PRZEDSIĘBIORSTWO DOŚWIADCZALNO-PRODUKCYJNE SZYBOWNICTWA

"PZL-BIELSKO"

BIELSKO-BIAŁA

F L I G H T M A N U A L
F O R A S A I L P L A N E

Issue I/JAR-22, May 1994

Type: S Z D - 5 0 - 3 "PUCHACZ"

Serial No	.....
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Document No	.....
Date of issue	.....

This is the translation of original Polish text approved by the Authority.

Translated by
Polish Authority
approved interpreter:

.....

Wiesław Stafiej, D.Sc.

This sailplane is to be operated in compliance with information and limitations contained herein.

FAA approved for U.S. registered gliders in accordance with FAR 21.29

This sailplane has been approved by the Federal Aviation Administration, in accordance with JAR-22 including Change 4, issued May 7, 1987, and Orange Papers through 22/90/1, 22/91/1, 22/92/1.
Type Certificate ..... has been issued on ..... ,
Category of Airworthiness: Utility.

Section 0

0. Issuances

0.1 Record of revisions

0.2 List of Effective Pages

0.3 Table of Contents

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0.1 RECORD OF REVISIONS

Any revision of the present manual, except actual weighing data, must be recorded in the following table and in case of approved Sections endorsed by the responsible airworthiness Authority.
The new or amended text in the revised page will be indicated by a black vertical line in the left hand margin, and the Revision and the date will be shown on the bottom left hand of the page.

Rev. No.	Affected Section	Affected Pages	Date	Approval	Date	Date Inserted	Signature

Rev. No.	Affected Section	Affected Pages	Date	Approval	Date	Date Inserted	Signature

0.2 LIST OF EFFECTIVE PAGES

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				7.4	Sept. 1995
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4	4.1	Sept. 1995			
	Appr.4.2	May 1994	8	8.1	Sept. 1995
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0.3 TABLE OF CONTENTS

Section 1

1. General

1.1 Introduction

1.1 Certification basis

1.3 Warnings, cautions and notes

1.4 Descriptive data

1.5 Three-view drawing

1.1 Introduction

The sailplane flight manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of the SZD-50-3 "PUCHACZ" sailplane.

This manual includes the material required to be furnished to the pilot by JAR-22. It also contains supplemental data supplied by the sailplane manufacturer.

1.2 Certification basis

This type of sailplane has been approved by Civil Aircraft Inspection Board of General Inspectorate of Civil Aviation in Poland, in accordance with JAR-22 including Amendment 4 - issue of May 7-th, 1987 and Type Certificate No BG-182 has been issued on April 9-th, 1992, Category of Airworthiness: Utility.

1.3 Warnings, cautions and notes

The following definitions apply to warnings, cautions and notes used in the flight manual.

WARNING : MEANS THAT THE NON-OBSERVATION OF THE CORRESPONDING PROCEDURE LEADS TO AN IMMEDIATE OR IMPORTANT DEGRADATION OF THE FLIGHT SAFETY.

CAUTION : MEANS THAT THE NON-OBSERVATION OF THE CORRESPONDING PROCEDURE LEADS TO A MINOR OR TO A MORE OR LESS LONG TERM DEGRADATION OF THE FLIGHT SAFETY.

NOTE : DRAWS THE ATTENTION ON ANY SPECIAL ITEM NOT DIRECTLY RELATED TO SAFETY BUT WHICH IS IMPORTANT OR UNUSUAL.

1.4 Descriptive data

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.

Moreover the operation range contains :

- training in basic aerobatics,
- training in blind and cloud flying,
- training and executing of wave flying,
- introduction into the performance flying technique.

The glider structure is made of glass-epoxy composite.

The covering of wings, stabilizers and fin are of sandwich structure. The elevators and rudder are fabric covered.

The upper wing and cross tail arrangements.

The fixed double wheel undercarriage employs the main wheel with shock absorber and tail wheel on the fuselage rear part.

The wide cockpit with tandem seats arrangement allows for pilots even of "two-meters" height.

Front pedals are adjustable in flight.

The rear seat pan adjustable on ground, in vertical and horizontal planes.

One piece canopy is side opened.

Two take-off hooks, the front and c.g. ones.

The trimming tab is conventional.

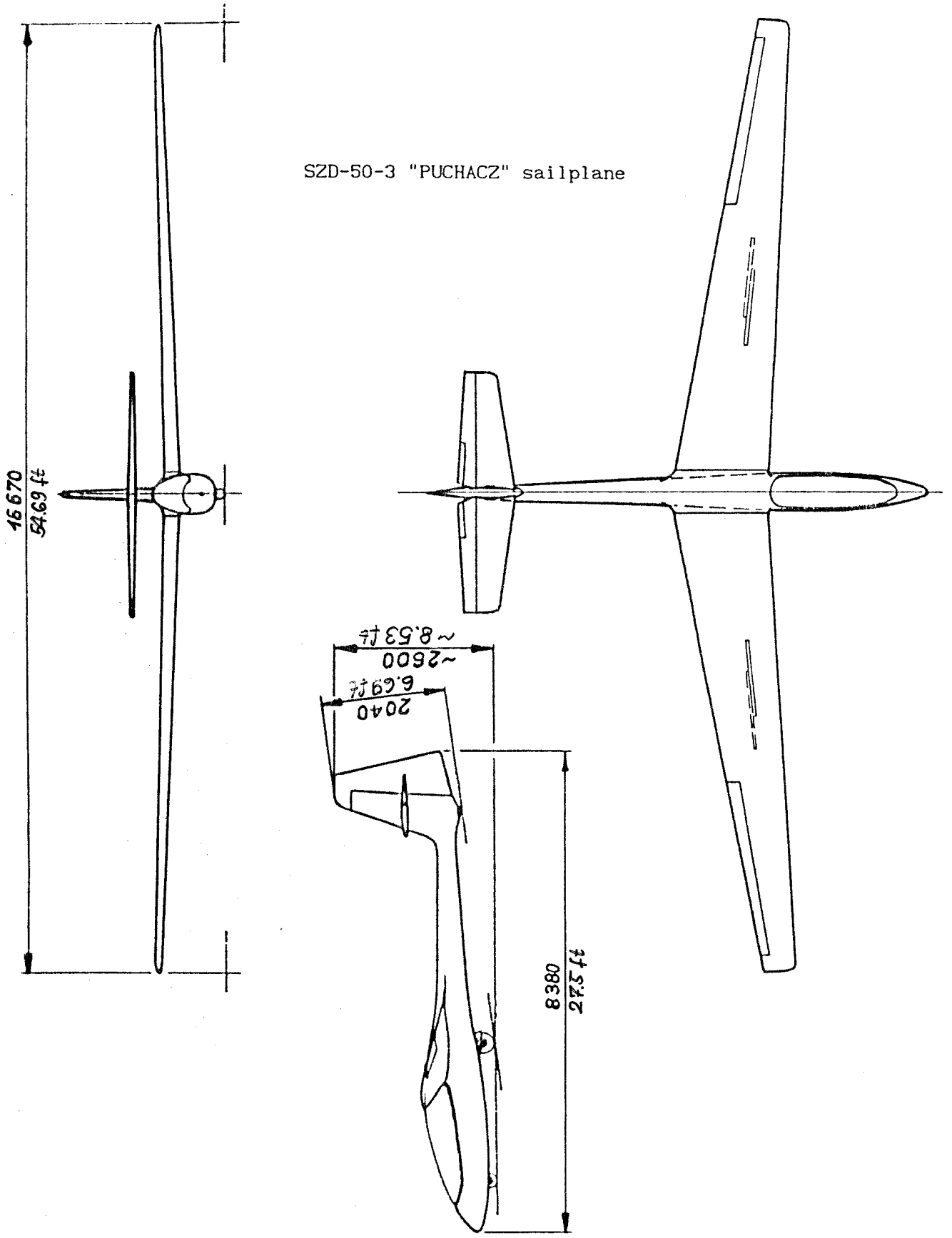
The air brake is efficient.

All the controls are connected automatically.

Technical data

Span	54.69 [ft]	(16.67 [m])
Length	27.50 [ft]	(8.38 [m])
Height	6.69 [ft]	(2.04 [m])
Aspect ratio	15.3	15.3
Mean Standard Chord (MSC)	3.865[ft]	(1.178 [m])
Tailplane span	13.78 [ft]	(4.20 [m])
All-up mass	1257 [lb]	(570 [kg])
Maximum wing loading	6.44 [lb/ft^2]	(31.4 [kg/m^2])

1.5 Three view drawing



Section 2

2. Limitations

2.1 Introduction

Section 2 includes operating limitations, instrument markings, and basic placards necessary for safe operation of the sailplane, its standard systems and standard equipment.
The limitations included in this section have been approved by Civil Aircraft Inspection Board of General Inspectorate of Civil Aviation in Poland.

2.2 Airspeed

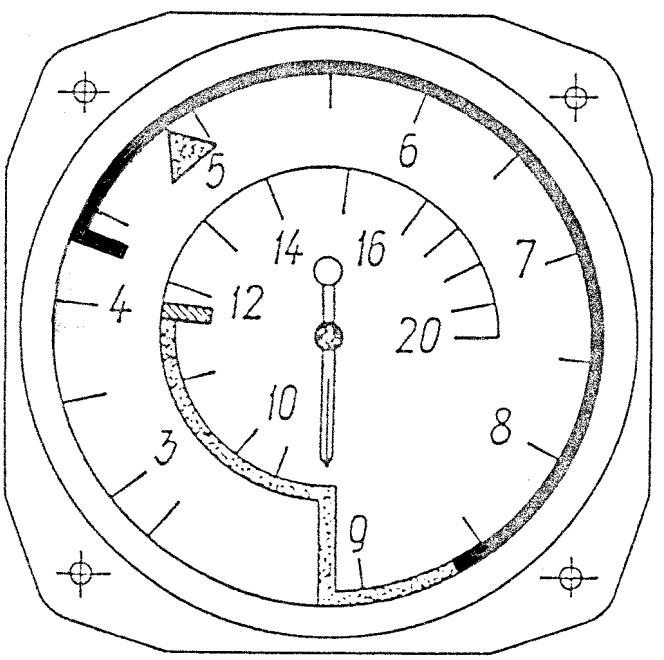
Airspeed limitations and their operational significance are shown below:

	Speed	IAS		Remarks
		kts	km/h	
V_{NE}	Never exceed speed	116	215	Do not exceed this speed in any operation and do not use more than 1/3 of control deflection
V_{RA}	Rough air speed	86	160	Do not exceed this speed except in smooth air, and then only with caution. Examples of rough air are lee-wave rotor, thunderclouds etc
V_A	Manoeuvring speed	81	150	Do not make full or abrupt control movement above this speed, because under certain conditions the sailplane may be overstressed by full control movement
V_W	Maximum winch-launching speed	59	110	Do not exceed this speed during winch-launching
V_T	Maximum aerotowing speed	81	150	Do not exceed this speed during aerotowing

2.3 Airspeed Indicator Markings

Airspeed indicator markings and their colour-code are shown below:

Marking	(IAS) value/ range [kts] ([km/h])	Significance
Green arc	43 thru 86 (80 thru 160)	*Normal Operating Range.* (Lower limit is maximum weight 1.1 V_{S1} for front limit c.g. location. Upper limit is rough air speed.)
Yellow arc	86 thru 116 (160 thru 215)	Manoeuvres must be conducted with caution and only in smooth air.
Red line	116 (215)	Maximum speed for all operations
Yellow triangle	49 (90)	Approach speed at maximum weight



KNOTS ×10

Airspeed indicator colour-code markings

colour: — red
— yellow
— green

2.4 Mass (weight)

- Maximum take-off mass 1257 [lb] (570 [kg])
- Maximum landing mass 1257 [lb] (570 [kg])
- Maximum mass of non-lifting parts (fuselage with tail-unit, without removable balancing weights) 425 [lb] (193 [kg])
- Maximum mass in baggage compartment (to the baggage mass the standard equipment is included as e.g. battery, hand-luggage).
  The hand-luggage should be fastened with cord or ribbon into 6 disassemblable lugs in the luggage compartment floor. 44 [lb] (20 [kg])

2.5 Centre of gravity

- Allowable range of in flight c.g. locations is:

  3.62 [in] thru 13.12 [in] (0.092 [m] thru 0.333 [m]), measured aft of leading edge of root chord.

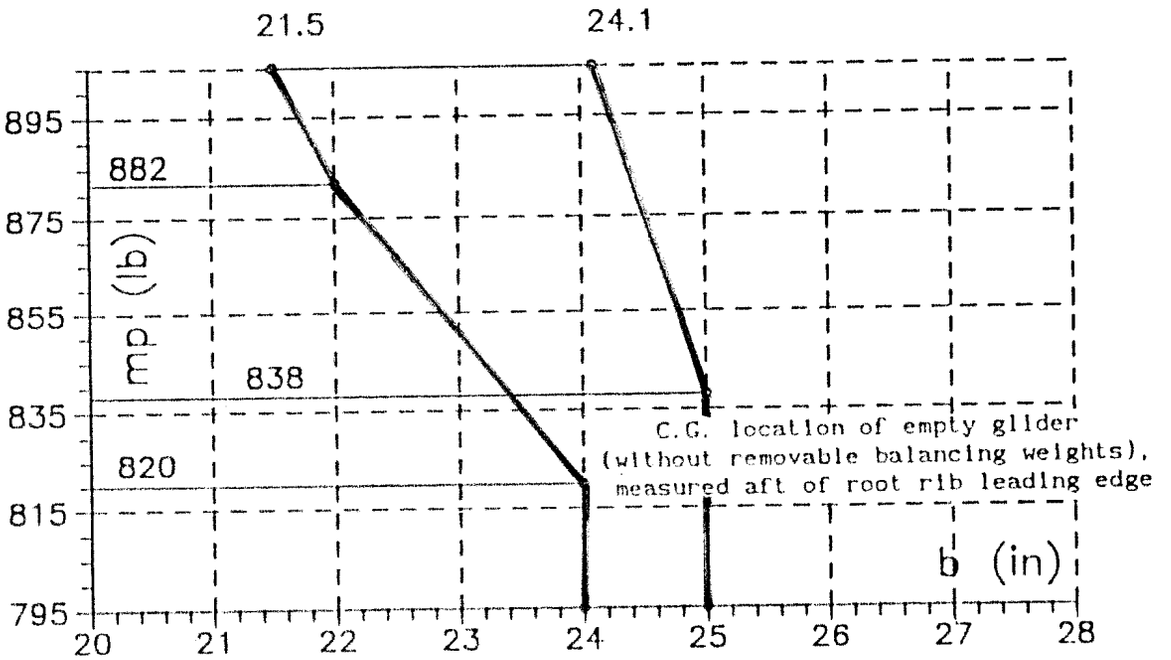
  This corresponds to 23.5 thru 44 per cent of MSC.

- Table and diagram of c.g. ranges at different empty masses.

a) Table

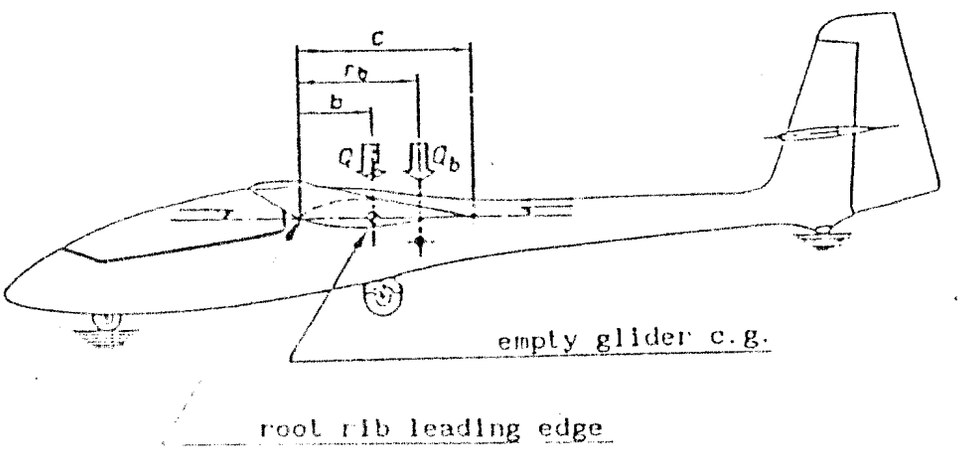
empty mass (without removable balancing weights) [lb] ([kg])	794 thru 820 (360 thru 372)	834 (380)	860 (390)	882 (400)	904 (410)
range of allowable c.g. locations of empty sailplane "b" [in] ([cm]) without removable balancing weights)	24 thru 25 (61 thru 63.5)	23.4 thru 25.0 (59.4 thru 63.5)	22.7 thru 24.7 (57.6 thru 62.8)	22.0 thru 24.4 (55.8 thru 62.0)	21.5 thru 24.1 (54.7 thru 61.2)

b) Diagram



c) Datum point

The datum point for glider c.g.location is the root rib leading edge.



