PRZEDSIĘBIORSTWO DOŚWIADCZALNO-PRODUKCYJNE SZYBOWNICTWA

"PZL-BIELSKO"

BIELSKO-BIAŁA UL. CIESZYŃSKA 325

OBOWIĄZUJE W
Allstar PZL Glider
Bielsko-Biała

TECHNICAL SERVICE MANUAL

OF GLIDER

SZD-59 "ACRO"

Issue II, July 1996

Factory No	
Registration No	

This is the translation of the original Polish text agreed with the Airworthiness Authority.

Translated by

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Tadeusz Zboś, Msc Eng.

No records or revisions are allowed to be introduced to this Manual unless agreed with the Airworthiness Authority.

0. ISSUANCES

0.1. List of revisions

The revision of text of this Manual is to be indicated with revision number and with a vertical line in the left hand margin of new text.

No	Page	Revision	Date	Signature
1	30	Replace page 30 with 30a.	18.06.1998	
2	3, 46, 50	Replace pages 3, 46, and 50 with3a,46a,50a–appropriately	2.12.1998	

No	Page	Revision	Date	Signature

0.2. Contents

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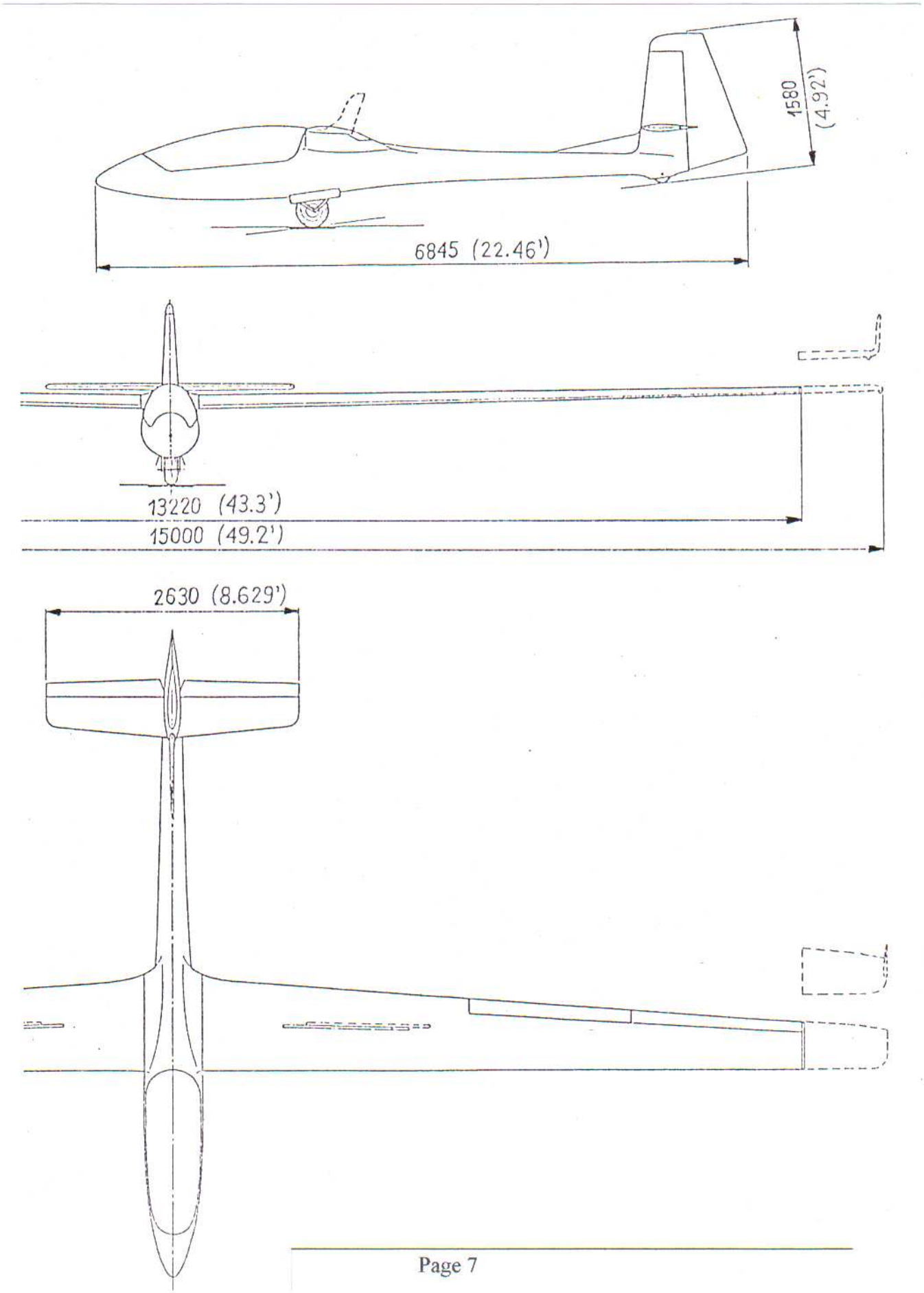
0.3. List of figures

1. TECHNICAL DESCRIPTION

1.1. Technical data.

	Version	
	Aerobatic	**Standard**
WINGS		
Span	13.20 [m] (43.3 [ft])	15.00 [m] (49.2 [ft])
Area	9.79 [m^2] (105.4 [ft^2])	10.66 [m^2] (114.7 [ft^2])
Aspect ratio	17.79	21.11
Dihedral	1.5 [°]	1.5 [°]
Root chord	0.950 [m] (3.117 [ft])	0.950 [m] (3.117 [ft])
Mean Standard Chord (MSC)	0.7654 [m] (2.511 [ft])	0.7424 [m] (2.436 [ft])
Aileron span	3.500 [m] (11.48 [ft])	3.500 [m] (11.48 [ft])
Aileron area	0.444 [m^2] (4.780 [ft^2])	0.444 [m^2] (4.780 [ft^2])
Area of one brake plate	0.120 [m^2] (1.292 [ft^2])	0.120 [m^2] (1.292 [ft^2])
TAILPLANE		
Span	2.630 [m] (8.629 [ft])	2.630 [m] (8.629 [ft])
Area	1.332 [m^2] (14.34 [ft^2])	1.332 [m^2] (14.34 [ft^2])
Elevator area	0.375 [m^2] (4.04 [ft^2])	0.375 [m^2] (4.04 [ft^2])
Setting angle, in ref. to wing chord	-2.0 [°]	-2.0 [°]
FIN AND RUDDER		
Height	1.400 [m] (4.593 [ft])	1.400 [m] (4.593 [ft])
Area	1.213 [m^2] (13.06 [ft^2])	1.213 [m^2] (13.06 [ft^2])
Rudder area	0.673 [m^2] (7.245 [ft^2])	0.673 [m^2] (7.245 [ft^2])
FUSELAGE		
Length	6.845 [m] (22.46 [ft])	6.845 [m] (22.46 [ft])
Width	0.60 [m] (1.97 [ft])	0.60 [m] (1.97 [ft])
Height	1.58 [m] (4.92 [ft])	1.58 [m] (4.92 [ft])
MASSES		
Empty glider with std. equipment (max.)	270 [kg] (595 [lb])	280 [kg] (618 [lb])
Useful load	65÷116 [kg] (143÷255[lb])	65÷116 [kg] (143÷255[lb])
Water ballast in wing	-----	150 [kg] (331 [lb])
Max. in-flight:		
- without water ballast	380 [kg] (835 [lb])	390 [kg] (860 [lb])
- with water ballast	-----	540 [kg] (1191 [lb])
Max. non lifting parts	132 [kg] (291 [lb])	132 [kg] (291 [lb])

Fig. 1 THREE VIEW DRAWING - MAIN DIMENSIONS



1.2. Description of glider.

SZD-59 "ACRO" is a high wing, monoplace glider with cross tail arrangement.

The basic structure is of glass/epoxy composite.

The glider may be operated in two versions :

- aerobatic, with wing of 13.2 [m] (43.3 [ft]) span;
- standard, with wing of 15 [m] (49.2 [ft]) span (after connection of tips) with capability of taking the water ballast in wings. The detachable wing tip can be equipped with winglet.

The tapered wing employs NN-8 profile, constant over the whole span. In the aerobatic version it has two, and in the standard version four panels.
Monospar wing structure with sandwich coverings, the box-type spar having roving caps.
In wing front torsion box the water ballast tank is located.
The wings are joined together in the plane of symmetry by means of a bolt. The 20 per cent aileron of two panels is suspended on 7 hinges, and actuated in 2 points.
The double-plate metal sheet air brake extended on upper and lower wing surface has a spring loaded composite cap, fitted to the wing contour.

The fuselage integral with the fin is made of solid composite shell. The tubular fuselage part is stiffened with semiframes. In fuselage central part a steel framework joins wings and retractable undercarriage, the latter comprising a 350 mm (13.79 in) diameter non-sprung wheel.
One piece, front hinged canopy, opening upwards with two - located on the canopy frame - lock handles.

The pilot's proper position in the cockpit is set by means of in flight adjustable pedals and on ground adjustable back-rest.

In the fin leading edge the aerial is installed with a wire led to the instrument panel.

The stabilizer is of sandwich structure.

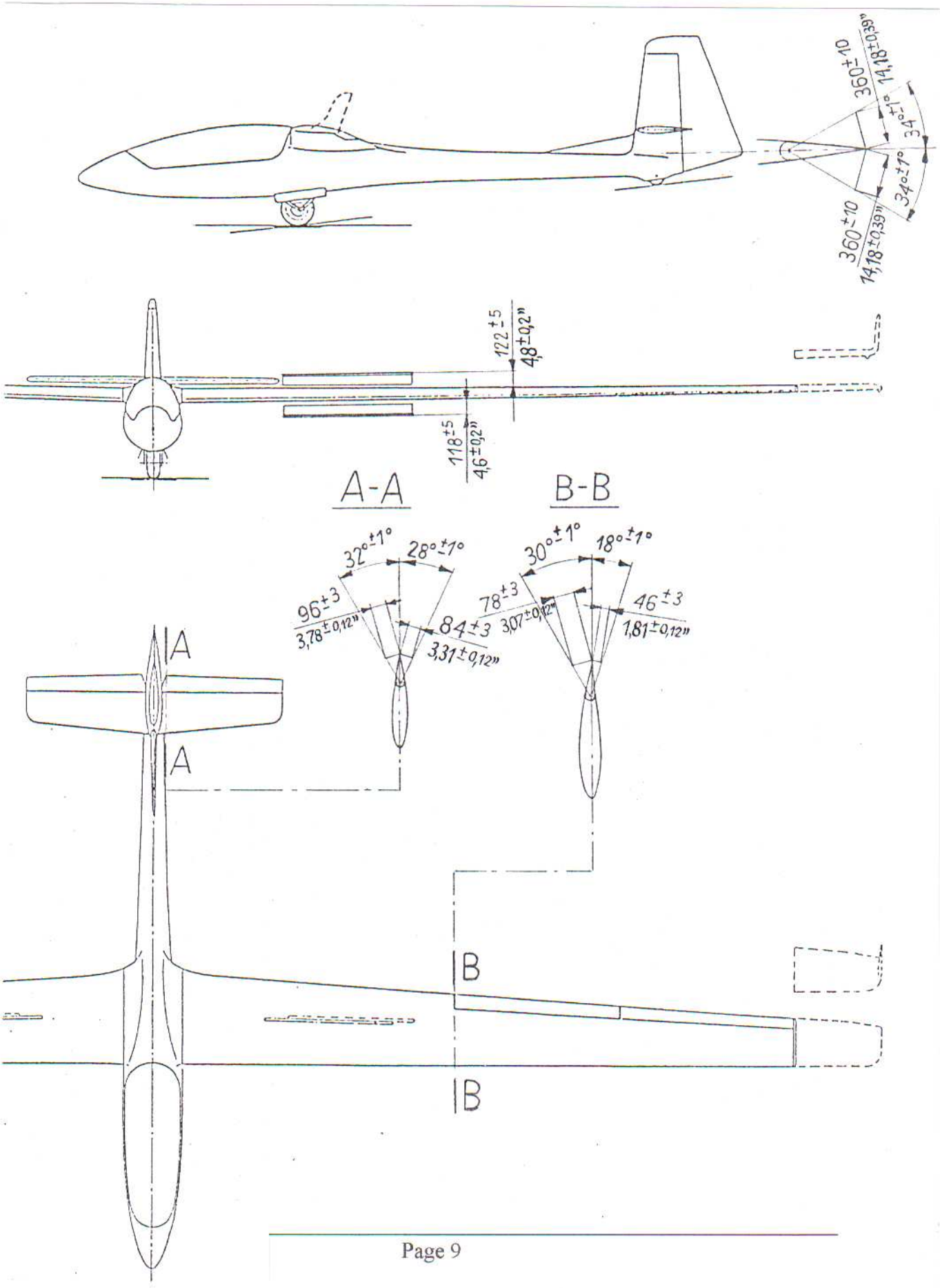
The elevator and rudder are mass balanced.

The towing hook is installed on the fuselage front part.

The winch-launching hook is installed on the main undercarriage.

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

Fig. 2 CONTROL SURFACES DEFLECTIONS



2. TECHNICAL SERVICE MANUAL

2.1. Assembly and disassembly of glider.

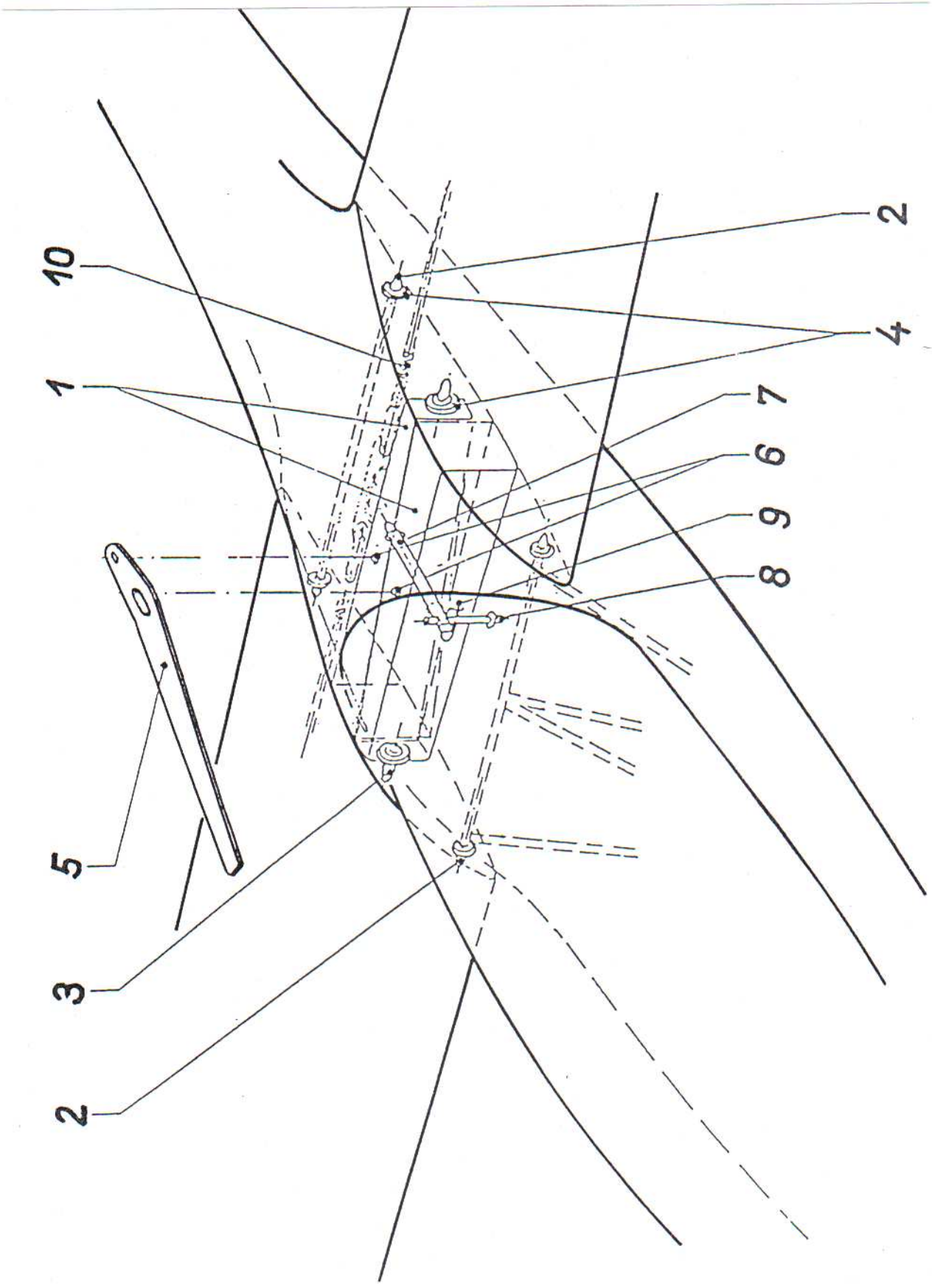
For assembly and disassembly of the glider 4 persons are required, or 3 persons if the special supports are available.
Before assembly, all mating surfaces of assembled sets should be cleaned with a rag and lubricated.

