

TWO-SEATER SZD-50-3 "PUCHACZ"
GLIDER

F L I G H T M A N U A L

Issue 3 - December 1985

This instruction is the part of the
Airworthiness Certificate of the glider of:

Serial No B-2083 Reg.No

This is the translation of the original
Polish Manual approved by Central
Administration of Civil Aviation /pages 1-3
to 5-17 /

Date

Translated by,

Wiesław Stafiej, D.Sc.

C O N T E N T S

1. LIST OF REVISIONS
2. OPERATION LIMITATIONS
 - 2.1. Permissible airspeeds
 - 2.2. Limit load factors
 - 2.3. Colour markings of airspeed indicator dial
 - 2.4. Towing cable safety link
 - 2.5. Restrictions
 - 2.6. Masses
 - 2.7. Permissible range of c.g. location
 - 2.8. Table of weighing the glider
 - 2.9. Graphical checking of c.g. location
 - 2.10. Placards and inscriptions.
3. PERFORMANCES
4. GLIDER OPERATION
 - 4.1. Pre-flight inspection
 - 4.2. Cockpits and their arrangements
 - 4.3. Service before take-off
 - 4.4. Controlling
 - 4.5. Aerobatics
 - 4.6. Danger and emergency conditions
 - 4.7. Assembling and disassembling

5. DRAWINGS AND DIAGRAMS

1. SZD-50-3 "PUCHACZ" glider
2. Installation of board instruments
Glider with two instrument panels
- 2a. Installation of board instruments
Glider with one instrument panel
3. Wiring diagram of electric turn indicator
4. Speed polar
5. Wings-to-fuselage assembling
6. Assembling of horizontal tailplane
7. Colour markings of airspeed indicator dial


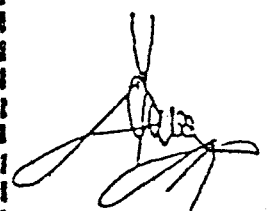
APPENDIX

Individual loading plan

1. LIST OF REVISIONS

NOTE:

The place, in which the text has been revised, is marked with vertical line on left side of text and with the number of revision.

Item	Page	Revision	Date	Signature
1	5-4 5-6	On page 5-4 the items 17 and 18 and on page 5-6 the item 16 have been added. The drawings Figs 2 and 2a have been revised.	1987 07-13	
2	2-3/1385 2-4 2-5 6-2	Replaced with 2-3a/1385, 2-4a, 2-5a and 6-2a.	14.09. 1992.	

2. FLIGHT LIMITATIONS

2.1. Permissible airspeeds IAS:

	kts
V_{NE} - max. permissible airspeed in smooth air	116
V_B - max. permissible airspeed in gust conditions	86
V_A - manoeuvring airspeed /speed of full control surface deflection/	81
V_T - max. permissible aerotowing airspeed	81
V_W - max. permissible winch launching airspeed	59
- max. permissible airspeed for extending and flight with airbrake extended	116
- max. permissible airspeed for inverted flight /in smooth air only/	97

2.2. Limit load factors

- positive	+ 5,3 g
- negative	- 2,65 g

2.3. Colour markings of airspeed indicator dial

	kts
V_{S1} /stalling speed/ radial green line at	38
V_{S1} V_B /normal operation range/- green arc at	from 38 to 86
V_B - V_{NE} - higher attention range/yellow arc	from 86 to 116
V_{NE} radial red line at	116

2.4. Towing cable safety link

The safety link of ultimate strength of 1520 lbs \pm 10 % should be installed on the towing cable.

2.5. Restrictions

- SOLO-FLIGHT ALLOWED ON THE FRONT SEAT ONLY.
- GLIDER NOT APPROVED FOR NIGHT FLYING
- FLYING UNDER ICING CONDITIONS NOT RECOMMENDED
- WINCH LAUNCHING WITH C.G. HOOK ONLY
- INVERTED FLIGHT, ROLL AND ASSOCIATED AEROBATICS ACC. TO ITEM 4.5.2. ALLOWED IN THE SMOOTH AIR ONLY AND WITH THE FLOOR BELT OF PILOT'S HARNESS FASTENED
FLICK ROLL ALLOWED FOR TWO PERSONS CREW ONLY.
WHEN PERFORMED BY OCCUPANT OF REAR SEAT THE REAR INSTRUMENT PANEL IS OBLIGATORY.

