-3
VAD

PRZEDSIĘBIORSTWO DOSWIADCZALNO-PRODUKCYJNE
SZYBOWNICTWA " PZL-BIELSKO"
43-300 BIELSKO-BIAŁA UL.CIESZYNSKA 325
POLAND

SZD-50-3 "PUCHACZ" SAILPLANE
OPERATING MANUAL
CANADIAN VERSION
ISSUE II

Sections 2, 3 and 4 of this manual constitute the approved flight manual. for Canadian registered gliders compliance with these sections is mandatory.

This manual is part of the airworthiness certificate of the sailplane of:

Fact No B-2199 ..... Reg. No C-GAB

Date .....

Translation of the original Polish manual approved by CACA /Pages 6-42/

Druk:OWPT Bielsko-Biała /2000/455/82

C O N T E N T S

Druk:OWPT Bielsko-Biała /2000/455/82

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	44 48	Pages 44 and 48 have been replaced with 44a and 48a according to the Bulletin BE-45/50-3/92 "PUCHACZ".	15.04.1998	

Item	Page	Revision	Date	Signature

2. FLIGHT LIMITATIONS

2.1. Permissible airspeeds IAS:

		kts	km/h
V_{NE}	- max. permissible airspeed in smooth air	116	215
V_B	- max. permissible airspeed in gust conditions	86	160
V_A	- manoeuvring airspeed /speed of full control surface deflection/	81	150
V_T	- max. permissible aerotowing airspeed	81	150
V_W	- max. permissible winch launching airspeed	59	110
	- max. permissible airspeed for extending and flight with airbrake extended	116	215

2.2. Limit load factors

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

2.3. Colour markings of airspeed indicator dial

	kts	km/h
V_{S1} /stalling speed/ radial green line at	38	70
V_{S1} - V_B /normal operation range/ - green arc at	38 to 86	70 160

		kts	km/h
V_B - V_{NE}	- higher attention range/	86	160
	yellow arc to	116	215
V_{NE}	radial red line	116	215

2.4. Towing cable safety link

The safety link of ultimate strength of 1521 lbs; 690 kG should be installed on the towing cable.

2.5. Restrictions

- SOLO-FLIGHT FROM FRONT COCKPIT ONLY
- GLIDER NOT APPROVED FOR NIGHT FLYING
- FLYING UNDER ICING CONDITIONS NOT RECOMMENDED
- WINCH LAUNCHING ON C.G. HOOK ONLY

2.6. Masses

- Max. permissible empty glider mass with the standard equipment - 816 lbs; 370 kg/ To the standard equipment belong:
  1. Instrument panel in the front cockpit only/instruments: airspeed indicator, altimeter, variometer with compensator, turn indicator, compass/.
  2. Two towing hooks of SZD III or TOST type
  3. Two sets of pilot's safety belts
  4. Two sets of seat pillow
  5. Assembling wrench
  6. First aid kit
- including max. permissible mass of fuselage with tailplane 425 lbs: 193 kg
- Max. permissible useful-load mass - see page 48.
- Max. permissible loading mass in front cockpit 240 lbs: 110 kg
- Max. permissible all-up mass 1256 lbs: 570 kg

2.7. Permissible range of c.g. location /in respect to root chord leading edge/

- empty glider without balancing weights 24,0 in to 25.0 in: 0,61 m to 0.635 m

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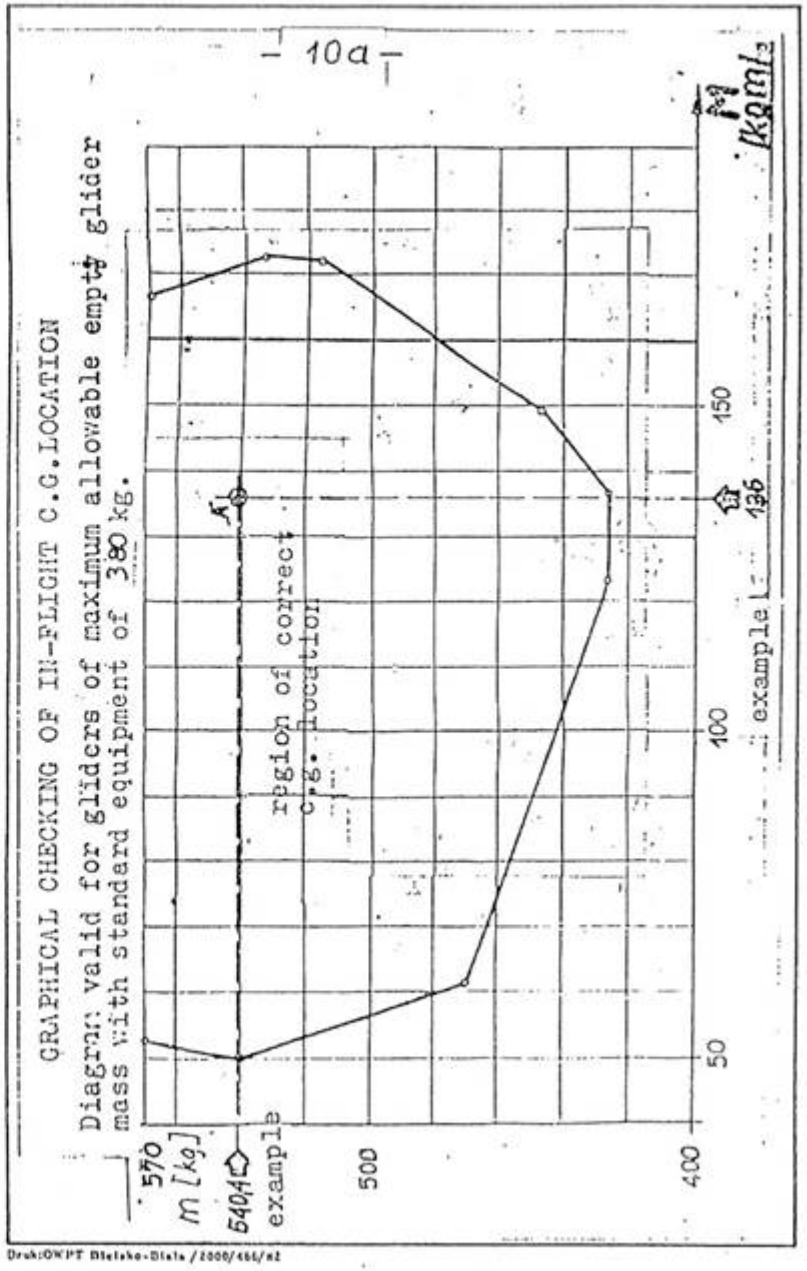
-glider in flight
3,6 in to 13,1 in: 0,092 m to 0,333 m
what correspondens the c.g. range of :
23.0 to 44.0 % MAC.
LOADING OF AIRCRAFT MUST FALL WITHIN THE AREA DESIGNATED ON THE MASS/MOMENT ENWELOPE CHART.

MAXIMUM LOAD MASS IN LUGGAGE COMPARTMENT

Maximum load mass in luggage compartment is 44 lb: 20 kg
To the luggage load belong all the elements or sets installed as fixed e.g. battery, transceiver block etc., as well as the hand luggage. The hand luggage should be fastened by means of tape or cord into the six screws with lugs fixed on the luggage compartment floor/anchor-nuts/. These screws are removable. The mass of luggage and equipment should be placed uniformly. The tape or cord fastening the luggage should be wound on the screw lugs several times and safely tied. The tie as well as the tape or cord itself should have enough strength to carry 440 lb, 200 kg.
The equipment and luggage placed uniformly in the luggage compartment does not change the glider c.g. location.



GRAPHICAL CHECKING OF IN-FLIGHT C.G.LOCATION

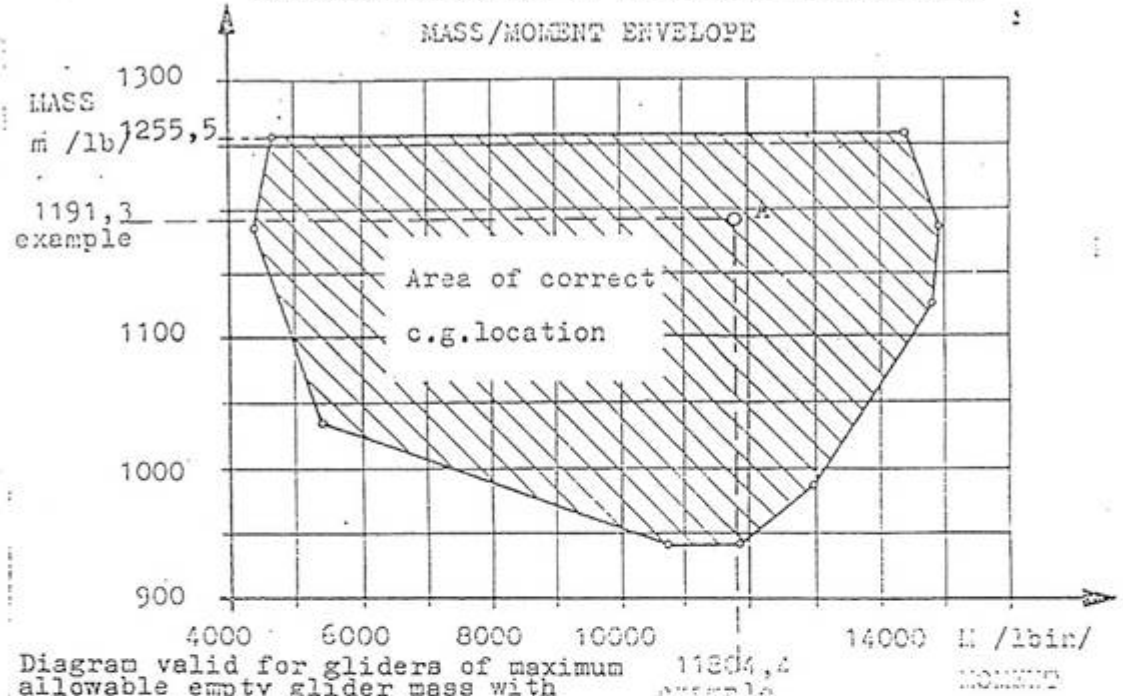


Diagram valid for gliders of maximum allowable empty glider mass with standard equipment of 380 kg.