2.1.1. Wing assembly Fig. 3

Put the air brake and water ballast control hand-grips in the cockpit into the "closed" position.
Retract the air brakes in the wing.
Shove the spar ends (1), first of the right-, and next of the left-hand wing into the fuselage. In continued motion, the pivots (2) protruding out of the framework and the spar pivots (3) should enter the ball nests (4) on the wing ribs.
Fix the assembling lever (5) onto the feet (6) on the spars, and pull the wings onto the fuselage.
Join the wings with the bolt (7) and secure it with a pin inserted into the hole (8), put on the safety pin (9).
Join the aileron control push-rods in wing with the quick-connecting push-rod ends (10). The air brake control system connects automatically.

Disassembly of wing requires the reverse sequence.

Fig. 3 WING ASSEMBLY



2.1.2. Tailplane assembly.

Insert the end of tubular spar (1) and front pivot (2) of the right-hand tailplane half into the nests (3) and (4) on the fin.
Pull off the securing bolt, protruding out of the leading edge of the left-hand tailplane half, and lock in this position by turning it 90° - in arbitrary direction.
Slide the left-hand tailplane half onto the protruding end of tubular spar (1) and insert simultaneously the front pivot (2) into the proper nest (4). When inserting the tailplane, pay attention to the automatic connection of the elevator control coupling nests (7) with the ball ends of control lever (8).
Secure the tailplane by rotating the bolt (5) 90° - in arbitrary direction, and insert it into the hole on the tubular spar. The bolt is maintained in this position with a spring (6). The bolt is correctly secured when its red-painted portion is invisible.

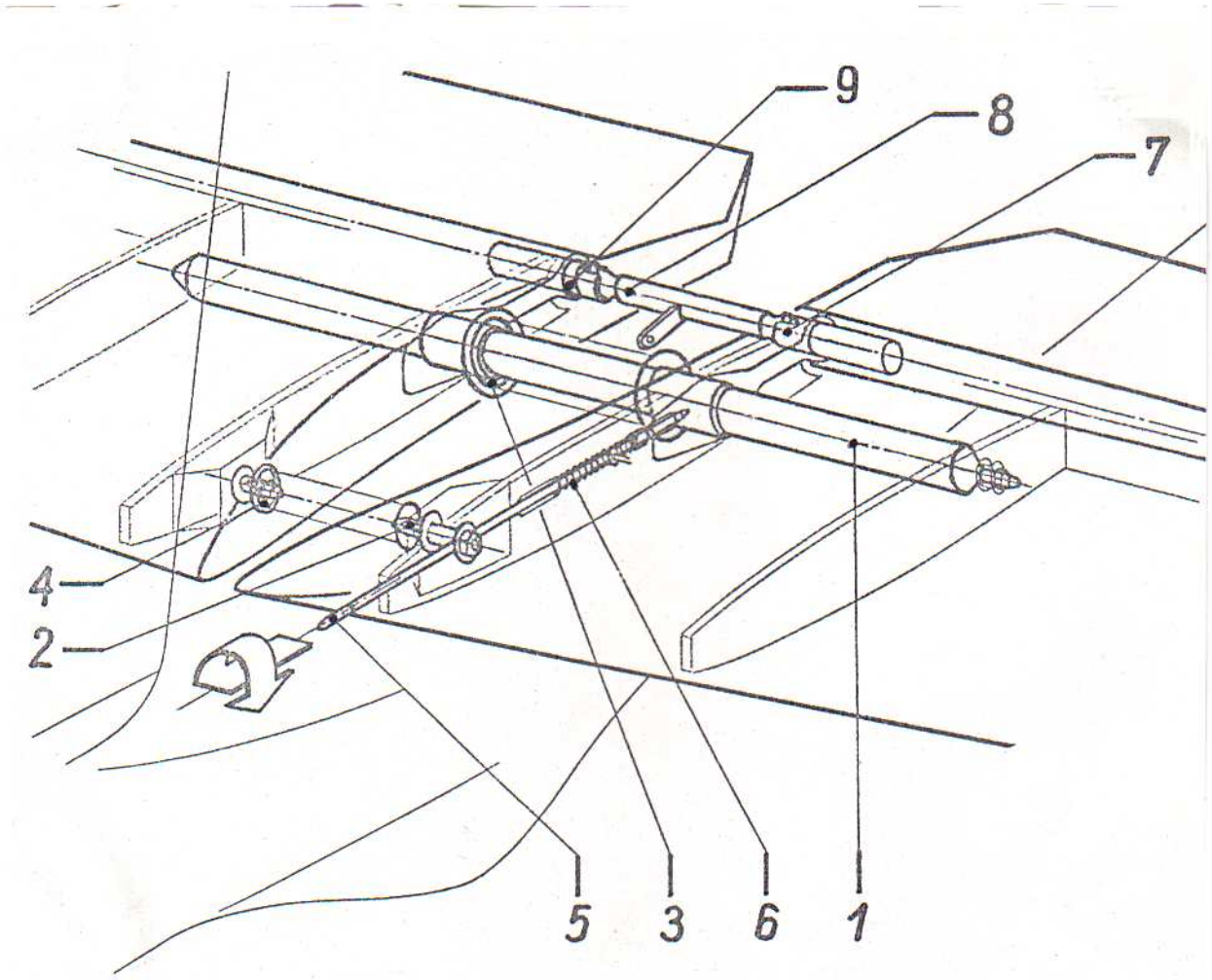
Disassembly of the tailplane requires the reverse sequence.

2.1.3. Disassembly and assembly of elevator.

Disassemble the stabilizer.
Remove the securing split pin (9) out of the coupling nest, being the hinge axle too.
Take the elevator out of hinges, shifting it outboards.

Elevator assembly requires the reverse sequence.

Fig. 4. TAILPLANE ASSEMBLY



2.1.4. Disassembly and assembly of rudder.

Screw off the covers of inspection holes, positioned on right-hand and left-hand sides of the fin.
Remove the safety-pin and undo the nut of the rudder upper hinge.
Unhinge the rudder, shifting it axially upwards.

Rudder assembly requires the reverse sequence.

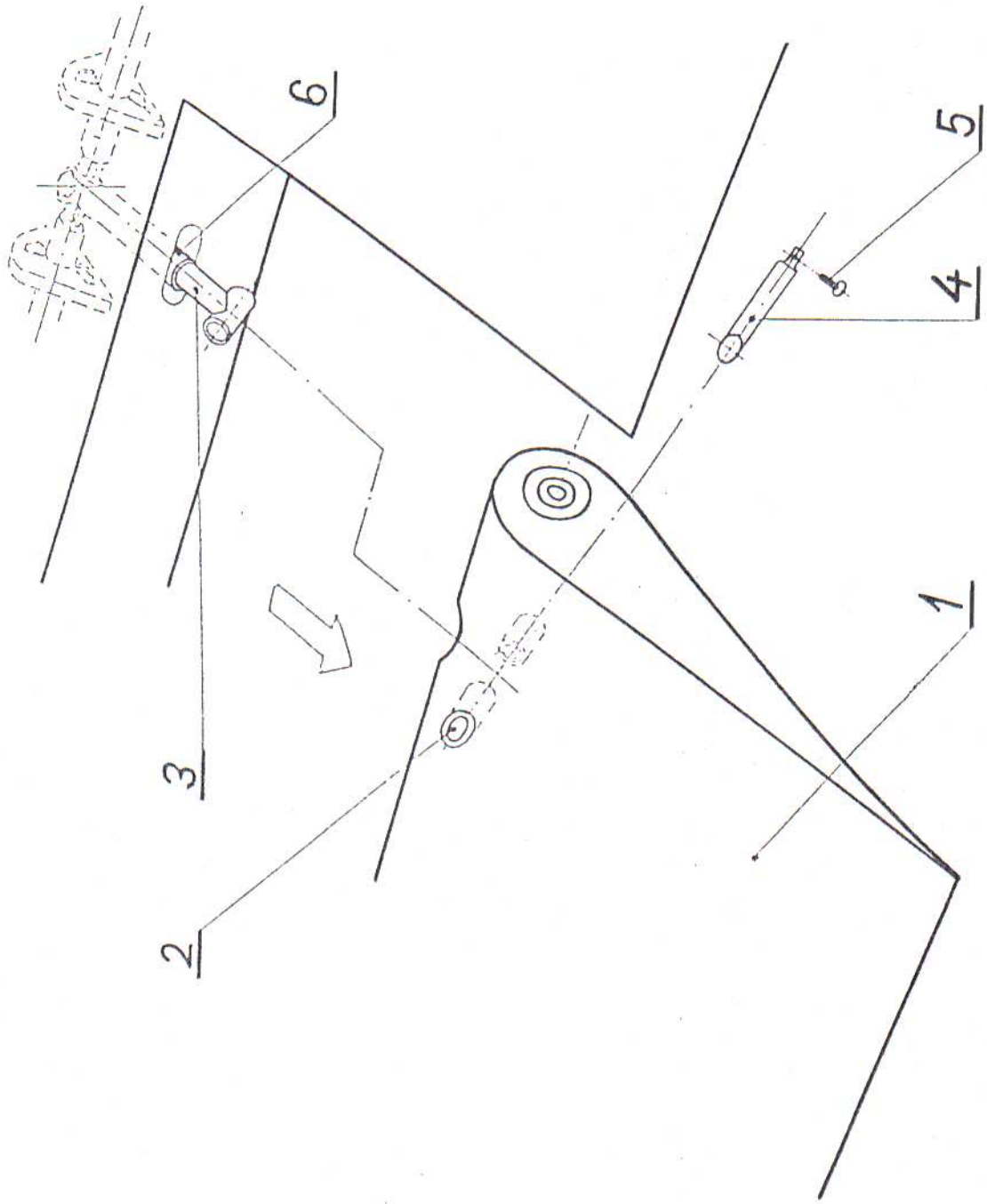
2.1.5. Disassembly and assembly of aileron Fig. 5.

Screw off the wing end plate, or disassemble the wing tip, depending on glider version used (see item 2.1.6 of this Manual).
Unhinge the outboard aileron, shifting it towards wing tip.
Remove the aileron together with lever (3) from the wing, shifting it in the direction indicated with an arrow.
Remove the screw (5).
Take the pin (4) out of the nest (2).
Take the lever (3) out of the aileron.
When removing the inboard aileron, repeat all the above operations except of the first one.

Aileron assembly requires the reverse sequence.

NOTE - BEFORE THE AILERON IS HINGED, THE LEVER (3) SHOULD BE INSERTED INTO THE SLEEVE (6).

Fig. 5 AILERON ASSEMBLY

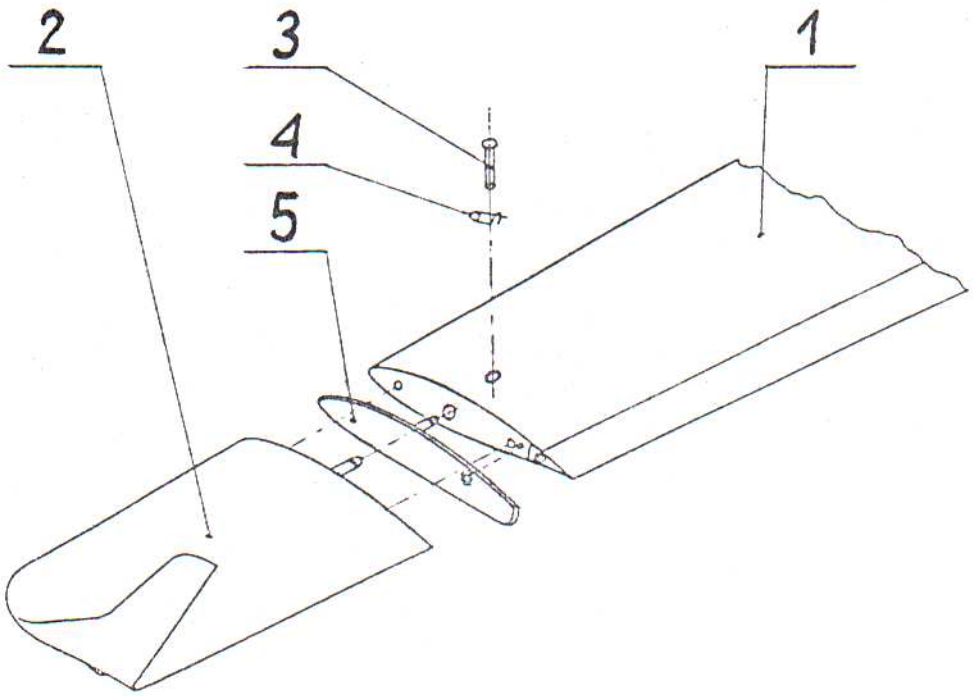


2.1.6. Assembly and disassembly of wing tips Fig. 6.

Screw off the wing end plate (5).
Remove the safety pin (4) and take off the securing bolt (3).
Shift off and remove the wing end plate.
Insert the wing tip pivot (2) into the wing sleeve (1). In continued motion, the pivots protruding out of the wing tip should enter the proper nests on the wing end rib.
Insert the securing bolt (3) and lock it with the safety pin (4).

Disassembly of the wing tips requires the reverse sequence.

Fig. 6 ASSEMBLY OF WING TIP



2.2. Control systems and their adjustment.

2.2.1. General.

On the glider the push-rod system is used for elevator, aileron, air brake, ballast water valves and undercarriage control.

The rudder, towing hook(s) and wheel brake are controlled with cable systems.

