.

Note : The removing of hard dirts out of the leading edge should be performed very carefully to avoid the introduction of local indentations or waviness resulting the glider performances degradation as well as affecting the stalling characteristics.

SECTION 12

12. AIRFIELD TRANSPORTATION

During the transportation the canopy should be closed and the windows opened or closed.

The airbrake plates may be deflected or retracted.

The glider (with crew inside or without) may be towed on front hook or the tail lug with the possibility of easy turns.

The towing cable should range at least 13 [ft] (4 [m]).

The glider may be also rolled on wheels forwards and backwards.

In turns the tail should be pressed or fuselage front lifted.

SECTION 13

13. TRAILER, ROAD, OR RAIL TRANSPORTATION

When transporting the glider on a trailer the assemblies can be fixed as follows :

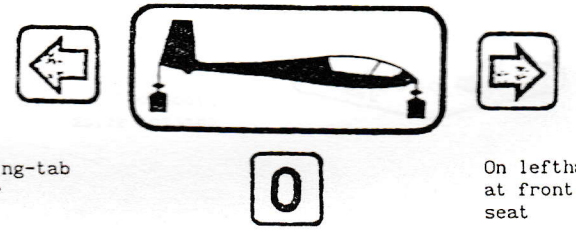
1. The outer surfaces by means of wide clamps upholstered with soft material or by means of strips.
2. Wings - by ends of spars.
3. Fuselage - by ends of main frame fittings provided that its front portion is supported on a belly and fuselage rear tube is immobilized also on a belly or by means of a strip.
   Additionally the fuselage can be fixed on main undercarriage elements or on the tail skid fitting.
   For the transportation immobilize the ends of control system torsional tubes of aileron, air brake and trimming-tab in the fuselage shell holes as well as the end of elevator control lever in the fin.
   Fittings and bearings should be protected against dirt and dust.

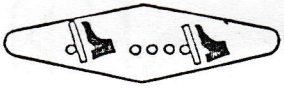
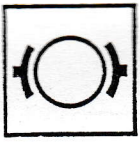
If the glider is transported by railway or road truck the supporting in car or in a container should be carried out acc. to special documentation.

SECTION 14

14. INFORMATION PLACARDS AND THEIR POSITIONS

14.1 Pictographs

Meaning	Pictograph	Position
Trimming-tab slider		On lefthand board at front and rear seat
Air brake slider		On lefthand board at front and rear seat
Lock of canopy emergency jettison		On the canopy frame at front and rear seat

Air conditioning tab slider		On instrument panel of front pilot
Pedal adjustment		On the front seat floor before the control stick
Wheel brake		On the lefthand board at front and rear seat
Towing hook release		On the lefthand board at frond and rear seat

14.2 Operation placards

14.2.1 Limitation placard

"Maximum permissible airspeeds"

SZD-50-3 „PUCHACZ" MAX. PERMISSIBLE AIRSPEEDS IAS km/h	
NORMAL FLIGHT IN: –smooth air. . . .	V_{NE} = 215
–gust conditions . .	V_{RB} = 160
MANOEUVRING AIRSPEED /airspeed for abrupt deflection of controls/:	V_A = 150
AEROTOWING	V_T = 150
WINCH-LAUNCHING	V_W = 110
AIRBRAKE EXTENDING and flight with air brake extended	= 215

Location :

- on the instrument panel of front pilot
- on the lefthand board at rear seat

14.2.2 Placard

"Loading plan"

SZD-50-3 „PUCHACZ" LOADING PLAN	
MAXIMUM ALL-UP MASS IN FLIGHT:	570 kg
MAXIMUM FRONT SEAT LOAD MASS IN FLIGHT:	110 kg
MINIMUM FRONT SEAT MASS	55 kg
USE OF BALANCING WEIGHTS:	
–for cockpit load mass up to 70 kg	OBLIGATORY
–for cockpit load mass above 100 kg	PROHIBITED
MAXIMUM LOAD MASS IN LUGGAGE COMPARTMENT	20 kg
SOLO FLIGHT ON FRONT SEAT ONLY	
IF THE FRONT SEAT OCCUPANT MASS EXCEEDS 100 kg IT IS PROHIBITED FOR THE OCCUPANT OF THE REAR SEAT TO USE THE ADDITIONAL BACK PILLOW IF HIS MASS /PARACHUTE INCLUDED/ EXCEEDS 75 kg	

Location : On the left board at front and rear seat.

14.2.3 Placard

"Individual loading plan"

SZD-50-3 „PUCHACZ" Fact. No. . . . . .

INDIVIDUAL LOADING PLAN

Mass of empty glider with standard equipment and the following additional equipment . . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . ranges . . . . . kg

Maximum all-up mass in flight 570 kg

Maximum summarized load mass i.e. crew and luggage . . . . . kg

Mass of pilot and parachute kg				Balancing weights pieces:	Date Signature Seal of Factory Inspection
Rear seat		Front seat minimum	Front seat maximum		
	0	55	70	2	
	0	70	110	0	
two persons flight	55	55	110	0	
	60	55	. . .	0	
	70	55	. . .	0	
	80	55	. . .	0	
	90	55	. . .	0	
	100	55	. . .	0	
	110	55	. . .	0	

Location : On the righthand board at rear seat.

SECTION 15

15. PERIODIC WORKS

15.1 General principles of performing the periodic works

When performing the maintenance works follow the directions included in chapters : 2, 3, 5, 6, 7, 8, 9, 10, 11 and 14.

15.2 Periodic works on equipment

Instrument maintenance works should be carried out acc. to Special Manuals for instruments.

15.3 Periodic works on towing hooks

The periodic works on towing hooks are specified in the hook producer's Manuals.

15.4 Maintenance works on glider

List of the maintenance works which shall be performed acc. to time-schedule are given on page 15.8.

15.4.1 Checking the integrity of the structure and coverings on the rigged glider. Pay the special attention to the assemblies heavily stressed, including :

1. Checking of external glider coverings and the condition of fabric on elevator and rudder.
2. Inspection of glider cockpit to be free of movable object which could enter the control systems and lock them.
3. Checking the condition of seat pans and the adjustment and securing of rear seat pan.
4. Checking the safety belts condition.
5. Checking of canopy perspex condition to be free of scratches or cracks and to be clearly transparent.
6. Checking of correct and sure locking of canopy.
7. Test of canopy emergency jettison.
8. Checking of correct rigging of glider components and their securing.
9. Check the rigging plays and the elasticity of wing-to-fuselage connection, as well as appearing of gap between the wings and fuselage.
   For checking move the wing tip quickly inserting a small force. In case the excessive plays are present they are perceptible in the form of small mutual movements of joined components and eventual taps.