SZD-50-3 "PUCHACZ" LOADING PLAN	
Max. All-up mass	1256 lbs ; 570 kg
Max. loading mass in front seat	240 lbs ; 110 kg
For the loading mass in cockpit below the application of balancing weights is obligatory	155 lbs ; 70 kg
For the loading mass in glider above the application of balancing weights is prohibited	220 lbs ; 100 kg
Max. Loading mass in luggage compartment	44 lbs ; 20 kg
The solo flight is allowed only in the front seat	
When the mass of pilot on front seat parachute included is greater than 220 lbs ; 100 kg the use of additional back-cushion for pilot on rear seat is prohibited if his mass is greater than 165 lbs;75 kg parachute included	

2.8. Placards and inscriptions

Loading plan placard.

Placard of permissible airspeeds:

PERMISSIBLE AIRSPEEDS IAS			
		kts	km/h
V_{NE}	- max. permissible airspeed in smooth air	116	215
V_B	- max. permissible airspeed in gust conditions	86	160
V_A	- manoeuvring airspeed /speed of full control deflection/	81	150
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V_W	- max. permissible winch launching airspeed	59	110
	- max. permissible airspeed for extending and flight with air brake extended	116	215

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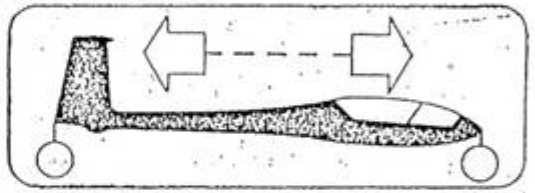
Placard of restrictions

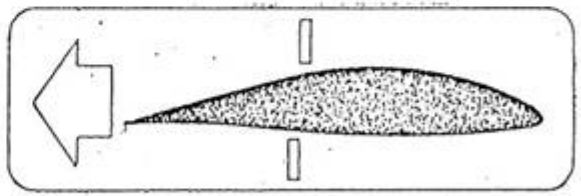
RESTRICTIONS
- GLIDER NOT APPROVED FOR NIGHT-FLYING - WINCH TAKE-OFF ALLOWED WHEN USED THE BOTTOM HOOK ONLY - FLYING UNDER ICING CONDITIONS NOT RECOMMENDED

Placards of handles



Trimming tab slider

- placard on the L.H. board in first and second cockpit



Airbrake slider

- placard on the L.H. board in first and second cockpit

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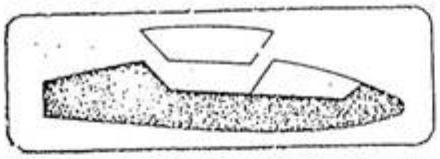
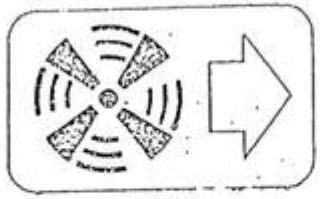
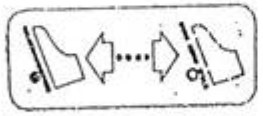


Canopy emergency jettisoning lock
- placard on the canopy frame in first and second cockpit

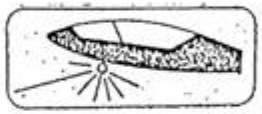


Air-conditioning tab slider
- placard on the instrument panel in first cockpit



Pedal adjustment
- placard on the first cockpit floor, before the control column

Wheel brake
- placard on the L.H. board in first and second cockpit



Towing cable release
- placard on the L.H. board in first and second cockpit

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3. NORMAL PROCEEDURES

3.1. Pre-flight inspection:

Check for:

- validity of all relevant certificates, permits, licences etc.
- 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 the canopy securing cable
- visually inspect the condition of the undercarriage and the air pressure in the tires,
- locking of seat and back-rest in second cockpit,
- pilot's safety belts,
- ports of total and static pressure,
- operation of airspeed indicator /it should operate when blowing on ports/,
- operation of slip-and-turn indicator

3.2. Service before take-off

3.2.1. Transportation on the airfield

During the transportation of the glider the cockpit should be locked and the windows opened. The air brakes can be extended or retracted. The glider /with or without the occupants/ can be towed by the front hook or by the tail lug having the posibility of free turns. The ground towing cable length should be at least 13 ft; 4 m.

The glider can be also rolled on wheels forward or backward. To turn the tail should be pressed down or the nose lifted.

3.2.2. Adjusting of the seat height in second cockpit

The seat in the second cockpit 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/

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2. Shift the supporting tube to the left up to release of seat pan.
3. Set the seat in the required position, put on the supporting tube and close the securing tab.

3.2.3. Locking of hooks

In gliders having TOST hooks, they are opened in the cockpit by pulling the releasing knob, when the knob is free the hooks close automatically.
In gliders having SZD-III hooks each one hook opens independently when the near hook positioned tension cable is pulled.

3.2.4. Filling the tube with air

It is necessary to use a valve extension. The main wheel valve is located on the R.H. side and is accessible after shield deflection. Pressure 42,6 psi; 3,0 at. The front wheel valve is located on the L.H. side. Pressure 17 psi; 1,2 at.

3.2.5. Drainage of ducts

- Remove the pressure ducts of the rear cockpit instrument panel/3a and 3b Fig. 2/ and plug on the port end.

- Detach the drainage units from the ducts of the front cockpit instrument panel/in points marked with arrows in Fig. 2/ and blow through the drainage units together with port ducts.
- screw out the drainage unit bowls, take out and dry the inserts. Install the dried elements and bowls /tighten firmly/
- connect the drainage units and free ducts to the rear cockpit instrument panel,
- check the operation of airspeed indicator/ it should operate when blowing on ports/ .

3.2.6. Assembling of balancing weights

Put the weight into proper nest and screw on full the clamping screw.

3.2.7. Procedures before take-off

1. Balance the glider with balancing weights according to the crew mass and if necessary put on the back cushion /small or light weight pilot/.

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2. Set the seat properly in the rear cockpit. Before solo flight secure free belts and protect /or remove/ the contents of side pockets in the rear cockpit.
3. Take place in the cockpit, adjust the pedals and fasten the belts.
4. 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.
5. Check the operation of turn indicator.
6. Close the canopy.
7. Insert the cable into the hook and check the locking by pulling it firmly.

3.2.8. Post-flight procedures

- Switch off the turn indicator. If necessary remove the used batteries.
- If necessary drain the instrument installation according to 3.2.5.
- Inspect the glider as before take-off and correct any faults.

3.3. Flight characteristics

3.3.1. 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:

- light pilot solo - "nose heavy"
- heavy crew - "neutrum"

The ground run begins on two wheels. At the airspeed of about 16÷22 kts; 30÷40 km/h the front wheel should be lifted by pulling slightly the elevator, while avoiding hitting the ground with the tail skid. According to the all-up mass the glider unsticks 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.

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3.3.2. Winch-launching /bottom hook/

Before take-off the glider should be positioned in line with towing cable. The slight directional deviation is allowed to the left of a cable but, the deviation to the right should be avoided in respect to the possibility front wheel to cable contact during the ground run /the possible touching or even the rolling of the front wheel over the tensioned cable does not create, however, any danger, not disturbs the ground run/.

The adjusting of the trimming tab according to the pilot's mass in the front cockpit:

- light pilot solo - "nose heavy"
- mean pilot - "nose heavy"
- heavy crew, - "neutrum"

The adjustment of the tab should not be corrected during take-off .

The glider ground run begins on two wheels. The run length depends on the crew mass and take-off conditions.

After becoming airborne avoid hitting tail skid on the ground 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 - 54kts 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 ease the cable tension.

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 a 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.

3.3.3. Longitudinal trim in free flight

The trimming tab allows for glider trim:

- for light pilot solo - within the airspeed range of 32 to 81 kts: 60 to 150 km/h.

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

3.3.4. Stalling /airspeeds IAS/

Depending on the glider all-up mass the stalling speed in straight flight is about 31 kts: 58 km/h for solo light weight pilot /to about 38 kts: 72 km/h heavy crew and all-up mass of about 1256 lb: 570 kg.

The stall warning is in the form of perceptible vibrations of fuselage oscillations of airspeed and "nose hight"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 proceded by distinct inclination to decrease the turn radius. With further pulling the stick 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 turnus without dropping.

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

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

3.3.5. Circling

When circling the 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.

3.3.6. Spinning

Before spinning in solo flight the pilo of mass below 165 lbs; 75 kg should chec the glider balancing with weights.

When entering a spin from straight flight it is recommended, for ease of entry, to have a little bank towards the intended spinning direction It is also possible to enter the spin from a turn. In both the cases it is recommended to decrease the airspeed

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by slowly pulling the stick and at the moment of stall initiation to pull the stick fully back and to deflect the rudder towards the intended spinning. The recommended aileron deflections are listed in table on page 29.
To obtain stable spinning especially in the case of heavy crew the precise full deflection of elevator is necessary /with the comparatively high force depending on the crew mass/.
When the above directions are observed the glider performs the steady spinning with the characteristics described in the table on page 29.

NOTE: The table of spinning characteristics is not the loading plan. The table concerns the glider with all the additional equipment variants acc to the loading plan on page ...12...

The aileron deflection towards the spin favours the appearance or augmentation of longitudinal oscillations /especially in the solo spinning with light pilot/ and therefore it is not recommended. Deflection of elevator /especially with heavy crew/ leads

to the airspeed increasing up to 54 kts 100 km/h or more and even the automatic break of the spinning.
The recommended recovery technique consists of:

- full rudder deflection opposite to th rotation, a considerable leg force is required
- waiting for about 1 sec.
- pushing the stick forward more than to its neutral position

The maximum delay when this technique is used is lower than 1 turn. In case of other technique or not resolute action the delay can be more than 1 turn.