The control systems are accessible for the adjustment when :

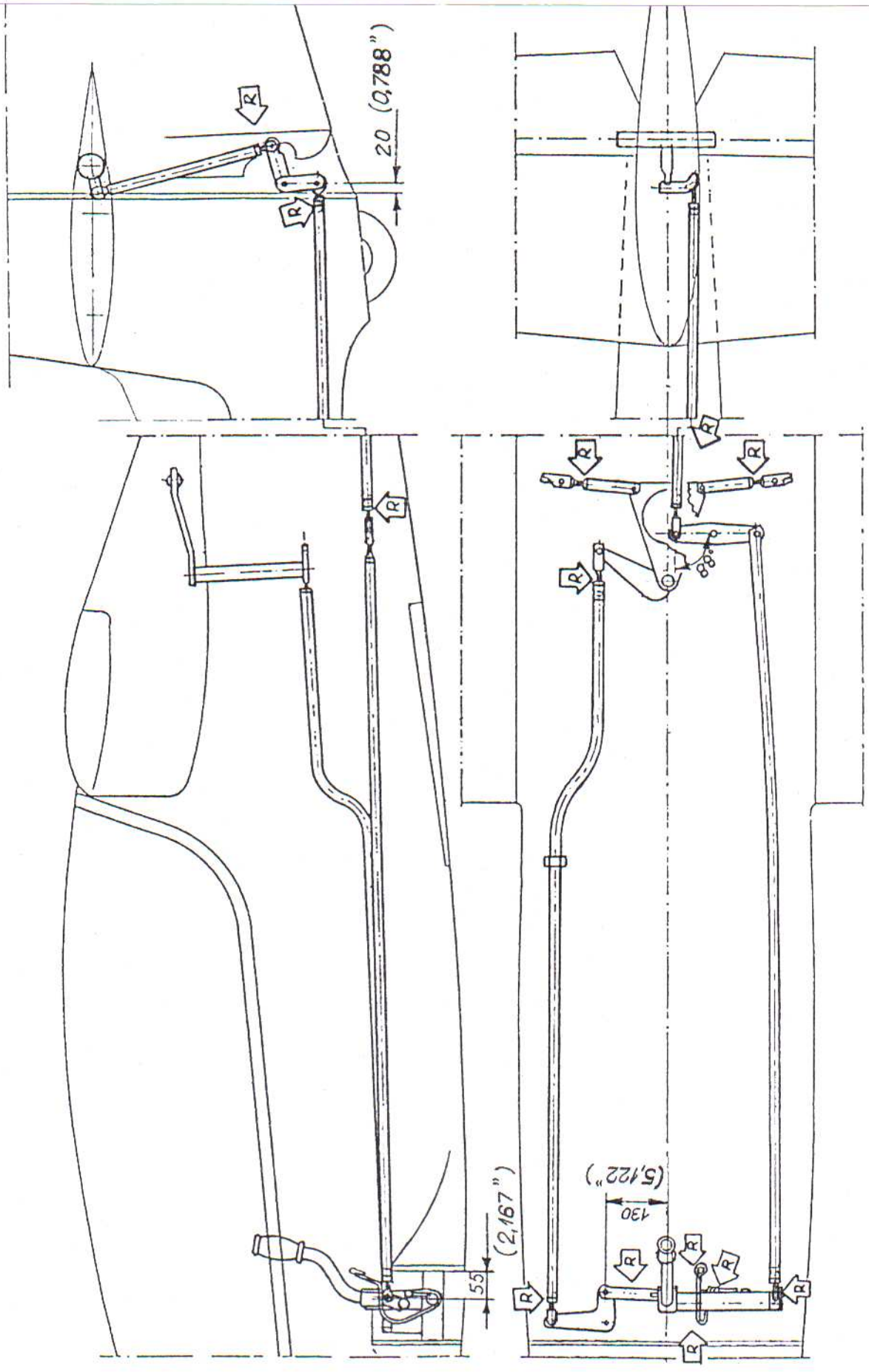
- the instrument panel and its base are disassembled (according to item 2.4.1, page 27)
- the cover of fuselage top inspection hole is opened,
- the cockpit floor is removed, } by removing the screws
- the fin inspection hole covers are disassembled. }

The adjustment should be performed when the excessive errors in control surfaces deflections, with respect to the values given in Fig. 2, are found.
On Figs. 7, 8, 9 and 10, the push-rod ends, turn-buckles and other elements used for adjustment of control systems have been marked with arrows and with "**R**" sign, and the levers neutral positions have been shown. In case of turn-buckles it is necessary that the end thread is invisible.
During the adjustment of push-rod ends, it must be checked if the inspection hole is covered with the end thread.
Having completed the adjustment, all adjusted elements shall be secured.

2.2.2. Elevator and aileron control system Fig. 7.

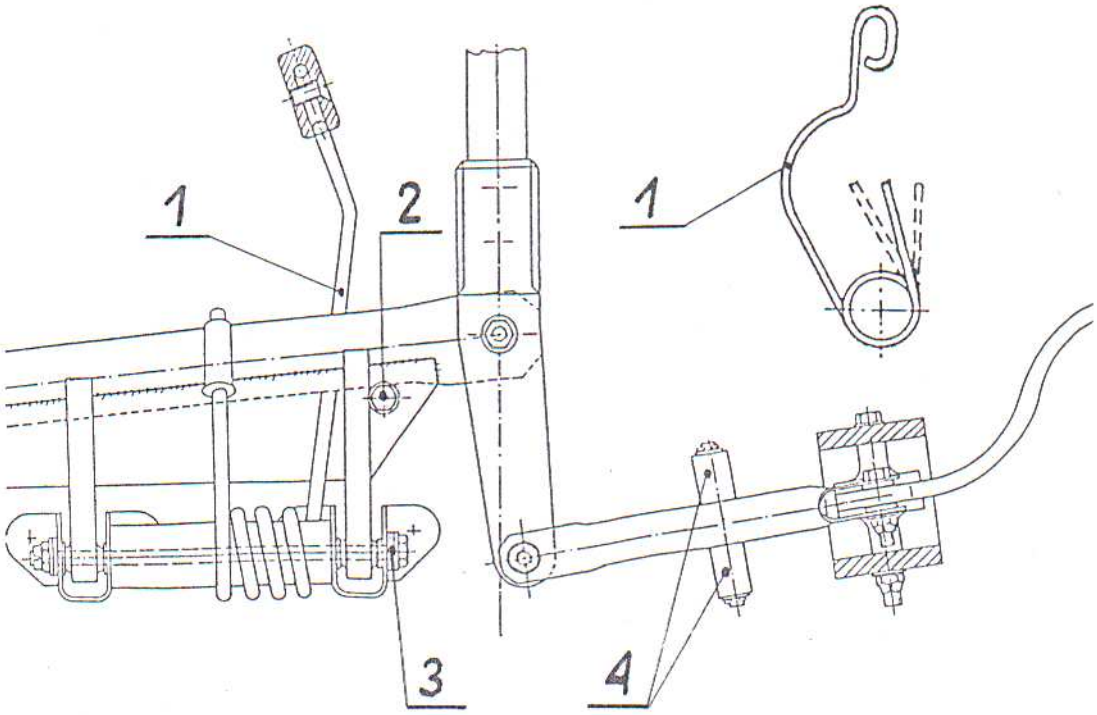
The elevator deflections are adjusted by means of screw stops ((2) in Fig. 7A) on the control column, or by means of push-rod ends.
The aileron deflections are adjusted by the washer ((3) in Fig. 7A) amount under the head of control column fixing screw (stick to the right), eventually by replacement of polyamide sleeves ((4) in Fig. 7A) (stick to left) or of push-rod ends.

Fig. 7 CONTROL SYSTEMS OF ELEVATOR AND AILERON



The adjustment of spring trimming device depends on bending the trimming spring ((1) Fig. 7A) - on the left-hand side of control stick.
The correctly shaped spring positioned in the 5-th slot (counting from front) should retain the elevator neutral.
The friction force of correctly adjusted spring trimming device should range about 0.3 [daN] (0.7 [lb]).

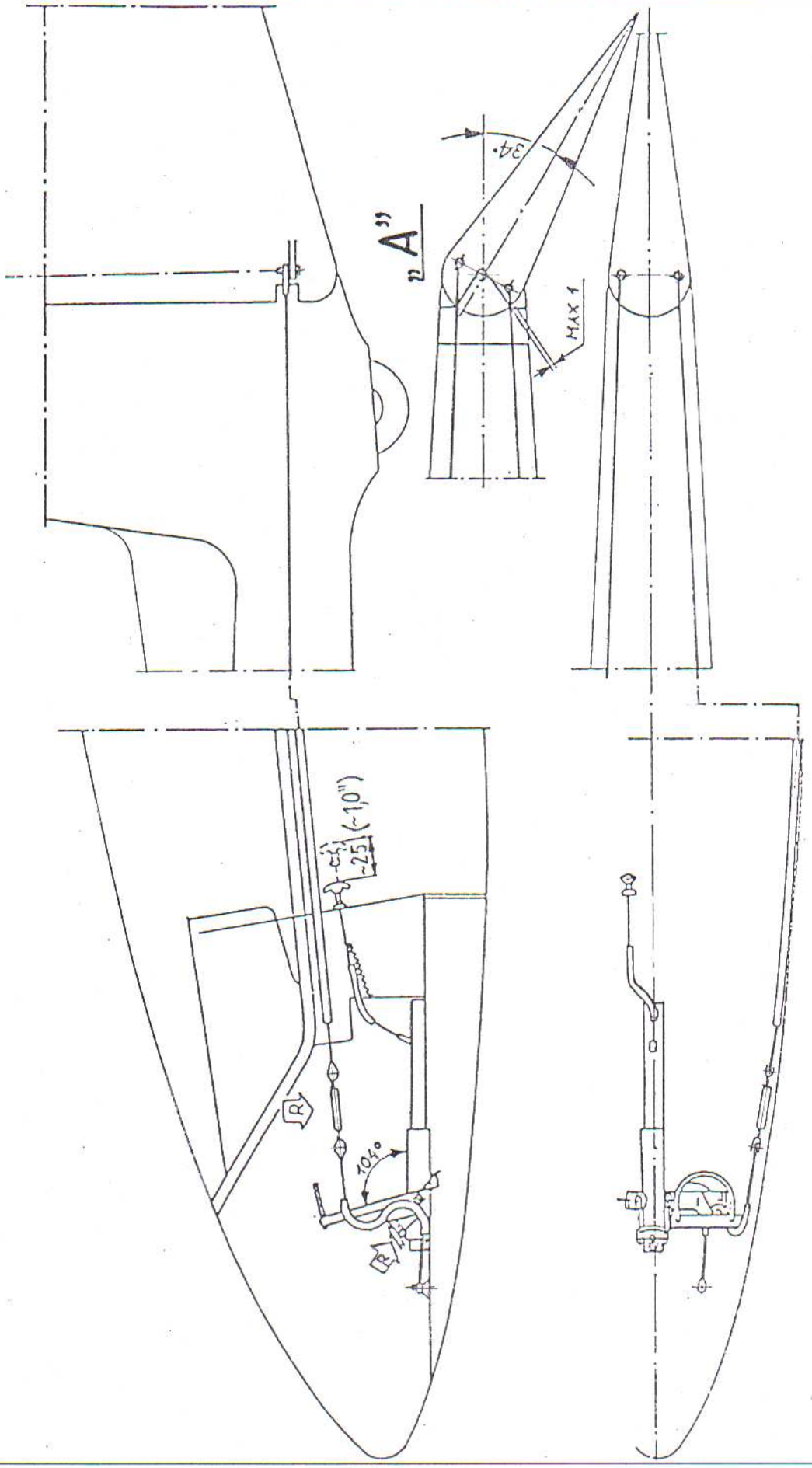
Fig. 7A ADJUSTMENT OF ELEVATOR AND AILERON DEFLECTIONS



2.2.3. Rudder control system Fig. 8.

Adjust the rudder deflection by means of screw stops on the pedals, or with turn-buckles.
The maximum allowed play between the additional stop of rudder deflection (to left and to right), and a fitting (detail "A" on Fig. 8) is 1 [mm] (0.04 [in]).
Required cable tension is 10±1 [daN] (22±2 [lb]).

Fig. 8 RUDDER CONTROL SYSTEM



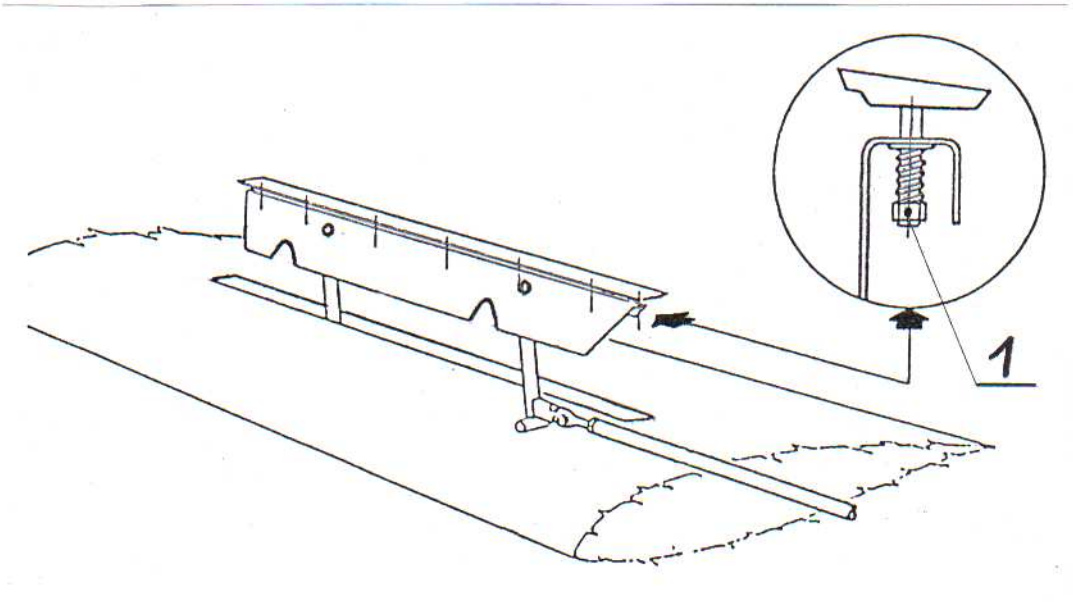
2.2.4. Air brake control system Fig 8A.

In the air brake control system only the plate caps are adjustable. The force in spring pressing the caps is changed by tightening or loosening the nuts ((1) Fig. 8A).

With air brake extended, the springs should be tensioned so that the force applied to the cap in spring attachment point is :

- 1.0 [daN] (2.2 [lb]) for lower caps,
- 1.5 [daN] (3.3 [lb]) for upper caps.

Fig. 8A CAP OF AIRBRAKE PLATE



2.2.5. Undercarriage control system Fig. 9.

The undercarriage control system is adjusted by means of push-rod ends.

The wheel brake control system is adjusted by means of :

- threaded Bowden's cable end,

NOTE - THE CABLE AFTER ADJUSTMENT OF ITS LENGTH SHOULD NOT RESULT IN THE PRE-DEFLECTION OF THE BRAKE LEVER ON THE WHEEL OUT OF ITS INITIAL POSITION.

- adjusting screw (1) on the brake disc, on its right-hand side, when the lock (2) is released (see detail "A", Fig. 9).

2.2.6. Allowable plays on the control stick.

The allowable play measured on the end of control stick for the elevator fixed in neutral position is :

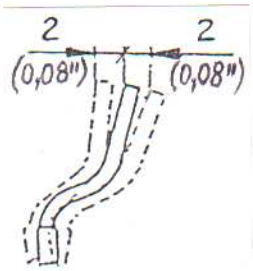
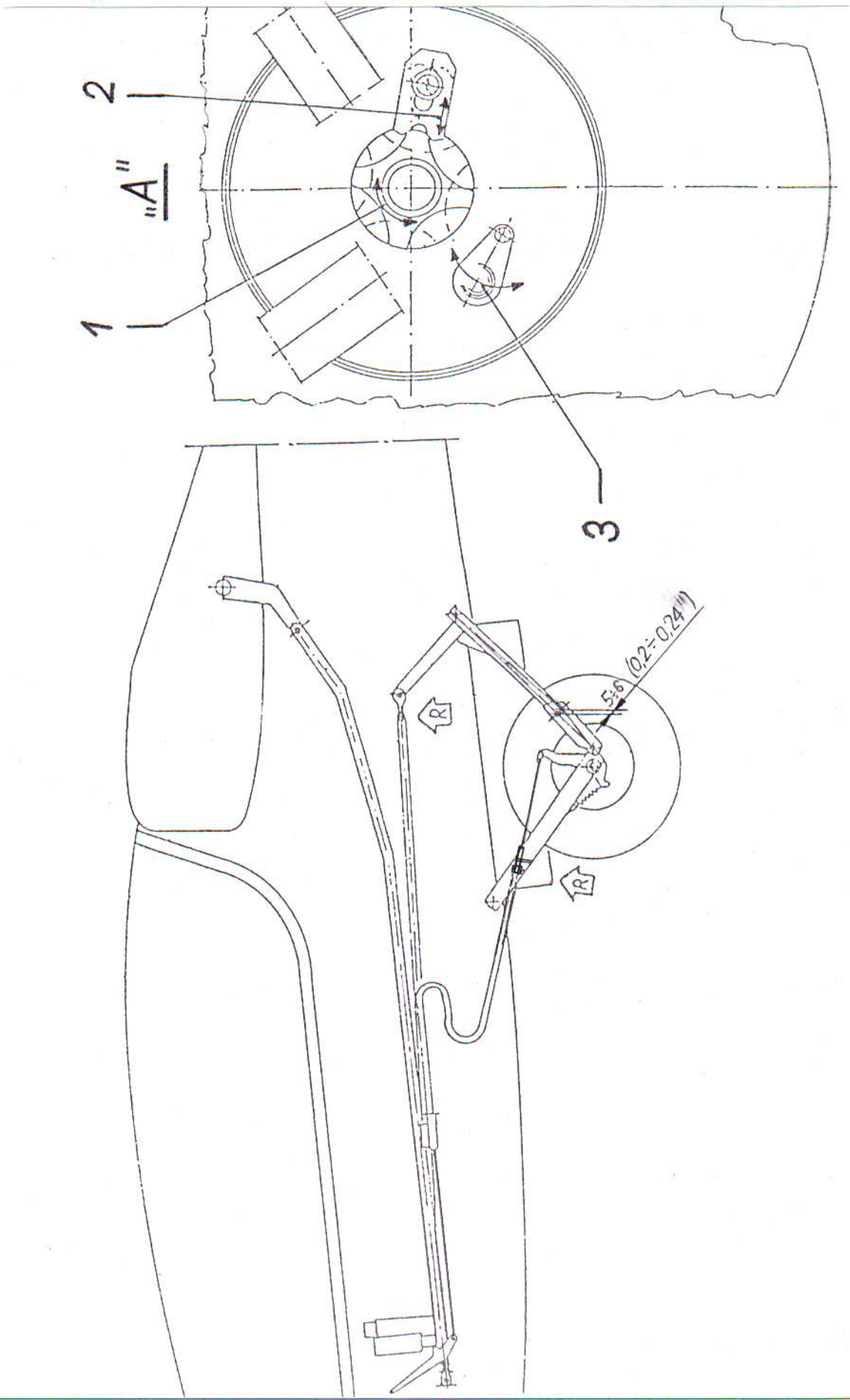
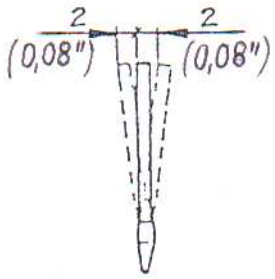