   Note : Do not confuse the plays on fitting with the elasticity of the connection.

   The connection elasticity and the value of gap between the wing and fuselage are to be checked acc. to item 3.2.4. (page 3.4).

10. Checking of rigging plays of the fittings of tailplane to fuselage connection is to be performed similar to this for wing/fuselage connection.

11. Checking of plays in elevators and rudder hinges - the eventual plays are perceptible when pulling the control surface trailing edge with varying force.

12. Checking of correct operation and drag forces of the controls in cockpit (see item 3.1.4, page 3.1).

13. Checking of plays in aileron and elevator control systems - is to be performed by the measurement of a play on the end of control stick handle.
The allowed plays of control stick are specified in item 3.2.1, (page 3.2).

14. Checking of allowable play of travel of upper air brake plates in vertical direction (see 3.2.5, page 3.6).

15. Checking of tension of circulating cable of rudder control system (see item 6, Fig. 7/2, page 2.17, for the tension value see item 3.1.2, page 3.1).

16. Checking of cable tension of trimming-tab control system (see item 5, Fig. 8/2, page 2.19, for the tension value see item 3.1.3, page 3.1).

17. Checking of trimming-tab self-locking (see item 3.3.8, page 3.13).

18. Checking of condition and correct operation of towing hooks.
Hook control - see Fig. 5/3, page 3.15.

19. Checking of main undercarriage condition, front wheel and tail wheel.
Inspect the condition, tyre wear, shock absorbing capability of the main undercarriage and braking efficiency.
Disassemble the wheels and grease the hub bearings.
Pressure in the tube - see item 3.1.1 page 3.1.

20. Checking of wheel brake condition - see Fig.6/3, page 3.17.

21. Checking of glider levelling - see chapter 6, page 6.1.

22. Checking of control surfaces deflections - see chapter 6, page 6.1.

15.4.2 Checking of tightness of instrument pneumatic system in the cockpit and operation of the instruments

The schemes of instrument pneumatic system - see Fig. 10/2, page 2.23 and Fig. 11/2, page 2.25.

15.4.3 Checking of turn indicator operation and battery fixation

Electric turn indicator system - see Fig. 12/2, page 2.27.

Note : The type of 12 V battery and its localization are individually agreed with a customer.

15.4.4 Checking of electric bonding between the towing hooks control sticks in the cockpit

To check the bonding use the 4.5 V battery with a bulb wired between the hook and not insulated metal part of the stick. The bulb should glow.

15.4.5 Checking of operation and correct installation of supplementary systems

The radio, oxygen and any other systems installed to the customer order could be classified to this category.

15.4.6 Checking of correct glider rigging and de-rigging

Rigging and de-rigging of the glider concerns the wing-fuselage and tailplane-fuselage connections.

Note : At every rigging all the joined parts should be greased (see chapter 5).

15.4.7 Checking the integrity of the structure on the de-rigged glider

1. Checking of the condition of wing spar ends and glued in fittings. Checking of spars connection with wing root rib (Rib No 1).
2. Inspection of Rib No 1 condition with special attention paid to the ball articulations and their nesting.
3. Inspection of the main pivot surface condition (the small scratches and local seizings are allowed).
4. Checking of internal structure condition of wing root - by eye through the openings for aileron control levers in root rib.
5. Disassembling of the ailerons. Checking the aileron hinges condition and their fixing on aileron and on wing.
   Checking of connection between the auxiliary spar for aileron hinges and covering of wing. Inspection of the aileron structure condition.

   Note : Before the assembling of ailerons the hinges and push-rod to lever connection should be greased (see chapter 5).

6. Checking of air brake and its control system fitting in air brake box.
Checking of metal elements accessible in air brake box, springs and air brake plate caps.
Grease the moving parts, if necessary, (see chapter 5).
Check the fitting of air brake plate caps to the wing contour.

7. Checking of condition and connection of fuselage central part, main frames, undercarriage spars, floor and wing/fuselage fittings (when wings are de-rigged).

8. Checking of the rest of fuselage internal structure and especially the spar, walls and ribs of the fin, upper and lower rudder hinges, control system segment fitting and movability, conditions of dog pins joining the segment and rudder.

9. Checking of wall set for control column fitting at front and rear seats. Inspection of control columns and their fixing. Inspection of the push-rods in cockpit for aileron and elevator control. Grease the working parts, if necessary, see chapter 5.

10. Disassemble the tailplane, elevators and trimming-tabs. Check the condition of root rib to covering connection, metal parts and fittings. Check the elevator hinges condition and their fixing to elevator and stabilizer.
Check the securing mechanism of tailplane to fuselage rigging - see item 2.2.
Before rigging grease all the assembling and movable connections (see chapter 5).

11. Disassemble the rudder. Inspect the external coverings and connections of rudder structure. Check the condition of fixing the pins of upper and lower rudder hinges in the nose ribs.
Check the sure and correct balancing weight fitting in the nose of rudder aerodynamic balance device.
Before assembling grease all the movable connections (wings and segment) and the dog pins of rudder (see chapter 5).

12. Inspect the elements and sets of control systems : control columns, levers, push-rods, pedals and cables in the accessible areas. The only one area not accessible is the rear fuselage tube, but the cables are conducted there in a linear way therefore the 50 hours inspection is not required.
Grease the movable connections, if necessary (see chapter 5).

15.5 Rules of tension-members operation

15.5.1 The recommended time period of operation of control cables and circulating cable of rudder (see items 6, 7, 19 - Fig. 7/2, page 2.17) is 500 flying hours or 5 years.

15.5.2 The recommended time period of operation of all other cables (control system of trimming-tab, hooks and wheel brake) is 1500 flying hours or 12 years.

15.5.3 Having completed the recommended operation period the cable accessible for disassembling should be taken out of the glider and carefully inspected. In case of correct technical condition the cable is valid for further operation.

15.5.4 The cables which cannot be disassembled without damage should be replaced with new ones.

15.5.5 All cables having completed 1500 flying hours or 12 years should be replaced.

15.5.6 The cables having : corrosion, broken single wires, worn wires to about a half of their diameter, worn tarnamide guides and jammed not rotating pulleys are not allowed for the further operation.

15.5.7 The replacement of cables and the repair of pulley guides should be recorded in the glider log-book.

Note : Lubrication of cables - see item 5.1.3, page 5.1.

15.6 Main overhaul of glider

15.6.1 General

Main inspection of gliders having the Polish registration and operated in Poland is carried out by Przedsiębiorstwo Doświadczalno - Produkcyjne Szybownictwa or other aeronautical plant or workshop, which has been Authorized for this purpose.