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SPINNING CHARACTERISTICS OF THE GLIDER

Mass of crew + parachutes	front seat	55÷75 kg 120÷165lbs +balancing weight	75÷90 kg 165÷200lbs ж	55÷75 kg 120÷165lbs ж	90÷110 kg 200÷240lbs ж	75÷90 kg 165÷200lbs ж	90÷110 kg 200÷240lbs ж
	rear seat	0 0	0 0	55–110 kg 120–243lbs жж	0 0	55–75 kg 120–165lbs жж	55–75 kg 120–165lbs жж
Recommended aileron deflection		opposite to the rotation			neutral or opposite to the rotation		
Longitudinal inclination		small			middle		great
Longitudinal oscillations		gentle			gentle or without oscillations		damped or without oscillations
Airspeed indications		about 0 km/h;0 kts			in range of 0÷60km/h; 0÷32 kts		in range of 0÷80 km/h 0÷43 kts

ж / For the with balancing weights and with:
a/ pilot solo of mass above 75 kg; 165 lbs
b/ full crew
in this table the equivalent mass increment should be taken into account, taking 10 kg; 22 lbs for each balancing weights.

жж / Maximum never exceed all-up mass of the glider is 570 kg; 1256lbs.

3.3.7. <u>Sideslip</u> – 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° during the slip the glider also turns towards the bank.

b/ With deflection of controls in an order: at first the ailerons, then the rudder when the bank of 15° is obtained. The glider allows entry into a directional sideslip with bank of up to about 30°. During deflection of rudder the force on pedal disappears and simultaneously the impulse to raise the glider nose above the horizon appears.

It is necessary at this moment to stabilize the glider by pulling back on tho stick. Indications of the air-speed indicator on this condition drop down to about 0.

When recovering with aileron and rudder deflections simultaneously /resolute deflection of the rudder toward the bank is required/ then the glider passes into a 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.

3.3.8. Aerobatics

Before the performing aerobatic manoeuvres it's necessary to:

- check the proper balancing weights /light pilot in solo flight/
- immobilize the free items in the cockpits,
- tighten the pilot's belts,
- trim the glider for 60 ÷ 65 kts; 110 ÷ 120 km/h /as for aerotowing/.

The glider performs correctly and easily the following manoeuvres:

Manoeuvre		Initial airspeed	
		one-man crew	two-men crew
Looping	kts km/h	85÷ 98 160÷180	90÷105 170÷190
Stall turn	kts km/h	85÷ 98 160÷180	90÷105 170÷190
Spiral	kts km/h	65 120	70 130
Quick half-roll-half-loop	kts km/h	50 95	55 100

NOTE: DURING AEROBATICS /ESPECIALLY LOOP AND QUICK HALF-ROLL-HALF-LOOP/ HIGH CONTROL LOADS MUST BE APPLIED WHEN INDICATED AIRSPEED DIFFERS GREATLY FROM THE TRIM-MED AIRSPEED OF THE AIRCRAFT.

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3.3.9. Air brake

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

3.3.10. Landing

Generally the landing should be performed against the wind. If necessary the landing with the cross wind up to 10 kts;5 m/s or the tail wind up to 6 kts; 3m/s is allowed when paying special attention.

The recommended approach speeds:

- in smooth air 49 ÷ 54 kts ; 90÷100 km/h depending on all-up mass,
- in turbulent air 54 ÷ 60 kts; 100÷ 110 km/h depending on all-up mass.

The glide-path 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 to 41 kts;65÷75km/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 dimnish 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 200 ÷ 260 ft; 60 ÷ 80 m depending on all up mass.

3.4. Assembling and disassembling /Fig. 5 and 6/

3.4.1. Tools

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

3.4.2. Assembling staff: min. 4 persons

3.4.3. Assembling procedure

1. Clean and grease the working surfaces of disconnected fittings and joints.

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2. Put the fuselage on the assembly stand. Support the front wheel /tail skid on the ground/
3. 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.
4. Insert the R.H. wing to the fuselage acc. to Fig. 5a /aileron in the neutral position, air brake retracted/.
5. 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. 5b. Insert the main pin, insert the tommy-bar into the hole in glass-fibre member and secure with the safety pin.

6. Assemble the R.H. half of a tailplane with the vertical stabilizer acc. to Fig, 6 /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/.
7. 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/red mark must disappear/.
8. Check all the connections and operation of controls. Close the fuselage upper inspection door.

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3.4.4. Disassembling procedure

1. Pull forward the protruding pin securing the L.H. half of tailplane and lock turning it by 90° /red mark on the pin should be visible/.
2. 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.
3. Retract the air brake and take-off safety-pin which secures the main pin. Support the wing ends and take out the pin.
4. Support the wing ends, put on the assembling lever on the spar feet and loosen the connection of spars with motion of a 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.

4. EMERGENCY PROCEEDURES

4.1. Break or unintended releasing of tow-cable at low height

1. Release the hook /if the cable remained with glider/.
2. Bring the glider to correct glide,
3. Land in place choosen with respect to the wind direction and other landing conditions.

4.2. Emergency jettisoning and use of parachute

a/ 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 controlled flight impossible,
- in case of sudden, severe mis-disposition of pilot during the flight /e.g. injured eyes/,
- in case of impossible return to the ground /e.g. extensive fog region/.

The decision of leaving the glider i taken by the pilot in command.

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b/ Sequence of leaving the glider.
The crew member being not the pilot in command leaves the glider first. The pilot in command leaves the glider second after using all possibilities to enable the second crew member to leave the glider.

c/ Sequence of procedures:

1. Release the control stick
2. Hold firmly and push forwards simultaneously:
   - canopy lock handle with left hand,
   - canopy emergency jettisoning lever /with right hand/.
3. When holding the handles push the canopy and jettison out.
4. Release the safety belts.
5. Fold the legs and jump out of the cockpit, If the glider is turning quickly jumptowards the centre of rotation.
6. Wait at least 3 sec to get a distance in respect to glider and open the parachute.

d/ Procedures in special cases:

- If the canopy cannot be jettisoned, destroy the perspex, starting from the windows. If necessary use the action of legs.
- If the cockpit exit occurs at an altitude below 656ft; 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 exit is required at high altitude take into consideration:
  a/ danger of further climbing on parachute in the strong climbing currents /in a cloud/ and danger of oxygen deficiency 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.

Druk:OWPT Dietzko-Dietz /2000/484/82

- If the damaged glider allows for the limited control and the altitude does not require an immediate abandoning of the glider the pilot in command 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 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.

5. PERFORMANCES /Fig.4/

Plotted on Fig.4 calculated speed polar has the following main points:

- min. sinking speed 1,36 kts:138 ft/min: 0,7 m/s at about 40 kts: 75 km/h,
- max. lift /drag ratio 30:1 at about 46 kts: 85 km/h

Speed polar points :

Airsped kts	40	50	60	70	80	90	100
Sinking kts	1.36	1.59	2.22	3.07	4.35	5.92	7.85

Airsped kts	40	50	60	70	80	90
Sinking ft/min	138	161	225	311	441	600

Airsped km/h	80	100	120	140	160	180
Sinking m/s	0.72	0.95	1.33	1.92	2.73	3.75

druk:OWPT Dzialdowo-Dlaia /2000/454/82

6. WEIGHT AND BALANCE

Individual loading plan

During the daily operation of the glider the simplified method of checking the loading mass and the number of weights required can be applied on the basis of the table "individual loading plan"/page 45/

Principles for the use of individual loading plan

1. The balancing weights are used only for solo flying if the pilot's mass/parachute incl./ is lower than 154 lbs: 70 kg
2. The total loading mass as the sum of real crew mass/parachutes incl./ and eventuel luggage cannot exceed the maximum mass defined in the placard.
3. The mass of crew member cannot exceed 240 lbs: 110 kg

Principles for the inscriptions into the individual loading plan placard

1. Inscriptions are made by the inspector of the workshop which has performed the maintence or replacement of additional equipment.
2. Always two placards are to be fullfiled. One is placed in this Manual the second one is placed into the pocket provided in the cockpit. In case of revision the unactual placards should be removed out of the Manual and spare placards of this Manual used /pages 46 and 47/.
3. It should be inscribed:
   - serial No of the glider,
   - actual additional equipment /e.g. transceiver, oxygen equipment, second instrument panel/,

1

- mass of the empty glider with standard equipment and additional equipment installed,
- maximum summarized load mass/crew with parachutes and luggage/equal to the result of formula given in "Table of weighing the glider Fact. No ... ", page 48, with standard equipment and additional equipment installed,
- maximum pilot's mass /parachute incl./ in front seat defined as the difference between the maximum load mass and the pilot's mass /parachute incl./ on the second seat. If the value of so defined mass exceed 240 lbs, 110kg the value of 240 lbs: 110 kg should be inscribed
- date, seal and signature of inspector

NOTE: The changes in the individual loading plan shall be accepted by the producer.

Table of individual loading plan

NOTE: The inscripted value of maximum summarized loading mass of the cockpits for the glider with standard equipment/without the additional equipment/must agree with the actual inscription on page 48.

SZD-50-3 „PUCHACZ" INDIVIDUAL LOADING PLAN

Fact. No .....

Empty glider mass with standard equipment and the following additional equipment .....

..... ranges.....lbs.....kg

Maximum all-up mass is 1256 lbs; 570 kg

Max. summarized load mass i.e. mass of crew and luggage is.....lbs .....kg

Mass of pilot (parachute incl.) Rear seat		Front seat minimum		Front seat maximum		Balancing weights (pieces)	Date Seal and Signature of Inspector
lbs	kg	lbs	kg	lbs	kg		
0	0	121	55	143	65	2	
0	0	143	65	154	70	2	
0	0	154	70	240	110	0	
121	55	121	55	...	...	0	
132	60	121	55	...	...	0	
154	70	121	55	...	...	0	
176	80	121	55	...	...	0	
198	90	121	55	...	...	0	
220	100	121	55	...	...	0	
240	110	121	55	...	...	0	

SZD-50-3 „PUCHACZ" INDIVIDUAL LOADING PLAN

Fact. No .....