Fig. 9 UNDERCARRIAGE AND AIRBRAKE CONTROL SYSTEM

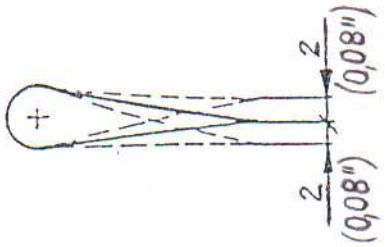


The allowable play measured on the end of the control stick for the ailerons fixed in neutral position is :

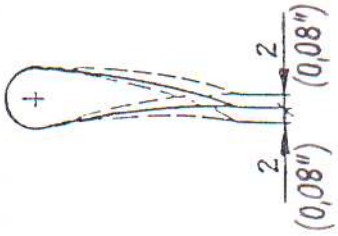


2.2.7. *Allowable plays of elevator and aileron.*

The allowable play of elevator with the control stick fixed in neutral position is :



The allowable play of aileron with the control stick fixed in neutral position is :



2.2.8. Allowable operation forces.

Forces in control systems (measured on the handle centre, control surfaces neutral):

- aileron		1.0	[daN]	(2.2	[lb]),
- elevator (without trimming spring)		0.25	thru	0.35	[daN]
		(0.55	thru	0.77	[lb]),
- rudder (measured on pedal upper feet)		2.5	[daN]	(5.5	[lb]),.

The allowable forces in other systems (measured at the handle centre) :

- air brake - extended/retracted	max.	16.0	[daN]	(35	[lb]),
- undercarriage - extended/retracted	max.	20.0	[daN]	(44	[lb]),
- canopy emergency jettisoning	max.	20.0	[daN]	(44	[lb]),
- canopy opening - handle L / R	max.	15.0	[daN]	(33	[lb]),
- towing cable release :					
in case one hook is installed :					
without cable tension	max.	9.0	[daN]	(20	[lb]),
with cable tension	max.	12.0	[daN]	(26	[lb]),
in case two hooks are installed :					
without cable tension	max.	6.0	[daN]	(13	[lb]),
with cable tension	max.	9.0	[daN]	(20	[lb]),

NOTE - THE LOWERED OPERATION FORCE IN CASE TWO HOOKS ARE INSTALLED RESULTS OF THE CHANGED GEAR.

2.3. Undercarriage.

The main wheel is suspended on the front and rear legs.
During retraction the rear leg is folded.
In the extended position the "dead point" on the rear leg is held by the lock on pushrod, in the cockpit.
The undercarriage well is closed with door, loaded with springs or tensioning cord.
Tyre pressure is 0.2 [MPa], which for empty glider and without water ballast results in a tyre deflection of about 20 [mm] (0.8 [in]).
The wheel hub split in 2 parts, with disc brake installed.
The tube inflation valve is accessible through the plugged hole in the brake disc on the right-hand side of fuselage.

DISASSEMBLING AND ASSEMBLING OF MAIN WHEEL AND TUBE.

Release the air pressure out of the tyre.

Remove the nuts and take out 2 screws joining wheel axle with leg.

Disconnect the wheel brake control, release the spring tensioning the brake lever on wheel.

Take out the axle and remove the hub out of the leg.

Remove the brake discs out of the hub.

Undo the nuts and take out 3 screw joining both "halves" of the hub - remove the tyre and tube.

Assembly of the wheel requires the inverted sequence.

NOTE - BEFORE ASSEMBLING BOTH HUB PARTS WITH TYRE AND TUBE, THE TUBE SHOULD BE SLIGHTLY INFLATED.

- THE BRAKE DISC WITH THE ADJUSTING SCREW FOR AXIAL PLAY SHOULD BE POSITIONED ON THE TUBE VALVE OUTLET SIDE OF THE HUB.

- ITEM 3, Fig. 9 - TUBE VALVE COVER.

Tail wheel of 200 x 50 [mm] size has the integral hub.
Tail wheel pressure 0.15 [MPa] results in the tyre deflection of 10 thru 15 [mm] (0.4 thru 0.6 [in]).

2.4. Glider equipment.

2.4.1. Instrument panel Fig. 10.

The instrument panel is fixed to its base by means of the screw on the front wall in the plane of glider symmetry.

To disassemble the panel the screw should be taken-out and the panel pulled back. Then all the instruments are accessible.

The producer recommends the standard panel equipment with the following instruments :

- PR-400S airspeed indicator (1),
- W-10S altimeter (2),
- WRs-30C variometer (3),
- bank indicator (4),
- BS-1 compass (5),
- accelerometer (6),
- compensator of total energy variometer (12).

NOTE - FOR FLYING ALLOWANCE, IN ACCORDANCE WITH THE AIRWORTHINESS REQUIREMENTS, THE FOLLOWING MINIMUM GLIDER EQUIPMENT SHALL BE INSTALLED: AIRSPEED INDICATOR, ALTIMETER AND ACCELEROMETER.

2.4.2. Pressure heads Fig. 10.

The following pressure heads are installed :

- two static pressure heads (7) in the fuselage front part, with the drainage unit (10),
- total pressure head (8) in the fuselage nose, with the draining unit (10),
- nest (9) in the upper part of fin leading edge adopted for installation of the additional Pitot's tube ∅6 to ∅7 [mm] (∅0.236 to ∅0.276 [in]), with drainage unit (10) on the pressure duct.

NOTE - GREASE THE PRESSURE HEAD IN THE FIN WITH TECHNICAL VASELINE BEFORE FITTING IT IN THE NEST (9).

The pressure duct connector (11) which allows the instrument panel to be taken out of the glider has the ends with coloured dots to connect the ducts in the following way :

- red, static pressure (7),
- black, total pressure (8),
- yellow, nest (9).

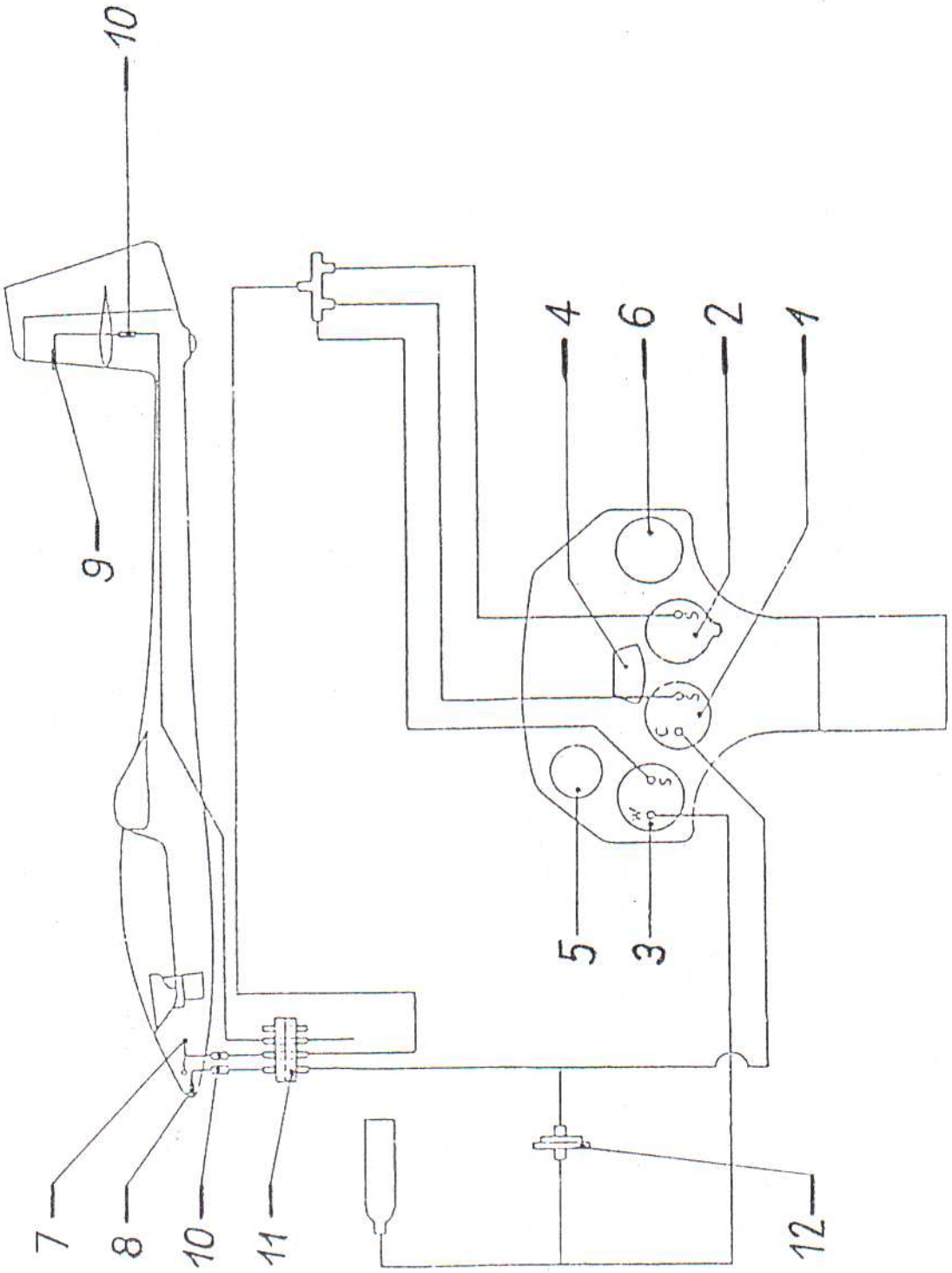
NOTE - THE PR-400S AIRSPEED INDICATOR TOTAL PRESSURE SHALL BE CONNECTED FROM THE HEAD (8) ONLY.

- AFTER FLYING IN RAIN OR IF WATER IS SUSPECTED TO HAVE ENTERED PRESSURE DUCTS, THEY SHALL BE DISCONNECTED OUT OF THE INSTRUMENTS AND BLOWN WITH THE AIR..

Drainage of instrument pressure ducts system :

- disassemble the 4-way connector(11), installed in instrument panel,
- blow the ducts through, on their portion between pressure head and connecting piece,
- in case of large amount of moisture in the drainage unit, replace or dry its absorbing insert (insert accessible on undoing the nut),
- assemble the 4-way connector,
- check the tightness of the instrument system.

Fig. 10 INSTRUMENT PANEL INSTALLATION



2.4.3. Cockpit equipment.

The pilot's cockpit is equipped with :

- 5 points pilot's belts :

  abdomen J5.10.00,
  shoulder J5.70.00,
  floor J5.90.00,

- seat upholstery,

- board pocket,

- rubber funnel of sanitary system (under the seat pan),

- balancing weights (for pilots below 70 [kg] (154 [lb])) :

  2 pcs of 4 [kg] (8.8 [lb]) each,
  2 pcs of 1 [kg] (2.2 [lb]) each.

2.4.4. Towing hooks Fig. 10A.

The following hooks can be installed :

1 - SZD IIIP or TOST (fixed in the fuselage front part) for aerotowing,

- TOST (fixed on the undercarriage leg) for winch launching

2.4.5. Additional equipment.

To the customer's order, the glider can be additionally equipped with :

- cockpit upholstery of sheepskin,

- coloured canopy perspex,

- front or C.G. hook of other type than TOST.

2.4.6. Other equipment.

Apart of the equipment listed in items 2.4.1 thru 2.4.5, the followings can be installed:

- electric variometer with computing set,

- artificial horizon,

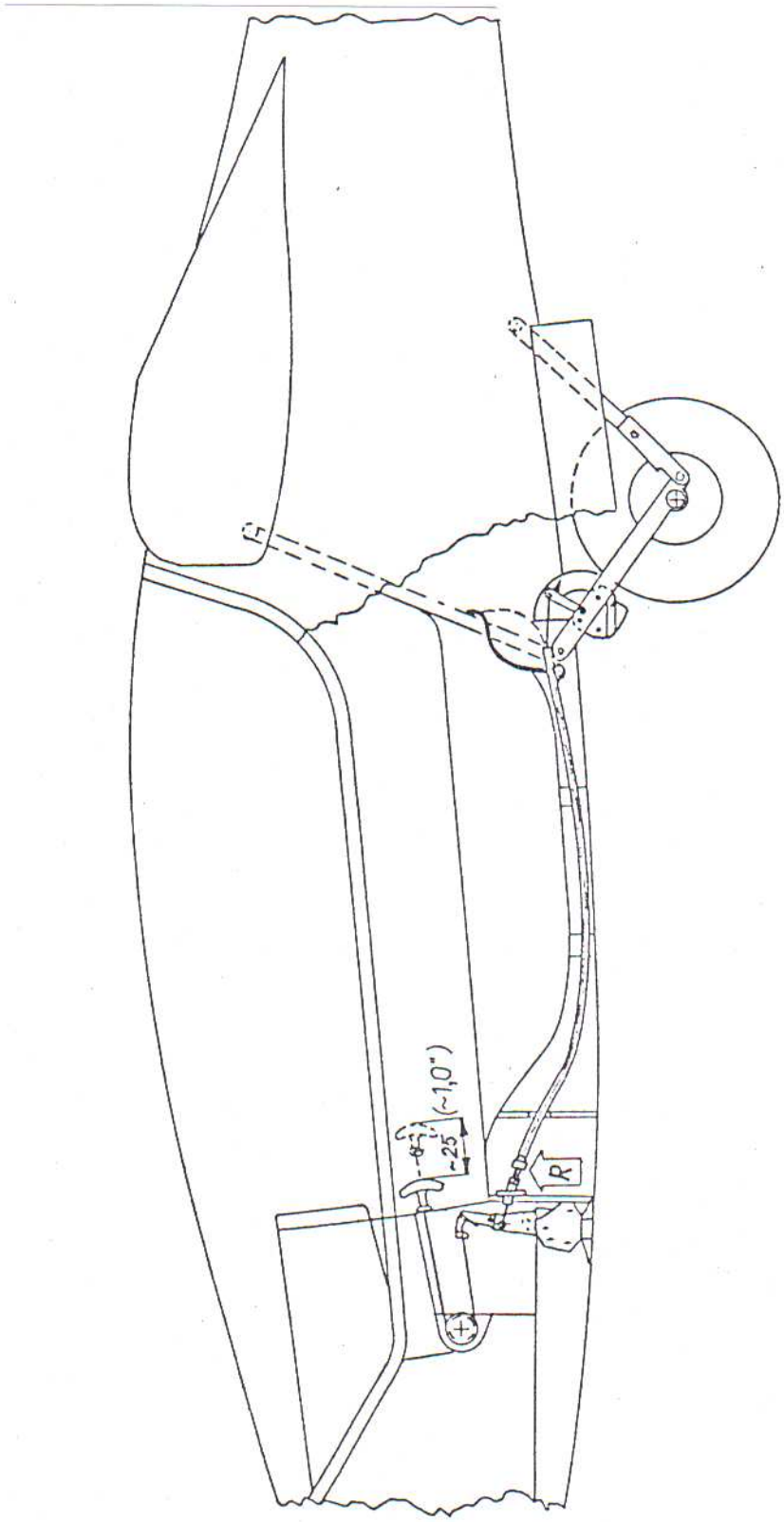
- board computer,

- transceiver,

- battery,

- photo-camera support.