NOTE : THE DIMENSIONS "b" AND "r_b" ARE TO BE MEASURED PARALLEL TO THE ROOT RIB CHORD "c".

NOTES to item 2.5 :

IN CASE THE GLIDER EQUIPMENT IS DIFFERENT AS THE STANDARD ONE (E.G. IN RESPECT TO AN INSTALLATION OF ADDITIONAL INSTRUMENTS, OXYGEN EQUIPMENT ETC.) THE EMPTY GLIDER C.G. LOCATION CHANGES.

ITS CORRECT LOCATION SHALL BE CHECKED ACC. TO THE TABLE OR DIAGRAM GIVEN ABOVE. IT SHOULD BE OBSERVED THAT THE ADDITIONAL EQUIPMENT INSTALLED IN THE BAGGAGE COMPARTMENT DOES NOT EXCEED THE MASS OF 44 [lb] (20 [kg]) ($m_b \leq$ 44 [lb] (20 [kg])) AND THAT THE ARM OF THIS ADDITIONAL MASS DOES NOT EXCEED 21.3 [in] (540 [mm]) (SUCH A VALUE OF DIMENSION "r_b" REACHES HALF OF THE BAGGAGE COMPARTMENT LENGTH).
ALL THE MARKINGS USED IN THE TABLE, DIAGRAM AND ABOVE TEXT ARE SHOWN ON THE DRAWING, PAGE 2-5.

2.6 Approved manoeuvres

This glider is certified in Utility category and the following manoeuvres are allowed:

- Positive loop
- Stall turn
- Chandelle
- Spin
- Lazy eight
- Steep turn

The entry speeds and manoeuvring directions are contained in Chapter 4 of this Manual.

2.7 Manoeuvring load factors

The following manoeuvring load factors shall not be exceeded:

- at the manoeuvring airspeed V_A (IAS):

  positive: +5.3
  negative: -2.65

- at the never exceed airspeed V_{NE} (IAS):

  positive: +4.0
  negative: -1.5

NOTE : WITH AIRBRAKE EXTENDED THE MAXIMUM POSITIVE LOAD FACTOR OVER THE WHOLE OPERATION SPEED RANGE IS +3.5.

2.8 Flight crew

For solo flight the following limitations are mandatory:

- maximum loading mass on the front seat
  242 [lb] (110 [kg]),

- minimum loading mass on the front seat
  121 [lb] (55 [kg]),

- the use of balancing weights:
  for the cockpit load mass up to 154 [lb] (70 [kg])
  is mandatory,

  for the cockpit load mass above 242 [lb] (110 [kg])
  is prohibited,

- solo flying on the front seat only,

- with pilot's mass on front seat over 220 [lb] (100 [kg]) (parachute included) using the additional back cushion on rear seat for the pilot, of the mass exceeding 165 [lb] (75 [kg]) (with parachute), is prohibited.

2.9 Kinds of operation

The SZD-50-3 "PUCHACZ" glider is type certified in Utility category and is allowed for day VFR flying.

After installing the equipment according to item 2.10.1, and providing the compulsory flight rules are observed, cloud flying is allowed.

2.10 Minimum equipment

According to the JAR-22 requirements the glider has the following minimum equipment :

front seat:

- airspeed indicator,
- altimeter,
- 4-point safety belts

rear seat:

- 4-point safety belts

2.10.1 Equipment recommended by producer

Equipment recommended by producer, in addition to the listed above, contains :

- variometer,
- compass,
- bank & turn indicator,

2.10.2 Additional equipment

The glider may be, to the customer order, additionally equipped with the instrument panel at rear seat.

2.11 Aerotow and winch-launching

V_T - maximum aerotow speed (IAS) 81 [kts] (150 [km/h]).

V_W - maximum winch-launching speed (IAS) 59 [kts] (110 [km/h]).

Winch take-off using the c.g. hook only.

The cable safety link of 1520 [lb] (690 [daN]) ± 10% strength shall be used.

Minimum towing cable length is 66 [ft] (20 [m]).

2.12 Other limitations
(not contained in items 2.1 thru 2.11 incl.)

Night flying not allowed.

Flying in icing conditions is prohibited.

Flying in conditions of elevated electrical conductivity and thunderstorms is prohibited.

The service life allowed for this glider is 6000 flying hours.

The glider external surfaces should have the white painting coatings. The colour markings on upper surfaces of wing and taiplane are prohibited.

2.13 Limitations placard

SZD-50-3 „PUCHACZ" MAX. PERMISSIBLE AIRSPEEDS IAS kts	
NORMAL FLIGHT IN: -smooth air. . . .	V_{NE} = 116
-gust conditions . .	V_{RB} = 86
MANOEUVRING AIRSPEED /airspeed for abrupt deflection of controls/:	V_A = 81
AEROTOWING	V_T = 81
WINCH-LAUNCHING	V_W = 59
AIRBRAKE EXTENDING and flight with air brake extended	= 116

2.14 High altitude flight

The maximum permissible airspeed V_{NE} should be reduced according to the table below:

Altitude [1000ft] [km]	0 thru 6.5 (0 thru 2)	9.8 (3)	13.1 (4)	16.4 (5)	19.7 (6)
Indicated V_{NE} [kts] [km/h]	116 (215)	110 (204)	104 (193)	99 (183)	93 (173)

2.12 Other limitations
(not contained in items 2.1 thru 2.11 incl.)

Night flying not allowed.

Flying in icing conditions is prohibited.

Flying in conditions of elevated electrical conductivity and thunderstorms is prohibited.

The service life allowed for this glider is 6000 flying hours.

The glider external surfaces should have the white painting coatings. The colour markings on upper surfaces of wing and taiplane are prohibited.

2.13 Limitations placard

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

2.14 High altitude flight

The maximum permissible airspeed V_{NE} should be reduced according to the table below:

Altitude [1000ft] [km]	0 thru 6.5 (0 thru 2)	9.8 (3)	13.1 (4)	16.4 (5)	19.7 (6)
Indicated V_{NE} [kts] [km/h]	116 (215)	110 (204)	104 (193)	99 (183)	93 (173)

Section 3

3. Emergency procedures

3.1 Introduction

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur.

3.2 Canopy jettison

THE PROCEDURE SEQUENCE :

Release the control stick.

HOLD FIRMLY AND PUSH FORWARD SIMULTANEOUSLY :

- canopy lock hand-grip (with left hand),
- canopy emergency jettison hand-grip (with right hand).

Holding the hand-grips push the canopy upwards and jettison it out.

If the canopy fails to jettison the plexiglass should be broken out beginning from the windows.

Use the force of legs, if necessary.

3.3 Bailing out

THE PROCEDURE SEQUENCE :

Decision to leave the glider.

Leaving the glider is the obligatory crew rescue, when it is impossible to land on the ground in controlled way, as e.g.:

- in case of fire or technical fault making impossible the controlled flight,
- in case of sudden, severe indisposition of pilot during the flight (e.g. injured eyes),
- in case of impossible return to the ground (e.g. the extensive fog region).

The decision of leaving the glider is taken by the ship-captain.

SEQUENCE OF LEAVING THE GLIDER :

The crew member being not the ship captain leaves the glider first. The ship-captain leaves the glider in second sequence after using all the possibilities to enable the second crew member to leave the glider.

When the canopy is jettisoned out (see item 3.2) the bail-out procedure is the following :

Fold the legs and jump out of the cockpit. If the glider gets the quick rotational movement - towards the centre of rotation.

Wait at least 3 sec. to get a distance in respect to glider and open the parachute.

PROCEDURES IN SPECIAL CASES THAT CAN OCCUR IN BAILING-OUT :

If the cockpit leaving occurs on the altitude below 655 [ft] (200 [m]) open the parachute immediately paying attention to avoid a collision of the parachute and glider structure or another crew member.

If the cockpit leaving follows on the high altitude, take into consideration:

a) danger of further climbing on parachute in the strong climbing currents (in a cloud) and danger of the lack of oxygen at low temperature, or icing,

b) danger of freezing the body at delayed parachute opening.

In respect to these circumstances it is recommended to stay in the cockpit of damaged glider (if its condition allows for) until it descends to the altitude of conditions for safe parachute use.

If the damaged glider allows for the limited control and the altitude does not require the immediate cockpit leaving the ship-captain can help the pupil in leaving the cockpit (e.g. giving instructions or maintaining the convenient flight condition) acc. to his decision e.g.:

- when controlling the glider to order the pupil to jettison the canopy and leave the cockpit,
- delay the jettisoning of the canopy or after jettisoning to control the glider again.

3.4 Stalling and stall recovery

STALLING (airspeeds IAS).

Depending on the glider all-up mass the stalling speed in straight flight is of about 31 [kts] (58 [km/h]) for solo lightweight pilot to about 39 [kts] (72 [km/h]) (heavy crew and all-up mass of about 1256 [lb] (570 [kg])).

The stall warnings is in form of perceptible vibrations of fuselage, oscillations of airspeed and "over horizon" attitude. When stalled the glider drops down symmetrically in general and (at further pulling the stick) with tendency to drop the wing.

The stall in turn is preceded by distinct inclination to decrease the turn radius. With further pulling the stick, the glider drops with tendency to increase the bank.

If, however, the tendency to decrease the turn radius is prevented with proper aileron counter action, the stalled and strongly vibrating glider turns without dropping.

With air brakes extended the stalling speed in straight flight is of about 35 to 41 [kts] (65 to 75 [km/h]) depending on all-up mass.

STALL RECOVERY :

In all the cases of stalling the glider allows for consistent recovery to normal flight by the resolute elevator deflection and if necessary by the other control deflection for balancing the bank.

3.5 Spinning and spin recovery

SPINNING

Before intentional spinning with one person crew the pilot of mass below 165 [lb] (75 [kg]) should check the proper glider balancing with weights.

When entering the spinning from straight flight it is recommended, for making it easy, to have a little bank towards the intended spinning direction.
It is also possible to enter the spinning from a turn.

In both the cases it is recommended to decrease the airspeed by slow pulling the stick and, in the moment of stall initiation, to pull the stick fully and to deflect the rudder towards the intended spinning.

To obtain the stable spinning, especially in the case of heavy crew, the precise maintenance of elevator full deflection is necessary (with the comparatively high force depending on the crew mass).

When the above directions are observed the glider performs steady and safe spinning, with all versions of additional equipment (acc. to "Loading plan" given in item 6.2.1 on page 6.2) and at every aileron deflection.

Aileron deflection towards the spinning direction promotes the appearance of longitudinal oscillation (especially with rear C.G. location) and therefore is not recommended.

Spinning characteristics with front, middle and rear C.G. location:

$$\left\{\begin{array}{l} \text{frontmost C.G. location} = 23.5\ [\%\ \text{MSC}] \\ \text{middle C.G. location} = 35.0\ [\%\ \text{MSC}] \\ \text{rearmost C.G. location} = 44.0\ [\%\ \text{MSC}] \end{array}\right\}$$

- With front C.G location the glider performs the steep spin at every aileron deflection.

  Airspeed indicator readings remain within the limits of 0÷49 [kts] (0÷90 [km/h]). Maintenance of the full elevator deflection is necessary, since its uncomplete deflection results in the airspeed increase up to, or above 54 [kts] (100 [km/h]), or even in self-interrupting the spin.

- With middle C.G. location the glider performs the spin with moderate longitudinal inclination at every aileron deflection.
  Airspeed remains within the range of 0÷32 [kts] (0÷60 [km/h]). Smooth longitudinal oscillations may appear.

- With rear C.G. location the glider performs the spin with small inclination. Airspeed indicator readings within 0÷32 [kts] (0÷60 [km/h]). Smooth, regular, longitudinal oscillations may appear.

SPIN RECOVERY

The recommended recovery technique consists of :

- setting control stick to ailerons neutral,
- full rudder opposite to the rotation, a considerable leg force is required,
- waiting for about 1 second,
- pushing the stick forward, more than to its neutral position.

The maximum delay during the recovery, when this technique is used, is less than 1 turn.

In case of other technique or not resolute action the delay can be more than 1 turn.

3.6 Spiral dive recovery

While spinning at front c.g. with the elevator not completely pulled aft the transition into "screw" spin of spiral dive characteristics, with increasing airspeed occurs - requiring recovery.

To recover from the above state it is necessary to :

- maintain the stick position corresponding to ailerons neutral,
- deflect rudder opposite to rotation slightly,
- push the stick slightly forward,
- recover from symmetrical diving conditions next, by means of smoothly pulling the stick, controlling the airspeed simultaneously.

3.7 Break or unintended releasing of towing cable at low altitude

In case of break or unintended releasing of towing cable at low altitude it is necessary to :

- release the hook (if the cable remained with glider),
- bring the glider to correct glide,
- land in place chosen with respect to the wind direction and other landing conditions.

3.8 Flight with incorrect trim

In case the required number of balancing weights are not installed (solo light weight pilot) :

- return to the airfield and land avoiding the stall.

In case of excessive balancing weights :

- return to the airfield and land

3.9 Danger of exceeding the maximum permissible airspeed

In case of an unintentional airspeed increase creating the potential danger of exceeding the allowed maximum airspeed (116 [kts] (215 [km/h])), the air brake shall be extended in advance, and the proper action for decreasing the airspeed and making the flight steady should be taken.

In such situations considerable stick pulling is not allowed.

Section 4

4. Normal procedures

4.1 Introduction

Section 4 provides checklist and amplified procedures for the conduct of normal operation.

4.2 Rigging and de-rigging

4.2.1 Tools

- assembling lever for fitting the spars,
- screwdriver,
- pliers,
- pin for service of tail plane securing bolt.

4.2.2 Rigging staff: min. 4 persons

4.2.3 Rigging procedures

WING TO FUSELAGE RIGGING - Fig. 1/4

a) Clean and grease the working surfaces of disconnected fittings and joints.