Abroad of Poland the main inspection may be performed only by a firm or plant which has the authorization of Przedsiębiorstwo Doświadczalno-Produkcyjne Szybownictwa for performing the repair works.

Specification of the inspection range should have a form of glider verification protocol based on the works completed acc. to chapter 15 of this Manual.

15.6.2 Basic works to be done during the inspection

1. Disassembling of wings ailerons, as well as air brake and their caps.
2. Disassembling of front and main wheels as well as the disassembling of hubs and washing of bearings.
3. Disassembling of rear skid.
4. Disassembling of towing hooks.
5. Disassembling of front and rear pedals.
6. Disassembling of control columns at front and rear seat.
7. Disassembling of elevator control lever item 17, Fig. 4/3, page 3.11.
8. Disassembling of instrument panels at front and rear seat.
9. Weighing of the glider acc. to chapter 7, page 7.1 of this Manual.
10. Checking of mass-balance of control surfaces acc. to chapter 8, page 8.1 of this Manual.

    Note : The weighings performed acc. to chapter 7, page 7.1 and chapter 8 should be recorded in Protocols and enclosed in glider documents.

11. Disassembling of components and systems installed on user's order e.g. transceiver, oxygen equipment or others and careful checking of their condition and correct installation.

15.6.3 Other inspection works

The element of control systems not accessible are :

1. Aileron control system components in wing (Fig. 9/2, page 2.21) :
   - push-rod 1,
   - intermediate lever 11,
   - pass-byes 8.
2. Air brake control system components in wing (Fig. 3/3, page 3.7) :
   - lever 4,
   - push-rod 1,
   - push-rod 5,
   - intermediate lever 15.

If resistances to motion appearing in these control system are within limits given in chapter 3 item 3.1.4, page 3.1 of this Manual, and the plays on the stick is not greater than ±0.039 [in] (±1 [mm]), the control systems condition is admitted as correct.

Otherwise the visual inspection of control systems elements should be carried out after making the holes in wing covering and eventual disassembling of the parts.

The disassembled elements such as control column, levers, pins etc. should be cleaned and washed and submitted to the close external visual inspection.

In case of suspicion of the plastic deformations the measurements of element shape in comparison with design drawing shall be performed.

Measurements of element diameters should be performed by using slide calipers, micrometer screws and eventually gauges.

In case of the suspected glider structure damages in a covered place, the lacquer layer should be removed to carry out the visual inspection, or the structure fragment should be opened by means of making a hole in the shell or cutting out the covering fragment.

15.7 Time schedule of maintenance works

Time of maintenance	Maintenance work according to chapter 15, pages 15.1 to 15.7 incl.	Notes
On the beginning of flying season	15.4.1 items 1 to 20 incl. 15.4.1 item 22 15.4.2 to 15.4.6 incl. 15.4.7 items 1 to 4 incl. 15.4.7 items 10 to 12 incl.	
After every 50 flying hours	14.4.1, especially: 15.4.1 items 1 to 6 incl. 15.4.1 item 9 15.4.1 items 10,11,13,15,18,19 Check the cables due to their life-time, acc. to p. 15.5.1 to 15.5.6. incl.	Checking of wing-fuselage slot is not required
After every 100 flying hours	15.4.1 items 1 to 20 incl. 15.4.1 item 22 15.4.2 to 15.4.6 incl. 15.4.7 items 1 to 12 incl. Check the cables due to their life-time, acc. to p. 15.5.1 to 15.5.6. incl.	For performing the 100 flying hours or annual inspection the glider shall be washed and clean. All inspection doors should be opened.
Annual inspection **- obligatory after every 12 months of calendar**	As after every 100 flying hours.	
After heavy landing	15.4.1, especially items: 1,3, 4, 5,6,8,9,10,11,12,13, 14,15,17,18,19,20,22 15.4.2 15.4.3 15.4.5 15.4.6 15.4.7 items 1 to 4 incl. 15.4.7 items 7 to 12 incl.	
Main glider inspection after every 1000 flying hours	15.4.1 items 1 to 22 incl. 15.4.2 to 15.4.6 incl. 15.4.7 items 1 to 12 incl. Check the cables for their life-time, acc. to items 15.5.1 to 15.5.6. incl.	

SECTION 16

16. GLIDER REPAIRS

16.1 Introduction

This Manual contains directions enabling the user to repair himself the minor failure of the glass-fibre gliders (damage have been classified in item 16.4).

The second group of failures - major ones - which do not require the factory repair, will be investigated individually by the producer after examination the real condition.

Depending on the complication of problem the repair will be performed either by user himself or by the specialist employed by him or by the authorized workshop or by the producer respectively.

The damaged excluded by the producer to be repaired by the user are specified in item 16.2.2.

Before starting the repair it is necessary to get acquainted with the following documents :

- glider log-book,
- Technical Service Manual,
- Certificates of equipment,
- Certificate of producer's inspection.

The repair shall be notified to the State Authority proper to user's location.

According to the principle that the glider after repair shall have full airworthiness, it should be checked after repair whether the glider weight limits are not exceeded.

If so, the data concerning the mass and loading conditions shall be corrected in proper way.

After the repair the correct position of glider c.g. shall be checked.

This instruction it associated with "Workshop Instruction for the Production of Stressed Composite Materials" IW-76/412,4.

16.2 Repair of composite materials

16.2.1 Conditions of repair

Besides the requirements listed in introduction it shall be observed that the room where the repair is performed has in the time of work the relative humidity of no more than 85% and the temp. of no less than +66°F (+19°C).

After the composite making (or gluing) has been finished the room temperature no less than +66°F (+19°C) shall be maintained for minimum 10 hours, i.e. the time of full composite hardening.

It is recommended after hardening the repaired place to be additionally heated for minimum several (4 to 6) hours in the temp. of +104°F to +140°F (+40°C to +60°C) (e.g. by means of infra-red lamps).

The temperature should be measured with the thermometer located in the glass-fibre (or shielded with glass-fibre plate) near the repaired place.

The room where the repair is made shall be clean, free of dust and well illuminated. The good ventilation is desired for health reasons.

The workers performing the repair of composite materials should be authorized for performing the stressed composite materials and have the training in production or repairs of glass-fibre gliders.

The directions given bellow allow for the correct repair.

16.2.2 Classification of failures

In respect to the various importance of the assemblies, subjected to damage, and the different repair methods of particular faults, the glider has been divided into 3 zones having the different dimensions of the faults allowed to be repaired by the user.