Fig. 10A TOWING HOOKS CONTROL SYSTEM



2.5. Water ballast.

Scheme of the water ballast system is shown on Fig. 11.
The water ballast tanks are located in front part of wing. Every tank has a jettisoning valve (1) located on the lower surface, near the root rib. The valve control system leads through the torque tube (2) joining both valves to the slider (3) on the left side of pilot's cockpit. The tank venting orifice is located on the lower wing surface, 70 [mm] (2.76 [in]) from the wing root.

FILLING THE TANKS WITH WATER :

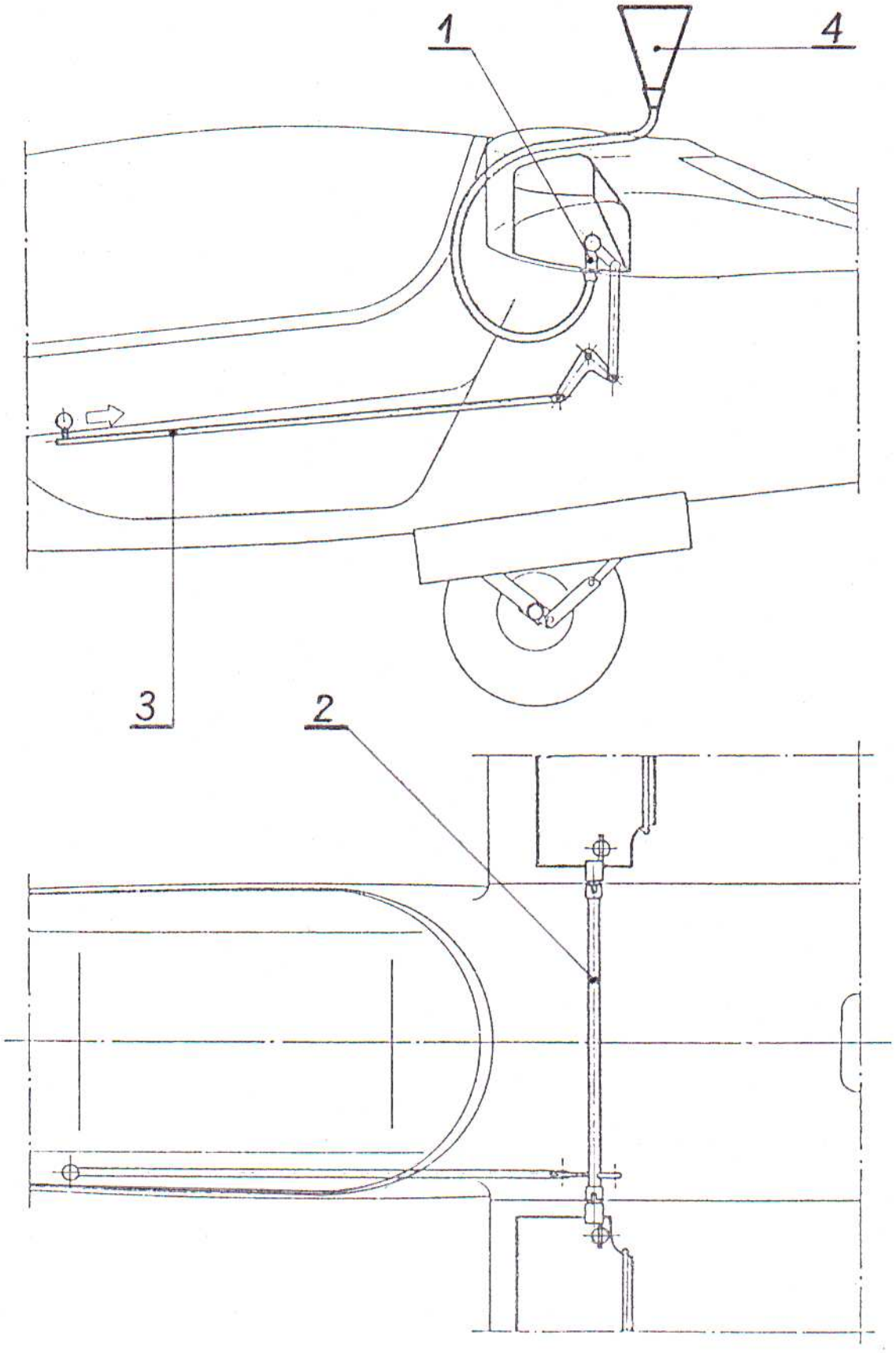
- put the glider "level" - without bank (support the wing with a brace or by hand),
- open the valves (movement "back"),
- insert the ends of special funnels (4) into the jettisoning openings on the wings,
- fill the tanks through the funnels till the constant flow appears in the venting holes (use clear water only),
- When the tanks are full close the valves moving the ball "forwards". What results is that funnel ends are pushed off from the jettisoning openings through the valve plugs,
- remove the funnels out of the wings.

NOTE - FILLING THE TANKS DIRECTLY FROM THE WATER SUPPLY UNDER PRESSURE, WITHOUT USING THE FUNNELS, IS PROHIBITED.

CHECKING OF TANK TIGHTNESS :

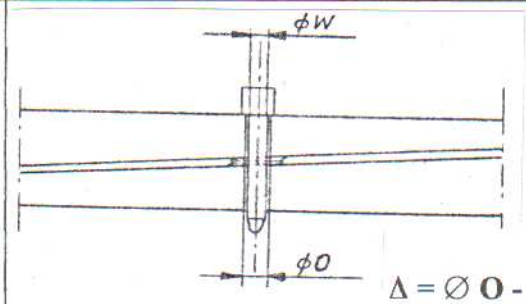
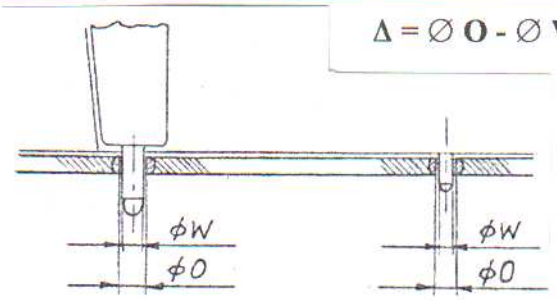
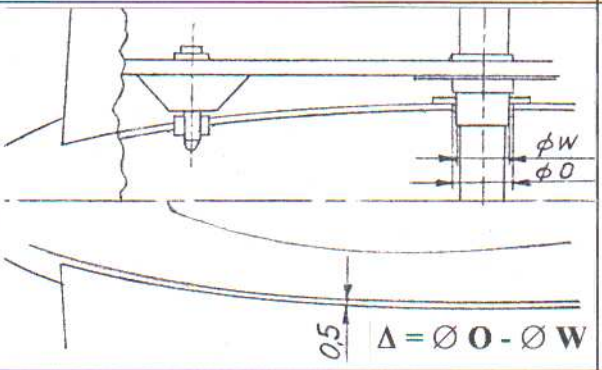
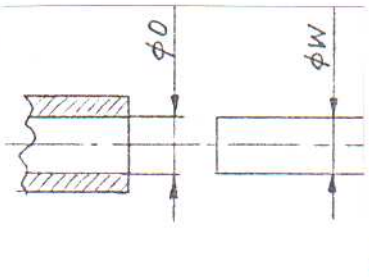
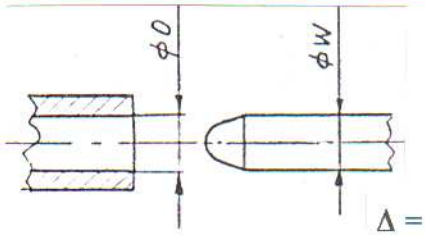
- plug the vent opening,
- check the tank tightness through the jettisoning opening in the wing,
- the checking depends on applying vacuum or water pressure,
- when using vacuum the measurement is made by means of altimeter. The check vacuum should correspond to 600 [m] (1969 [ft]) of altitude (with tolerance of 100 [m] (328 [ft])),
- when applying pressure by means of water, the water column (measured in respect to the wing upper covering) should range 700 [mm] (28 [in]) (with tolerance of 120 [mm] (5 [in])),
- the tank is estimated to be tight if during 15 minutes neither of the following will take place:
  - vacuum change greater than 20 [m] (65 [ft]
  - pressure drop in measuring pipe greater than 20 [mm] (0.8 [in])
- in annual inspection, before checking the tank tightness, remove the valve sealings and when the symptoms of damage or properties degradation appear replace with new ones

Fig. 11 WATER BALLAST



2.6. Allowable plays.

In the joints specified below the plays can appear in operation.
The allowed play values are listed in table below.

Joint	Sketch of joint	Allowed play Δ
Wing spars		0.10 [mm] (0.004 in)
Wing to fuselage		0.15 mm(0.006 in) for ∅>18 mm (0.71 in) 0.10 mm(0.006 in) for ∅<18 mm (0.71 in)
Tailplane to fin		0.15 [mm] (0.006 in)
Slide and ball bearing of control column		0.10 [mm] (0.004 in)
Wing tip to wing		0.15 [mm] (0.006 in)

2.7. Weighing the glider.

The glider is to be weighed with standard equipment (according to item 2.4.1 of this Manual).
Remove loose items, water ballast, etc.
Weigh the glider on two balances of ±0.2 [kg](±0.4 [lb]) accuracy.
Support the main and tail wheels Fig. 12.

The difference of support height should be selected so that the wing trailing edge at root rib is 22 [mm] below the leading edge at this section, when the wings are positioned without bank (Fig. 12A). This corresponds to glider attitude in which the wedge block, taper 1:100, placed on the rear top fuselage (Fig. 12A), is horizontal along its upper edge.

Fig. 12 WEIGHING THE GLIDER

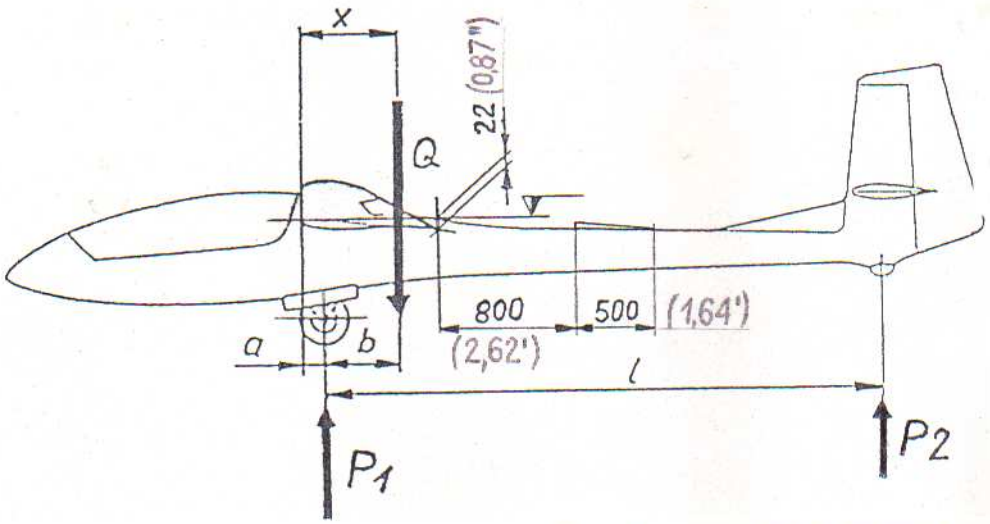
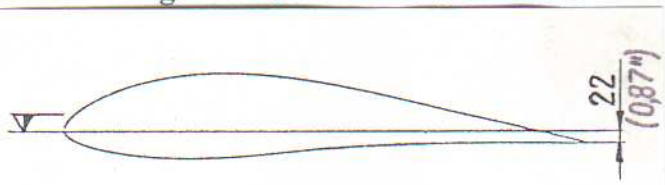
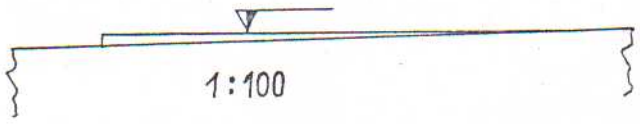


Fig. 12A GLIDER LEVELLING



$$X = a + b;$$

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



where: P_1, P_2

a, l - to be measured

The allowed C.G. location (x) of empty glider with basic equipment is specified in "Flight Manual" item 2.5.

NOTE - C.G. LOCATION OF EMPTY GLIDER IS SPECIFIED FOR AEROBATIC VERSION (FOR WEIGHING ASSUMED TO BE THE BASIC ONE).

2.8. Allowed loading conditions.

The following maximum mass values are allowed in the particular glider zones (Fig. 13) :

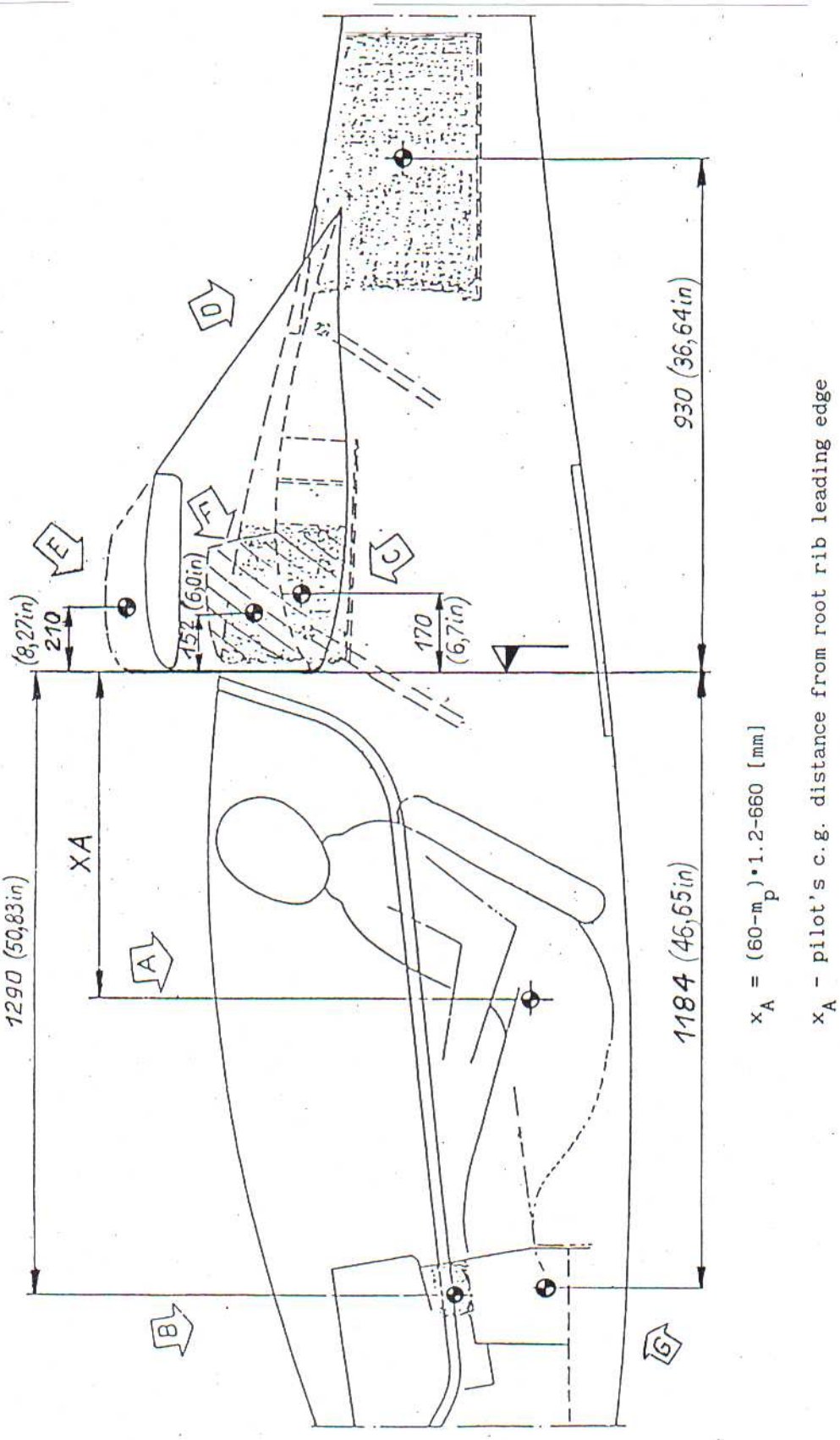
I. FOR THE GLIDER IN AEROBATIC AND STANDARD VERSIONS