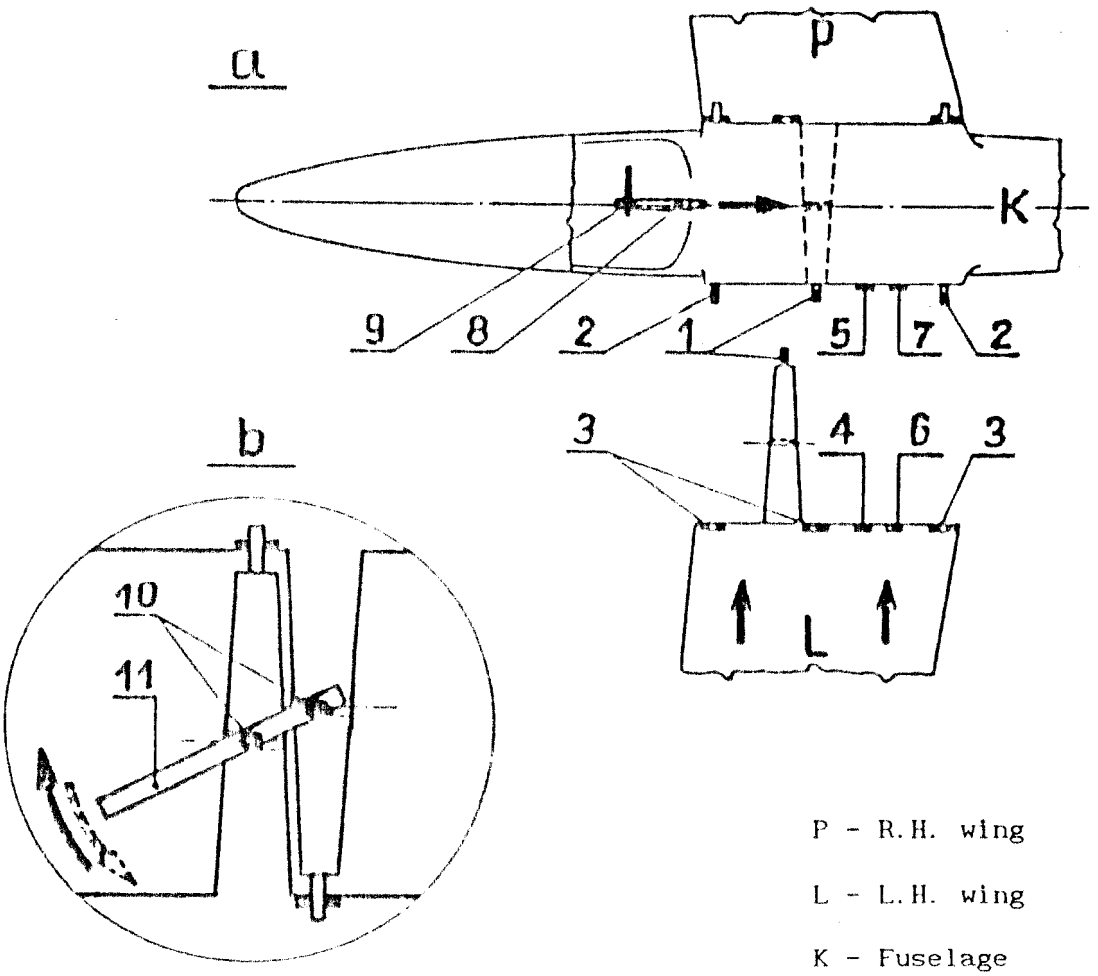
b) Put the fuselage on the assembly stand. Support the front wheel (tail skid on the ground).

c) Take off the fuselage upper inspection door. Retract the air brake in wings, set up the brake slider in the cockpit in the front position and the control stick in the plane of glider symmetry.

d) Insert the R.H. wing to the fuselage - see Fig. 1/4 detail "a" - (aileron to the neutral position, air brake retracted).

e) Insert the L.H. wing to the fuselage keeping the ailerons in the neutral position. Obtain the connection of pivots and nests, as well as elements coupling the control system.
After having wings in position lock the spars finally by the lever installed on spar feet acc. to Fig. 1/4 detail "b".
Insert the main bolt, insert the pin into the hole in glass-fibre member and secure with the safety pin.

Fig. 1/4 WING TO FUSELAGE RIGGING



P - R.H. wing

L - L.H. wing

K - Fuselage

1 - Spar root pivots

2 - Fuselage pivots

3 - Self-aligning nests in wings

4 - Control systems joints in wings

5 - Air brake control system joints in fuselage

6 - Aileron control system joints in wings

7 - Aileron control system joints in fuselage

8 - Main bolt with tommy-bar

9 - Safety-pin

10 - Spar thrust pivots

11 - Assembling lever

RIGGING OF TAILPLANE - Fig. 2/4

a) Assemble the R.H. half of a tailplane with the vertical stabilizer acc. to Fig. 2/4 (insert the tubular spar end and the front fixing pivot into proper nests).
Connect the control system joint (set up the elevator and trimming tab properly).

b) Slide on the L.H. half of a tailplane on the tubular spar protruding from the L.H. side of a vertical stabilizer. Pull forward the protruding end of securing pin and lock it turning by 90°.
Connect the control system joints (set up properly the elevator and trimming tab). After connecting the L.H. half of a tailplane turn the securing pin by 90° and press it back (the warning red mark Fig. 2/4, detail "6a" disappear).

NOTE :

WHEN THE GLIDER IS RIGGED-UP CHECK ALL THE CONNECTIONS AND OPERATION OF CONTROLS.

CLOSE THE FUSELAGE UPPER INSPECTION DOOR.

4.2.4 Derigging procedures

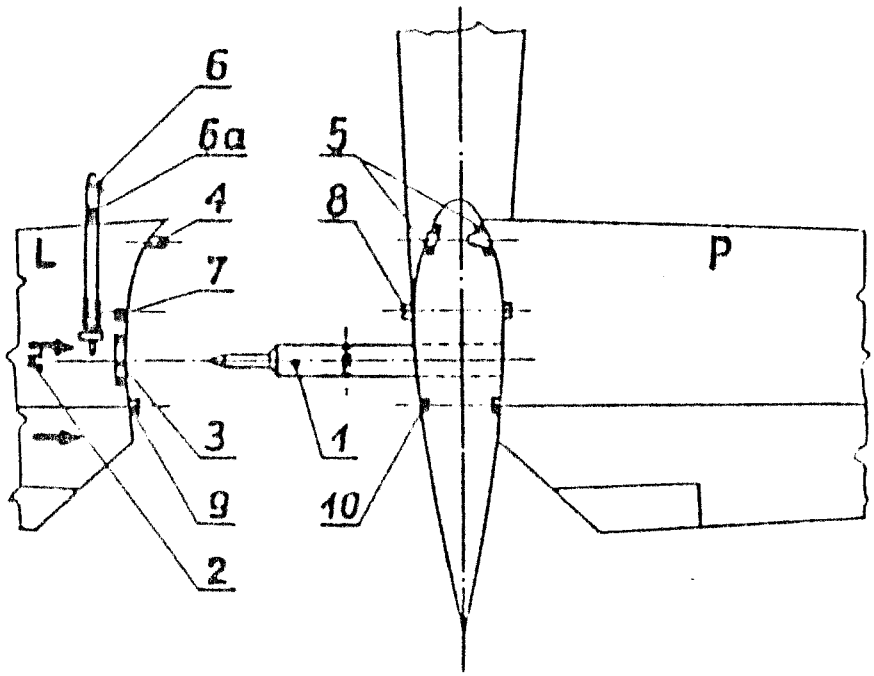
a) Pull forward the protruding pin securing the L.H. half of tailplane and lock turning it by 90° (red warning mark on the pin - Fig. 2/4, detail "6a" should be visible).

b) Take off at first the L.H. and then the R.H. half of the tailplane (pull outside applying the oscillating motions to loosen the connection).
If necessary beat the carrying tube end using the hammer and the wooden block.

c) Retract the air brake and take off the safety-pin which secures the main pin.
Support the wing ends and take out the pin.

d) Support the wing ends, put on the assembling lever on the spar feet and loosen the connections of spars with motion of the lever.
Next support the fuselage and take off at first the L.H. and next the R.H. wing.
Install the main pin into the fuselage fitting and secure with safety-pin.

Fig. 2/4 TAILPLANE RIGGING



P - R.H. half tailplane (with carrying tube) fitted with fin

L - L.H half of tailplane with trimming-tab

1 - Carrying tube

2,3- Carrying tube nests in L.H. half

4 - Pivot fixing fin half

5 - Nest for fixing pivot

6 - Securing pin in dissecured position (protruded forward) secured position (small hole in vertical position). Red warning sign visible in this position disappears when the pin is pressed in.

6a- Red warning sign (the securing pin groove painted red)

7 - Trimming-tab control joint on L.H. half of control surface

8 - Trimming-tab control joint on vertical stabilizer

9 - Control joint on elevator

10 - Elevator control joint on fin

4.3 Daily inspection (on beginning of flying day)

1. Check the validity of inspection certificate in the glider log book.
2. Check the structure integrity and condition of the coverings of wings, fuselage and tail-unit.
3. Check the correct wing rigging and securing of the main bolt in wing to fuselage connection.
4. Check the control surface operation (in cockpit - aileron, elevator, trimming-tab, rudder) and the plays on control stick at the control surface fixed (hold the aileron and elevator resting on stops).
5. Check the air brake operation (extending, retracting and dead point).
6. Check the correct connection and securing of assembling elements of joints and control systems.
7. Check that there are no foreign objects in the aileron and elevator control system housings in the cockpit.
8. Check the condition and operation of the take-off hooks
9. Check the operation of the main wheel brake (Try to roll the glider when the wheel brake lever control hand-grip is pulled full).
10. Check the undercarriage condition, pressure in the tube of main, front and rear wheels (by eye) and the rollability of the wheels.
11. Check the condition of total and static pressure heads, operation of airspeed indicator (should react when blowing on the pressure head). The above concerns the second instrument panel too, if installed.
12. Check the turn indicator operation.
13. Check the correct operation of canopy locks, the cable holding the opened canopy and securing of the emergency jettison.

14. Check the correct assembly of rear seat pan.
15. Check the correct tailplane rigging.
16. Check the cable tension of the rudder in cockpit (by means of touching with pressure).
17. Check the plays on the connections of
    - wing to fuselage,
    - tailplane to fuselage,
    - aileron to wing,
    - elevator to stabilizer,
    - rudder to fin,
    - trimming-tab to elevator.

    These plays are approximately appreciated when moving the wing or tailplane tip up and down as well as forwards and backwards.

NOTE :

WHEN PULLING THE WING TIPS FORWARDS (IN HORIZONTAL PLANE) THE CHARACTERISTIC ELASTICITY OF THE CONNECTION IS PERCEPTABLE AND THE INCREASING OF THE SLOT BETWEEN THE WING AND FUSELAGE IS SEEN (SEE Fig. 3/4).

THE MAXIMUM SAFE OPERATION PLAY "a" MEASURED ON THE TRAILING EDGES OF THE RIGHTHAND AND LEFTHAND WINGS IS 0.6 [in] (15 [mm]). THIS PLAY SHOULD BE MEASURED BETWEEN THE TRAILING POINTS OF WING RIB AND FUSELAGE RIB WHEN THE WING TIP IS LOADED WITH THE FORCE OF 66 [lb] (30 [daN]) IN HORIZONTAL PLANE - THEN a = b - s (FOR NON LOADED WINGS a = 0, b = s).

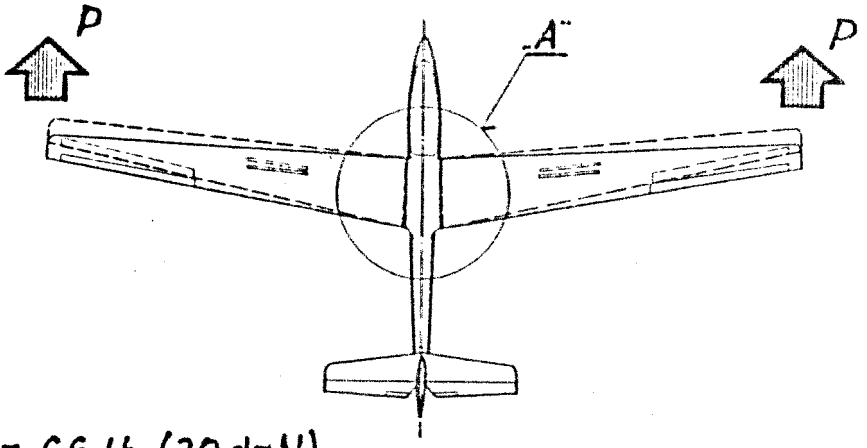
THE AILERON AND ELEVATOR ARE PULLED ON THE TRAILING POINT AND PLAYS ON HINGES ARE CHECKED WITH THE FINGER PRESSURE, APPLIED SIMULTANEOUSLY ON THE APRON AND CONTROL SURFACE. IF AT SUCH AN EXAMINATION NO PERCEPTIBLE MUTUAL SHIFT CAN BE FOUND BETWEEN THE CONTROL SURFACE (AILERON, ELEVATOR, RUDDER) AND ITS APRON, THE PLAY VALUE IN THIS CONNECTION IS CORRECT.

NOTE :

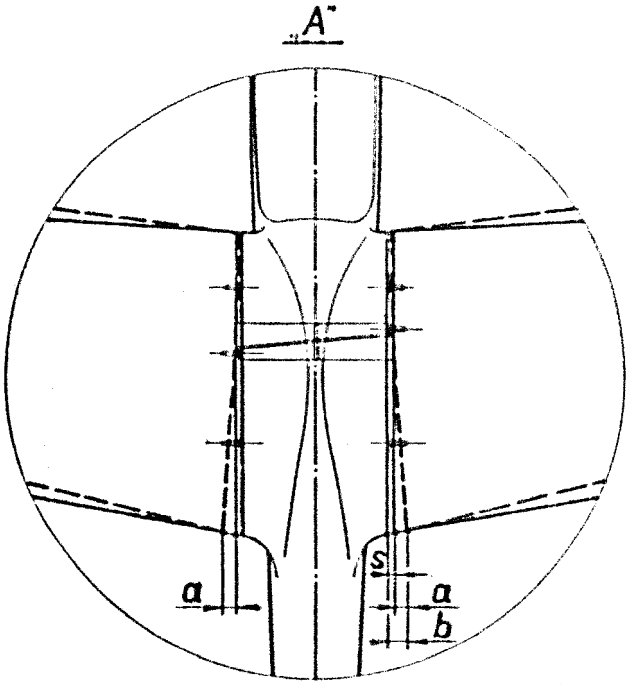
FOR ALLOWED VALUES OF PLAYS AND TOLERANCES IN THE ASSEMBLY CONNECTIONS AND CONTROL SYSTEM JOINTS REFER TO TECHNICAL SERVICE MANUAL - Iss. I/JAR-22, ITEM 3.2.

18. Check the pilot's belt

Fig. 3/4 ALLOWED SLOT INCREMENT IN WING TO FUSELAGE CONNECTION



P = 66 lb (30 daN)



a = b - s

4.4 Preflight inspection

4.4.1 Procedures before take-off

a) Balance the glider with the weights acc. to the crew mass and put eventually the back cushion (small or light pilot).

b) Adjust the rear seat. For solo flight fasten and secure the belts (and remove the content of the side pockets) at the rear seat.

c) Take place in the cockpit, adjust the pedals and fasten the belts.

d) Check full movements of controls, air brake and trimming-tab. Retract the air brake. Set the trimming-tab slider according to the take-off method and crew mass.

e) Adjust altimeter to current pressure/field elevation.

f) Check the operation of turn indicator.

g) Close the canopy.

h) Insert the cable into the hook and check the locking pulling it firmly.

4.4.2 Post-flight procedures

a) Switch off the turn indicator. If necessary remove the batteries.

b) If necessary drain the instrument installation according to 7.5.3.

c) Inspect the glider as before take-off and remove the eventual failures.

4.5 Normal procedures and recommended speeds

GENERAL CHARACTERISTICS OF CONTROLLING

The SZD-50-3 "PUCHACZ" glider allows for correct and easy controlling as do it most of the modern performance sailplanes.

Characteristics:

- short and well shock-absorbed ground run at take-off,
- good lateral and directional controllability,
- safe low speed behaviours without the excessive inclination to spin.

4.5.1 Winch-launching (C.G. hook)

Before take-off the glider should be positioned in line with towing cable. The slight directional deviation is allowed to the left of the cable but, the deviation to the right should be avoided in respect to the possibility of front wheel to the cable contact during the ground run (the possible touching or even the rolling of the front wheel through the tensioned cable does not create, however, any danger, nor disturbs the ground run).

The adjusting of the trimming-tab according to the pilot's mass on the front seat.

- solo light weight pilot - **"nose heavy"**,
- average pilot - **"nose heavy"**,
- heavy crew - **"neutral"**.

NOTE : THE ADJUSTMENT OF THE TAB SHOULD NOT BE CORRECTED DURING TAKE-OFF.