This is illustrated on Figs. 1/16 and 4/16.

The table below gives the types and sizes of the faults for particular zones.

It.	DEFECT	ZONE I	With limited size of faults ZONE II	ZONE III
1.	Holes	ϕ 5.91 [in] (ϕ 150 [mm])	0.668x4.728 [in] (220x120 [mm]) longwise and at small angle	5.91x3.546 [in] (150x90 [mm]) longwise and at small angle
2.	Cracks	9.85 [in] (250 [mm]) longwise 5.91 [in] (150 [mm]) in any direction	3.94 [in] (100 [mm]) only longwise of the assembly span	
3.	Unglued nose	3.94 [in] (100 [mm]) ailerons	3.94 [in] (100 [mm]) wings and stabilizer	
4.	White spots	as 1 and 2 for I zone, but around main fittings INADMISSIBLE		
5.	Ungluing of trailing edge	9.85 [in] (250 [mm])		
6.	Damaged lacquer	arbitrary		

In case of any doubt in the interpretation of the fault type or size it is necessary to contact the producer, who after examination of the description and pictures of the fault will give his assistance.

The producer excludes the possibility of repair performed by the user in following cases :

a) Removed fitting or damaged (whitened) surroundings of main fittings.

b) Spar flange broken.

c) Wing root-rib or spar root damaged.

d) Fuselage, wing, stabilizer, control surfaces broken.

e) If the fuselage covering is damaged in a place of shell internal stiffening. These stiffenings are located between fuselage centre portion frames, under floor and on rear fuselage shell (riffles).

f) In each case, when the repair cannot be expertly completed.

Fig. 1/16 Distribution of zones and material specification for repair of fuselage

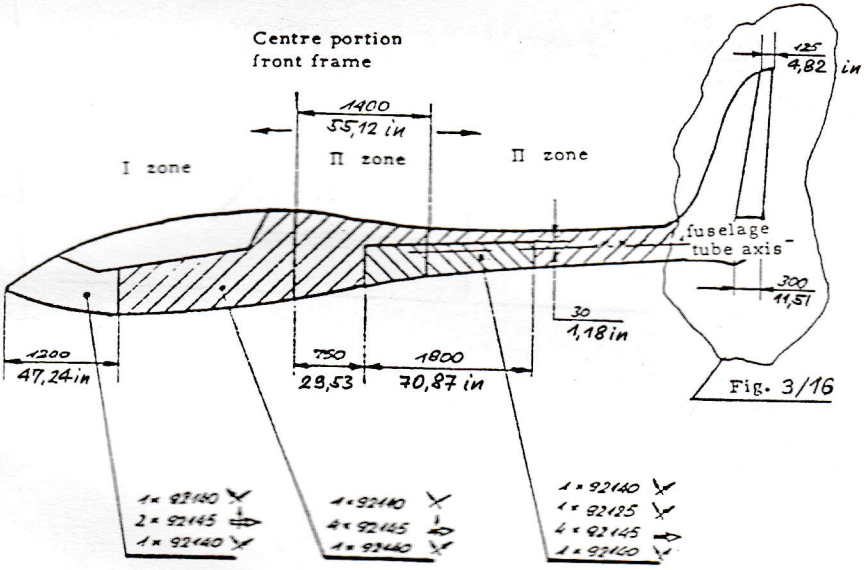
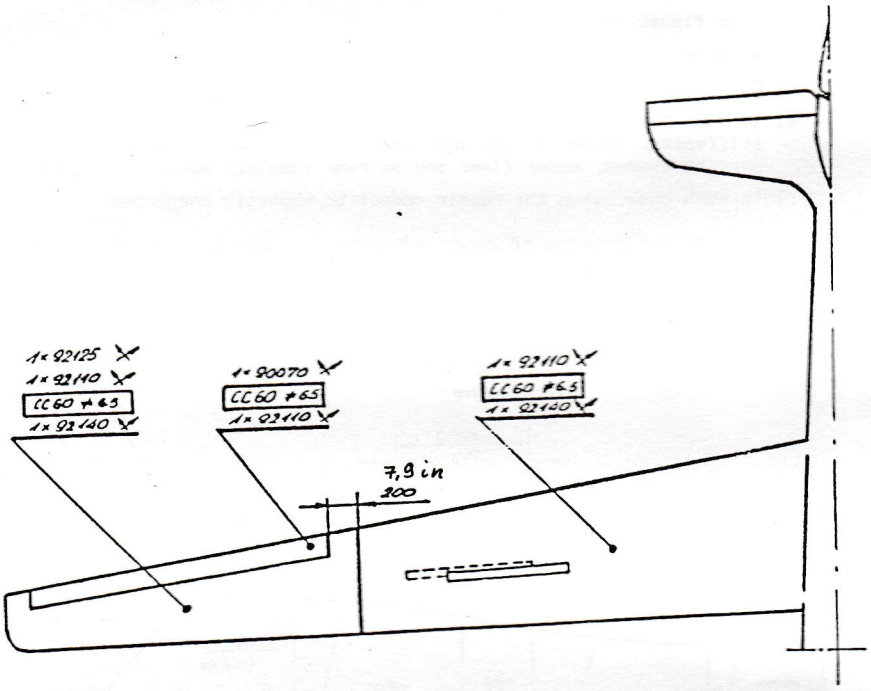