Empty glider mass with standard equipment and the following additional equipment .....

..... ranges.....lbs.....kg

Maximum all-up mass is 1256 lbs; 570 kg

Max. summarized load mass i.e. mass of crew and luggage is.....lbs .....kg

Mass of pilot (parachute incl.) Rear seat		Front seat minimum		Front seat maximum		Balancing weights (pieces)	Date Seal and Signature of Inspector
lbs	kg	lbs	kg	lbs	kg		
0	0	121	55	143	65	2	
0	0	143	65	154	70	2	
0	0	154	70	240	110	0	
121	55	121	55	...	...	0	
132	60	121	55	...	...	0	
154	70	121	55	...	...	0	
176	80	121	55	...	...	0	
198	90	121	55	...	...	0	
220	100	121	55	...	...	0	
240	110	121	55	...	...	0	

Druk: OWPT Bielsko-Biała /2000/466/82

SZD-50-3 „PUCHACZ" INDIVIDUAL LOADING PLAN :

Fact. No. B-2199

Empty glider mass with standard equipment and the following additional equipment Instrument panel 2-nd cockpit.

ranges 816 lbs 370,4 kg

Maximum all-up mass is 1256 lbs; 570 kg

Max. summarized load mass i.e. mass of crew and luggage is 438 lbs 199,8 kg

Mass of pilot (parachute incl.)						Balancing weights (pieces)	Date Seal and Signature of Inspector
Rear seat		Front seat					
		minimum		maximum			
lbs	kg	lbs	kg	lbs	kg		
0	0	121	55	143	65	2	10.04.98
0	0	143	65	154	70	2	
0	0	154	70	240	110	0	
121	55	121	55	240	110	0	
132	60	121	55	240	110	0	
154	70	121	55	240	110	0	
176	80	121	55	240	110	0	
198	90	121	55	240	108	0	
220	100	121	55	218	98	0	
240	110	121	55	198	88	0	

Table of weighing the glider Fact. No B-2199

Empty glider mass with standard equipment m_o lbs/kg	809,2 Lb. 367. kg
Location of c.g. for empty glider with standard equipment in respect to root chord leading edge x_o ft/m/	24,98 in 0,632 m
Static moment of mass of empty glider with standard equipment in respect to root chord leading edge $M_o = m_o \cdot x_o$ lb in /kgm/	20134 Lbin 231,9 kgm
Max. permissible loading mass * $763 + Q_S - 2Q_C$ lb /kg/	453 Lb. 205,6 kg
Date, signature and seal of Inspector	10.04.98

* Q_S - mass of both wings, Q_C - mass of empty glider

Druk: OWPP Bielsko-Biała / 2000/466/82

Graphical checking of c.g. location
/see diagramm on page 52 or 55:/

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 48/
   - pilots with parachutes $m_1 + m_2$
   - additional equipment and balancing weights incorporated m_3 /see table on page 50/

   The resultant mass of the glider - in flight mark on the vertical axis of diagram on page 52 or 55

   $m = m_o + m_1 + m_2 + m_3$

2. Add /algebraicaly, respecting the sign /the mass moments of:
   - empty glider M_o /see the table on page 48/
   - pilots with parachutes $M_1 + M_2$ /see tables on pages 53 and 54, or 56 and 57/

- additional equipment and balancing weights incorporated M_3 /see table on page 50/:

NOTE: Dimensions of mass moment of pilot in the I and II cockpit in respect to the leading edge of wing root chord placed in the tables on pages 53 and 54 or 56 and 57 are given at assumption that the crew use the parachute or back-pillow thickness/as bend/ not lower than 4,7 in: 120mm.

Equipment	mass		moment	
	lbs	kg	lbin	kgm
Instrument panel at rear seat	11,5	5,2	-347,28	- 4
1 balancing weight	13,9	6,3	-954,96	-11
2 balancing weights	27,8	12,6	-1909,92	-22
Snow-ski installed on the glider	25.3	11,5	26,1	-0,3
Luggage contained in luggage compartment	44,1	20	-938,3	+10.8

The weight and static moments in respect to root chord leading edge of additional e uipment installed on the glider /when approved by the local Authority/ is to be defined by the user and values should be inscripted into

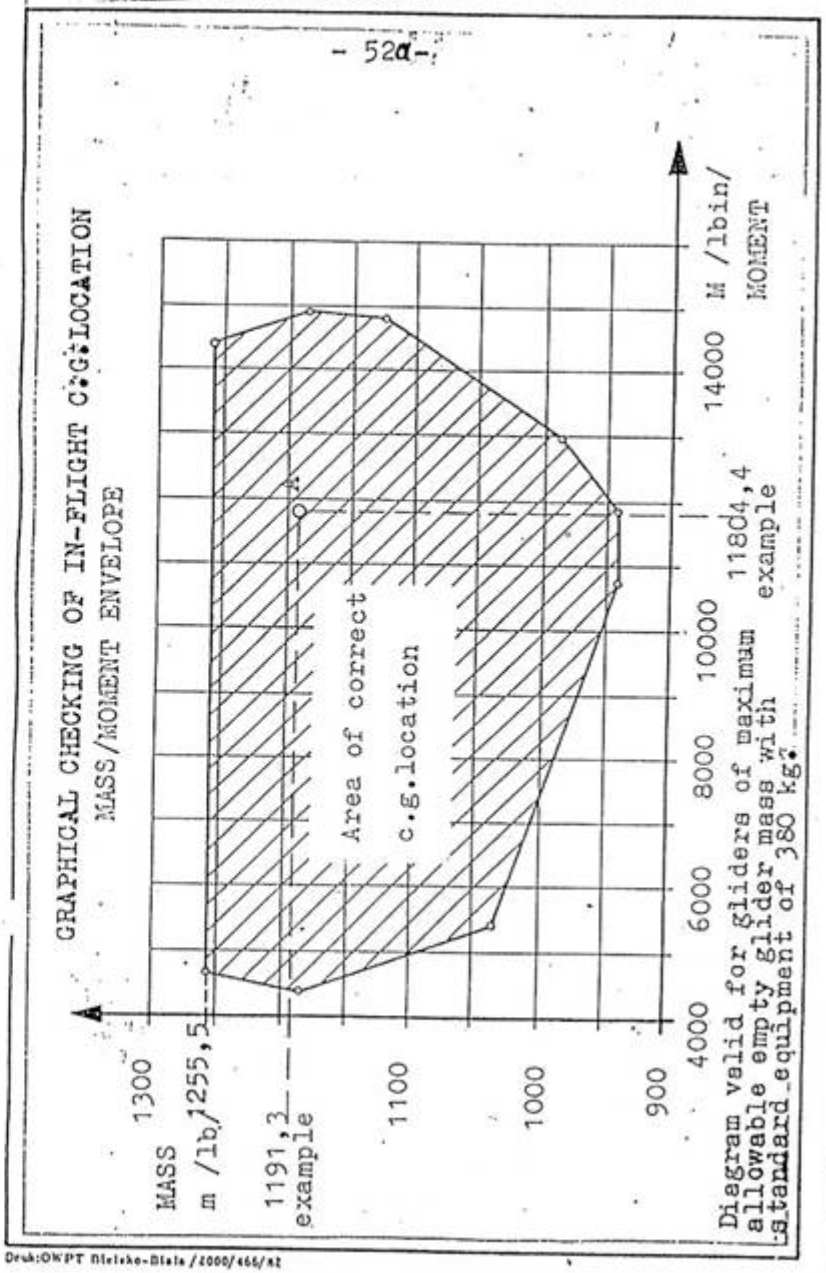
Druk:ZWPT Bielsko-Biała /2000/466/82

the free space of the table above.
The resultant value of glider mass moment is:

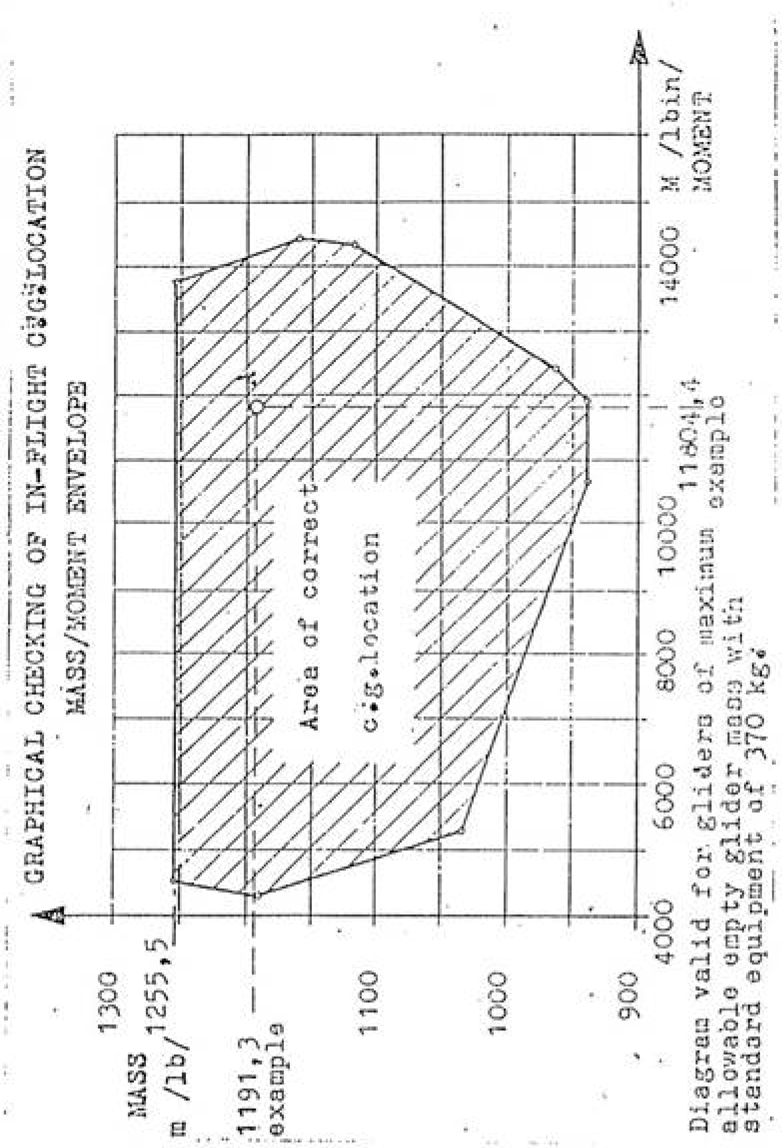
$$M = M_o + M_1 + M_2 + M_3$$

Mark the resultant value of the mass moment on the horizontal axis of the diagram on page 52 or 55.