The glider ground run (initially on two wheels, next on the main wheel) is correct, and the run length depends on the crew mass and take-off conditions. After airborning fly correctly near ground avoiding the tail skid to ground contact and pass into steep climbing.
With glider correctly balanced the stick forces are not large, and with incorrect balance the forces are not excessive.
The launching speed should be 49÷54 [kts] (90÷100 [km/h]) (not less than 43 [kts] (80 [km/h])).
In the final climb phase slightly pull the stick.
Before releasing the cable put the stick forwards to discharge the cable.
During intended self-releasing the stick should be pushed forward after the releasing.
After releasing the cable pull the releasing handle once more and pass into the normal glide.
Depending on the glider all-up mass and the winch power, with a cable 1800 [ft] (550 [m]) long, in smooth air the gained height reaches 660÷820 [ft] (200÷250 [m]).

WARNING : WINCH-LAUNCHING IS ALLOWED ON C.G. HOOK ONLY !

4.5.2 Take-off and flight in aerotowing (front hook)

Pay attention to have the towing cable straight-tensioned before take-off.
According to the crew mass adjust the balancing tab :

- solo flight - "**nose heavy**",

- heavy crew - "**neutral**".

The ground run begins on two wheels.
At the airspeed of about 16 thru 22 [kts] (30 thru 40 [km/h]) the front wheel should be lifted by pulling slightly the stick, when avoiding to hit the ground with the tail skid. According to the all-up mass the glider airborns at speed of 35 to 41 [kts] (65 to 75 [km/h]).
When the flight becomes stable correct the setting of trimming tab.

Recommended towing airspeeds :

- at climb 51 to 65 [kts] (95 to 120 [km/h]),

- at cross-country flight 65 to 81 [kts] (120 to 150 [km/h]).

WARNING : AEROTOW IS ALLOWED ON FRONT HOOK ONLY !

4.5.3 Free flight

THE LONGITUDINAL GLIDER TRIM IN FREE FLIGHT

The trimming tab allows for glider trim :

- for solo light weight pilot - within the airspeed range of 32 to 81 [kts] (60 to 150 [km/h]),

- for heavy crew - within the airspeed range of about 42 to about 116 [kts] (78 to 215 [km/h]).

CIRCLING

When circling in thermals the glider has very good lateral controllability. The circling speed is of 38 to 49 [kts] (70 to 90 [km/h]) depending on all-up mass, bank and flight conditions.

SIDESLIP

Sideslip - can be performed in 2 ways :

a) With simultaneous, gradual deflection of ailerons and rudder at the airspeed of about 38÷43 [kts] (70÷80 [km/h]), the directional sideslip with bank of to 10÷15° is obtained. Indications of airspeed indicator drop below 27 [kts] (50 [km/h]).
Keeping up the rudder deflection requires the applying of resolute force on pedal : releasing of this force causes the automatic neutralizing of rudder and the glider passes into a turn towards the bank.
With the bank of above 15° the glider also turns towards the bank.

b) With deflection of controls in an order : at first the ailerons, then rudder, when the bank of ~ 15^{o} is obtained, the glider allows to enter into directional sideslip with bank of up to about 30^{o}. During deflection of rudder the force on pedal disappears simultaneously, it appears the impulse to raise the glider nose above the horizon.
It is necessary, in this moment, to stabilize the glider by pushing the stick.
Indications of the airspeed indicator in this condition drop down to about 0.
When recovering with aileron and rudder deflections simultaneously (it is necessary the resolute deflection of rudder towards the bank) the glider passes into the turn.
When recovering with aileron at first as the bank diminishes the rudder is neutralized automatically and the glider passes gradually to the straight flight ; such a recovery is a little slower than the previous one.

4.5.4 Approach and landing

Generally the landing should be performed against the wind.
If necessary the landing with the side wind up to 10 [kts] (5 [m/s]) or the back wind up to 6 [kts] (3 [m/s]) is allowed when paying special attention.

The recommended approach speeds :

- in smooth air 49 thru 54 [kts] (90 thru 100 [km/h]) depending on all-up mass,
- in turbulent air 54 thru 60 [kts] (100 thru 110 [km/h]) depending on all-up mass.

The flying-path inclination should be adjusted by the air brake. According to all-up mass and air brake travel the touch-down with the main wheel follows at airspeed of about 35÷41 [kts] (65÷75 [km/h]). It is recommended to touch-down with the partly extended air brake. After touch-down the glider rolls at first on the main shock-absorbed wheel. Then smoothly drops the front wheel. This effect can be delayed (to diminish the shock during rolling) with gradual pulling of stick.

The length of landing run in windless condition is :

- without use of wheel brake - about 295-360 [ft] (90-110 [m]) depending on all-up mass,
- with use of wheel brake - about 195-260 [ft] (60-80 [m]) depending on all-up mass.

The air brake is very efficient and can be, if necessary, extended in full range of permissible airspeeds. The effectiveness of brakes allows to avoid the use of sideslips during normal approach to landing.

4.5.5 High altitude flight

It should be remembered that in line with increasing flight altitude the true airspeed is higher than indicated.

Therefore the maximum permissible airspeed V_{NE} should be reduced according to the table given in item 2.14.

4.5.6 Flying in rain

During the flight in rain the general degradation of sailplane performances should be taken into account. For safe operation the minimum airspeed in straight flight and circling should be elevated by about 5 [kts] (10 [km/h]). Having a bad visibility and moistened perspex open the air conditioning valve and side windows. The sailplane wetted by rain should be dried before the next take-off.
Having the wet sailplane do not fly in isotherm below zero since it creates a danger of overall icing.

4.5.7 Aerobatics

Before take-off for aerobatics it's necessary to:

1. Check the correct glider balance with balancing weights (concerns solo flight).
2. Remove the free elements out of the cockpit.
3. Check the locking of back rest tube at the rear seat.
4. Check the full deflections of controls having the belts fastened.
5. Before the solo flight remove the needless pillows and fasten the pilot's harness at the rear seat.

In the flight just before performing the manoeuvres it is necessary to:

1. Fasten the back belts.
2. Balance the glider with trimming-tab on the airspeed of 60 thru 65 [kts] (110 thru 120 [km/h]) i.e. similar as for towed flight.
3. Check the locking of canopy and air brake.
4. Shut the window and air-conditioning tab.

The schooling in aerobatics can be performed in the good horizon visibility conditions only.

Entry airspeeds for the particular manoeuvres:

MANOEUVRE	initial airspeed [km/h]			
	crew			
	one person		two persons	
	[kts]	[km/h]	[kts]	[km/h]
Looping, stall turn	85÷ 98	160÷180	90÷105	170÷190
Chandelle	81	150	97	180
Lazy eight	81	150	97	180

MANOEUVRING RECOMMENDATIONS:

GENERAL:

- In manoeuvres requiring the considerable use of elevator (looping, quick half-roll-half-loop) the increased forces on the stick are required specially in flight with heavy crew.

LOOPING:

- In looping first the considerable pushing force during the acceleration to initial airspeed is necessary. Then the smooth transition to pulling force takes place to obtain its maximum in the upper loop bow. This force is distinctly higher in flight with the mass near to all-up one.

CHANDELLE:

- At the initial airspeed of 81/97 [kts] (150/180 [km/h]) the glider should be entered into the sharp climbed turn with 45^{o} bank with such an attention that when recovered for the returned direction (180^{o}) the airspeed ranged 38÷43 [kts] (70÷80 [km/h]).

LAZY EIGHT:

- At the initial airspeed of 81/97 [kts] (150/180 [km/h]) the glider should be centered into the sharp climbed turn with 45^{o} bank with such an attention that when the direction changed by 180^{o} the turning airspeed was about 43 [kts] (80 [km/h]).
  After the next 45^{o} the glider should be recovered out of the turn, the airspeed of 75/81 [kts] (140/150 [km/h]) gained once-more, and the same manoeuvre performed into the reversal direction, then recovered into the original direction.

SPINNING:

- Perfoming the spin is described in item 3.5, page 3.5 of this Manual.

STEEP TURN:

- Performing the steep turn is typical, maintaining the increased airspeed to prevent stalling the glider should be remembered.

Section 5

5. Performance

5.1 Introduction

5.2 Approved data

5.2.1 Airspeed indicator system calibration

5.2.2 Stall speeds

5.3 Additional non-approved information

5.3.1 Performances with wind side component

5.3.2 Flight polar

5.1 Introduction

Section 5 provides data for airspeed calibration, stall speeds and non-approved additional information.

The data in these charts and tables has been computed from actual flight tests with the glider in good condition and using average piloting techniques.

5.2 Approved data

5.2.1 Airspeed indicator system calibration

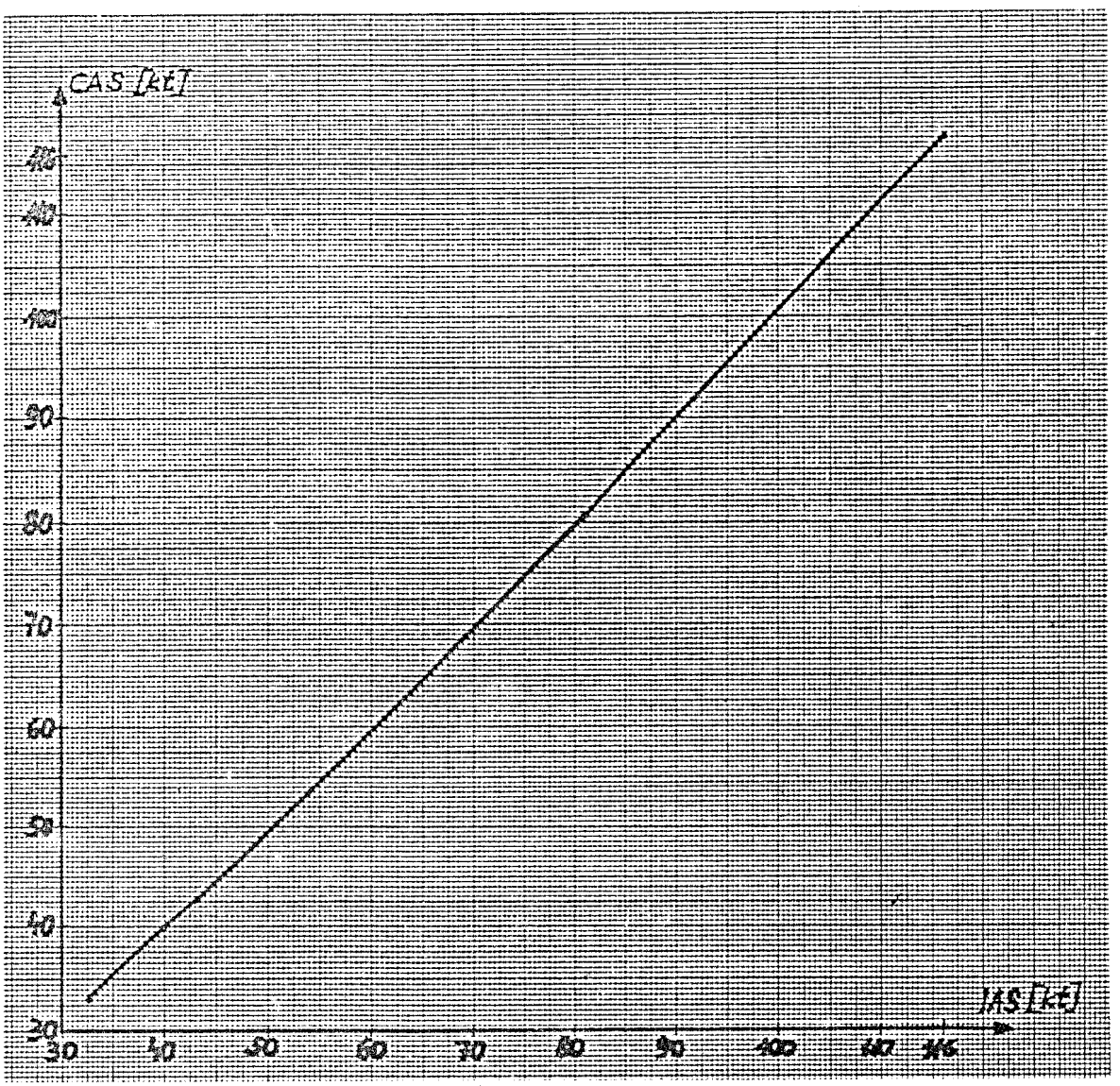


Diagram of: $V_{CAS} = f(V_{IAS})$

5.2.2 Stall speeds

- STRAIGHT FLIGHT STALL :

  With the all-up mass and front c.g. limit (23.5 per cent of MSC) the stalling speed is:

  V_{S1} = 39 [kts] (IAS) = 38.6 [kts] (CAS).

  (V_{S1} = 72 [km/h] (IAS) = 71.5 [km/h] (CAS)).

  Height loss does not exceed 98 [ft] (30 [m]).

  Inclination in respect to horizon: does not exceed 30^{o}

  Extending the air brake in condition near to stall results dropping the nose a little with a tendency to a small airspeed increment.

- STALL IN TURN WITH 45^{o} BANK :

  With the all-up mass and front c.g. limit the stall warning begins at 40 [kts] (IAS) = 40.2 [kts] (CAS)
  (74 [km/h] (IAS) = 74.5 [km/h] (CAS)).

  The glider tends to narrow the turn. It can be avoided by opposite aileron deflection. Then the stalled and strong oscillating glider circles further without dropping down. It is possible to pull the stick full with the intensive controlling the flight.

  The recovery produces no troubles.

5.3 Additional non-approved information

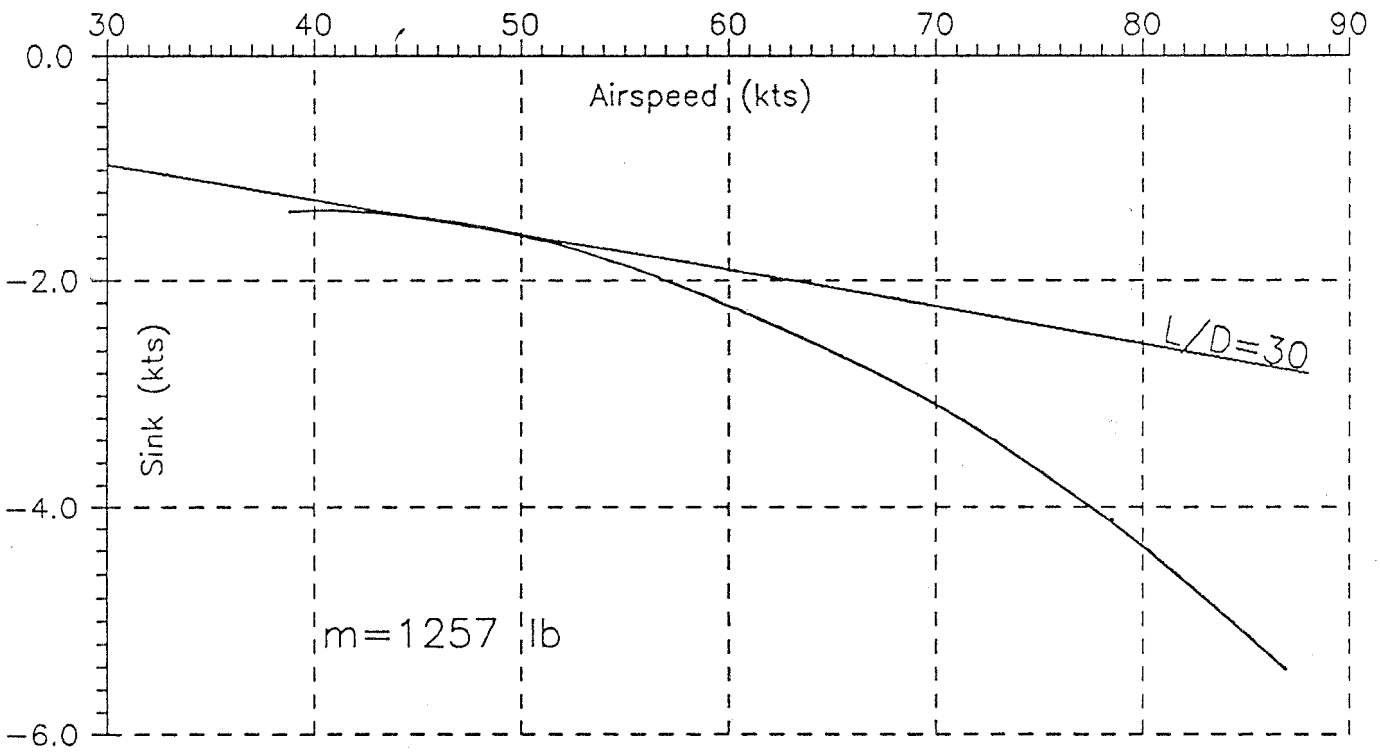
5.3.1 Performances with wind side component

Kind of take-off	Maximum velocity of wind side component [km/h]	
	[kts]	[km/h]
Winch-launching	8	15
Aerotowing	8	15

LANDING : Maximum side-wind velocity 8 [kts] (15 [km/h]).