Fig. 2/16 Distribution of zones and material specification for repair of wings



I zone - wing

III zone - stabilizer, aileron

Fig. 3/16 Material specification for repair of fin

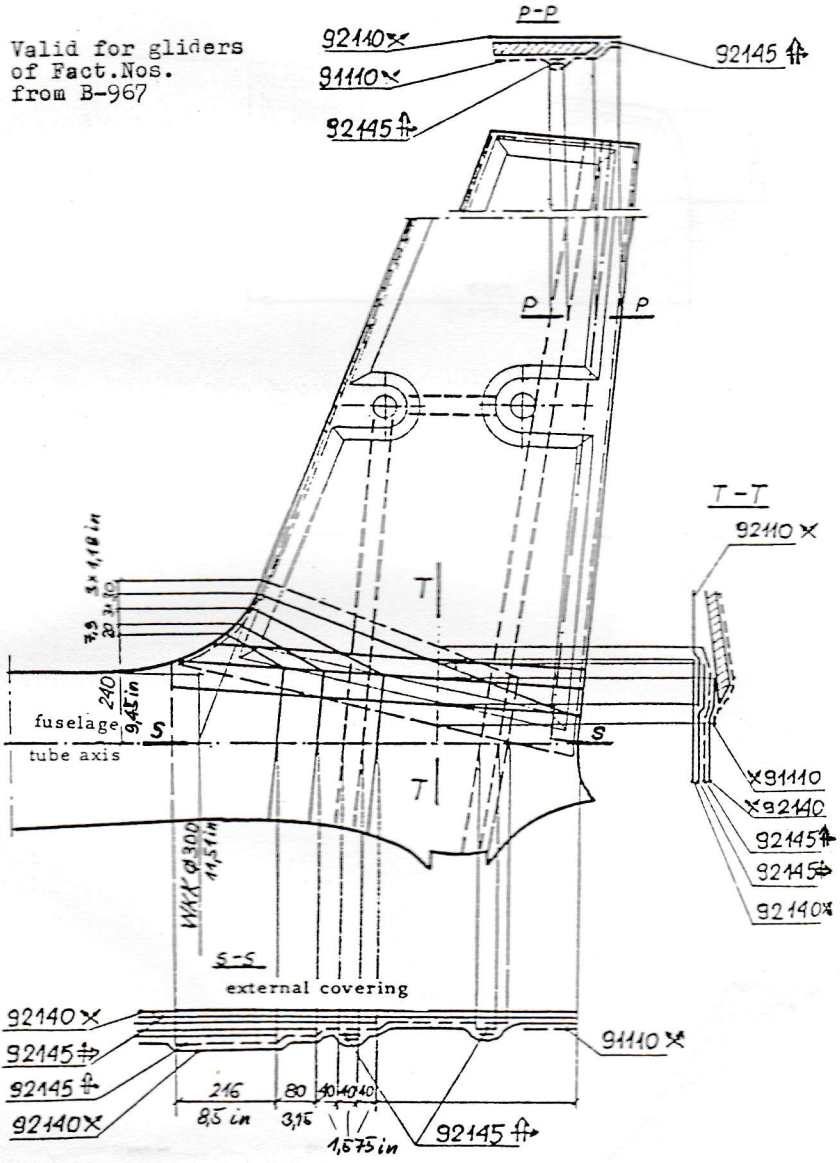
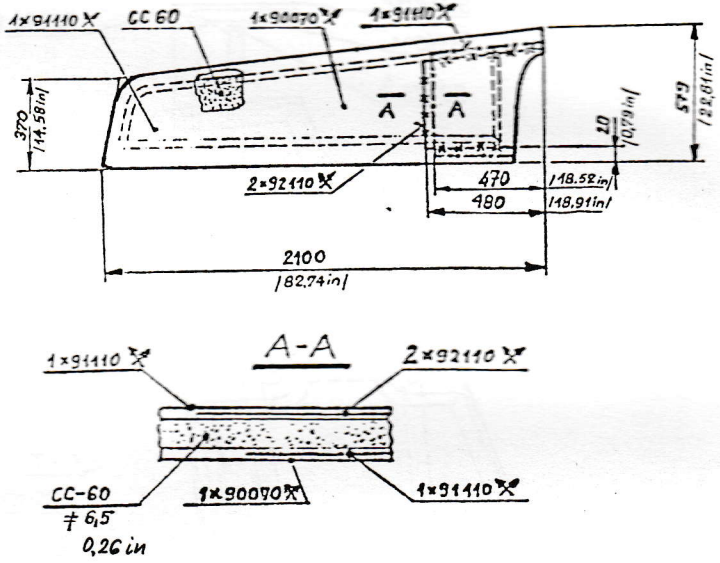


Fig. 4/16 Material specification for repair of stabilizer (conc. only repair in range of item 16.3 - typical repairs).



16.3 Typical repairs

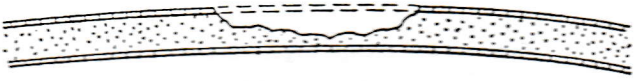
All the repairs of composite parts shall be performed acc. to the schemes given below taking moreover into account :

- application of materials prescribed in Figs. 1/16,2/16,3/16,4/16 and described below in items 16.3.1 to 16.3.4 including,
- preparation of the surface for resining or gluing by means of degreasing with carbon tetrachloride (composite) or with acetone (metal), regriding with sand-paper ca "180" and removing the dust,
- protection of materials against a grease dirt and moisture,
- accurate doses of the hardener,
- pot time of resin (hardener composition) being at room temp. ca 30 minutes,
- time of resin (hardener composition hardening) being min. 10 hours at temp. no less than ≥ +66°F (+19°C).

16.3.1 Glass-fibre/foam sandwich shell

If the damage is not right through,

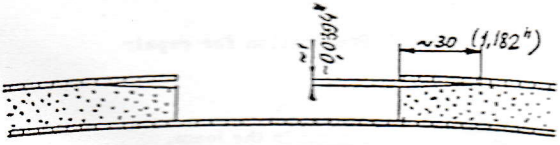
Fig. 5/16a Damage



the repair sequence is the following :

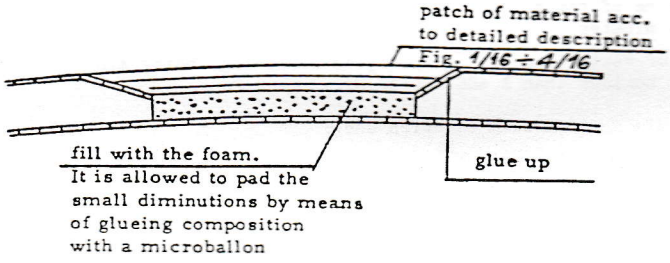
- round off hole edges,
- remove the foam from the hole to be sure that the inner covering is undamaged,
- cut the foam under the outer covering,

Fig. 5/16b Preparation for repair



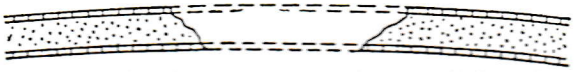
- glue in the foam having the smaller thickness than original one by about 0.0394 [in] (1 [mm]) and glue in the outer covering to the oblique edges of the foam round the hole.
- after hardening of the glue clean the edges of the outer covering round the hole pad in the foam,
- complete the outer covering using the glass fabrics as prescribed in Figs. 1/16 to 4/16.