2.6. Masses kg

- Max. permissible empty glider mass with standard equipment^{x/}..... 370
- 2 | - where the mass of fuselage and tail unit /without the moveable balancing weights/is 193
- Max. permissible load mass /see page /
- Max. permissible load mass in the luggage compartment /see page /
- Max. permissible load mass on front seat in:
 - normal flight 110
 - inverted flight^{xx/} two persons crew 95
- Max. permissible all-up mass in
 - normal flight 570
 - inverted flight 540

x/ The standard equipment consists of:

1. Instrument panel /at front seat only/ with airspeed indicator, altimeter, variometer with compensator, slip and turn indicator, compass.
2. Two towing books of SZD-III or TOST type.
3. Two sets of four-belts pilot's harness.
4. Two sets of seat pillows.
5. Assembling wrench
6. First aid kit.

xx/ Inverted flight, the aerobatic manoeuvres listed in item 4.5.2. included.

LOAD IN LUGGAGE COMPARTMENT

Max. load in luggage compartment is 20 kg. The above load comprises the fixed equipment /battery, transceiver block etc./ and a hand luggage. The mass of luggage uniformly distributed in the compartment does not contribute to the c.g location of glider in flight.

The hand luggage should be immobilized by means of cord or belt using the six removable lugs on compartment floor.

2.7. Allowed range of c.g.location /in respect to wing root leading edge/:

- empty glider without the balancing weights: 0,610 to 0,635 m

- glider in normal flight:
0,092 to 0,333 m

what corresponds to the range of:
23,5 to 44,0 per cent of M.S.C.

- glider in inverted flight:
0,133 to 0,333 m

what corresponds to the range of:
27,0 to 44,0 per cent of M.S.C.

- for performing the flick-roll:
0,133 to 0,204 m

what corresponds to the range of:
27,0 to 33,0 per cent of M.S.C.

NOTE: To define the „Maximum permissible loading mass” use the formulas given in item 2.8.

Example: The empty glider with standard equipment /without balancing weights/mass is: $Q_c = 370$ kg. Both wings mass is $Q_g = 172$ kg. According to the formula: $\frac{763 + Q_g - 2Q_c}{}$ /item 2.8./ maximum loading mass $\Rightarrow 763 + 172 - 740 = \underline{\underline{195}}$ kg

2.8 ALLOWABLE WEIGHTS AND PILOT ARMS

FRONT SEAT:	MAXIMUM PILOT	110 kg
	PILOT ARM	-1339 mm

REAR SEAT:	MAXIMUM PILOT	110 kg
	PILOT ARM	-247 mm

NOTE! Pilot arms assume a 70 mm thick cushion or parachute

MAXIMUM WEIGHT OF NON FLYING PARTS: 398 kg

MAXIMUM BAGGAGE ALLOWANCE: 20 kg

2.9 PLACARD REQUIREMENTS

NORMAL CATEGORY:

- (1) PLACARD MINIMUM SOLO PILOT WEIGHT WITHOUT REMOVABLE BALLAST BARS FITTED.
- (2) PLACARD MINIMUM SOLO PILOT WEIGHT FOR EACH OF 2 REMOVABLE BALLAST BARS WHEN FITTED
- (3) PLACARD FOR FRONT AND REAR PILOT COMBINATIONS

AEROBATIC, INVERTED FLIGHT:

- (1) PLACARD MAXIMUM SOLO PILOT WEIGHT.
- (2) PLACARD FOR FRONT AND REAR PILOT COMBINATIONS

2.9 PLACARD REQUIREMENTS (cont)

FLICK ROLL

(1) PLACARD FOR FRONT AND REAR PILOT COMBINATIONS

In this case the AFT CG LIMIT is moved forward making it most unlikely that a rear pilot can be carried.

2.10 WEIGHING THE GLIDER

The glider should be weighed to scheme 3 on GFA weighing form W1 and the pilot limits computed on form W2. Both of which should be glued into the back of the log book.