5.3.2 Flight polar

Fig. 1/5 FLIGHT POLAR



The calculated flight polar (Fig. 1/5) has the following special points ($m_{in\text{-}flight}$ = 1257 [lb]):

- minimum sinking speed 1.36 [kts] (0.7 [m/s]) at about 40 [kts] (75 [km/h]),
- maximum gliding ratio 1:30 at about 46 [kts] (85 [km/h]).

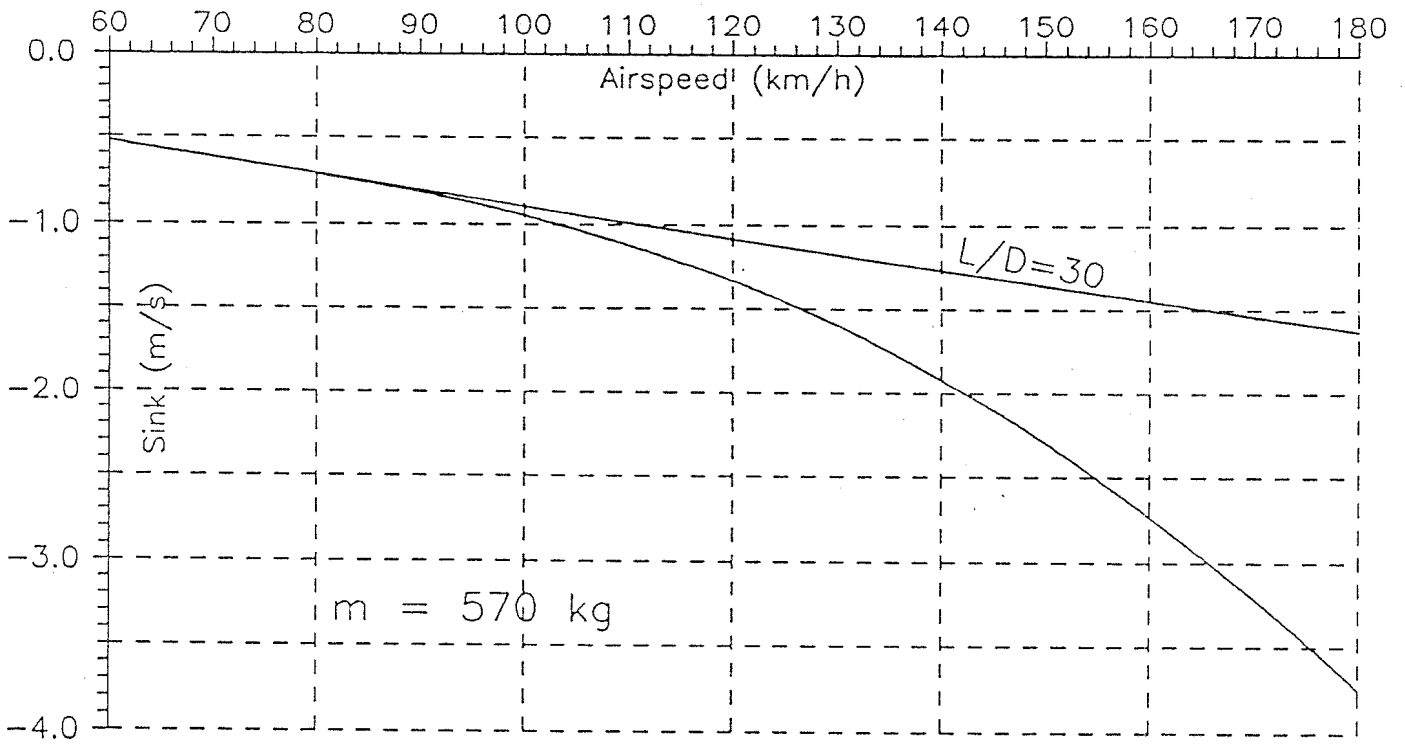
Polar data :

V [kts]	40	50	60	70	80	90	100
w [kts]	1.36	1.59	2.22	3.07	4.35	5.92	7.85

V [km/h]	80	100	120	140	160	180
w [m/s]	0.72	0.95	1.33	1.92	2.73	3.75

5.3.2 Flight polar

Fig. 1/5 FLIGHT POLAR



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- minimum sinking speed 1.36 [kts] (0.7 [m/s]) at about 40 [kts] (75 [km/h]),
- maximum gliding ratio 1:30 at about 46 [kts] (85 [km/h]).

Polar data :

V [kts]	40	50	60	70	80	90	100
w [kts]	1.36	1.59	2.22	3.07	4.35	5.92	7.85

V [km/h]	80	100	120	140	160	180
w [m/s]	0.72	0.95	1.33	1.92	2.73	3.75

Section 6

6. Mass (weight) and balance/equipment list

6.1 Introduction

6.2 Weighing and balance record and allowed useful load range

6.3 Individual loading plan

6.1 Introduction

This section contains the payload range within which the glider may be safety operated.
Procedures for weighing and the calculation method for establishing the Centre of Gravity of the glider are contained in the Technical Service Manual, issue I/JAR-22.

6.2 Weight and balance record and permitted payload range

6.2.1 Loading plan

SZD-50-3 „PUCHACZ" LOADING PLAN	
MAXIMUM ALL-UP MASS IN FLIGHT:	1256 lbs
MAXIMUM FRONT SEAT LOAD MASS IN FLIGHT:	240 lbs
MINIMUM FRONT SEAT MASS	122 lbs
USE OF BALANCING WEIGHTS:	
–for cockpit load mass up to 155 lbs	OBLIGATORY
–for cockpit load mass above 220 lbs	PROHIBITED
MAXIMUM LOAD MASS IN LUGGAGE COMPARTMENT	44 lbs
SOLO FLIGHT ON FRONT SEAT ONLY.	
IF THE FRONT SEAT OCCUPANT MASS EXCEEDS 220 lbs IT IS PROHIBITED FOR THE OCCUPANT OF THE REAR SEAT TO USE THE ADDITIONAL BACK PILLOW IF HIS MASS /PARACHUTE INCLUDED/ EXCEEDS 165 lbs	

6.2.2 Empty mass with standard equipment

Maximum allowable empty mass
with standard equipment 816 [lb] (370 [kg]),

in which the fuselage
(without the removable balancing weights) 425 [lb] (193 [kg]).

The standard equipment consists of :

a) Instrument panel (at front seat only) with airspeed indicator, altimeter, variometer with compensator, turn indicator, compass.

b) Two towing hooks of SZD-III or TOST type.

c) Two sets of four-belts pilot's harness.

d) Two sets of seat pillows.

e) Assembling wrench.

f) First aid kit.

6.2.3 Table of weighing the glider

Table of weighing the glider Fact. No .....

Mass of empty glider with standard equipment m_o [lb]			
Location of C.G. for empty glider with standard equipment in respect to root chord leading edge x_o [in]			
Static moment of mass of empty glider with standard equipment in respect to root chord leading edge $M_o = m_o * x_o$ [lb in]*			
Max permissible loading mass $1682 + m_s - 2m_o$ [lb]			
Date, signature and seal of inspection representant			

* m_s - mass of both wings ; m_o - mass of empty glider with standard equipment

NOTE:

TO DEFINE THE "MAXIMUM PERMISSIBLE LOAD MASS" USE THE FORMULAS CONTAINED IN THE ABOVE TABLE OF WEIGHING THE GLIDER

EXAMPLE:

Empty glider mass with standard equipment (without movable balancing weights) is:

$m_o = 816$ [lb]

Mass of both wings is $m_s = 379$ [lb]

Acc. to the formula:

$1682 + m_s - 2m_o$ as above,

the maximum load mass is: 1682 + 379 - 1632 = 430 [lb]

6.2.3 Table of weighing the glider

Table of weighing the glider Fact. No .....

Mass of empty glider with standard equipment m_o [kg]			
Location of C.G. for empty glider with standard equipment in respect to root chord leading edge x_o [m]			
Static moment of mass of empty glider with standard equipment in respect to root chord leading edge $M_o = m_o * x_o$ [kg m]*			
Max permissible loading mass $763 + m_s - 2m_o$ [kg]			
Date, signature and seal of inspection representant			

* m_s - mass of both wings ; m_o - mass of empty glider with standard equipment

NOTE:

TO DEFINE THE "MAXIMUM PERMISSIBLE LOAD MASS" USE THE FORMULAS CONTAINED IN THE ABOVE TABLE OF WEIGHING THE GLIDER

EXAMPLE:

Empty glider mass with standard equipment (without movable balancing weights) is:

$m_o = 370$ [kg]

Mass of both wings is $m_s = 172$ [kg]

Acc. to the formula:

$763 + m_s - 2m_o$ as above,

the maximum load mass is: 763 + 172 - 740 = 195 [kg]

6.2.4 Graphical checking of C.G. location

(see diagram on page 6.7)

Before the flying day or before the every change of loading condition the C.G. location of the glider in flight shall be checked acc. to the following procedure:

1. Add the masses of
   - empty glider m_o (see table on page 6.4),
   - pilots with parachutes $m_1 + m_2$ (from table, page 6.6,7),
   - additional equipment and balancing weights incorporated m_3 (see table on page 6.5)

   The resultant mass of the glider in flight mark on the vertical axis of diagram on page 6.7

   $$m = m_o + m_1 + m_2 + m_3$$

2. Add (algebraically, respecting the sign) the mass moments of:
   - empty glider M_o (see the table on page 6.4),
   - pilots with parachutes $M_1 + M_2$ (see tables on page 6.6,7)
   - additional equipment and balancing weights M_3 incorporated (see table on page 6.5).

NOTE :

THE MASS MOMENT VALUES FOR PILOTS ON I AND II SEAT IN RESPECT TO ROOT CHORD LEADING EDGE ARE LISTED IN TABLES, PAGE 6.6,7 PROVIDING THAT THE CREW USES THE PARACHUTES OR BACK PILLOWS OF THICKNESS (IN DEPRESSED CONDITION) NOT LOWER THAN 4.7 [in] (12 [cm]).

Additional equipment	Mass [lb]	Mass [kg]	Mass moment * [lb in]	Mass moment * [kg m]
Instrument panel at rear seat	11.5	5.2	-347.3	-4
One balancing weight	13.9	6.3	-955.0	-11
Two balancing weights	27.8	12.6	-1910.0	-22
Baggage stored in the baggage compartment (uniformly distributed)	44.1	20.0	-938.3	+10.8
Transceiver	depending on type		Calculated or by weighing	
Oxygen equipment	depending on type			
Other equipment (e.g. snow ski)	depending on type			

* in respect to root rib leading edge

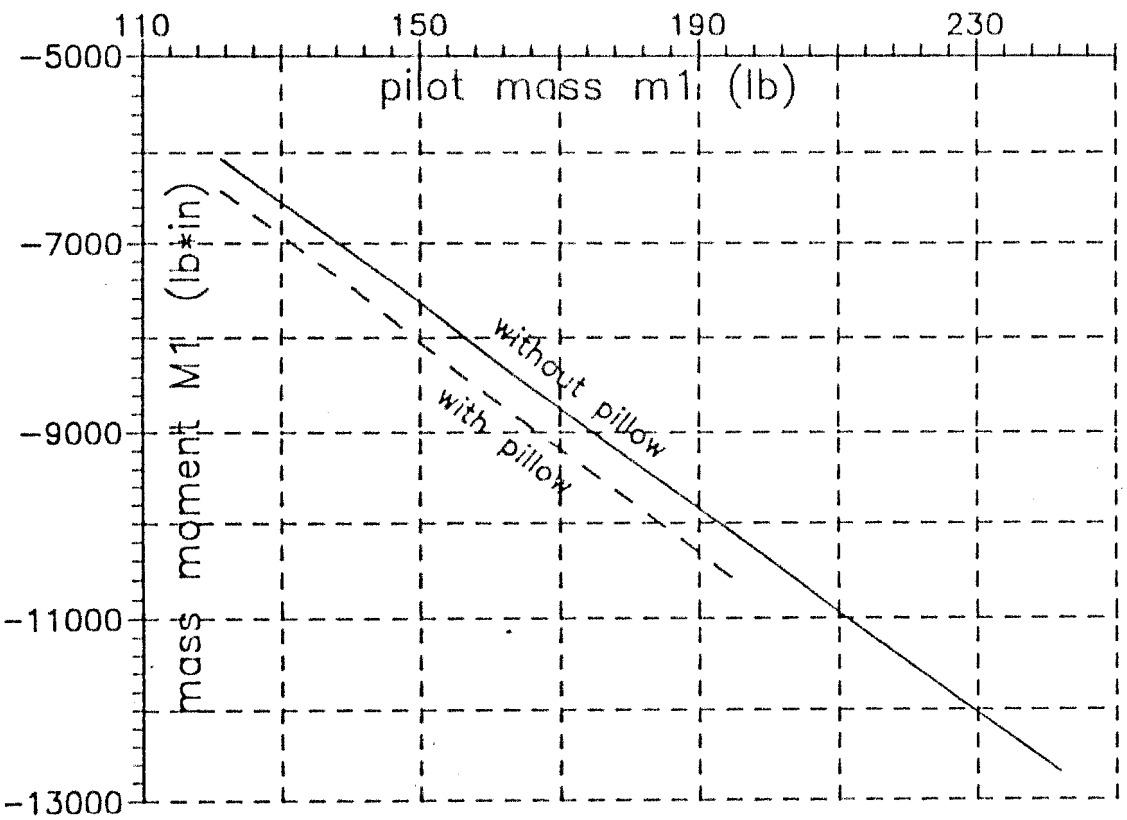
The resultant value of glider mass-moment:

$$M = M_o + M_1 + M_2 + M_3$$

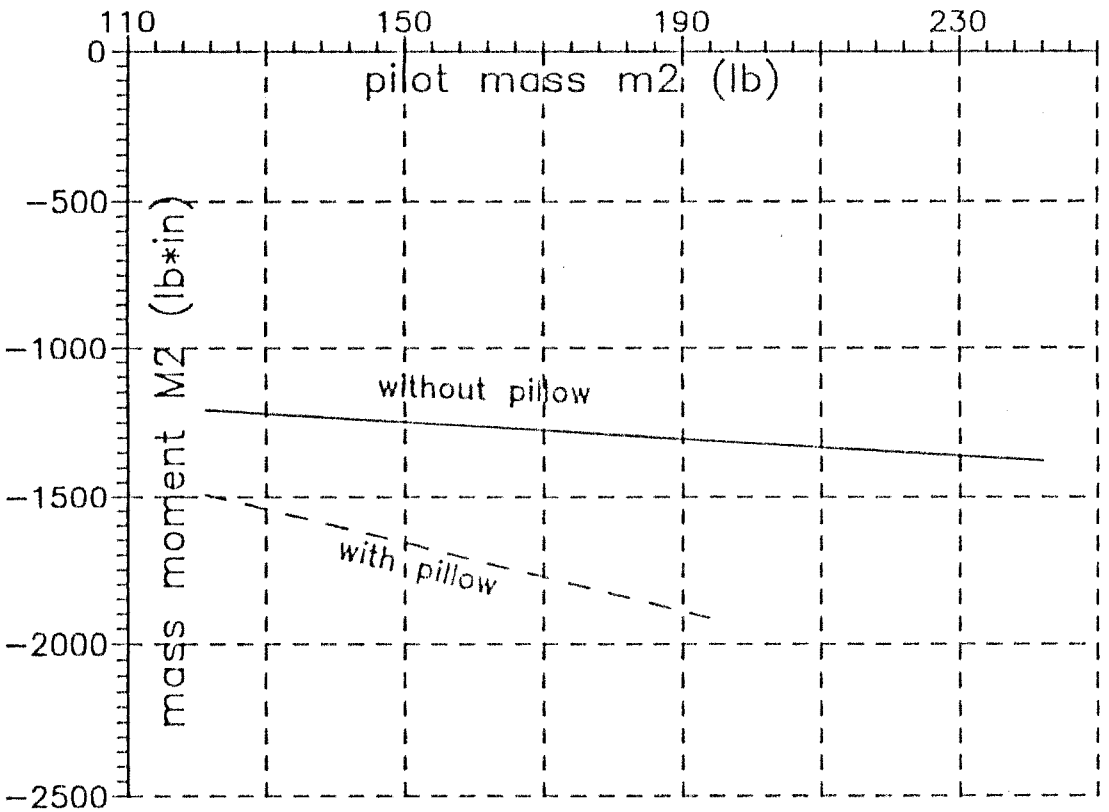
mark on the horizontal axis of diagram on page 6.7.