A.	In the cockpit near pilot's C.G.	55 thru 110 [kg] (121 thru 242 [lb])
B.	In the instrument panel (additional equipment)	4 [kg] (9 [lb])
C.	In the central baggage compartment, before the spars	20 [kg] (44 [lb])
D.	In the rear baggage compartment	8 [kg] (18 [lb])
G.	At the instrument panel column base (balancing weight for pilot below 60 [kg] (132 [lb]))	10 [kg] (22 [lb])

II. FOR THE GLIDER IN STANDARD VERSION ONLY

E.	Mass increase due to the wing tips installation	10 [kg] (22 [lb])
F.	Water ballast in wings	150 [kg] (331 [lb])

Fig. 13 SITUATION OF GLIDER LOADING ZONES



2.8.1. Glider loading plan.

The correct C.G. location is obtained if the masses are distributed according to the following table :

Load in pilot's cockpit **"A"**	Load in instrument panel **"B"**	Load in central baggage compartment **"C"**	Load in rear baggage compartment **"D"**
55 thru 75 kg (121 thru 165 lb)	max. 4 kg (9 lb)	max. 20 kg (44 lb)	max. 8 kg (18 lb) For every 1kg (2 lb) load 0.5 kg (1 lb) in instrument panel
75 thru 100 kg (165 thru 220 lb)	max. 4 kg (9 lb)	max. 20 kg (44 lb)	max. 8 kg (18 lb)
100 thru 110 kg (220 thru 243 lb)	max. 4 kg (9 lb) For every 0.5kg (1lb) load 1 kg (2 lb) in rear baggage compartment	max. 16 kg (35 lb)	max. 8 kg (18 lb)
NOTE: BALANCING WEIGHTS **"G"** FOR PILOT OF MASS: 55 kg (121 lb) thru 60 kg (132 lb) - total mass 10 kg (22 lb) - **MANDATORY** 60 kg (132 lb) thru 70 kg (154 lb) - total mass 8 kg (18 lb) - **MANDATORY** above 90 kg (198 lb) - **PROHIBITED**			

NOTE - THE TOTAL MASS OF EMPTY GLIDER AND FUSELAGE LOAD CANNOT EXCEED :

- 380 [kg] (838 [lb]) IN AEROBATIC VERSION,

- 390 [kg] (860 [lb]) IN STANDARD VERSION (WITH WING TIPS).

The empty mass of 280 [kg] (618 [lb]) in standard version allows for maximum ballast (of 150 [kg] (331 [lb])) for every pilot (55 thru 110 [kg] (121 thru 242 [lb])), having not exceed the maximum in-flight mass with water ballast (540 [kg] (1191 [lb])).

In case the glider is loaded in different way than provided in this Manual, mass and C.G. location of the glider should be checked by means of weighing the glider with the full load.

2.8.2. Examples of C.G. location checking.

The correct in-flight glider C.G. location range is :

145 [mm] < x < 275 [mm],
acc. to item 2.5. of "Flight Manual".

The C.G. location is calculated acc. to the formula :

$$x = \frac{\sum m_i * x_i}{\sum m_i}$$

where:

$\sum$ - summation symbol

x - glider C.G. position, aft of datum [mm],

m_i - mass component [kg],

x_i - C.G. position of component, in respect to datum [mm].

The "datum" point is the leading edge of the root rib.

EXAMPLE I - FOR AEROBATIC VERSION

m_{sz} = 265 [kg] - empty glider mass acc. to item 6.2. (weighing table) of "Flight Manual",

xs_z = 513 [mm] - distance of empty glider C.G, aft of datum, acc. to item 6.2., of "Flight Manual"

m_A = 90 [kg] - pilot + parachute mass,

x_A = -696 [mm] - pilot's C.G. distance before datum, calculated acc. to the formula :

$$x_A = (60 - m_A) * 1.2 - 660 = (60 - 90) * 1.2 - 660$$

m_B = 2 [kg] - loading in instrument panel,

x_B = -1290 [mm] - its distance before datum (Fig. 13),

m_C = 10 [kg] - loading in central baggage compartment,

x_C = 170 [mm] - its distance aft of datum (Fig. 13),

m_D = 5 [kg] - loading in rear baggage compartment,

x_D = 930 [mm] - its distance aft of datum (Fig. 13),

Checking of glider all-up mass :

$$\sum m_i = m_{sz} + m_A + m_B + m_C + m_D = 265 + 90 + 2 + 10 + 5$$

$$\sum m_i = 372 < 380[kg]$$

In-flight C.G. position for glider all-up mass :

$$x = \frac{m_{sz} * x_{sz} + m_A * x_A + m_B * x_B + m_C * x_C + m_D * x_D}{m_{sz} + m_A + m_B + m_C + m_D}$$

$$x = \frac{265 * 513 - 90 * 696 - 2 * 1290 + 10 * 170 + 5 * 930}{265 + 90 + 2 + 10 + 5} = \frac{77075}{372} = 207[mm]$$

145 [mm] < x = 207 [mm] < 275 [mm]

This C.G. position is contained within the allowed range, specified in item 2.5. of "Flight Manual".

EXAMPLE II - FOR STANDARD VERSION WITH WATER BALLAST

m_{sz} = 270 [kg] - empty glider mass acc. to item 6.2. (weighing table) of "Flight Manual",

x_{sz} = 498 [mm] - distance of empty glider C.G, aft of datum, acc. to item 6.2., of "Flight Manual"

m_A = 100 [kg] - pilot + parachute mass,

x_A = -708 [mm] - pilot's C.G. distance before datum, calculated acc. to the formula :

$$x_A = (60 - m_A) * 1.2 - 660 = (60 - 100) * 1.2 - 660$$

m_B = 3 [kg] - loading in instrument panel,

x_B = -1290 [mm] - its distance before datum (Fig. 13),

m_C = 0 [kg] - loading in central baggage compartment,

x_C = 170 [mm] - its distance aft of datum (Fig. 13),

m_D = 6 [kg] - loading in rear baggage compartment,

x_D = 930 [mm] - its distance aft of datum (Fig. 13),

m_E = 10 [kg] - mass increase due to the wing tips installation,

x_E = 210 [mm] - distance of these, aft of datum (Fig. 13),

m_F = 150 [kg] - mass of water ballast,

x_F = 152 [mm] - its distance, aft of datum (Fig. 13).

Checking of glider all-up mass :

$$\sum m_i = m_{sz} + m_A + m_B + m_C + m_D + m_E + m_F = 270 + 100 + 3 + 0 + 6 + 10 + 150$$

$$\sum m_i = 539 < 540[kg]$$

In-flight C.G. position for glider all-up mass :

$$x = \frac{m_{sz} * x_{sz} + m_A * x_A + m_B * x_B + m_C * x_C + m_D * x_D + m_E * x_E + m_F * x_F}{m_{sz} + m_A + m_B + m_C + m_D + m_E + m_F}$$

$$x = \frac{270 * 498 - 100 * 708 - 3 * 1290 + 0 * 170 + 6 * 930 + 10 * 210 + 150 * 152}{270 + 100 + 3 + 0 + 10 + 150} =$$

$$= \frac{90270}{539} = 167.5[mm]$$

145 [mm] < x = 167.5 [mm] < 275 [mm]

This C.G. position is contained within the allowed range, specified in item 2.5. of "Flight Manual".

2.9. C.G. and mass balance of control surfaces.

The way of checking the C.G. of control surfaces is shown in Fig. 14.

The maximum allowable distance of C.G. of control surface in respect to hinge line are the following :

- for inner aileron 46 [mm] (1.81 [in]),
- for outer aileron 37 [mm] (1.46 [in]),
- for elevator 45 [mm] (1.77 [in]),
- for rudder 4 [mm] (0.16 [in]).

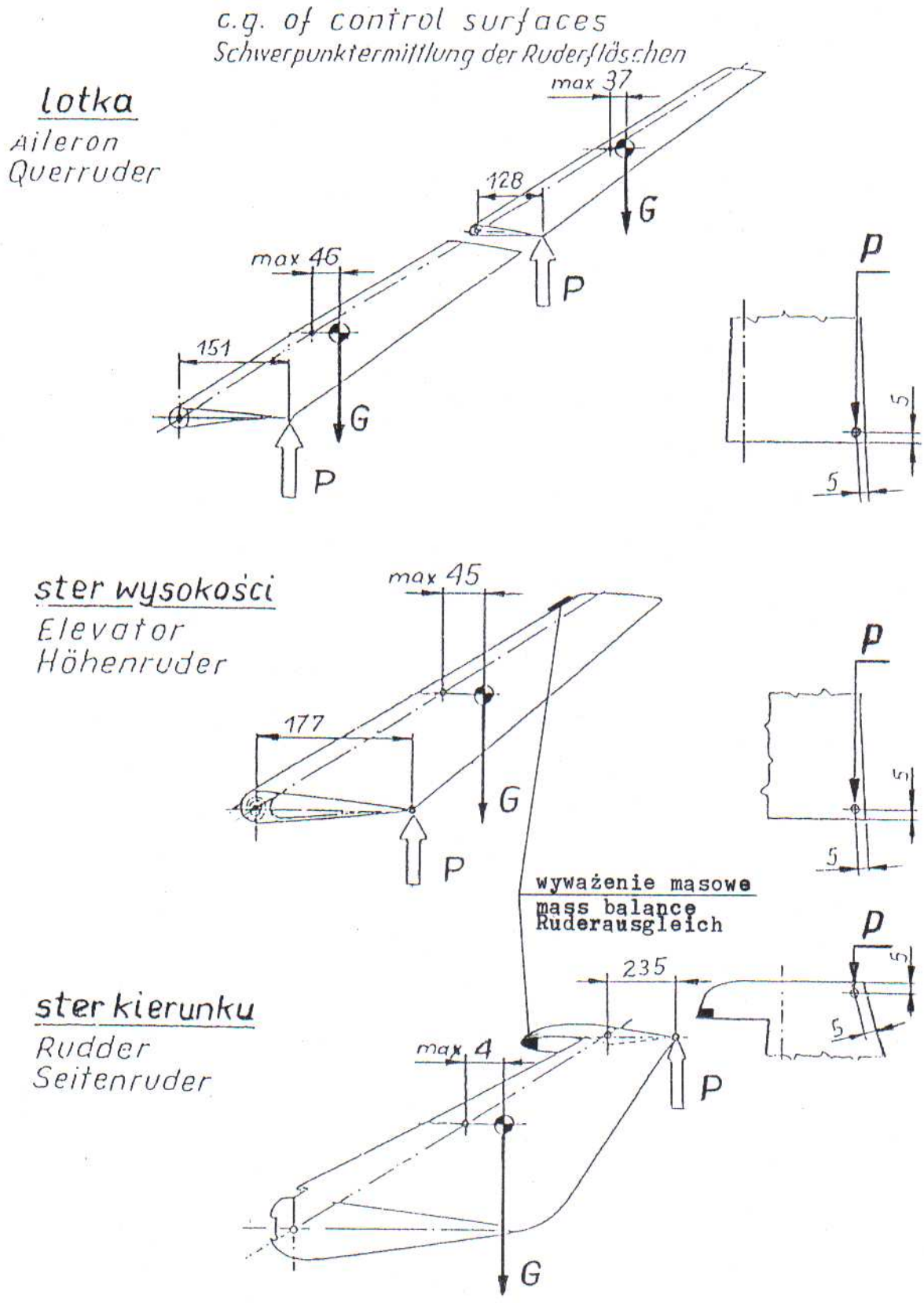
On exceeding these specified above limits of C.G. position the mass balancing of control surfaces should be employed (Fig. 14).

Moreover, the maximum mass of elevator half with mass balance shall not exceed 0.95 [kg] (2.1 [lb]).

2.10. Towing cable safety link.

The towing cable safety link of the strength of 690 [kG] (1521 [lb]), with tolerance of ±10 per cent, should be used.

Fig. 14 C.G. AND MASS BALANCE OF CONTROL SURFACES



3. PERIODIC WORKS

3.1. Pre-flight inspection.

Before the start of flying, check the following :

- validity of glider documents,
- condition of the structure, especially the coverings and glue joints,
- securing of assembling elements and this of control system joints,
- operation of control systems and control surfaces,
- operation of towing hooks,
- condition of the undercarriage (main and tail wheels), operation of wheel brake, air pressure in the tyres, cleanness of undercarriage well included,
- pilot's belts,
- total and static pressure heads,
- satisfactory operation of instruments.

3.2. Post-flight inspection.

Post-fight inspection is the same as pre-flight one.

Complete the records in the Glider Log Book.

3.3. Maintenance works.

1. Inspect the glider structure condition. Pay special attention to the components severely loaded during the take-off, flight and landing.
2. Inspect the condition of the surface of main fittings and bolts and assembling plays of the main glider components.
3. Inspect the correct securing of the assembling elements of the glider main sets, and this of control systems (see item 1.2, 2.2 of this Manual).
4. Check the reliability of the canopy locking and emergency jettison.
5. Check the condition and correct operation of the towing hooks pulling the towing cable with hand.
6. Inspect the condition of the surface and hinges of control surfaces, and of air brake.
7. Check the friction forces of control system and devices actuating forces (see item 2.2.8 of this Manual).
8. Check the condition of the undercarriage - main and tail wheels, and operation of the wheel brake, as well as this of retracting/extending system (see item 2.2.5 of this Manual).
9. Check the condition and dependable operation of the instruments.
10. Inspect the condition of metal elements protective coatings, especially those exposed to mechanical damage and corrosion (cables, undercarriage components).
11. Clean and lubricate with the proper grease the bearings and joining elements acc. to the "Lubrication Plan", item 3.7.
12. Check the tightness of the water ballast tanks (see item 2.5.).
13. Check the deflection angles of the control surfaces Fig. 2.

3.4. Maintenance works schedule (acc. to item 3.3 of this Manual).

Time of scheduled work	Kind of work
Before start of flying season	1÷13
After every 100 flying hours	1÷11
After end of flying season or before the prolonged hangaring	acc. to item 3.6
2 General inspection after every 500 flying hours, whichever comes first	acc. to item 3.8

Unscheduled works	Kind of work
After landing with undercarriage damaged	1÷ 9
After heavy landing	1,2,7,8,9

3.5. Allowed glider life-time.

2 The allowed glider life-time is 4000 flying hours, providing the life-time overhaul - according to the "Program of life-time overhaul" (enclosed in Annex No 1 to this Manual) - is repeated every 500 hours. The first life-time overhaul must be performed on a glider on completing 1500 hours total flying time.

The allowed (provisory) glider life-time up to the first general inspection is 500 flying hours.

The above does not concern :

- towing hooks,
- instruments,
- pilot's belts,

which have the life-time specified in their certificates.

NOTE - THE MINOR DAMAGES OCCURRING IN OPERATION ARE TO BE REPAIRED ACCORDING TO SZD-59 "REPAIR MANUAL".

3.6. Hangaring and transportation.

In case a prolonged break in operation is provided, the disassembly of glider components is recommended.

If the glider is to be stored in assembled condition the wing tips should be supported.