2.11 SAMPLE PLACARDS

NORMAL CATEGORY

		VH-###		
		FRONT	REAR	
		kg	min	max
<hr/>		45	75	110
		50	60	110
Minimum Solo	70 kg	55	40	110
Maximum Solo	110 kg	60	25	110
Max fuse load	195 kg	65	10	110
<hr/>		70	0	110
		75	0	110
		80	0	110
		85	0	110
		90	0	105
		95	0	100
		100	0	95
		105	0	90
		110	0	85

D:\m:\Or PT Usteko-Glala / 2000 / 154 / 22

2.8. Table of weighing the glider Fact. No B-2083.

Empty glider mass with standard equipment m_0 / kg /	370,3.	
Location of c.g for empty glider with standard equipment in respect to root chord loading edge x_0 / m /	0,633.	
Static moment of mass of empty glider with standard equipment in respect to root chord loading edge: $M_0 = m_0 \cdot x_0$ / kgm /	234,4	
Max. permissible loading mass $763 + Q_s - 2Q_c$ / kg / *	198	
Max. permissible loading mass in inverted flight $733 + Q_s - 2Q_c$ / kg / *	168	
Date, signature and seal of inspection representant	16 11 02 <i>[Signature]</i>	KOT B2

2

2

* / Q_s - mass of both wings;
 Q_c - mass of empty glider.

2-58

2.9. Graphical checking of c.g. location

/see diagram on page 2-11 /

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_0
/see table on page 2-5 /
- pilots with parachutes $m_1 + m_2$
- additional equipment and balancing weights incorporated m_3
/see table on page 2-7 /

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

$$m = m_0 + m_1 + m_2 + m_3$$

2. Add /algebraical, respecting the sing/ the mass moments of:

- empty glider M_0 /see the table on page 2-5 /
- pilots with parachutes $M_1 + M_2$
/see tables on pages 2-9 and 2-10 /
- additional equipment and balancing weights M_3 incorporated /see table on page 2-7 /

Equipment	Mass kg	Moment kgm
Instrument panel of rear seat	5,2	- 4
RS-6101-1 transceiver	7,2	+ 2
TA - 03-A Oxygen equipment	18,5	+ 1
1 balancing weight	6,3	-11
2 balancing weights	12,6	-22
Snow-ski installed on glider	11,5	- 0,3
Luggage-stored in the luggage compartment	20,0	+10,8

The resultant value of glider mass-moment:

$$M = M_0 + M_1 + M_2 + M_3 \quad \text{mark on the}$$

horizontal axis of diagram on page

3. From the points marked on the diagram axes on page 16 draw the perpendicular lines to the axes and find the point of intersection

If this point is located in the dashed field of the diagram c.g. is in the correct position.

If this point is located out of the dashed 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 wing root chord. M_1 /kgm/

Pilot of mass M_1 /parach.incl/kg	0	1	2	3	4	5	6	7	8	9
50 without pillow						-70	-71	-72	-74	-75
50 with pillow						-74	-75	-76	-78	-79
60 without pillow	-77	-78	-79	-81	-82	-83	-85	-86	-87	-89
60 with pillow	-81	-82	-84	-85	-87	-88	-90	-91	-92	-94
70 without pillow	-91	-92	-93	-94	-96	-97	-99	-100	-101	-103
70 with pillow	-95	-97	-98	-100	-101	-102	-104	-105	-107	-108
80 without pillow	-104	-106	-107	-108	-110	-111	-113	-114	-116	-117
80 with pillow	-110	-111	-113	-114	-116	-117	-119	-120	-122	-123
90 without pillow	-119	-120	-121	-123	-124	-126	-127	-129	-130	-132
100 without pillow	-133	-134	-136	-137	-138	-140	-141	-142	-144	-145
110 without pillow	-146									