Fig. 5/16c Repair of covering



In case the damage of the sandwich shell is right through the first step procedure is different :

Fig. 6/16a Damage right through



- prepare the hole edge,
- cut out the foam around the hole as in Fig. 6/16b and make a cut under the outer covering as previously,
- glue up or resin the patch on the cleaned inner covering as shown in Fig. 6/16c,

Fig. 6/16b Preparation for repair

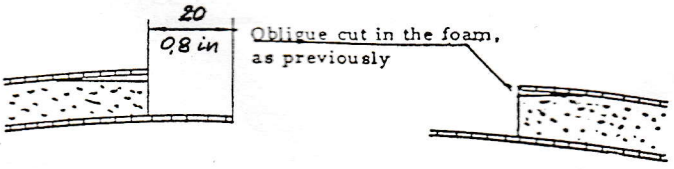
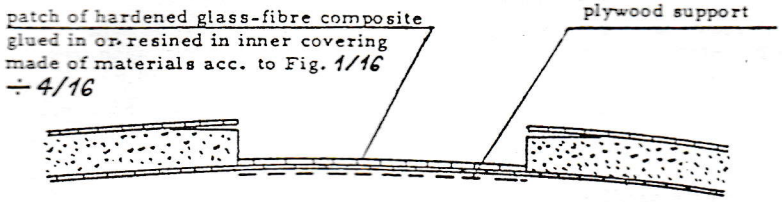


Fig. 6/16c Repair of inner covering



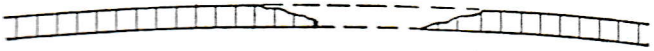
Note : If the inner covering edges are flexible it is necessary to glue up from inside the supporting piece of plywood fixed with the wire or like.

- further procedure is the same as before (see Fig. 5/16c).

16.3.2 Sole glass-fibre shell

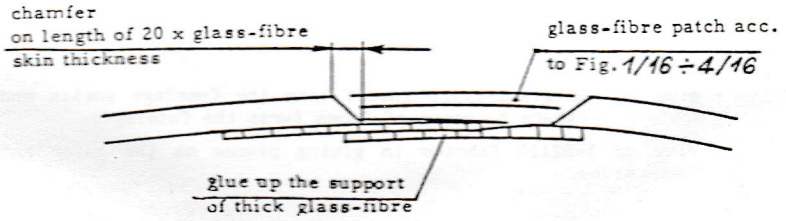
In case of damage of sole glass-fibre, as shown in Fig. 7/16a the procedure is following.

Fig. 7/16a Damage



- smooth the edges, to the regular shape,
- chamfer the edges into 1 : 20,
- if the hole is rather large glue up the support to avoid the flexibility during completing of glass-fabrics,
- cut off the fabrics acc. to directions in Fig. 7/16b stepping the dimensions of sequent layers by the value :
  length of oblique cut divided by the number of layers,
- further procedure is the same as before (see Fig. 5/16c).

Fig. 7/16b Preparation and repair



16.3.3 Disglueing trailing edges

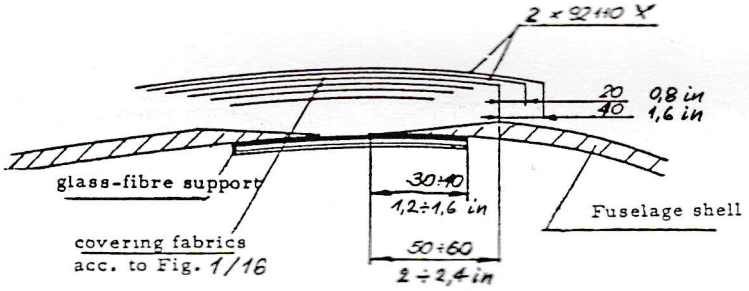
After removing and cleaning off the old glue joint, the repair of damage depends on repeated gluing up of both surfaces with resin composition condensed with the fillers prescribed in item 16.5.

During the hardening both surfaces shall be fixed together, e.g. trailing edges with spring clamps using two strips as support noses by means of tapes tensioned with weights, or with rubber.

16.3.4 Repair of fuselage (rear tube and centre portion covering - II and III zone)

1. Wet repair :
   - prepare the pad 3x92125,
   - chamfer the edges 1 : 20,
   - glue up the glass-fibre support from inside,
   - glue up fabrics acc. Fig. 8/16.

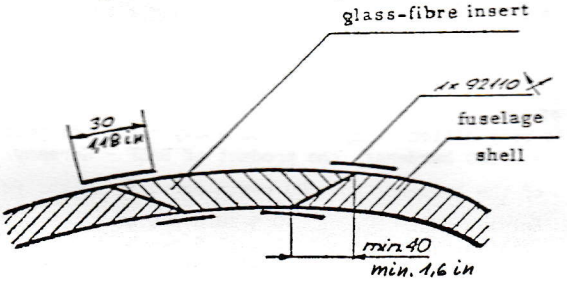
Fig. 8/16 Scheme of repair



Note : Put on the 92110 fabric instead of the last layer of 92140 fabric.

2. Dry repair :
   - smooth the hole edges, to regular shape,
   - form the glass-fibre shell piece of similar curvature (near the damaged place or using the other glider when arranging the fabrics acc. to Fig. 1/16).
   - chamfer damage edges on the length of 1.5 [in] (40 [mm]),
   - match the glass-fibre insert into the chamfered edges,
   - glue up the glass-fibre insert into the fuselage shells and apply a pressure by means of tapes (wrap the fuselage),
   - glue up 1x92110 fabrics in gluing places on the outer and inner sides.

Fig. 9/16 Scheme of repair



Note : If in the shell there are holes of a diameter smaller than 3.152 [in] (80 [mm]) and no access from inside exists the wet repair is recommended.
If the holes are of a diameter above 3.152 [in] (80 [mm]) the dry repair is recommended.

16.4 Painting

The repaired places shall be dry grinded with sandpaper "120" and than filled with epoxy resins with addition of talc and titanium white.

When the pad gets dry grind dry using "120" sandpaper and then "220".

The repaired surfaces can not protrude of the wing external contour more than allowed in "Technical Requirements" (check with the pattern or rule).

After regrinding with sandpaper "220" spray (crossed movement) 2 times with the polyurethane enamel or the other one of similar properties.

After hardening grind the enamel with sandpaper "220", "320", "400", "600" and next polish with abrasive compound.

16.5 Materials for typical repairs of particular glider assemblies

For repairs the materials listed below shall be used, providing that they are attested and the prescribed storage time limit has been not exceeded. For the composition use the Epidian 53 or Epidian 52 epoxy resin and Z1 hardener the products of Zakłady Chemiczne Sarzyna - Poland.

In case of lack of above mentioned composition elements this allowed to use the composition of Epicote 162 epoxy resin the product of Shell and Laromin C 260 hardener, the product of BASF - Germany.

The ratio of the hardener for 100 resin parts by weight is For :

Epidian 53	10.5 ±0.5 p.w.b.
Epidian 52	13 ±0.5 p.w.b.
Epikote 162	38 ±1 p.w.b.