Grease the fittings and metal elements.

Put the individual covers on the main glider sets.

Put the fuselage into the belly supports, placed under the undercarriage well and fin. Place the wings with chord vertical. Shore the wings with supports under the leading edge at midspan, and under the extending spar ends near the root rib.

Release the pressure in the tyre.

NOTE - DO NOT HANGAR IN WET COVERS.

In case the glider is transported in a trailer, the components are to be fastened on their external surfaces on the wide clamps upholstered with a soft padding, or with bands.

Fasten the wings on spar root and support the leading edge at the semispan. The fuselage should be supported on the undercarriage wheels and wing connection pivots.

Fix the tailplane in the clamps.

For transportation secure the mating surfaces of the fittings, inspection holes and bearings against dust and dirt.

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

In case an open trailer is used, the external surfaces of the main glider components should be protected with individual covers and, in case of rain, with a foil.

For glider ground rolling the "tail forwards" attitude is recommended.

Pulling the glider at wing tips is not recommended.

For motor-car transportation "nose forwards" use the towing cable with connection link and towing hook.

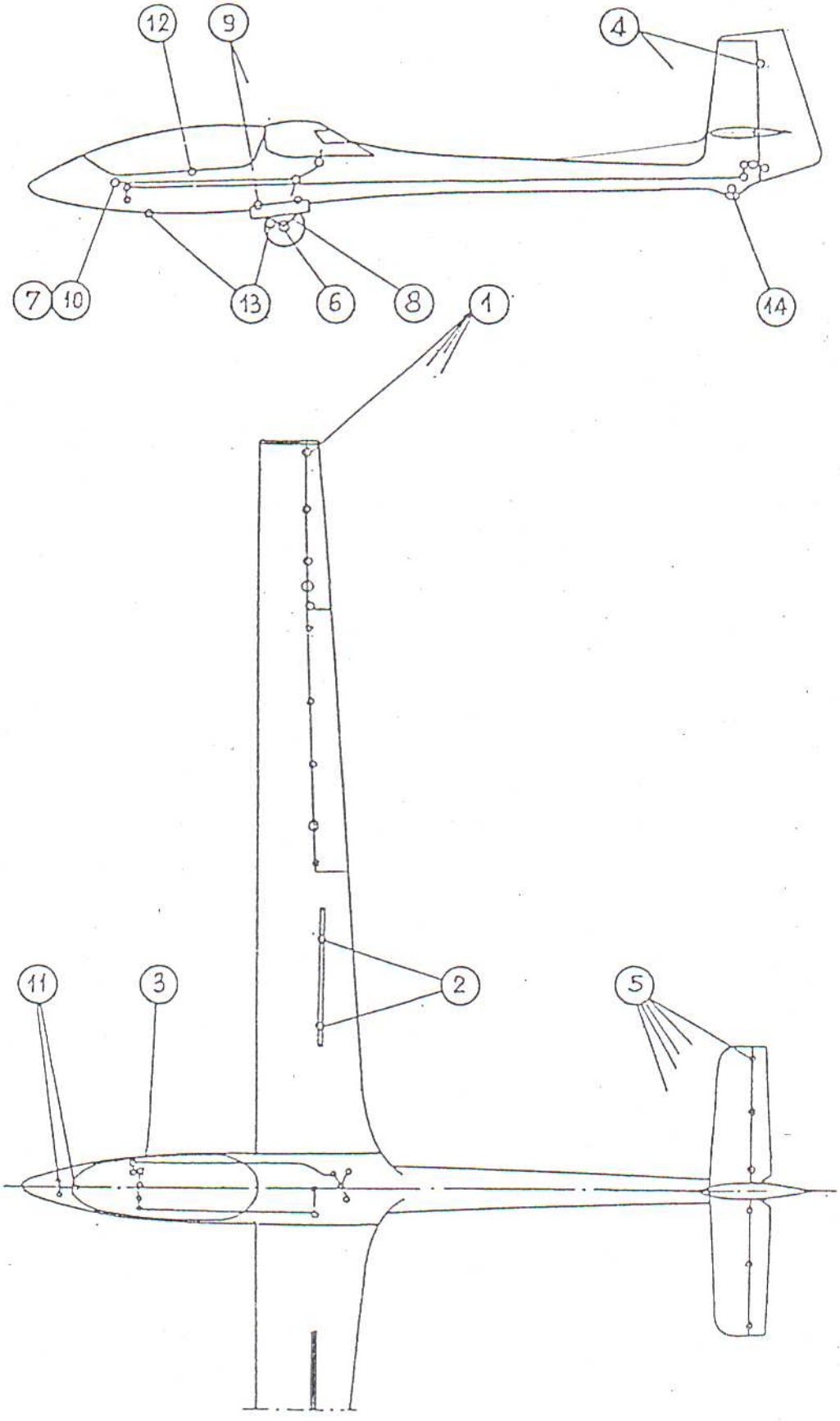
Immobilize the control stick (with the safety belts).

3.7. Lubrication plan.

Lubricate with bearing grease items shown on Fig. 15 :

1. Hinges (bearings) and levers of aileron control system.
2. Fittings of air brake plates.
3. Bearings of control column and these of ailerons and elevator control system.
4. Rudder hinges.
5. Elevator hinges.
6. Main wheel bearings.
7. Guide and bearings of main wheel control system.
8. Main wheel leg bearings.
9. Undercarriage door hinges.
10. Guide and bearings air brake control system.
11. Bearings and guides of pedals.
12. Canopy locks and front hinge.
13. Towing hooks.
14. Tail wheel bearings.

Fig. 15 LUBRICATION PLAN



3.8. General inspection of glider.

2 | After every 500 flying hours, the general inspection of the glider shall be performed according to the specified program.

The technical inspection is performed by the staff of the inspectors trained in the production or repairs, having the necessary auxiliary tools.

The inspection should be carried on at the producer's plant, in repair workshop or by any other, authorised for this, organisation unit. The place and conditions of inspection in each particular case should be agreed with the responsible Airworthiness Authority.

THE FOLLOWING ACTS SHALL BE COMPLETED DURING THE INSPECTION :

1. Perform all the works specified in the Schedule of Periodic Works for before start of flying season.
2. Measure the play in wing/fuselage connection.
   The allowed play between the shaft and opening, or ball and nest, is Δ=0.1 [mm] (0.004 [in]) for the diameters of up to 18 [mm] (0.71 [in]), and Δ=0.15 [mm] (0.006 [in]) for the diameters above 18 [mm] (0.71 [in]) (see item 2.6 of this Manual).
3. Measure the play in fin/stabilizer connection.
   Allowed play between the shaft and opening is Δ=0.15 [mm] (0.006 [in]), and the vertical movement of tailplane tip resulting thereof cannot exceed 1.8 [mm] (0.071 [in]) (upwards and downwards) (see item 2.6 of this Manual).
4. Measure the play on elevator.
   Allowed free deflection is Δ=±2 [mm] (±0.08 [in]) (acc. to item 2.2.7. of this Manual). The measurement should be performed in the plane of root rib and with the stick fixed.
5. Measure the play in aileron.
   The allowed free deflection is Δ=±2 [mm] (±0.08 [in]) (acc. to item 2.2.7. of this Manual). The measurement should be performed at the aileron inboard rib (the fuselage side end) with the stick fixed.

6. Measure the play in elevator, rudder and aileron hinges.
   Allowed play between the hinge axle and opening is Δ=0.1 [mm] (0.004 [in]).

7. Measure the play on the control stick with the elevator and aileron fixed in neutral position.
   The allowed play in aileron and elevator control systems is Δ=±2 [mm] (±0.08 [in]) (acc. to item 2.2.6. of this Manual).

8. Measure the play in the undercarriage set connections.
   The allowed play between the shaft and hole is Δ=0.15 [mm] (0.006 [in]).

9. Measure the forces for control systems and devices operation.
   The maximum forces cannot exceed those specified in item 2.2.8. of this Manual.

NOTE - MEASUREMENTS OF ITEMS 4, 5, 6, 7, 9 ARE TO BE PERFORMED AFTER ALL THE MOVABLE SURFACES OF CONTROL SYSTEMS ARE CLEANED, WASHED AND GREASED.

10. Check the rudder mass-balance.
    The rudder suspended in horizontal plane on its hinges should be balanced to maximum 4 [mm] (0.16 [in]) aft of the hinge line (see item 2.9. of this Manual).

11. Check the elevator mass-balance.
    Every elevator half suspended in horizontal plane on its hinges should be balanced to maximum 45 [mm] (1.77 [in]) aft of the hinge line, and its mass cannot exceed 0.95 [kg] (2.1 [lb]) (see item 2.9. of this Manual).

12. Check the aileron mass-balance.
    Every aileron suspended in horizontal plane on its hinges should be balanced to maximum 46 [mm] (1.81[in]) (for inner aileron), and 37 [mm] (1.46 [in]) (for outer aileron) aft of the hinge line (see item 2.9. of this Manual).

13. Adjust the spring trimming device.
    The way of adjusting is described in item 2.2.2. of this Manual. The friction force for the correctly adjusted spring trimming device should not exceed 0.3 [daN] (0.7 [lb]).

14. Replace the cables of hook release and rudder control system with new ones. (see Fig. 8 and 10A of this Manual).

15. Disassemble the towing hook(s) and check :
- on front hook, the condition of joint. In case the distortions are found, the joints should be repaired.
- on C.G. hook on the undercarriage front leg, special attention should be paid to the condition of weld in the hook fitting joint. In case the cracks are found, the front leg should be repaired.

16. Check the condition and the framework-fuselage connection, after the undercarriage is disassembled. Pay the special attention to :

- composite whitening,

- weld joints cracks,

- buckling of front and rear upper framework tubes.

The places where the composite gets white or the framework is cracked, shall be repaired. On finding the framework tube buckling exceeding 2 [mm] (0.08 [in]), the concerned tube shall be replaced following the special repair procedure. The way of the repair should be agreed with the glider producer, or authorised repair workshop and with Airworthiness Authority.

17. Check the composite for white spots around the following metal parts :

- pivot on the spar root,

- sleeves in the spar walls,

- nests in the root rib,

- joints of tailplane to fuselage,

- control systems and hinges of control surfaces,

- pilot's belts fittings,

- canopy locks.

In case white spots are found or composite is damaged, the adequate repair should be performed.

18. Check the spar root protruding out of the rib No 1. Pay special attention to rib to spar and rib to covering connections.
In case white spots or other damages are found the required repair should be performed.

19. Check the condition of external coatings of :

- wings,
- ailerons,
- fuselage,
- stabilizer,
- elevators,
- rudder.

In the areas of lacquer cracks the paint layer should be removed and the surfaces should be inspected for white spots. In case of damages found, the covering should be repaired.
For paint layer removal use scraper or sand paper of grade 180 to 220 for preliminary, and 320 or finer for final removal.

20. Check the condition of lacquer coatings and protective coats on metal parts. Restore if necessary acc. to "Repair Manual" and "Technical Service Manual".

21. Inspect the hooks, instrument and additional equipment installed on the glider, following the manuals issued by the equipment producer.

22. Check the condition and tightness of the pneumatic system, pay attention to the duct and drainage units condition. Replace with new ones, if necessary.

23. Check the condition of limitation and information placards. Replace with new ones, if necessary.

24. Check the water tanks tightness (acc. to item 2.5 of this Manual).
In case leakage occurs the damaged area should be found (e.g. around the rib No 1, outlet and drainage pipes) and sealed by means of applying a layer of composite, on the previously prepared surface - in accordance with the valid instructions.

If the leakage cannot be located the following procedure should be used :

A. Dry the tank by blowing hot air of minimum 20°C (52 F) and maximum 40 C (72 F) temperature through the venting pipe for minimum 5 hours. When blowing, the jettison valve must provide free flow.

B. Pour into the tank 2 litres (0.53 [US gal]) of denatured spirit. Plug the venting pipe and jettison valve. Move the wing to wash all the inner surfaces of the tank.

C. Drain the denatured spirit out of the tank.

D. Dry the tank, as in item "A" for 1 hour.

E. Pour into the tank 1.5 [kg] (3.3 [lb]) of polyester thinnerless lacquer and rotate the wing to distribute the lacquer on all the inner tank surfaces. Pour out the rest of lacquer through the jettison valve.

F. Dry the tank, as in item "A" for 10 hours.

G. Check the tank tightness. If leakage is found once more, the whole operation should be repeated. If this procedure is unsuccessful, contact the manufacturer for instructions on special repair (to be done in the producer authorised repair workshop).

25. After all the repairs and inspections are completed the glider should be weighed and C.G. location found. If necessary, the corrections in glider documents should be introduced (limitations in "Flight Manual", limitations placard in the cockpit) concerning the allowed loading mass and its distribution.

3.9. Cleaning and care.

In case the glider external surfaces are dirtied (e.g. with insects) use clear water with gentle detergents without abrasive agents. Dry the washed surfaces with flannel (shammy). Dry the wetted glider inside (e.g. air brake box), ensure drainage holes are clear.

Polish the lifting surfaces from time to time with no-siliceous paste with movements along the chord mechanically, or with long slat manually.

Wash the canopy with clear water, eventually with addition of detergents for perspex.

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

3.10. Special tools and covers.

Every glider is equipped with the following special service tools :

1. Extension for filling the tube of main wheel with air.
2. Funnels with strainer for filling the wing ballast tanks with water.
3. Lever for wings assembling.
4. Tool bag.

Every glider may be equipped additionally with the following covers :

1. Wing cover - 2 pieces.
2. Canopy flannel cover.
3. Fuselage cover.
4. Tailplane cover.

3.11. List of materials for minor repairs.

In case minor structure damages occur, having no influence on glider strength, like local scratches, small surface indentations, edge cracks etc., the user can repair them by himself.

The materials allowed for such repairs are listed below :

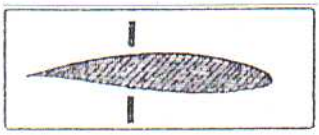
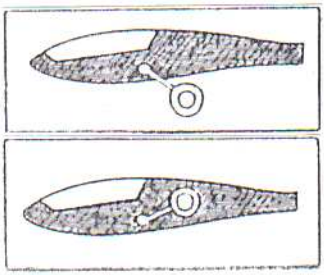
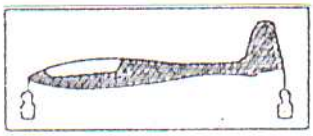
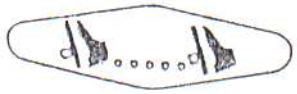
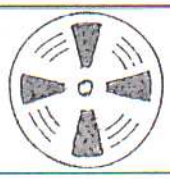
1. Glass fabrics, produced by INTERGLAS.
2. Ep 53 resin + Z1 hardener.
3. Ep 52 resin + Z1 hardener.
4. Polyurethane enamel for aviation or VORGELAT T30 (T35) - on the external coatings.
5. Fillers : colloidal silica, microbaloon, cotton flakes, chopped roving etc.

3.12. Airfield equipment.

To the user order, producer of this glider supplies the specified below airfield equipment.

1. Tail wheel for ground transportation.
2. Wingtip wheels for ground transportation.
3. Tow bar (thrill).

INFORMATION PLACARDS AND THEIR LOCATION

Meaning	Pictograph	Location
air brake - extended		on the left-hand side close to the hand-grip
undercarriage extended retracted		on the right-hand side close to the hand-grip
longitudinal trim		on seat pan, on the hand-grip left-hand side
canopy emergency jettison		on the hand-grip
towing cable release		on the hand-grip
pedals adjustment		on the hand-grip
cockpit venting		on the hand-grip
opening valves of water ballast tanks		on the left-hand side close to the hand-grip

OPERATION LIMITATIONS PLACARDS

1. OPERATION LIMITATIONS - on the left-hand cockpit side
2. GLIDER LOADING TABLE - on the left-hand cockpit side.
3. MAXIMUM FLIGHT ALTITUDE WITH WATER BALLAST - on the right-hand cockpit side.
4. Procedures BEFORE FLIGHT - on the right-hand cockpit side.
5. Factory placard of the glider - on the inner side of the fuselage rib nose.
6. ALLOWED AEROBATIC MANOEUVRES - on the right-hand cockpit side.
7. PRESSURE IN TYRES - on the right-hand cockpit side.