3. From the points marked on the diagram axes on page 6.7 draw the perpendicular lines to the axes and find the point of intersection.
   If this point is located inside the field enveloped with the broken line, C.G. is in the correct position.
   If this point is located out of above field, the C.G. location shall be corrected with the balancing weights and C.G. location checked once more.

Mass moment of pilot (parachute incl.) on the front seat in respect to the leading edge of the wing root chord M_1 [lb*in]

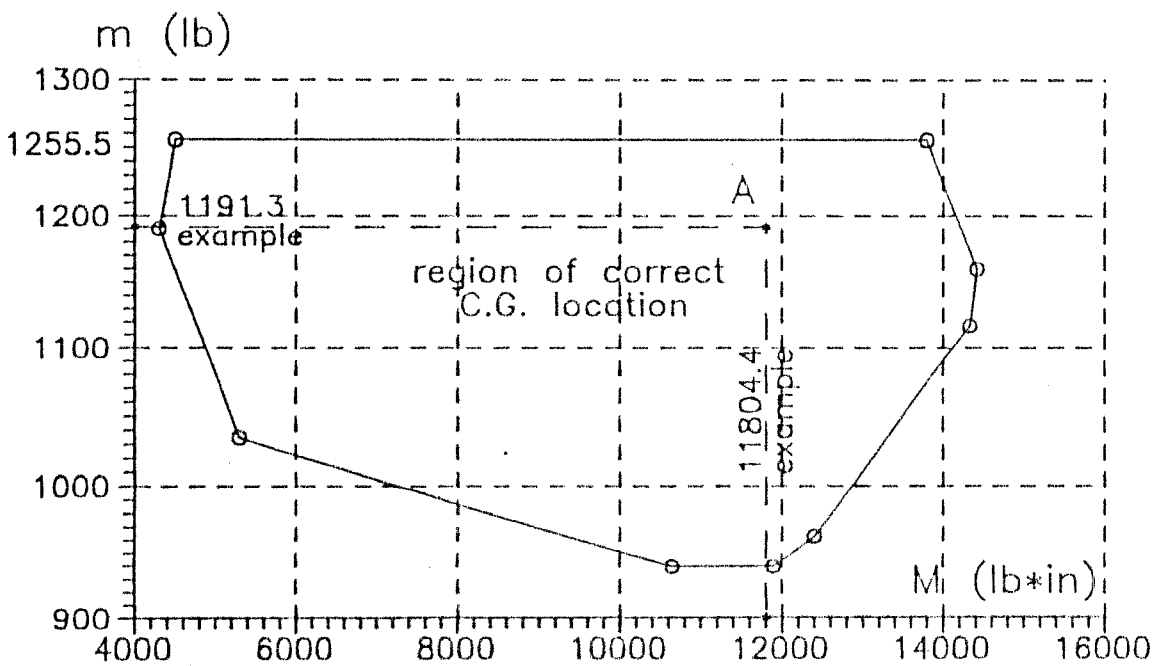


Mass moment of pilot (parachute incl.) on the rear seat in respect to the leading edge of the wing root chord M_2 [lb*in]

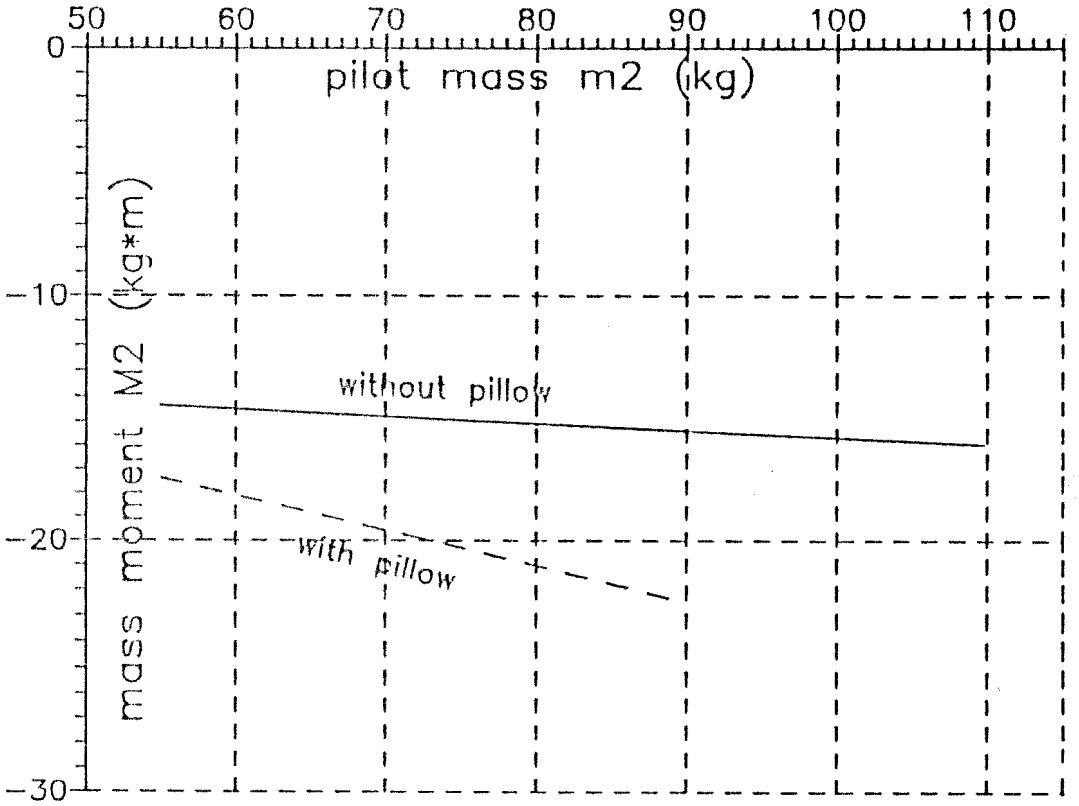


GRAPHICAL CHECKING OF IN FLIGHT C.G. LOCATION

Diagram valid for gliders of maximum allowable empty glider mass (with standard equipment) of 816 [lb] (370 [kg]).

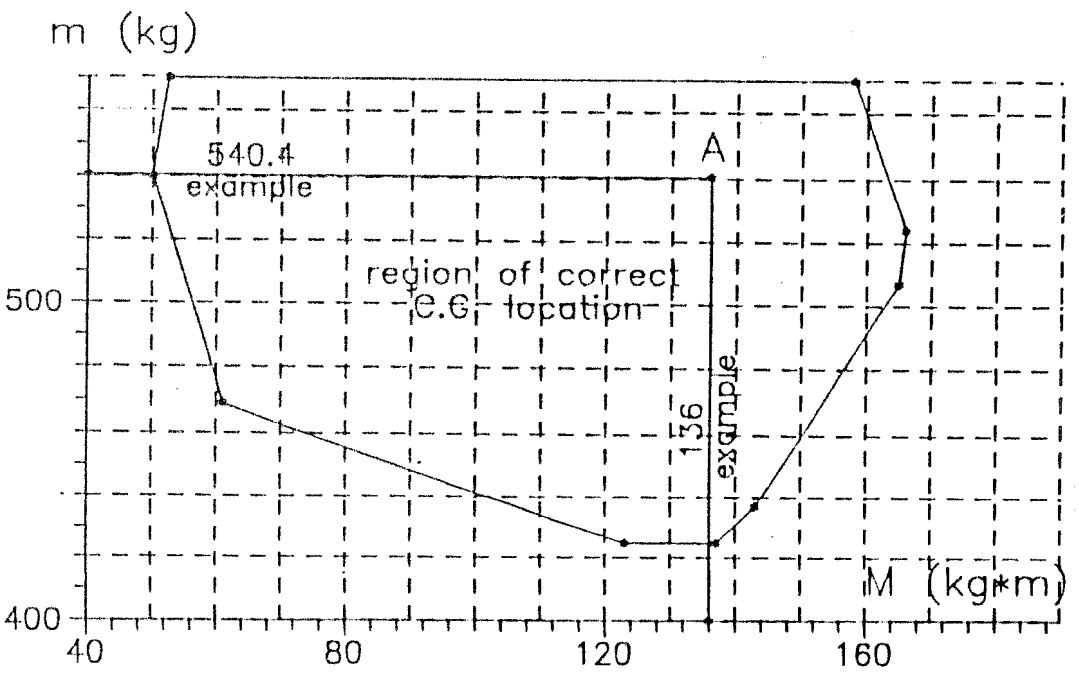


Mass moment of pilot (parachute incl.) on the rear seat in respect to the leading edge of the wing root chord M_2 [kg*m]



GRAPHICAL CHECKING OF IN FLIGHT C.G. LOCATION

Diagram valid for gliders of maximum allowable empty glider mass (with standard equipment) of 816 [lb] (370 [kg]).



EXAMPLE:

Individual data of empty glider (from table of weighing the glider on page 6.4):

m_o = 820 [lb] M_o = 20400 [lb in],

Crew:

front seat
pilot with pillow m_1 = 132.3 [lb] M_1 = -7032 [lb in],

rear seat
pilot without pillow m_2 = 211.7 [lb] M_2 = -1389.6 [lb in],

Additional equipment:

-instrument panel of rear seat	11.5 [lb]	-348 [lb in],
-transceiver	15.9 [lb]	174 [lb in]
	m_w = 27.3 [lb]	M_w = -174 [lb in]

Glider in-flight mass :

$m = 820 + 132.3 + 211.7 + 27.3 = 1191.3$ [lb]

Moment of glider in-flight mass:

$M = 20400 - 7032 - 1389.6 - 174 = 11804.4$ [lb in]

The perpendicular lines from points:

m = 1191.3 [lb] and M = 11804.4 [lb in],

on diagram of page 6.7, cross in point "A", which is inside the field enveloped with the broken line.

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

EXAMPLE:

Individual data of empty glider (from table of weighing the glider on page 6.4):

m_o = 372 [kg] M_o = 235 [kgm],

Crew:

front seat
pilot with pillow m_1 = 60 [kg] M_1 = -81 [kgm],

rear seat
pilot without pillow m_2 = 96 [kg] M_2 = -16 [kgm],

Additional equipment:

-instrument panel of rear seat	5.2 [kg]	-4 [kgm],
-transceiver	7.2 [kg]	+2 [kgm],
	m_w = 12.4 [kg]	M_w = -2 [kgm]

Glider in-flight mass :

$m = 372 + 60 + 96 + 12.4 = 540.4$ [kg]

Moment of glider in-flight mass:

$M = 235 - 81 - 16 - 2 = 136$ [kgm]

The perpendicular lines from points:

m = 540.4 [kg] and M = 136 [kgm],

on diagram of page 6.7, cross in point "A", which is inside the field enveloped with the broken line.

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

Individual loading plan placard
(Copy of the placard placed in the glider)

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

INDIVIDUAL LOADING PLAN

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

. . . . . .

. . . . . .

. . . . . .

. . . . . ranges . . . . . lbs

Maximum all-up mass in flight: 1256 lbs

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

Mass of pilot and parachute lbs			Balancing weights pieces:	Date Signature Seal of Factory Inspection
Rear seat	Front seat minimum	Front seat maximum		
0	121	154	2	
0	154	240	0	
Two persons flight 121	121	240	0	
132	121	. . .	0	
154	121	. . .	0	
176	121	. . .	0	
198	121	. . .	0	
220	121	. . .	0	
240	121	. . .	0	

Individual loading plan placard
(spare placard for the glider)

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

INDIVIDUAL LOADING PLAN

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

. . . . . .

. . . . . .

. . . . . ranges . . . . . lbs

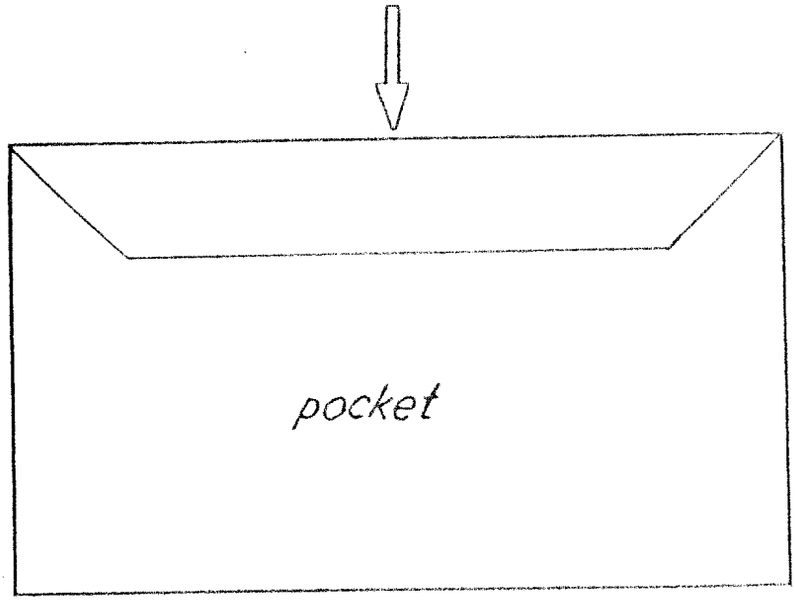
Maximum all-up mass in flight: 1256 lbs

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

Mass of pilot and parachute lbs			Balancing weights pieces:	Date Signature Seal of Factory Inspection
Rear seat	Front seat minimum	Front seat maximum		
0	121	154	2	
0	154	240	0	
two persons flight 121	121	240	0	
132	121	. . .	0	
154	121	. . .	0	
176	121	. . .	0	
198	121	. . .	0	
220	121	. . .	0	
240	121	. . .	0	

In case of revision make the inscriptions acc. to new page 6.10 and place in the cockpit.

Here store the spare placard.



Individual loading plan placard
(spare placard for the glider)

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

INDIVIDUAL LOADING PLAN

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

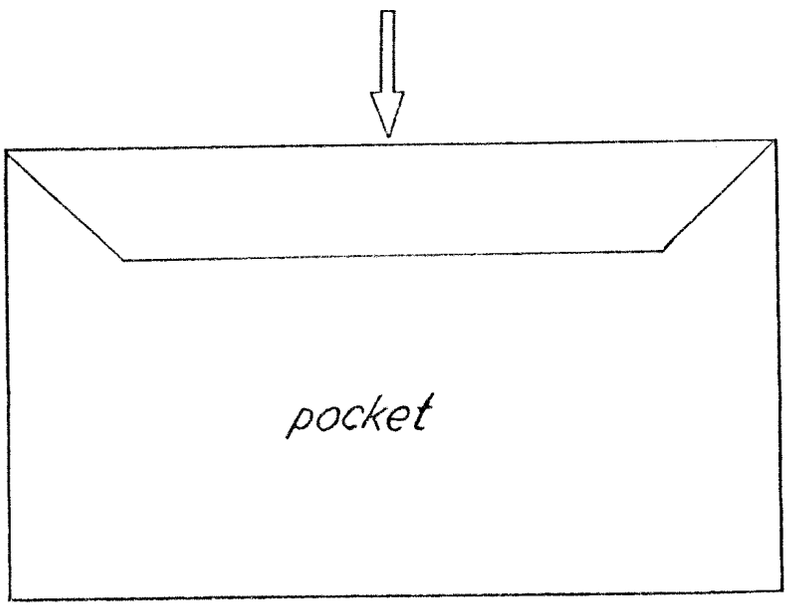
Maximum all-up mass in flight 570 kg

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	

In case of revision make the inscriptions acc. to new page 6.10 and place in the cockpit.