3. From the points marked on the diagram axes on page 52 or 55 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 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.



Druk:ZWPT Bielsko-Biała /2000/466/82



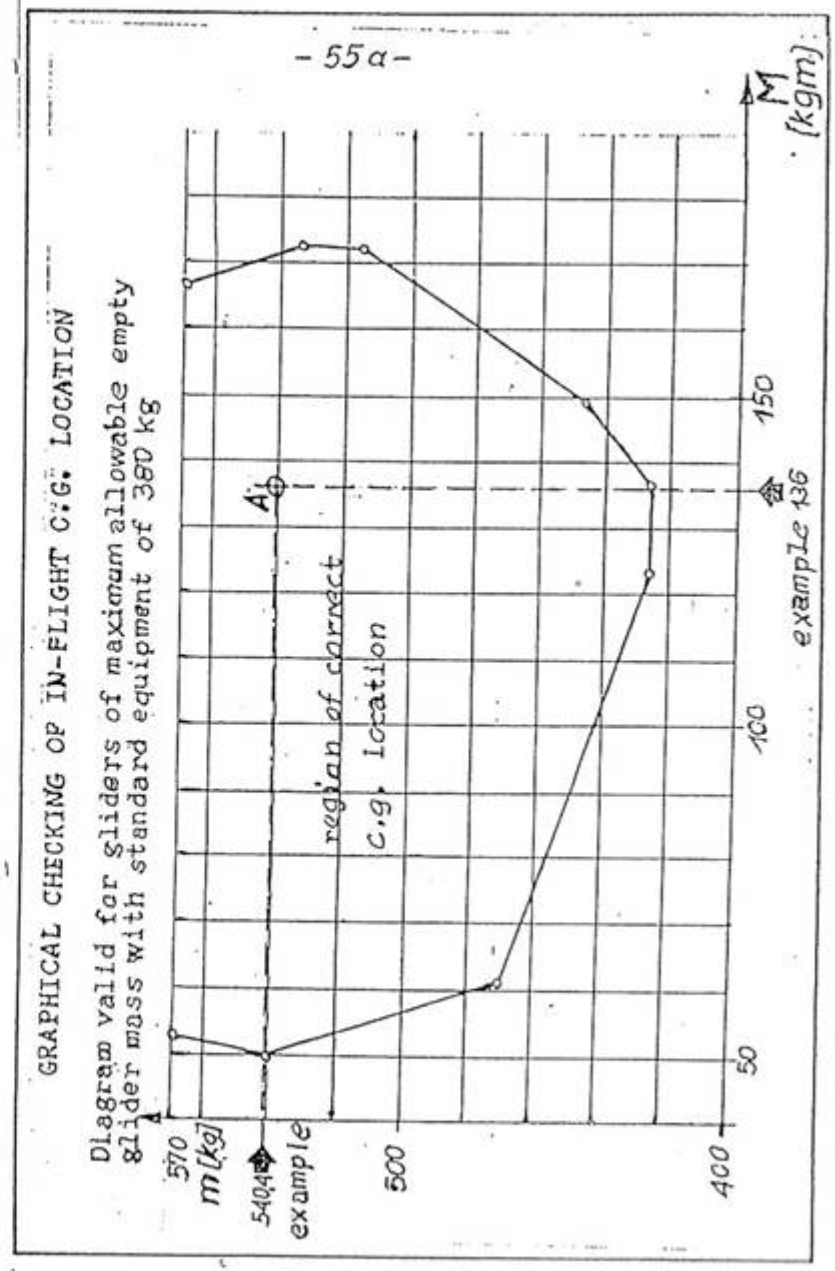
Druk:OWPT Bielsko-Biala /2000/466/82

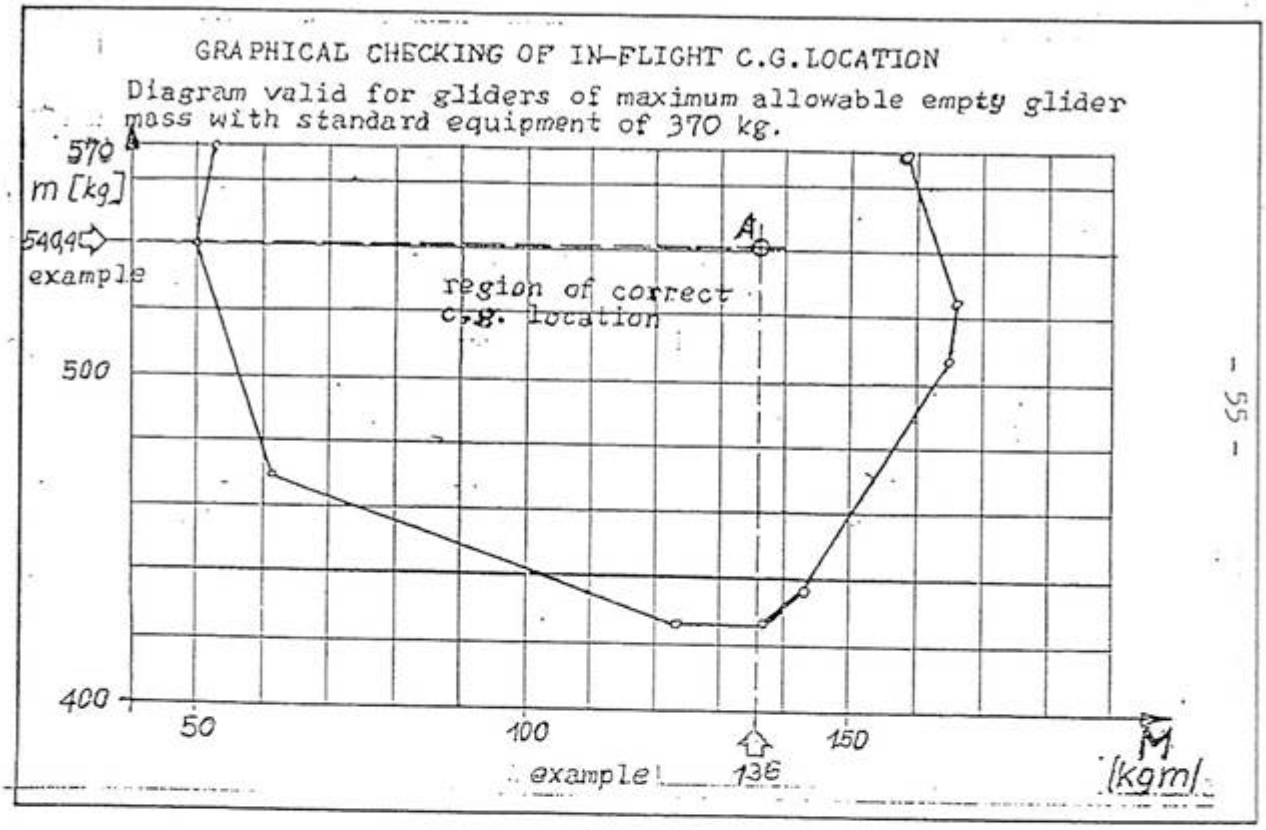
Moment of pilot's mass at front seat in respect to wing root leading edge M_1 /lbin/

Pilot's mass m_1 /lbs/	Moment of pilot's mass M_1 /lbin/ without pillow	with pillow
121,3	- 6063,6	- 6398,4
125	- 6262,8	- 6607,2
130	- 6531,6	- 6890,4
135	- 6792,0	- 7164.0
140	- 7064,4	- 7449,6
145	- 7336,8	- 7736,4
150	- 7599,6	- 8012,4
155	- 7875,6	- 8302,8
160	- 8152,8	- 8593,2
165	- 8418,0	- 8872,8
170	- 8697,6	- 9166,8
175	- 8978,4	- 9460,8
180	- 9248,4	- 9744,0
185	- 9531,6	- 10040,4
190	- 9816,0	- 10339,2
195	- 10100,4	- 10638,0
200	- 10375,2	- 10926,0
205	- 10663,2	- 11228,4
210	- 10951,2	- 11532,0
215	- 11229,6	- 11822,4
220	- 11521,2	- 12127,2
240	- 12684.0	- 13343,5

Moment of pilot's mass at rear seat in respect to wing root leading edge M_2/lbin/

Pilot's mass m_2 /lbs/	Moment of pilot's mass M_2 /lbin/	
	without pillow	with pillow
121,3	- 1165,2	- 1498,8
125	- 1184,4	- 1528,8
130	- 1209,6	- 1567,2
135	- 1231,2	- 1603,2
140	- 1252,8	- 1638
145	- 1272,0	- 1671,6
150	- 1288,8	- 1701,6
155	- 1304,4	- 1731,6
160	- 1320	- 1759,2
165	- 1329,6	- 1784,4
170	- 1340,4	- 1808,4
175	- 1348,8	- 1831,2
180	- 1354,8	- 1850,4
185	- 1359,6	- 1869,6
190	- 1363,2	- 1887,6
195	- 1364,4	- 1899,6
200	- 1364,4	- 1911,2
205	- 1362	- 1927,2
210	- 1358,4	- 1936,8
215	- 1352,4	- 1945,2
220	- 1344	- 1951,2
225	- 1335,6	- 1956,0
230	- 1324,8	- 1958,4
235	- 1311,6	- 1959,6
240	- 1297,2	- 1958,4
242,6	- 1288,8	- 1957,2