Druk:OW.PT Bielisko-Biala /2000/466/R2

23

Mass moment of pilot /parachute incl/ on the rear seat M_2 /kgm/

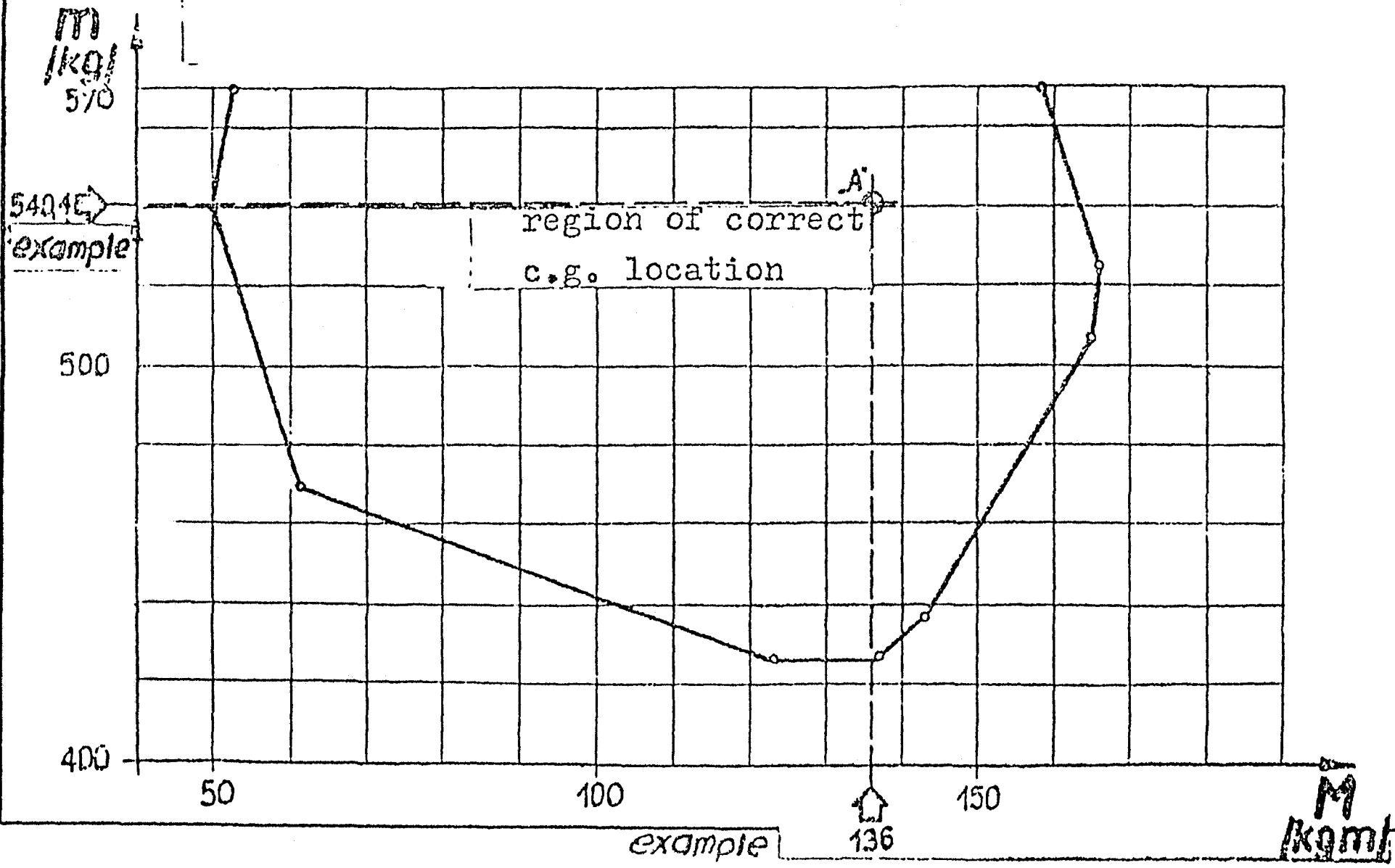
Pilot of mass M_2 /parach.incl/kg ²	0	1	2	3	4	5	6	7	8	9
50 without pillow						-13	-13	-14	-14	-14
50 with pillow						-17	-17	-18	-18	-18
60 without pillow	-14	-14	-14	-14	-14	-15	-15	-15	-15	-15
60 with pillow	-18	-18	-18	-18	-19	-19	-19	-19	-19	-20
70 without pillow	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15
70 with pillow	-20	-20	-20	-20	-20	-20	-21	-21	-21	-21
80 without pillow	-15	-16	-16	-16	-16	-16	-16	-16	-16	-16
80 with pillow	-21	-21	-21	-21	-22	-22	-22	-22	-22	-22
90 without pillow	-16	-16	-16	-16	-16	-16	-16	-16	-16	-16
100 without pillow	-15	-15	-15	-15	-15	-15	-15	-15	-15	-15
110 without pillow	-15									

2-10

Druck: OW PI Bielefeld-Diala / 2000/466/82

GRAPHICAL CHECKING OF IN FLIGHT C.G. LOCATION

Diagram valid for gliders of maximum allowable empty glider mass /with standard equipment/ of 370 kg



page valid for gliders from Fact. No B-1385

- 2-11/1385 -

EXAMPLE:

Individual data of empty glider /from table of weighing the glider on page 2-5/ c.g. :

$m_0 = 372 \text{ kg}$

$M_0 = 235 \text{ kgm}$

Crew:

Front seat

pilot with pillow $m_1 = 60 \text{ kg}$, $M_1 = -81 \text{ kgm}$

Rear seat

pilot without pillow $m_2 = 96 \text{ kg}$; $M_2 = -16 \text{ kgm}$

Additional equipment

- Instrument panel of rear seat

$5,2 \text{ kg} - 4 \text{ kgm}$

- transceiver ----- 7,2 kg + 2 kgm -----

$m_w = 12,4 \text{ kg}$ $M_w = - 2 \text{ kgm}$

Glider-in-flight mass:

$m = 372 + 60 + 96 + 12,4 = 540,4 \text{ kg}$

Moment of glider-in-flight mass:

$M = 235 - 81 - 16 - 2 = 136 \text{ kgm}$

The perpendicular lines from points $m = 540,4 \text{ kg}$ and $M = 136 \text{ kgm}$ on diagram of page 2-11 cross in point A which is in the dashed field. The glider-in-flight c.g. location is correct.

Druck:OWPT Bielsko-Biala / 2000/466/82

SZD-50-3
"PUCHACZ"

LOADING PLAN

MAXIMUM ALL-UP MASS IN:	- normal flight	570 kg
	- inverted flight	540 kg

MAXIMUM FRONT SEAT LOAD MASS IN:		
- normal and inverted one person flight		110 kg
- inverted two persons flight		95 kg

MINIMUM FRONT SEAT MASS 55 kg

USE OF BALANCING WEIGHTS		
- for cockpit load mass up to 70 kg		OBLIGATORY
- for cockpit load mass above 100 kg		PROHIBITED

MAXIMUM LOAD MASS IN LUGGAGE COMPARTMENT 20 kg

SOLO FLIGHT ON FRONT SEAT ONLY

IF THE FRONT SEAT OCCUPANT MASS EXCEEDS 100 kg IT IS PROHIBITED FOR THE OCCUPANT OF THE REAR SEAT TO USE THE ADDITIONAL BACK PILLOW IF HIS MASS /PARACHUTE INCLUDED/ EXCEEDS 75 kg

Placard of permissible airspeeds:

- 2-14 -

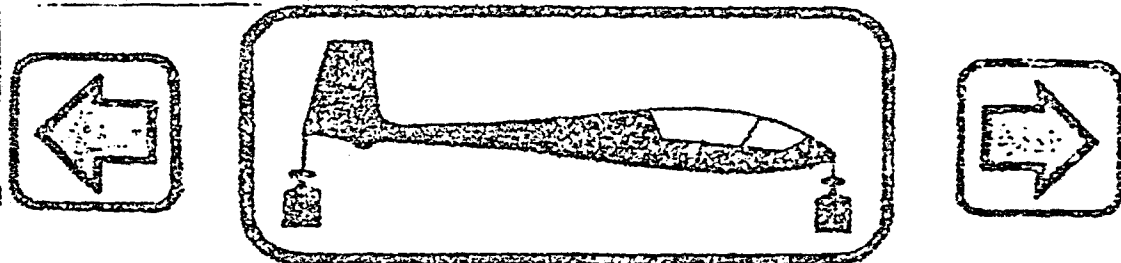
SZD-50-3		MAXIMUM PERMISSIBLE AIRSPEEDS		IAS	kts
"PUCHACZ"					
NORMAL FLIGHT IN:	- smooth air	V_{NE}	=		116
	- gust conditions	V_B	=		86
INVERTED FLIGHT IN:	- smooth air				97
	- gust air			not allowed	
MANOEUVRING AIRSPEED /airspeed for abrupt deflection of controls/:		V_A	=		81
AEROTOWING		V_T	=		81
WINCH-LAUNCHING		V_W	=		59
AIRBRAKE EXTENDING and flight with air brake extended					116

Placard of restrictions

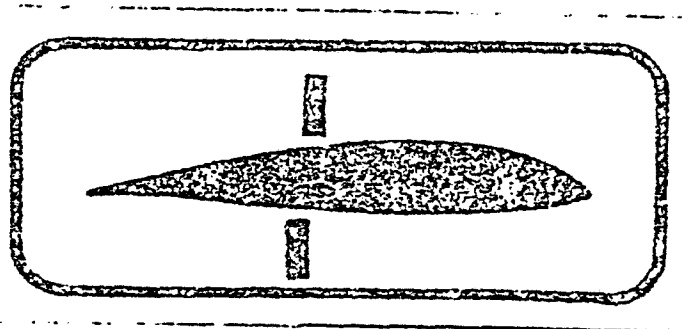
RESTRICTIONS

- GLIDER NOT APPROVED FOR NIGHT-FLYING.
- WINCH TAKE-OFFS ALLOWED WHEN USED THE BOTTOM HOOK ONLY.
- FLYING UNDER ICING CONDITIONS NOT RECOMMENDED.
- INVERTED FLIGHT, ROLL AND ASSOCIATED AEROBATIC MANOEUVRES - allowed in smooth air only and with floor-belt fastened.
- FLICK ROLL - only with two occupants
- PERFORMING OF THESE MANOEUVRES BY THE REAR OCCUPANT allowed only when the rear instrument panel is installed