Here store the spare placard.



Section 7

7. General sailplane and systems description

7.1 Introduction

This Section provides description and operation of the sailplane and its systems.

The glider structure is made of sole glass-epoxy composite.

Wing - in two panels of trapeze outline, Wortmann laminar airfoils. Composite-foam-composite sandwich skin.
Box spar with longerons of glass roving. The spar 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.

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

Horizontal tailplane - bipartite, located on the fin. Tailplane structure of sandwich type: composite-foam-composite. Cloth covered elevator of composite structure.

Rudder - composite, cloth covered.

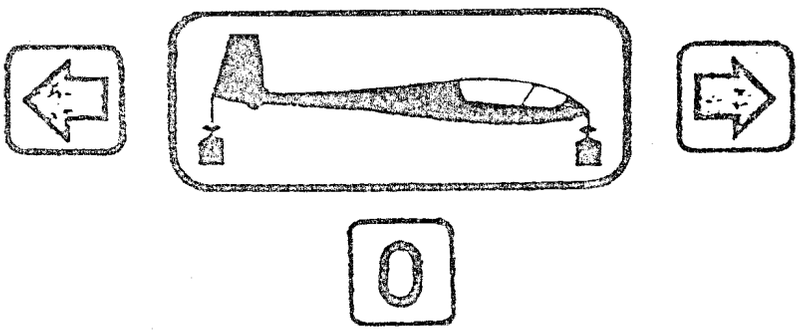
7.2 Cockpit controls

Both seats have the control columns coupled each other, the pedals and other control levers, marked with placards. Operation of controls is of conventional type.

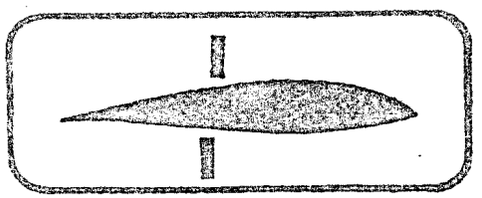
The handles are arranged as follows:

Control system	Position of handle	Colour of handle
Air brake slider	on the left	blue
Wheel brake knob	on the left	black
Trimming tab slider	on the left	green
Towing cable release handle	on the left	yellow
Canopy locking lever	on the left	red
Canopy emergency jettison handle	on the right	red, sealed with lead

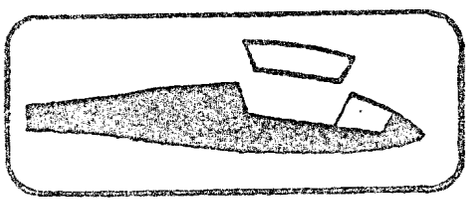
Placards of handles:



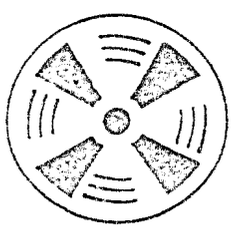
Trimming tab slider -
- placard on the L.H. board at front and rear seat



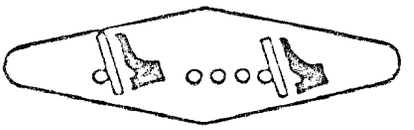
Air brake slider -
- placard on the L.H. board at front and rear seat



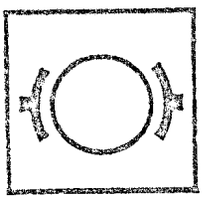
Canopy emergency jettisoning lock -
- placard on the canopy frame at front and rear seat



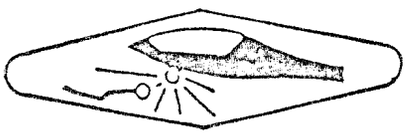
Air-conditioning tab slider -
- placard on the instrument panel at front seat



Pedal adjustment -
- placard at front seat floor, in front of control column



Wheel brake -
- placard on the L.H. board at front and rear seat

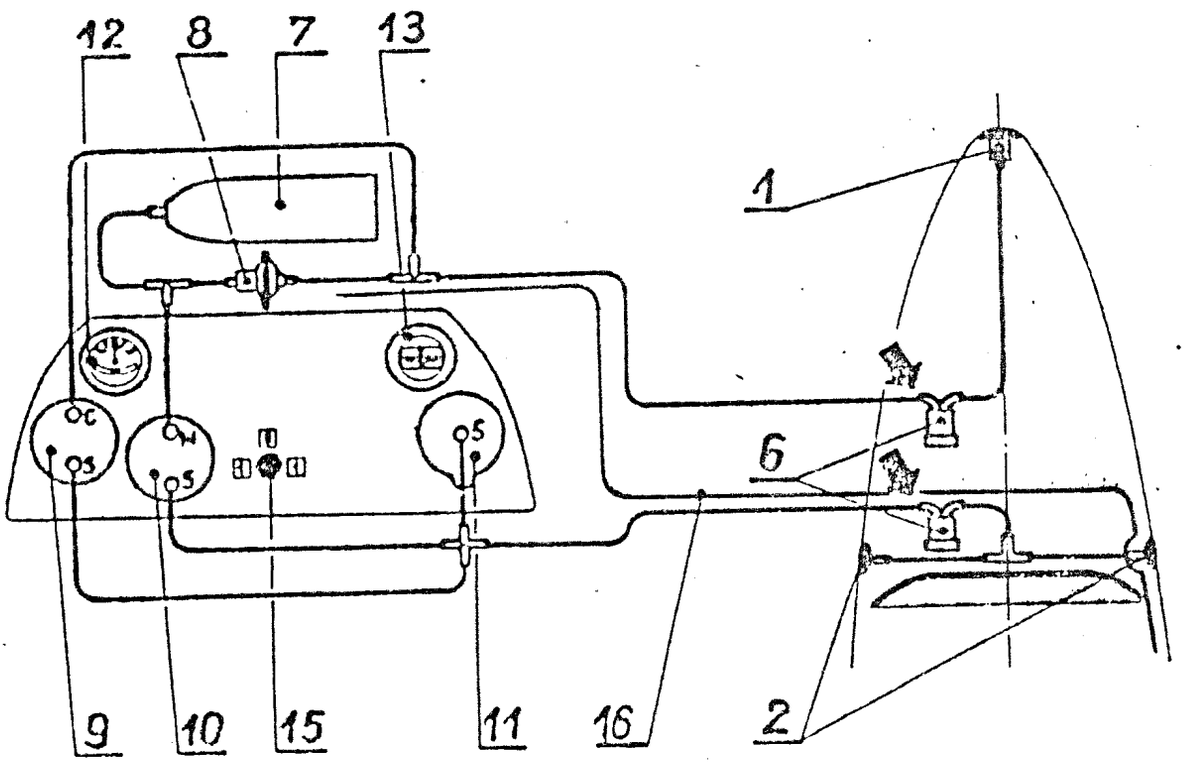


Towing cable release -
- placard on the L.H. board at front and rear seat

7.3 Instrument panels

The standard equipment comprises one instrument panel at front seat only. The instruments are located in such a way that they are satisfactorily visible from the rear seat also. During the flight the upper panel edge allows for controlling the glider in respect to horizon, or in respect to towing airplane.
Additionally the glider can be equipped with the second instrument panel mounted on the canopy.

FIG. 1/7 GLIDER WITH ONE INSTRUMENT PANEL



1 - Total pressure port
2 - Static pressure port
6 - Drainage unit
7 - Bottle
8 - Compensator
9 - Airspeed indicator
10 - Variometer
11 - Altimeter
12 - Turn indicator
13 - Compass
15 - Turn indicator switch
16 - K-1 tube duct

Arrows mark the drainage units ends "6", which should be disconnected when draining the installation.

Explanation for fig. 2/7 - glider with two instrument panels

A - Instrument panel of front seat

B - Instrument panel of rear seat

C - Location of panels, ports and ducts in fuselage

1 - Total pressure port

2 - Static pressure port

3a- Total pressure duct end in fuselage (bottom)

3b- Static pressure duct end in fuselage (upper)

4 - Rubber ducts

5a- Total pressure duct end of rear instrument panel

5b- Static pressure duct end of front instrument panel

6 - Drainage unit

7 - Bottle

8 - Compensator

9 - Airspeed indicator

10 - Variometer

11 - Altimeter

12 - Turn indicator

13 - Compass

15 - Turn indicator switch

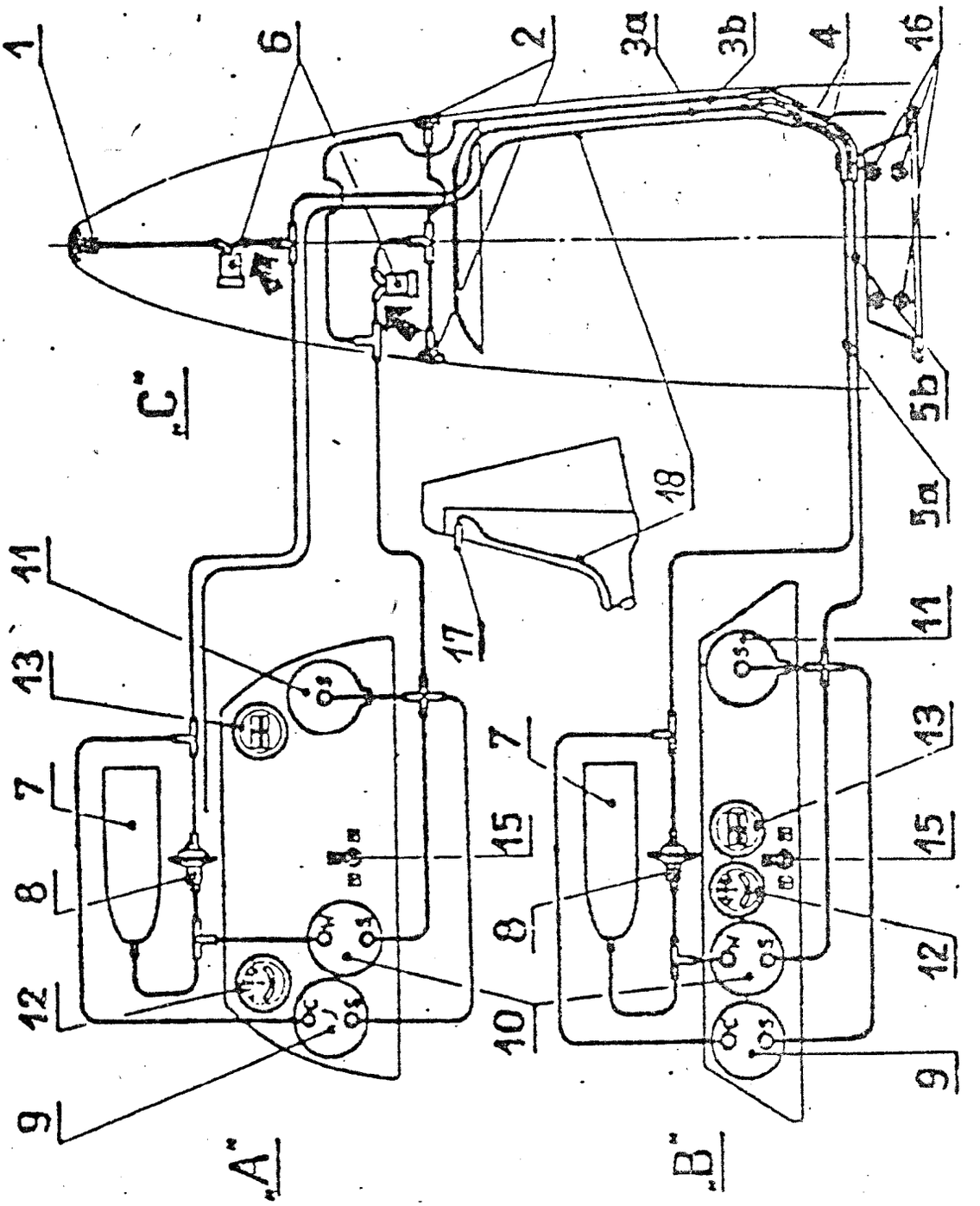
16 - Nuts fixing the rear instrument panel to canopy

17 - K-1 tube

18 - K-1 tube duct

Arrows mark the drainage units ends "6", which should be disconnected when draining the installation.

FIG. 2/7 GLIDER WITH TWO INSTRUMENT PANELS

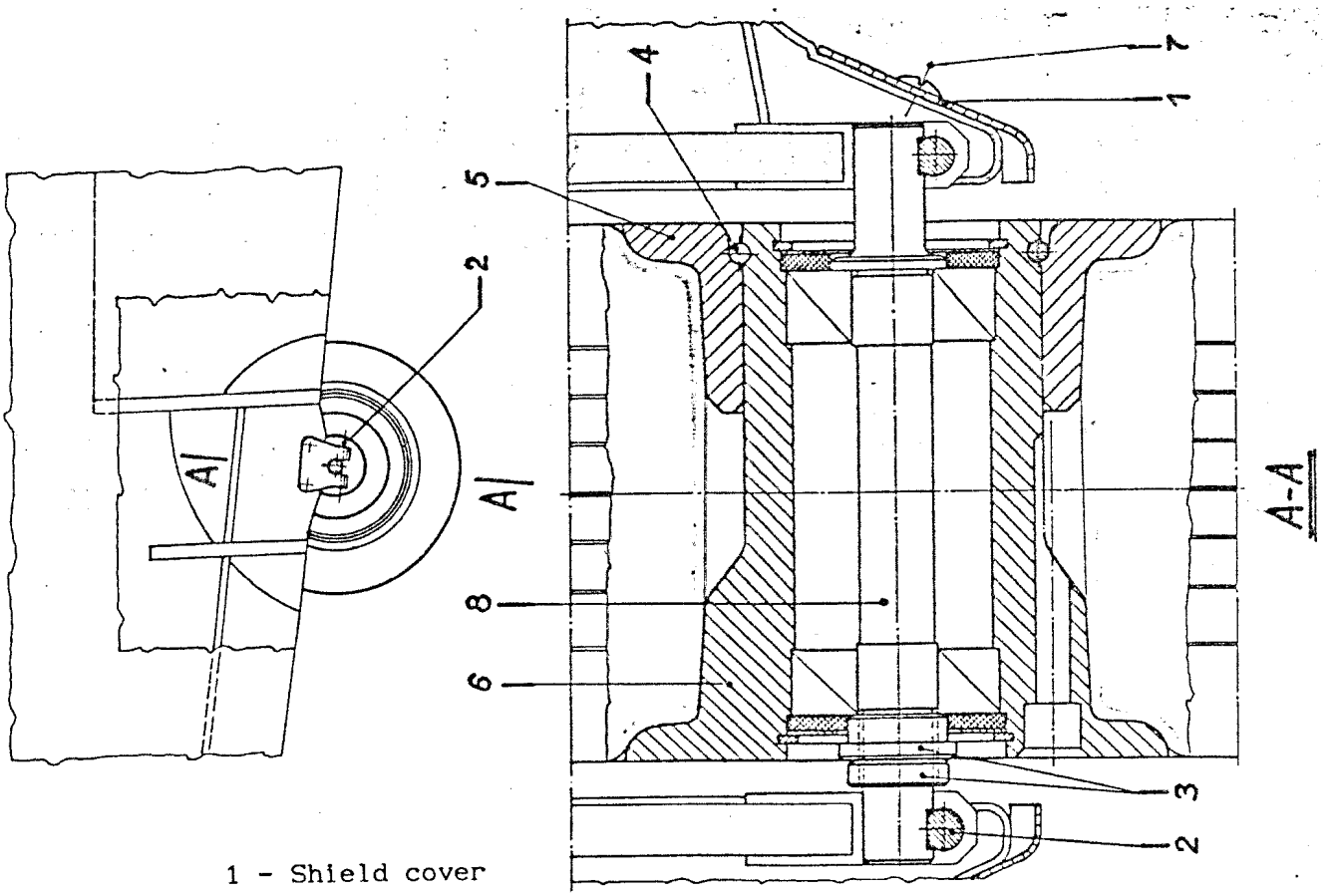


7.4 Landing gear

Undercarriage - two wheeled single track. The main shock-absorbed ϕ 350x135 [mm] (13.79x5.32 [in]) wheel with the disk brake. The front ϕ 255x110 [mm] (10.05x4.33 [in]) fixed wheel is not braked. The fuselage is equipped with a tail skid, which has been replaced with a tail wheel ϕ200x60 [mm] (7.88x2.36 [in]) beginning with the glider of Fact. No B-2022 incl.
Wheel brake is operated by pulling the knob (cable system) located on left board at front and rear seat.