Moment of pilot's mass at front seat in respect to wing root chord leading edge M_1 /kgm/

Pilot of mass m_1 /kg/		0	1	2	3	4	5	6	7	8	9
50	without pillow						- 70	- 71	- 72	- 74	- 75
	with pillow						- 74	- 75	- 76	- 78	- 79
60	without pillow	- 77	- 78	- 79	- 81	- 82	- 83	- 85	- 86	- 87	- 89
	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
	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
	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									

Moment of pilot's mass at rear seat M_2 /kgm/

Pilot of mass m_2 /kg/	0	1	2	3	4	5	6	7	8	9
50 without pillow with pillow						- 13 - 17	- 13 - 17	- 14 - 18	- 14 - 18	- 14 - 18
60 without pillow with pillow	- 14 - 18	- 14 - 18	- 14 - 18	- 14 - 18	- 14 - 19	- 15 - 19	- 15 - 19	- 15 - 19	- 15 - 19	- 15 - 20
70 without pillow with pillow	- 15 - 20	- 15 - 20	- 15 - 20	- 15 - 20	- 15 - 20	- 15 - 20	- 15 - 21	- 15 - 21	- 15 - 21	- 15 - 21
80 without pillow with pillow	- 15 - 21	- 16 - 21	- 16 - 21	- 16 - 21	- 16 -22	- 16 - 22	- 16 - 22	- 16 - 22	- 16 - 22	- 16 - 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									

EXAMPLE :

Individual data of empty glider /from table of weighing on page ..48.. /.

m_0 = 820 lbs; 372 kg M_0=20400 lbin;235 kgm

Crew :

Front seat :

pilot with pillow m_1=132,3 lbs; 60 kg
M_1=-7032 lbin;-81 kgm

Rear seat :

pilot with pillow m_2=211,7 lbs; 96 kg
M_2=-1389,6 lbin -16 kgm

Additional equipment :

instrument panel at rear seat
11,5 lbs; 5,2 kg;-346,8 lbin; -4kgm

radio 15,9 lbs; 7,2 kg;+174 lbin ; +2kgm

m_w=27,3 lbs; 12,4 kg; M_w= -174 lbin ;-2kgm

All-up mass:

m=820 + 132,3 + 211,7 + 27,3 = 1191,3 lbs
540,4 kg

Moment of all-up mass:

M= 20400-7032-1389,6-174 = 11804,4 lbin
136 kgm

The perpendicular lines from points m=1191,3lb 540,4 kg and M=11804,4 lbin;136 kgm on the diagrams pages 52,55 and cross at the point"A which finds in the shadowed area. The c. g. location in flight is correct.

Druk: OWPT Bielsko-Biała / 2000/ 466/ 82

7. COCKPIT LAYOUT.

The cockpits are designed to use back-type parachutes. The first cockpit allows for the pilot about 79 in; 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. Pilots having short legs or small mass should use an additional cushion on the back-rest.

The second cockpit allows for the pilot about 79 in; 2m tall. The seat pan is adjusted on the ground / vertically and longitudinally / by shifting the backrest cross tube/4 positions/.

In general, the higher the pilot's position in second cockpit, the better is the visibility forward including the instrument panel in the first cockpit.

Pilots having short legs should use an additional back rest pillow.

The cockpit is closed with integral perspex canopy fixed on two hinges on the R.H. board with the provision for emergency jettisoning.

The open canopy is held up with a cable which, when closing the canopy, retracts automatically into a reel behind the first cockpit back rest.

Both cockpits have control columns coupled each other; the pedals and other control levers are marked with placards. Operation of the flying controls is conventional.

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/

The cockpits are ventilated independently through the side windows in canopy.

The first cockpit has an adjustable vent on the perspex front part above the instrument panel operated by the slider in the panel / black ball-knob/.
Both cockpits have side pockets accessible in flight.
Two nests for balancing weights are located before the seat in the first cockpit.
The weights of mass 13,9 lbs; 6,3 kg not interchangeable. They are fixed on bolts with tommy-bars without using of tools.
In the cockpits and the luggage compartment fittings for oxygen equipment and transceiver are installed.

8. DRAWINGS AND DIAGRAMS

Druk:OWPT Bielsko-Biała /2000/466/82

Fig. 1 SZD-50-3 PUCHACZ glider

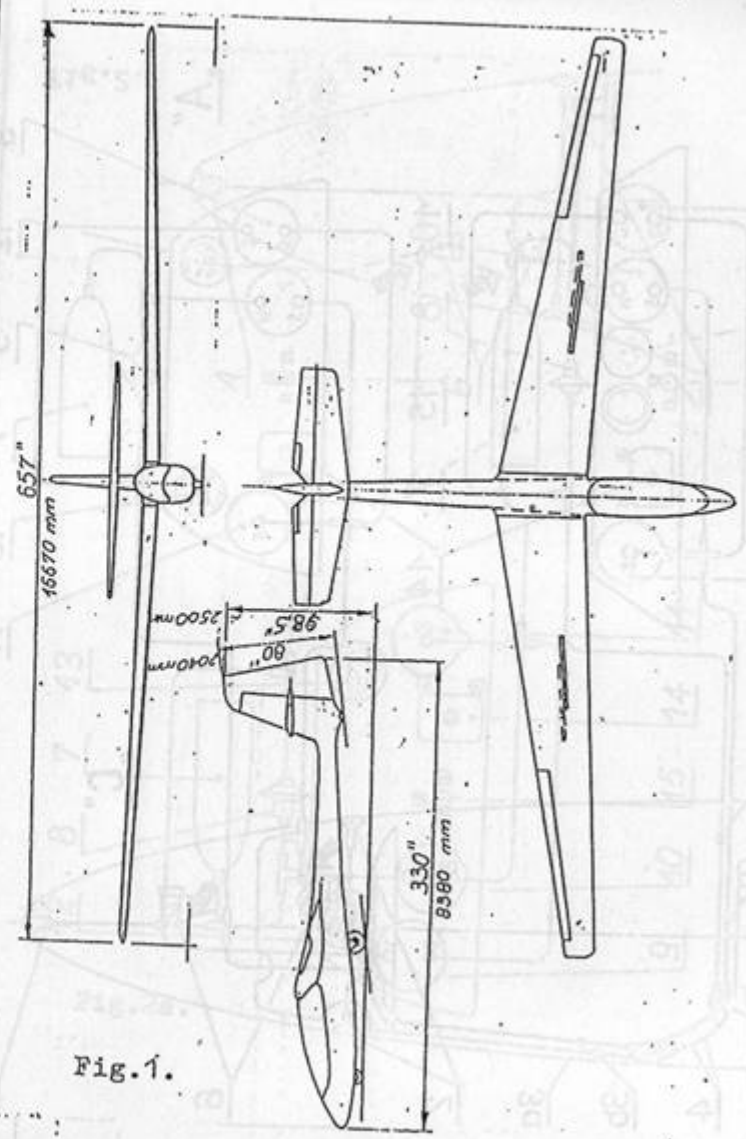


Fig.1.

DrukiOWPT Bielsko-Biała /2000/486/82

Fig. 2. Installation of board instruments.
Glider with two instrument panels.

A - Instrument panel of 1-st cockpit
B - Instrument panel of 2-nd cockpit
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 second instrument panel
5b - Static pressure duct end of first instrument panel
6 - Drainage unit
7 - Bottle
8 - Compensator
9 - Airspeed indicator
10 - Variometer
11 - Altimeter
12 - Turn indicator
13 - Compass
14 - Turn indicator battery socket
15 - Turn indicator switch
16 - Nuts fixing the second instrument panel to canopy

Arrows mark the drainage units end which should be disconnected when draining the installation.

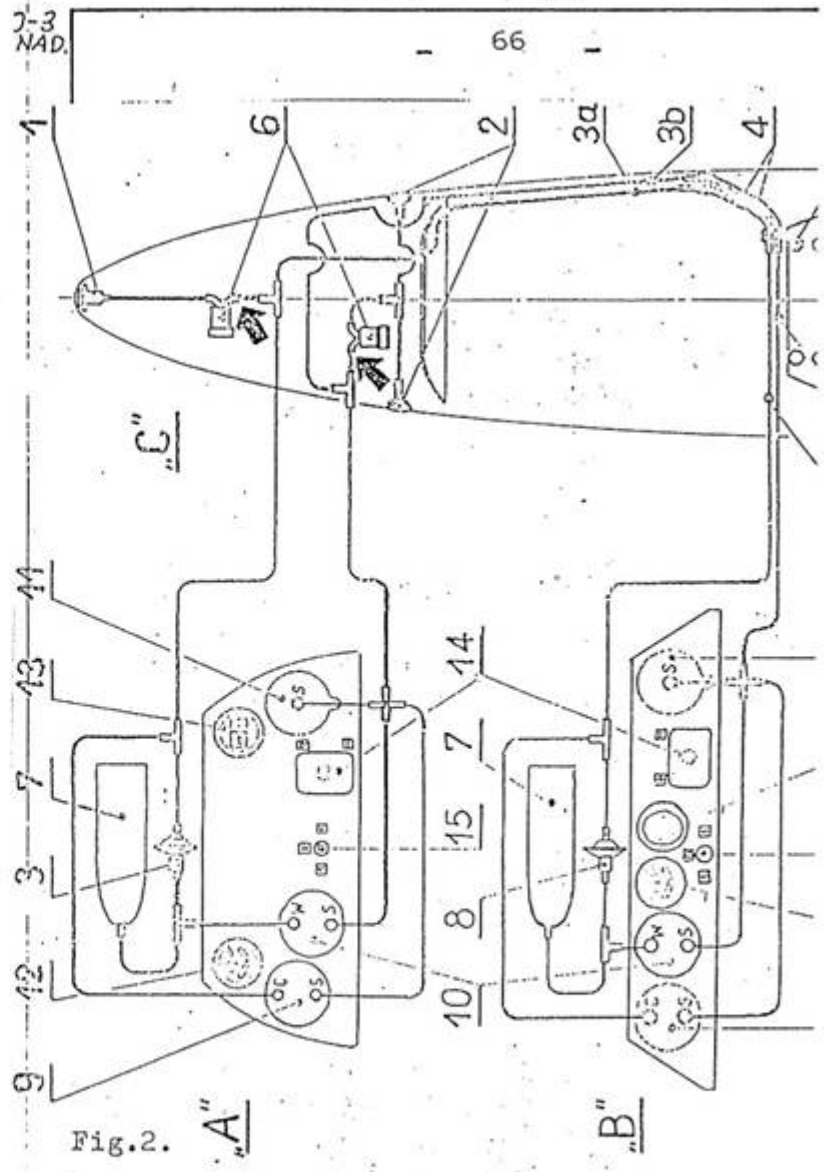


Fig.2.