The Epicote 162 and Laromin C 260 resin can be dosed also in respect of volume : 1 hardener part by volume to 2 resin parts by volume.

Both composition components should be thoroughly mixed until the homogeneity is obtained. If the composition is used as a glue for thick glue joint, the filler should be added.
The pot-life of both compositions is of about 30 min. at room temperature.

For one repair only the one composition kind can be used.

Besides the mentioned composition the other can be used, providing they are approved by the National Authority.

AS the reinforcement it should be used the glass fabrics of Interglas G.F.R. with I 550 or Volan A preparation.

The type and the amount of fabrics which should be used for repair of particular glider parts is listed in Figs. 1/16 to 4/16 and in table below.

For covering of the rudder and elevator the PERKAL IA-140 cotton fabric (acc. to BN-65/7537 issue II standard) is used.

Catalogue No	Kind of fabric	Mass	Thickness of 1 glass-fibre layer (formed by hand)
90070	Linen	0.0164 [lb/sqft] (80 [g/m^2])	0.00394 [in] (0.10 [mm])
91110	Crossed	0.0225 [lb/sqft] (110 [g/m^2])	0.00670 [in] (0.17 [mm])
92110	Crossed	0.0328 [lb/sqft] (160 [g/m^2])	0.00790 [in] (0.20 [mm])
92125	Double crossed	0.0574 [lb/sqft] (280 [g/m^2])	0.01380 [in] (0.35 [mm])
92140	Double crossed	0.0809 [lb/sqft] (395 [g/m^2])	0.01970 [in] (0.50 [mm])
92145	Linen unsymmetrical 6 x 7	0.0440 [lb/sqft] (215 [g/m^2])	0.00790 [in] (0.20 [mm])

If the other types of glass-fabrics admitted for aircraft production and approved by the National Authority is used follow a principle that the total amount of glass in used fabrics is at least equal to this of fabrics listed in Figs. 1/16 to 4/16.
For roving parts the roving ER 2003 of tex 2280 the products of Krośnieńskie Huty Szkła - Poland, or the ES 10 400x60 K92 roving the product of Gewetex Textilglas - Germany shall be used.
When repairing the sandwich shell the core diminutions shall be supplemented with the Conticell CC 60 foam of mass density 3,745 [lb/cu.ft] (0.06 [g/cm^3]) or CC 41 - 2.497 [lb/cu.ft] (0.04 [g/cm^3]) acc. to directions of Figs. 5/16a to 5/16c and 6/16a to 6/16c.

Instead of the foam listed above the other core materials applied in glass-fibre gliders can be used especially if the damage is minute.

To condense the composition for gluing or padding purpose use the one of fillers listed below :

- brown microballon of Union Carbide (Brenntag GmbH),
- fibre cut of above mentioned rovings on the length of 0.1182 to 0.2364 [in] (3 do 6 [mm]),
- colloidal silicon dioxide (aerosil).

For selection follow the principle :

- foam and the fillet edges glue up with addition of microballon,
- blocks fittings etc. glue up with addition of cut fibres and colloidal silicon (aerosil).

16.6 Repair non-composite

16.6.1 Repair of metal parts

All repairs of the damaged metal parts are allowed only on the approval of the Authority or on the producers direction.

The welding should be performed only by the skilled air-craft welding operators.

Damages of the anodized, galvanized or painted protective coverings, providing that the strength reducing corrosion did not appeared, can be repaired by cleaning up to the pure metal, degreasing, applying the anticorrosive layer and outer enamel. Use the painting products for aircraft industry or motor-car parts, following the directions of the enamel producer.

16.6.2 Replacement of rudder control system cables

The rudder control system (see Fig. 7/2, page 2.17) comprises the following cables :

1. Cable (it. 6) ϕ0.0985 [in] (ϕ2.5 [mm]), 7x7 acc. to PN-65/M-80235 with the thimbles C 3 of PA6N acc. to BN-78/3813-45 on both ends.
2. Cables (it. 7 - 2 pieces) ϕ0.1182 [in] (ϕ3.0 [mm]), 7x19 acc. to PN-65/M-80235 with the thimbles C 3.5 of PA6N acc. to BN-78/3813-45 on both ends.
3. Cables (it. 19 - 2 pieces) ϕ0.1182 [in] (ϕ3.0 [mm]), 7x19 acc. to PN-65/M-80235 with the thimbles C 3.5 of PA6N acc. to BN-78/3813-45 on both ends.

Nominal force tearing off the cable is :

- for cable ϕ0.0985 [in] (ϕ2.5 [mm]) , 1102.50 [lb] (500 [daN]),
- for cable ϕ0.1260 [in] (ϕ3.2 [mm]) 1653.75 [lb] (750 [daN]).

In case of cable replacement apply the pre-tension being 0.5 to 0.6 of nominal force tearing the cable, during min. 3 minutes. The thimbles should be incorporated into cables by means of splicing or clamping. The clamping of the cables i allowed only when admitted by the Authority. The sequence of particular operations of cable splicing or clamping depends on the rudder control system design (see Fig. 7/2, page 2.17).
When disassembling the cables (it. 7) cut off the endings with thimbles (it. 8) and fix the thin wire on cable end to make it possible to drive the new cables through the polyamide pipes in the fuselage rear part.

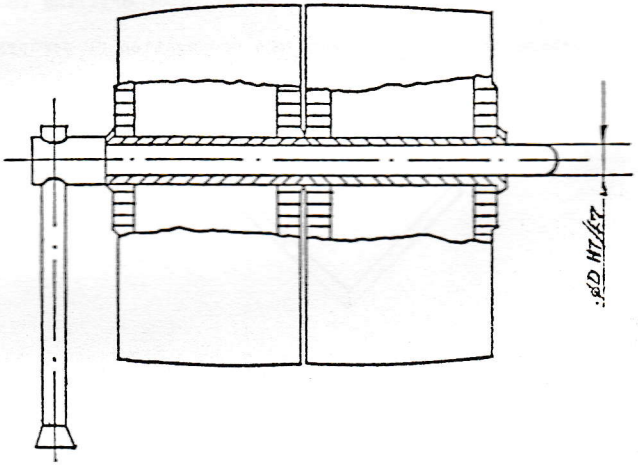
16.6.3 Reaming of fittings

For repair-reaming of the fittings it is obligatory, as the general principle, to maintain unchanged kind of fit. The particular reaming steps and appropriate dimensions are given in Fig. 10/16.
For each step of reaming the producer supplies the collaborating part of the oversized dimension marked with concave points made at the visible place (the number of points corresponds to the reaming step).
In case of hand-reaming use the unidirectional reamer rotation and apply a slight axial pressure.
From time to time take out the reamer to remove the chips and check the reamed surface condition.