7.4.1 Front wheel fitting and hub

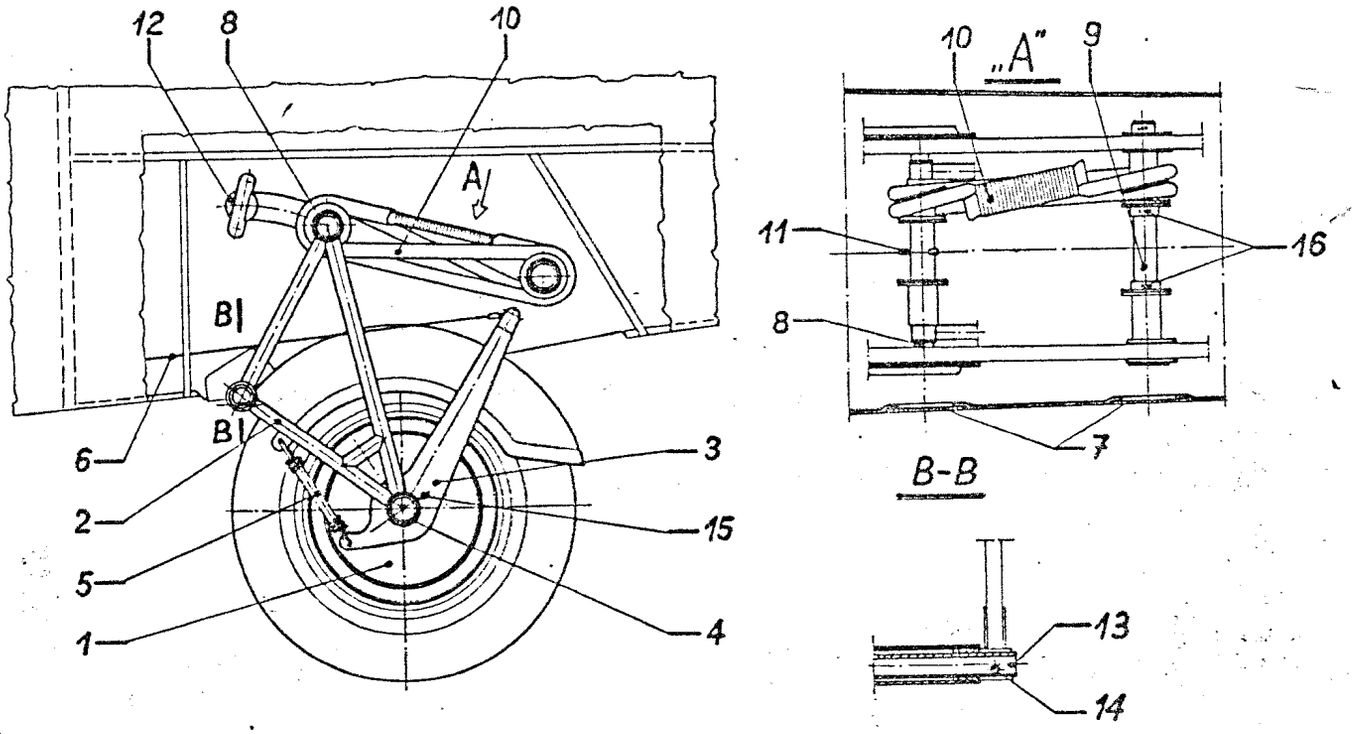
FIG. 3/7 - FRONT WHEEL FITTING AND HUB



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

7.4.2 Main wheel fitting

FIG. 4/7 - MAIN WHEEL FITTING

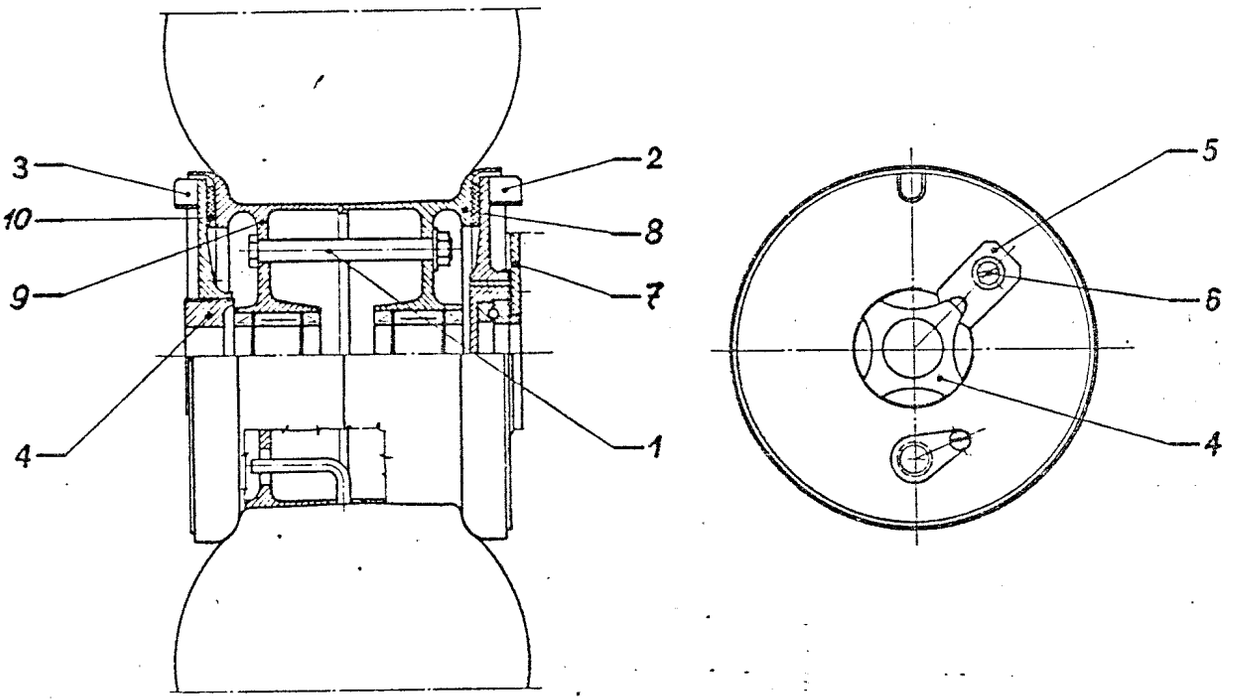


1 - Wheel hub
2 - Rocker arm
3 - Brake lever
4 - Wheel axle
5 - Return spring
6 - Air brake tension member
7 - Fixed inspection window
8 - Tube
9 - Axle
10 - Shock absorber of aircraft rubber cord
11 - Split pin
12 - Rubber shock absorber
13 - Rocker arm axle
14 - Bolt
15 - Screw
16 - Split pin

NOTE : FIXED INSPECTION WINDOWS 7 ARE FITTED IN THE L. H. FUSELAGE SHELL AND OPPOSITE TO THE TUBE 8 AND AXLE 9. SHELL SECTION AT THIS LOCATION IS SHOWN IN "A" VIEW.

7.4.3 Main wheel hub

FIG. 5/7 - MAIN WHEEL HUB



1 - Connecting bolt
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

Filling the tube with air

The extending end of tube inflation valve is necessary.
The main wheel valve is accessible after deflection of shield on the R.H. side.
Pressure 0.3 [MPa].
The front wheel valve is located on the L.H. side.
Pressure 0.12 [MPa].

7.5 Cockpit, canopy, seats and safety harness

The cockpit is designed to use back type parachutes or pillows of 4.7 [in] (12 [cm]) thickness when pressed. The front seat allows for the pilot above 6.6 [ft] (2 [m]) tall. The pedals are adjustable in flight (5 positions); adjustment of pedals is made by feet when the knob on the floor (painted brown) is pulled.
The rear seat allows for the pilot above 6.6 [ft] (2 [m]) tall. The seat pan is adjusted on ground (vertically and longitudinally) by shifting the back rest cross tube (4 positions). When the position is adjusted the cross tube should be secured with the lock.
In general, the higher pilot's position in the rear seat, the better is the visibility forward including the instrument panel at the front seat.
Pilots having the short legs should use the additional back rest pillow.
The standard equipment comprises four belt pilot's harness at both seats.
The cockpit is closed with the integral perspex canopy fixed on two hinges on the R.H. board with the possibility of emergency jettisoning. The opened canopy is hold up with a cable which, when closing the canopy pulls up automatically into the winding set behind the front seat back rest.

The cockpit is air conditioned with the side windows in the canopy, separate for the front and rear seat.
The front seat has adjusted inflation on the front part above the instrument panel operated by the slider in the panel (black ball-knob).
Both seat have side pockets accessible in the flight.

Rear seat vertical adjustment

The rear seat can be adjusted in an unloaded condition as follows:

1. Open the canopy and the securing tab on the L.H. fuselage surface under the wing (accessible from inside),
2. Release the lever of locking mechanism. Shift the supporting tube to the left up to release the seat pan,
3. Set the seat in the required position, put on the supporting tube, lock it and close the securing tab.

Locking of hooks

In the gliders having the TOST hooks they are operated from cockpit by pulling the releasing knob. When the knob is free the hooks close automatically.
In the gliders having SZD-III hooks each one hook opens independently when the tension cable (positioned close to hook) is pulled.

Assembling of balancing weights

Two nests for the balancing weights are located in front of the front seat. The weights of singular mass of 13.9 [lb] (6.3 [kg]) are not interchangeable.
For the assembling the screws with turning grips are used, no tools necessary. Put the weight to the proper nest and tighten the fixing screw.

7.6 Board instruments system

Components of board instruments system are given on Fig. 1/7 and 2/7, item 7.3.

Drainage of ducts

1. Disconnect the pressure ducts of the rear seat instrument panel (3a and 3b Fig. 2/7, page 7.9 and plug them on the port end.
2. Detach the drainage units from the ducts of the front seat instrument panel (in points marked with arrows in Fig. 2/7), and blow through the drainage units together with port ducts and ports.
3. Screw out the drainage unit bowls, take out and dry the inserts. Install the dried elements and bowls (tighten firmly).
4. Connect the drainage units and free pressure ducts of the rear seat instrument panel.
5. Check the operation of airspeed indicator (it should operate when blowing on ports).

7.7 Air brake

Air brake consist of single plates extended on upper and lower wing surfaces.
The plates are equipped with adjusted glass-fibre caps loaded with springs.
The air brake is operated conventionally by a blue slider positioned on the left board, at both front and rear seat.
Air brake control of push rod type.

7.8 Baggage compartment

The baggage compartment is located in the fuselage central part behind the rear seat pan, between the frames.

To the load of the baggage compartment belongs the fixed equipment (e.g. battery) and hand luggage.
The hand luggage should be distributed uniformly and fastened with a cord to the disassemblable lugs in baggage compartment floor (6 lugs).

Maximum luggage compartment load is 44 [lb] (20 [kg]).

The influence of the load in baggage compartment on glider c.g. location is specified in item 2.5 of this Manual.

Section 8

8. Sailplane handling, care and maintenance

8.1 Introduction

8.2 Sailplane periodic inspections

8.3 Sailplane alterations or repairs

8.4 Ground handling/ road transport/ railway transport

8.5 Cleaning and care

8.1 Introduction

This Section contains manufacturer's recommended procedures for proper servicing and ground handling of the sailplane.
It also identifies certain inspection and maintenance requirements which must be followed if the sailplane is to retain the new-plane performance and dependability.
It is wise to follow a planned schedule of lubrication and preventive maintenance, based on climatic and operating conditions encountered.

8.2 Sailplane periodic inspections

The periodic inspections - see Section 15 of Technical Service Manual of the glider - Issue I/JAR-22.

8.3 Sailplane alterations or repairs

It is necessary that the responsible Airworthiness Authority be contacted prior to any alteration on the sailplane to ensure that the airworthiness of the sailplane is not affected.

For repairs refer to Section 16 of Technical Service Manual of the glider, Issue I/JAR-22.

8.4 Ground handling/ road transport/ railway transport

At ground handling on the airfield, like securing against the wind, connecting the tow cable, anchoring, drainage of instrument system ducts, proceeding with wetted sailplane, the generally accepted rules for sailplane handling should be observed.

NOTE : LEAVING A GLIDER OUTSIDE, WITHOUT PROTECTION AGAINST THE ATMOSPHERIC CONDITION, UNFAVOURABLY AFFECTS THE LACQUER COVERING DURABILITY.

In case of anticipated prolonged inactivity de-rigging of glider is recommended.
After de-rigging the fittings and metal elements should be greased, the fuselage positioned on the support ahead of the undercarriage well and under the fin, and the wings supported onto the supports under the leading edges at semispan and under the spar ends, near the root rib (wing chord vertically).

Release the pressure in the wheel tube.

If the glider is stored in rigged condition, the wing tips should be supported.

NOTE : DO NOT HANGAR IN WET COVERS.

While transporting sailplane on the airfield the canopy should be closed and windows opened. The air brake may be extended or retracted.

The sailplane (with or without crew) may be towed on front hook or tail lug, providing the free turns are available.

The cable length should be at least 13 [ft] (4 [m]). The sailplane may be also rolled on wheels forwards and backwards. In turns the tail should be pushed or the nose raised.

When transporting the glider on a trailer the components may be fixed as follows :

- on external surfaces by means of wide clamps padded with a soft material or by means of ribbons,
- wings - on the spar ends,
- fuselage - on the ends of fittings of the main frames, providing the fuselage front part is supported in the clamp and the rear fuselage tube immobilized in a clamp too with a ribbon.
  Additionally the fuselage may be fixed on the main undercarriage elements or fittings of the rear skid.

During transportation the ends of torque tubes of aileron, air brake and trimming-tab control should be immobilized in the fuselage holes, as well as the ends of the control levers of the elevator immobilized in the fin.

The fittings and bearings should be protected against the dust and dirt.

If the sailplane is railway or truck transported, the loading into a container and fixing should be done according to the special instruction.

8.5 Cleaning and care

Canopy perspex

Canopy perspex should be washed with reach amount of hot water (up to 50°C) and wiped with a soft rag or sponge. In case of fat or other oil dirt add to the water a small amount of detergent (e.g. for motor-cars) or water solution of soap. After washing rinse thoroughly, wipe with a soft rag and allow to dry.

Painted external surfaces

The painted surfaces should be washed with a hot water with detergent, than rinsed and wiped.

If on the surface the hard dirt exists (insects, mud etc) it could be wet sanded with fine sand paper of "800" up to "1000" grade and than polished with a paint polish.

After washing and polishing the lacquer surface may be covered with the silicon or wax paste, to obtain the additional gleam.

NOTE : THE REMOVING OF THE HARD DIRT FROM THE WING LEADING EDGE BY MEANS OF SANDING SHOULD BE MADE VERY CAREFULLY TO AVOID THE LOCAL INDENTATIONS OR WAVES, WHICH REDUCE THE GLIDER PERFORMANCES AND MAY RESULT IN THE STALL CHARACTERISTICS ALTERATION.