Druk:OWPT Dzielsko-Biała /2000/466/82

Fig. 2a. Installation of board instruments
Glider with one instrument panel

1 - Total pressure port
2 - Static pressure port
6 - Drainage unit
7 - Bottle
8 - Compensator
9 - Airpseed indicator
10 - Variometer
11 - Altimeter
12 - Turn indicator
13 - Compass
14 - Turn indicator battery socket
15 - Turn indicator switch

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

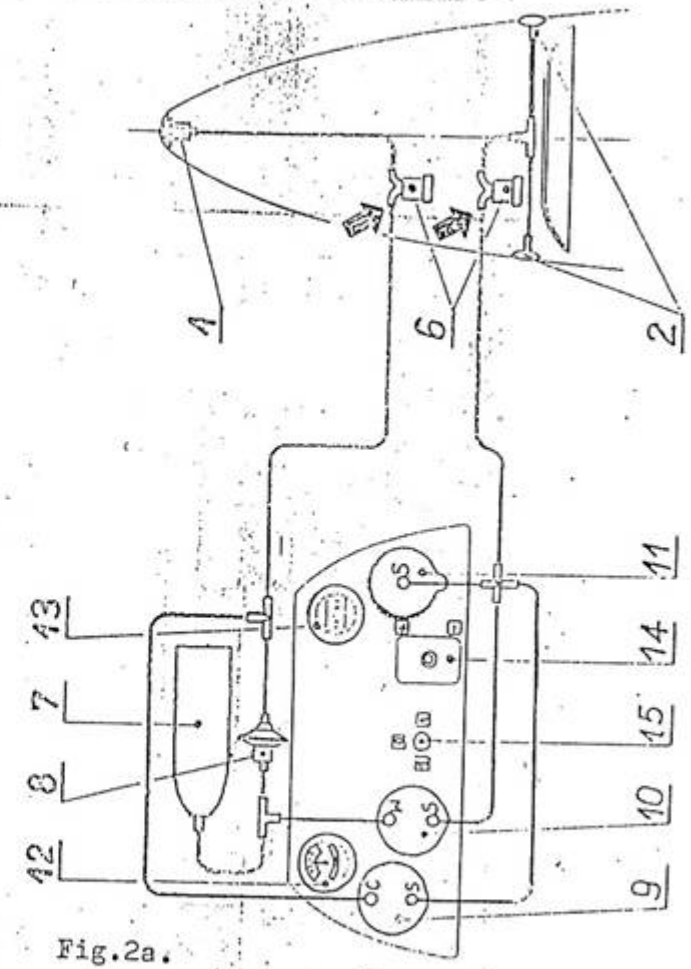


Fig.2a.

Druk:OWPT Bielsko-Biała /2000/466/82

Fig. 3. Wiring diagram of electric indicator

1 - Turn indicator
2 - Switch
3 - Batteries /the poles arrangement shown on drawing/

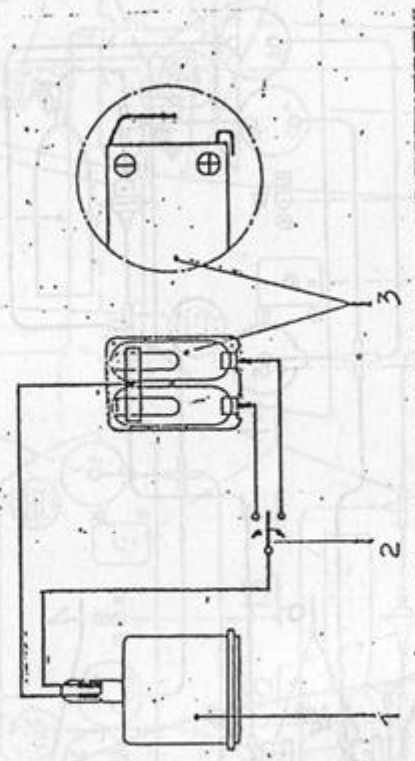


Fig.3.

Druk:OWPT Bielsko-Biała /2000/466/82

Fig. 4. Speed polar

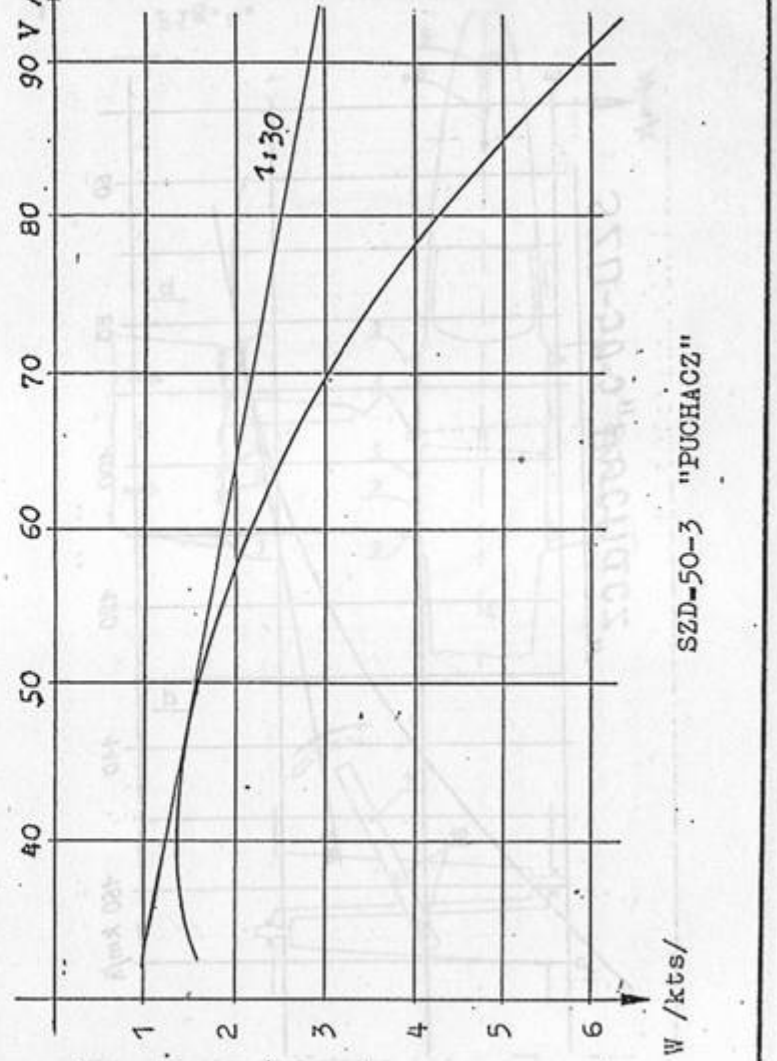


Fig.4.

Druk:OWPT Bielsko-Biała /2000/466/82

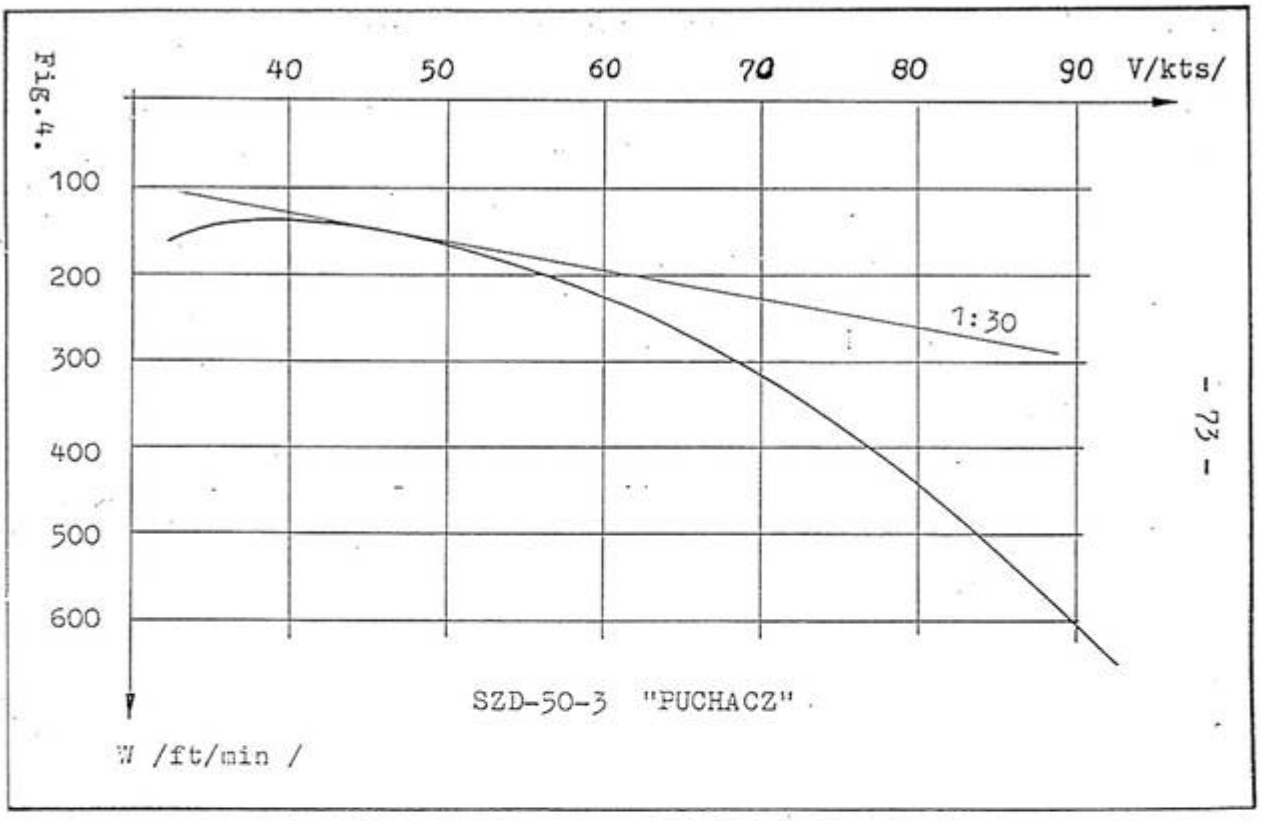


Fig.4.
40
50
60
70
80
90
V/kts/
100
200
300
400
500
600
1:30
SZD-50-3 "PUCHACZ"
W /ft/min /