During reaming it is advised to use the following lubricants :

- for steel - machine oil,
- for duraluminium - kerosene,
- for bronzealuminium - machine oil.

Fig. 10/16 Reaming the sleeves of the main bolt joining the spars

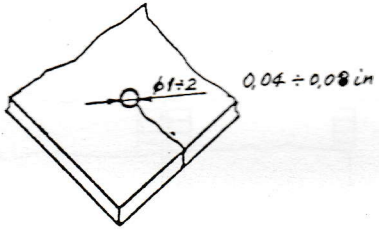


Nominal dimension	D = 0.867 [in] (22 [mm]) H7
1 st reaming step	D_1= 0.877 [in] (22.25 [mm]) H7
2 nd reaming step	D_2= 0.886 [in] (22.5 [mm]) H7
3 rd reaming step	D_3= 0.896 [in] (22.75 [mm]) H7

16.6.4 Perspex of canopy

The glider canopy employs the polymetan methacrylate - organic glass. In case of appearance of small micro-cracks (as a result of glass aging under influence of light) the whole perspex panel must be replaced. The same concerns the long linear cracks or impact holes. The propagation of cracks is prevented by means of drilling the small holes at the end the crack.

Fig. 11/16 Scheme of action to avoid the propagation of perspex crack



The cracks or complementing small pieces are to be glued with the glues for perspex observing the directions of the glue producer.

16.6.5 Replacement of parts

The design and production method of the glider allow the user to replace the following worn or damaged parts :

1. Main bolt (connecting both the spars) of dimension :
   a) nominal d = 0.867 [in] (22 [mm]) f7,
   b) after first reaming (I) d = 0.877 [in] (22.25 [mm]) f7,
   c) after second reaming (II) d = 0.886 [in] (22.5 [mm]) f7,
   d) after third reaming (III) d = 0.896 [in] (22.75 [mm]) ft.

2. Part of main undercarriage and front wheel :
   a) front wheel
   b) main wheel
   c) rocker arm item 2
   d) rocker arm axle item 13
   e) tube item 8
   f) axle item 9
   g) shock absorber item 10
   h) rubber buffer item 12

   see Fig. 4/2, page 2.9

   i) tail skid

3. Air brake caps.
4. Air brake plates.
5. A-56 and TOST Europa hooks.
6. Pilot's cockpit mobile equipment :
   a) instrument panel at front and rear seat
   b) instrument panel shield
   c) L.H. and R.H. at front seat
   d) L.H. and R.H. at rear seat
   e) rear seat assembly
7. Canopy :
   a) perspex without frame
   b) perspex with frame
   c) canopy frame
8. Control surfaces :
   a) rudder
   b) elevator
   c) ailerons
9. L.H. and R.H. stabilizer.
10. Wings.

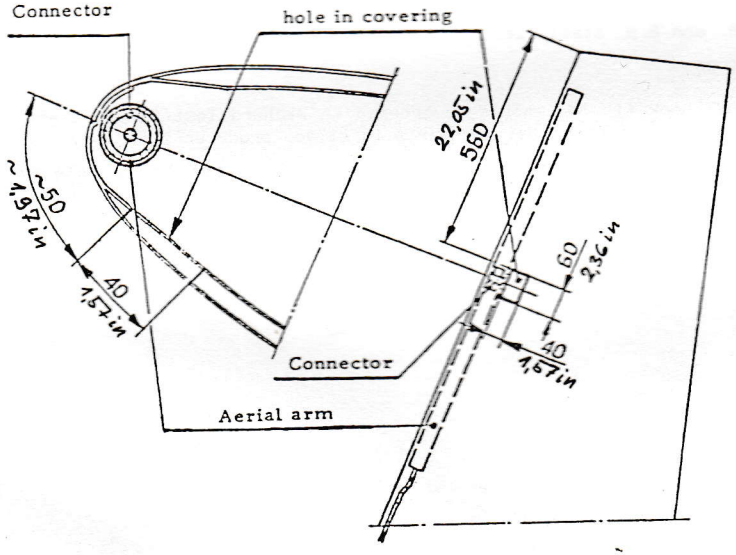
The TOST hook (it. 5) should be ordered in Richard Tost Fluggerätebau 8000 München Germany remaining parts in glider producer's factory.

If the owner, when ordering parts, is not sure that he is able to perform the replacement properly, he should order each necessary part mentioned in It. 16.6.5 together with the replacement instruction.

16.6.6 Transceiver aerial repair

Transceiver VHF aerial is a standard equipment used on all the types of glass-fibre gliders produced by "PZL-Bielsko".
It is glued up in the leading edge.
As a result of long operation of these aerials it has been found that the repair is needed only for soldered joints located in the connector positioned in the aerial midspan.
To have an access to the connector the hole in the covering should be made in place shown on Fig. 12/16.
The soldered joints are accessible through the inspection holes in the aerial arms at the top and bottom of connector in distance of about 1.2 [in] (30 [mm]) in respect to its centre.
After repair the holes in the aerial arms should be plugged with Conticell foam glued up with composition.
The plugging of holes in the covering should be made acc. to this Repair Manual item 16.3.1.

Fig. 12/16 Scheme of transceiver aerial repair



16.7 Primary structure components

16.7.1 Primary structure components of composite and plywood

1. Main spars
2. Wing root rib (Rib No 1)
3. Wing upper and lower coverings
4. Complete wing
5. Aileron
6. Front main frame
7. Rear main frame
8. Fuselage shell (complete fuselage structure)
9. Undercarriage spar
10. Luggage compartment floor
11. Upper floor (in central part)
12. Stabilizer spar
13. Stabilizer
14. Elevator
15. Rudder
16. Hook housing

16.7.2 Primary structure components of metal

1. Spar fitting (block with the pivot glued into the spar end)
2. Main bolt
3. Fuselage front fitting tube (fitted to the front main frame)
4. Fuselage rear fitting tube (fitted to the rear main frame)
5. Tubular spar of the stabilizer
6. Front pin of stabilizer fitting

16.8 Replaceability of components

The producer ensures the fabrication replaceability of the following components :

a) wings

b) ailerons

c) stabilizer

d) elevators

e) rudder

f) canopy perspex

g) main and front undercarriage and tail wheel

h) sets of control systems

i) instrument panels

Note : The term "FABRICATION REPLACEABILITY" is understood as the possibility of correct assembling of cooperating components manufactured on the separate stands.

In particular cases it can require the common reaming of fittings of joined components and fitting the outlines.