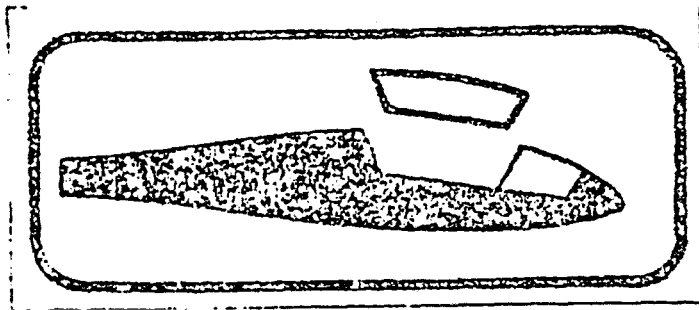
Placards of handless



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

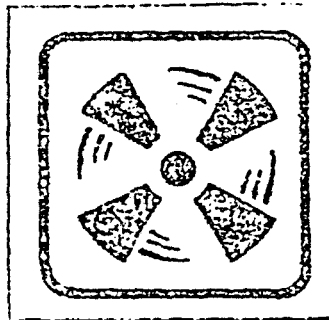


Air brake slider - -
- placard on the L.H. board at front and rear seat



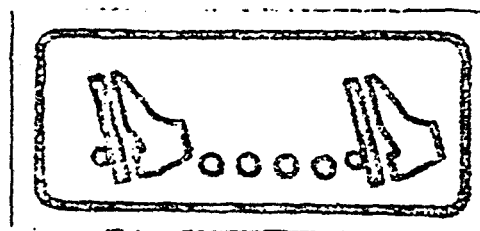
Canopy emergency jettisoning lock

- placard on the canopy frame at front and rear seat



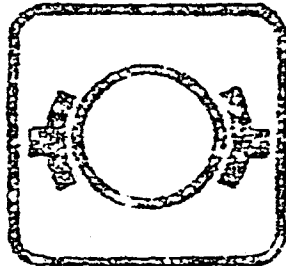
Air-conditioning tab slider

- placard on the instrument panel at front seat



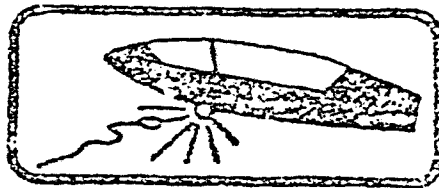
Pedal adjustment

- placard at front seat floor before the 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.

3. PERFORMANCES /Fig. 4/

Calculated speed polar plotted on Fig. 4 has the following main points:

- min. sinking speed 138 ft/min at about 40 kts
- max. lift /drag ratio 30:1 at about 46 kts

Other points of the polar:

V kts	43	54	65	75,5	86	97
W ft/min	142	187	262	378	537	738

where: V - airspeed

W - sinking speed

4. GLIDER OPERATION

4.1. Pre-flight inspection:

Check for:

- validity of inspection certificate in the glider log-book,
- the integrity of structure and covering,
- locking of fittings and control system joints,
- control system operation,
- towing-hook operation,
- locking and opening of canopy and the condition of canopy in open position securing cable,
- condition of undercarriage, wheel rollability, air pressure in tires /by eye/,
- locking of seat and back-rest at rear seat,
- pilot's safety belts,
- ports of total and static pressure,
- operation of airspeed indicator /it should operate when blowing on ports/,^{x/}
- operation of slip-and-turn indicator^{x/}

x/ In the rear instrument panel also, if installed.

4.2. Cockpits and their arrangements

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 aeroplane.

Additionally the glider can be equipped with the second instrument panel mounted on the canopy.

The cockpit is designed to use back-type parachutes or pillows of 12 cm thickness when pressed. The front seat allows for the pilot above 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 pilots having short legs or small mass should use the additional cushion on the backrest.

The rear seat allows for the pilot above 2 m tall. The seat pan is adjusted on the ground /vertically and longitudinally/ by shifting the backrest 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 installation of the floor-belt /additional equipment/ is possible.