- 73 -

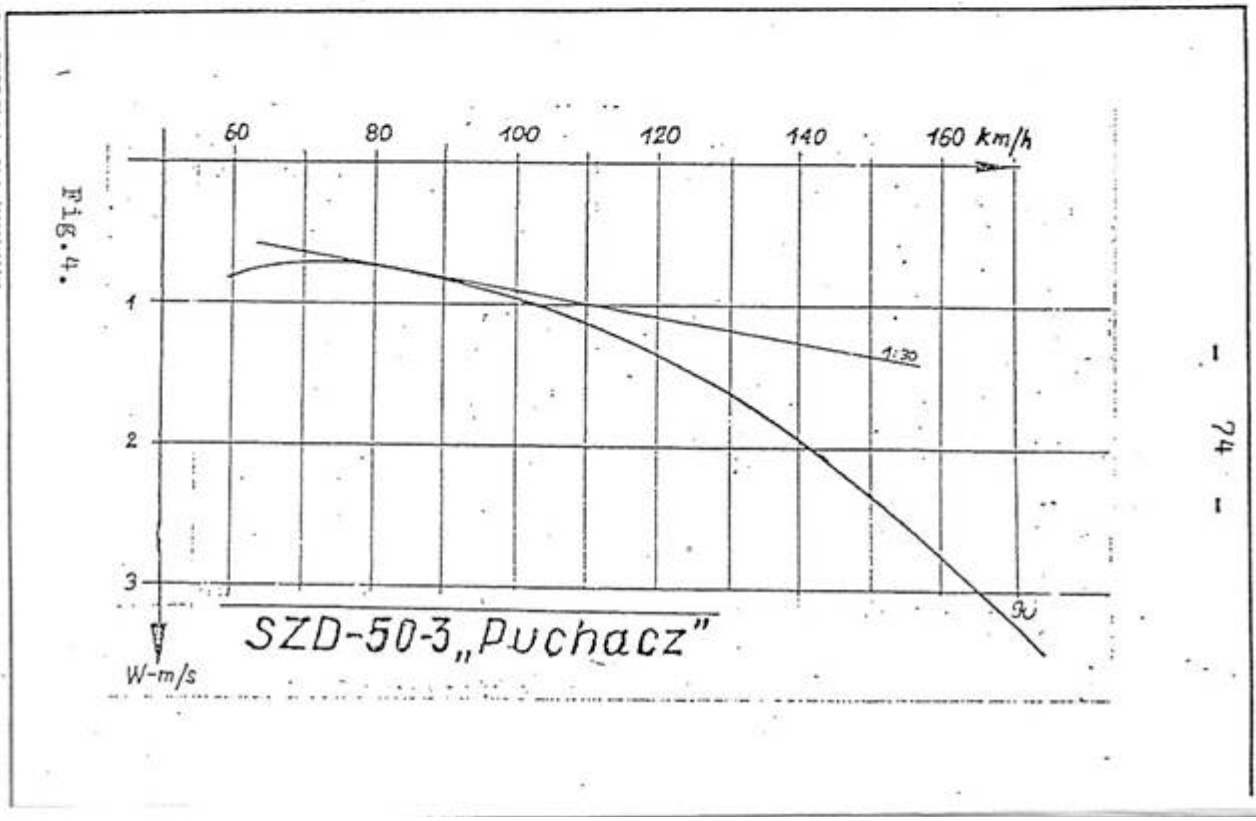


Fig.4.
60
80
100
120
140
160 km/h
1
2
3
1:30
SZD-50-3„Puchacz"
W-m/s

- 74 -

Fig. 5. Wings-fuselage assembling

a/ R.H. wing fitted to fuselage
L.H. wing prepared for fitting
b/ Locking the spars by means of assembling lever attached on thrust pivots.
Full arrow : rigging. Brocken arrow: derriging.

1 - Spar root pivots
2 - Fuselage pivots
3 - Self-aligning nests in wings
4 - Control system 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
P - R.H. wing
L - L.H. wing
K - Fuselage

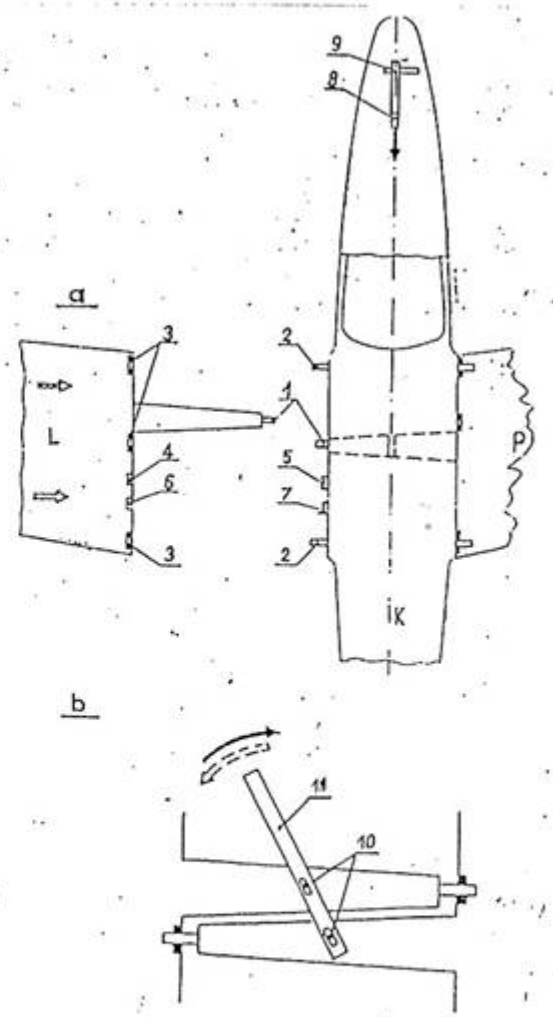


Fig.5.

Druk:ÓWPT Bielsko-Biała /2000/464/82

Fig. 6. Assembling of horizontal tailplane

P - R.H. half of 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 - Securing pin in dissecured position /protruded forward/ secured position /small hole in vertical position/. Red caution sign visible in this position disappears when the pin is pressed in.
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 vertical stabilizer

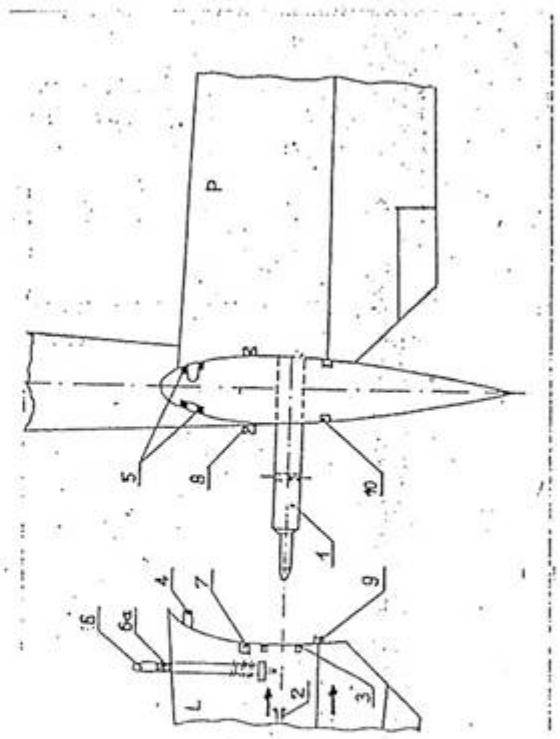


Fig.6.

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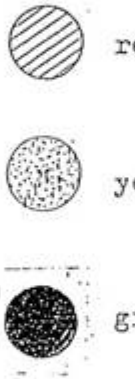
Fig. 7.

Colour markings of airspeed indicator dial



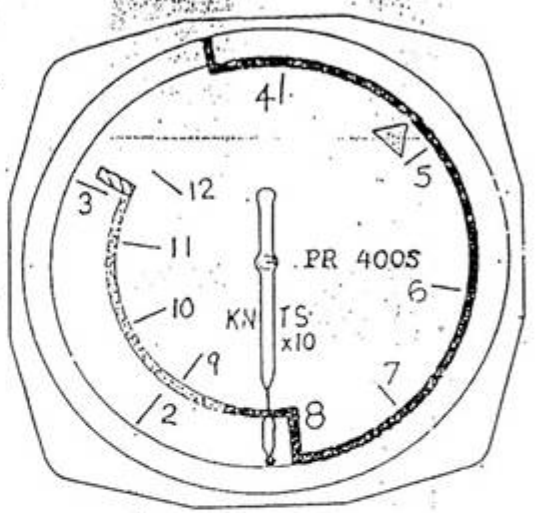


Fig.7.

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