OPERATION LIMITATIONS						
GLIDER VERSION	**AEROBATIC "A"**			**STANDARD "U"**		
AIRSPEEDS (IAS):	km/h	mph	kts	km/h	mph	kts
V_{NE} - never exceed	**285**	**177**	**154**	**265**	**164**	**143**
V_A - manoeuvring	**200**	**124**	**108**	**200**	**124**	**108**
V_T - aerotowing	**150**	**93**	**81**	**150**	**93**	**81**
V_W - winch launching	**150**	**93**	**81**	**150**	**93**	**81**
V_{LO} - undercarriage operation	**285**	**177**	**154**	**265**	**164**	**143**
MASSES:	kg		lb	kg		lb
MAXIMUM EMPTY GLIDER	**270**		**595**	**280**		**617**
ALL-UP WITH WATER BALLAST	-----		-----	**540**		**1191**
ALL-UP WITHOUT WATER BALLAST	**380**		**838**	**390**		**860**
MAXIMUM COCKPIT LOAD	**116**		**256**	**116**		**256**
MINIMUM COCKPIT LOAD	**65**		**143**	**65**		**143**
OTHER:						
TOWING CABLE SAFETY LINK **690±10 % [kG].**						
NIGHT FLYING PROHIBITED !						
SPINNING WITH WATER BALLAST PROHIBITED !						
AEROBATICS WITH WATER BALLAST PROHIBITED !						

Load in pilot's cockpit **"A"**	Load in instrument panel **"B"**	Load in central baggage compartment **"C"**	Load in rear baggage compartment **"D"**
55 thru 75 kg (121 thru 165 lb)	max. 4 kg (9 lb)	max. 20 kg (44 lb)	max. 8 kg (18 lb) For every 1kg (2 lb) load 0.5 kg (1 lb) in instrument panel
75 thru 100 kg (165 thru 220 lb)	max. 4 kg (9 lb)	max. 20 kg (44 lb)	max. 8 kg (18 lb)
100 thru 110 kg (220 thru 243 lb)	max. 4 kg (9 lb) For every 0.5kg (1lb) load 1 kg (2 lb) in rear baggage compartment	max. 16 kg (35 lb)	max. 8 kg (18 lb)

NOTE: BALANCING WEIGHTS **"G"** FOR PILOT OF MASS:

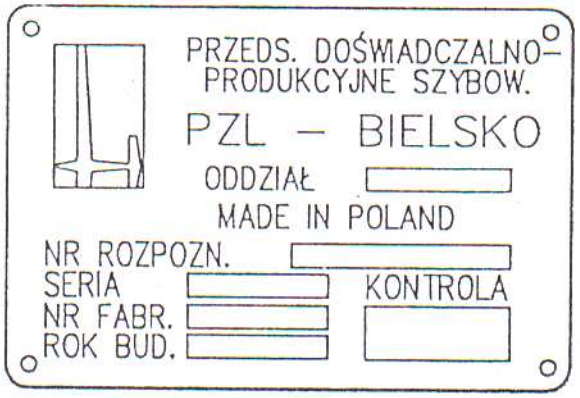
55 kg (121 lb) thru 60 kg (132 lb) - total mass 10 kg (22 lb) - **MANDATORY**

60 kg (132 lb) thru 70 kg (154 lb) - total mass 8 kg (18 lb) - **MANDATORY**

above 90 kg (198 lb) - **PROHIBITED**

MAX. FLIGHT ALTITUDE WITH WATER BALLAST						
Min. temperature on ground	[°C]	13.5	17.5	24	31	38
Max. flight altitude	[m]	1500	2000	3000	4000	5000
Min. temperature on ground	[°F]	56.5	69.6	81.0	90.3	96.0
Max. flight altitude	[ft]	5000	8000	11000	14000	17000

PROCEDURES BEFORE TAKE-OFF		
1	WING TIPS before aerobatic flights disassembled	- CHECK
2	WATER BALLAST TANKS before aerobatic flights empty	- CHECK
3	BALANCING WEIGHT	- CHECK
4	PARACHUTE	- PUT ON
5	SAFETY BELTS	- FASTEN
6	UNDERCARRIAGE LOCKING	- CHECK
7	CONTROLS DEFLECTIONS	- CHECK
8	AIR BRAKE	- RETRACT
9	TRIMMING DEVICE set up for take-off	- CHECK
10	ALTIMETER set up zero	- CHECK
11	CANOPY	- LOCK
12	RADIO	- CHECK
13	TOWING CABLE CONNECTION	- CHECK



ALLOWED AEROBATIC MANOEUVRES	
AEROBATIC VERSION "A"	**STANDARD VERSION "U"**
Spin, Inverted spin, Loop, Inverted loop, Stall turn, Inverted stall turn, Climbing turn, Quick half-roll-half-loop, Controlled half-roll-half-loop, Half-loop-half-roll Controlled roll, Quick roll, Quick roll in downward angle, Quick roll downwards, Inverted quick roll, Inverted quick roll in downward angle, Inverted quick roll downwards Controlled half roll upwards and half loop, Cuban eight, Inverted Cuban eight	Spin, Loop, Stall turn, Climbing turn, Lazy eight, Steep turns

PRESSURE IN TYRES		
Main wheel	2.0 [at]	0.20 [MPa]
Tail wheel	1.5 [at]	0.15 [MPa]

PROGRAM OF LIFE TIME OVERHAUL

CONTENTS

0. GLIDER DATA

GLIDER **SZD-59 "ACRO"**

Factory No .....

Registration .....

Total flying time ..... [hours]

Translated by

.....

Tadeusz Zboś

PROGRAM & RESULS OF LIFE TIME OVERHAUL

Operation No	Operation specification	Notes
1	2	3
1.	**INTRODUCTION**	
1.1.	To extend the service life of SZD-59 „ACRO" glider within the range 1500 through 4000 hours, after reaching 1500 hours total flying time on a plane operator is obliged to make a life time overhaul according to the following program every 500 hours.	
1.2.	Appropriately skilled and authorised persons, in agreement with responsible airworthiness Authority can accomplish the overhaul.	
1.3. 1.3.1. 1.3.2. 1.3.3. 1.3.4. 1.3.5. 1.3.6. 1.3.7. 1.3.8.	List of necessary documents : Glider Log Book, Flight Manual, Technical Service Manual, Repair Manual, Certificate of origin, Report on flight test, Weighing report, Certificates of board instruments and towing hook(s)	
1.4.	The inspection room should ensure the temperature of 18°C through 25°C (64°F through 77°F), as well as good illumination.	

1	2	3
1.5.	List of tools and instruments necessary in overhaul:	
1.5.1.	Micrometer for diameter range of 5 through 30 mm,	
1.5.2.	Inside micrometer - set for diameter range of 5 through 30 mm,	
1.5.3.	Slide caliper of ~ 250 mm length,	
1.5.4.	Reading glass with magnifying power of 5,	
1.5.5.	Gap gauge,	
1.5.6.	Outrigger equipped lamp, to illuminate interior area,	
1.5.7.	Lamp with long cable,	
1.5.8.	Outrigger equipped mirror (small size),	
1.5.9.	Dynamometer with measuring range up to 25.0 daN,	
1.5.10.	Steel rule 500 mm,	
1.5.11.	Set of rigging tools (pliers, open ended and tubular spanners, screwdrivers, e.t.c.),	
1.5.12.	Cable tension gauge.	

1	2	3
2.	**GENERAL INSPECTION**	
2.1.	Become acquainted with the contents of documents specified under item 1.3. Special attention is to be paid to entries in glider Log Book on periodic maintenance works, as well as on repairs and overhauls.	
2.2.	Assemble the airframe - precede this with cleaning the sailplane sets, and lubrication of all metal connectors. While assembling, the proper procedures must be observed including the procedures for correct linking of control systems, and main bolt securing in the wing/fuselage connection as given under paragraph 2.1, Fig. 3, of Technical Service Manual.	
2.3.	When assembling tailplane, check the correct functioning of locking bolt, see paragraph 2.1.2, Fig. 4 in Technical Service Manual.	
2.4.	Check the correct assembly and locking of wing tips, paragraph 2.1.6, Fig. 6 in Technical Service Manual.	
2.5.	Check the correct geometry of glider in accordance with data in Fig. 1, page 7, of Technical Service Manual.	

1	2	3
2.6.	Measure with dynamometer the operation forces in control systems of: aileron, elevator, rudder, air brake, landing gear, locking and. emergency jettison of cockpit canopy, as well as in tow hook release system. Compare the measured values with data specified in para. 2.2.8. of Technical Service Manual	
2.7.	Check the play values in aileron and elevator control systems, according to paragraph 2.2.6. and 2.2.7 of Technical Service Manual.	
2.8.	Check correct functioning of elevator trim device, paragraph 2.2.2. of Technical Service Manual.	
2.9.	Check correct functioning of landing gear retraction & blocking mechanism.	
2.10.	Check the correct operation of ballast tanks valve control system.	
2.11.	Check the correct operation of tow hook(s) control system, according to the hook „Operation manual".	
2.12.	Check the correct locking and emergency jettison of cockpit canopy.	
2.13.	Estimate efficiency of wheel brake (when braked, this should withstand force of one person pulling at the front edge of cockpit cut-out).	

1	2	3
3.	**DETAILED VERIFICATION OF WING**	
3.1.	Check the tightness of ballast tanks, following the procedure of paragraph 2.5, Technical Service Manual.	
3.2.	Check the condition of wing spar root, pay attention to possible white spots and to mechanical damage to composite, especially at rib - spar and at rib - skin joints, as well as installation of pin in the spar end. Neither white spots, nor other damages to composite allowed.	
3.3.	Check the main bolt in spar connection (pay attention to cracks, surface condition - scratch, wear out evidence – ovalization), condition of sleeves in spar root and this of seats in wing root rib. By measurements find the play between bolt and mating opening in wing/fuselage fittings. Compare the results found with data given in paragraph 2.6. of Technical Service Manual.	
3.4.	Check the condition of, and installation of wing tip fittings. Measure, and compare with data in paragraph 2.6 of Technical Service Manual.	
3.5.	Check the condition of wing skin, wing tip as well as the leading and trailing edges. Pay special attention to lacquer cracks, especially in the area of glue joint of wing skin. On the sites of lacquer crack, the lacquer must be removed, and the composite inspected thoroughly against white spots.	

1	2	3
3.6.	Disassemble the aileron, following procedure of paragraph 2.1.5. of Technical Service Manual. Check the condition of aileron skin and glue joints, as well as this of bearings in aileron wing hinges.	
3.6.1.	Check the condition of wing rear web over aileron portion, its bonding to wing skin, as well as the installation, and condition of aileron hinges.	
3.6.2.	Check the installation, and condition of aileron push-rod guides. Verify smooth/unrestricted movements of push-rod by actuating this at wing root rib	
3.6.3.	Clean and lubricate the fasteners of aileron. Install the aileron on the wing, pay attention to insert the lever into its guide correctly. Assemble the wing tip and check the axial play of aileron, allowed value 0.5÷1.0 mm (0.02÷0.04 in)	
3.7.	Check the condition of air brake plates, caps and cap loading springs, as well as matching of caps in retracted position.	
3.7.1.	Dismount the air brake plates, and check the plays at air brake arms. The play measured at arm tip, in flight direction, should not exceed 1 mm (0.04 in)).	
3.7.2.	Clean and lubricate the disassembled elements of air brake. Assemble the air brake again.	

1.	2.	3.
4.	**DETAILED VERIFICATION OF FUSELAGE**	
4.1.	Disassemble the rudder according to paragraph 2.1.4. of Technical Service Manual. Check the condition of skin, fittings and measure the play at fittings. Check mass balance of the rudder, see Fig. 14 in page 43 of Technical Service Manual.	
4.2.	Check the condition of fuselage skin, pay attention to cracks of lacquer coat (as these may indicate the damage to structure).	
4.2.1.	Cockpit side boards, especially at rear edge, in the area of openings for canopy locking bolts.	
4.2.2.	Condition of main wheel well, and landing gear mounting joints.	
4.2.3.	Joint between fuselage shells on top and bottom surfaces.	
4.2.4.	Bonding of front, upper and baggage compartment floors to fuselage skin.	
4.2.5.	Bonding between fin rear web and skin, as well as the condition of rudder hinges installation.	
4.2.6.	Condition of landing gear well doors, and door loading springs.	

1.	2.	3.
4.3.	After dismounting the landing gear, check condition of framework and its installation in a fuselage, with special attention paid to: - White spots in composite - Cracks to weld points - Buckling of the front, and rear upper tubes in framework	
4.4.	Check the condition, and installation of tailplane mounting seats in a fin. Measure play at joints and compare results with data in paragraph 2.6, Technical Service Manual.	
4.5.	Check the condition of pilot back rest and joints of its mounting	
4.6.	Verification of control systems: Use Fig. 7 and 8 in Technical Service Manual. Pay attention to play size and wear-out evidence, especially at connection points, as well as in the accessible push-rod guides.	
4.6.1.	Check the elevator control system – determine play at control column, and in angle lever installed on a fin rear web.	
4.6.2.	Check the aileron control lever – measure play in articulated bearings of control stick, and in the angle lever, under seat pan in a cockpit.	

1.	2.	3.
4.6.3.	Rudder control system. Check condition of pedals, and their installation in a floor. The control cables and these at pedals are to be replaced according to Bulletin No BE-007/94. Record cables replacement in the glider Log Book.	
4.6.4.	Check the ballast tanks control system. Dismount the valves of ballast tanks in a wing, clean and lubricate these. Elements wear out are to be replaced (e.g. O-ring). Assemble the valves again and verify correct operation of the complete system.	
4.6.5.	Check the control systems of towing hooks (use the Operation Manual of Towing Hook), canopy emergency jettison, and wheel brake. Check the cable of main wheel brake.	
4.7.	Check condition, and operation of landing gear.	
4.7.1.	Check condition of fuselage framework joints for landing gear leg mounting, as well as condition of auxiliary springs.	
4.7.2.	Make sure on reliability of landing gear locking both in extended and retracted position.	
4.7.3.	Check condition of main wheel tyre. On removing the main wheel, check also the condition of brake friction lining.	
4.7.4.	Verify condition of tail wheel, including condition of tyre and bearings.	

1.	2.	3.
4.8.	Check the pressure system (of board instruments).	
4.8.1.	Blow through the pressure ducts with compressed air, on disconnecting them first from board instruments. Replace the damaged ducts with new ones..	
4.8.2.	Replace the inserts of drainage units – as necessary.	
4.8.3.	Check tightness of particular branches in pressure system.	
4.9.	Safety harness.	
4.9.1.	Service life, as well as inspection of safety harness according to the BE-006/93/J5.00.00 Bulletin	
5.	**DETAILED VERIFICATION OF HORIZONTAL TAILPLANE**	
5.1.	Disassemble the elevator, according to paragraph 2.1.3, Technical Service Manual.	
5.2.	Verify condition of left, and right hand halves of stabilizer.	
5.2.1.	Check condition of: - Skin on stabilizer halves, including their bonding at leading edge, - Bonding between stabilizer root rib and skin, - Bonding between rear web and skin, - Installation of elevator hinges in a web, - Installation of pins and tube spar in stabilizer ribs.	

1.	2.	3.
5.2.2.	Measure play between tube spar, pins and seats in a fin. Compare the measured values with allowed play value, specified under paragraph 2.6, Technical Service Manual.	
5.2.3.	Check condition of elevator halves, pay attention to: - Elevator skin, - Skin bonding at the leading and trailing edges, - Installation of elevator actuating lever.	
6.	**FINAL ASSEMBLY**	
6.1.	Having removed all defects in fuselage, wing and taiplanes, complete lubrication at all points specified under "Lubrication plan" according to paragraph 3.7, Technical Service Manual.	
6.2.	Complete the final assembly, with attention paid to correct and reliable locking of main joints (following recommendations of paragraph 2, Technical Service Manual).	
6.3.	Adjust deflection of control surfaces – in accordance with data in Fig. 2, page 9 of Technical Service Manual.	
	Note: In doubtful cases contact producer for further explanation Producenta.	
- THE END -		