

Fastening of the floor-belt is obligatory for flight in which the inverted flying and associated aerobacy manoeuvres /controlled roll, controlled half-roll-half-loop, controlled half-loop-half-roll/ are intended. In other flights when the floor-belt is out of operation it should be placed below the seat pillow and immobilized by means of the button. 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.

Both seats have the control columns coupled each other, the pedals and other control levers are 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/

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 perspex 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.

Two nests for balancing weights are located before the front seat.

The weights of mass 6,3 kg each are not interchangeable. They are fixed on bolts with tommy-bars without using of tools.

In the cockpit and the luggage compartment the fittings for the oxygen equipment and transceiver are installed.

#### 4.3. Service before take-off

##### 4.3.1. 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 possibility of free turns. The ground towing cable length should be at least 4m.

The glider can be also rolled on wheels forward or backward. At turns the tail should be pressed or the nose lifted.

#### 4.3.2. Adjusting of the rear seat height

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. 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 and close the securing tab.

#### 4.3.3. Locking of hooks

In the gliders having 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 rear hook positioned tension-cable is pulled.

#### 4.3.4. Filling the tube with air

It is necessary to use the extending end. The main wheel valve is located on the R.H. side and is accessible after shield deflection. Pressure 3,0 at. The front wheel valve is located on the L.H. side. Pressure: 1.2 at.

#### 4.3.5. Drainage of ducts

- Remove the pressure ducts of the rear seat instrument panel /3a and 3b Fig.2/ and plug them on the port end.
- Detach the drainage units from the ducts of the front seat 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 free ducts to the rear seat instrument panel,
- check the operation of airspeed indicator /it should operate when blowing on ports/.

#### 4.3.6. Assembling of balancing weights

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

#### 4.3.7. 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/.
2. Adjust the rear seat correctly. Before the solo flight clamp the 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 pulling it firmly.

#### 4.3.8. Post-flight procedures

- Switch off the turn indicator. If necessary remove the used batteries.
- If necessary drain the instrument installation according to 4.3.5.
- Inspect the glider as before take-off and remove the eventual failures.

#### 4.4. Controlling

##### 4.4.1. 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,
- good lateral and directional controllability,
- safe low speed behaviours without the excessive inclination to

spinning.

#### 4.4.2. 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 16-22 kts. 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. When the flight becomes stable correct the setting of trimming tab.

Recommended towing airspeeds:

- at climb 51 to 65 kts
- at cross-country flight 65 to 81 kts.

#### 4.4.3. 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 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"
- mean pilot - "nose heavy"
- heavy crew - "neutral"

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 /not less than 43 kts/.

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 pulled 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 550 m long in smooth air the gained height reaches 200 - 250 m.

#### 4.4.4. Longitudinal 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.
- for heavy crew - within the airspeed range of about 42 to about 116 kts.

#### 4.4.5. Stalling /airspeeds IAS/

Depending on the glider all-up mass the stalling speed in the straight flight is of about 31 kts for solo lightweight pilot to about 38,8 kts /heavy crew and all-up mass of about 570 kg /.

The stall warning 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 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 about 41 kts 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.

#### 4.4.6. Circling

When circling in thermals the glider has very good lateral, controllability. The circling speed is of 38 to 49 kts depending on all-up mass, bank and flight conditions.

#### 4.4.7. Spinning

Before the intended spinning in one person flight the pilot of mass below 165 lbs should check the proper glider balancing with weights.

When entering the spinning in the 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 in the 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 full. Deflect the rudder towards the intended spinning. The recommended aileron deflections are listed in table on page 4-13. To obtain the 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 4-13

NOTE: The table of spinning characteristics is not the loading plan. The table concerns glider with all the additional equipment variants acc to the loading plan on page 2-13

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

The not full deflection of elevator /specially with heavy crew/ leads to the airspeed increasing up to 54 kts or more and even the automatic break of the spinning.

The recommended recovery technique consists of:

- full rudder deflection opposite to the 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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CHARACTERISTICS OF GLIDER IN SPINNING

Crew mass +parachu- tes kg	front seat	55-75 +weights	75-90 <sup>x/</sup>	55-75 <sup>x/</sup>	90-110 <sup>x/</sup>	75-90 <sup>x/</sup>	90-110 <sup>x/</sup>
	rear seat	0	0	55-100 <sup>xx/</sup>	0	55-75 <sup>xx/</sup>	55-75 <sup>xx/</sup>
Recommended aileron deflection		opposite to rotation			neutral or opposite to rotation		
Longitudinal inclination		little			moderate		high
Longitudinal oscillations		smooth			smooth or without oscillation		disappearing or without oscilla- tions
Airspeed indications		about 0 kts			in range of 0-32 kts		in range of 0-43 kts

4-13g

x/ For the flight with balancing weights

a/ pilot of mass more than 75 kg flying solo, b/ full crew.  
In this table the equivalent mass increment should be observed  
in the front cockpit, taking 10 kg for each balancing weight.

xx/ Never exceed real mass of glider - in flight is 570 kg

4.4.8. Sideslip - can be performed in 2 ways:

- a/ With simultaneous, gradual deflection of ailerons and rudder at the airspeed of about 38 - 43 kts, the directional sideslip with bank of to 10 - 15° is obtained. Indications of airspeed indicator drop below 27 kts. 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° is obtained, the glider allows to enter into directional sideslip with bank of up to about 30°. 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 pulling back 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.

#### 4.4.9. Air brake

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.

#### 4.4.10. Landing.

Generally the landing should be performed against the wind. If necessary the landing with the side wind up to 10 kts or the back wind up to 6 kts is allowed when paying special attention.

The recommended approach speeds:

- in smooth air 49 - 54 kts depending on all-up mass,
- in turbulent air 54 - 60 kts 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 to 41 kts .

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 90 - 110 m depending on all-up mass,
- with use of wheel brake - about 60 - 80 m depending on all-up mass.

#### 4.5. Aerobatics

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

- check the correct glider balance with balancing weights /concerns solo flight/
- remove the free elements out of the cockpit,
- check the locking of back rest tube at the rear seat,
- check the full deflections of controls having the belts fastened,
- 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's necessary to:

- fasten the back belts,
- balance the glider with trimming-tab on the airspeed of 60 - 65 kts i.e similar as for towed flight,
- check the locking of canopy and air brake,
- shut the window and air-conditioning tab.

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

4.5.1. The following manoeuvres can be performed without fastening the floor-belt

MANOEUVRE	initial airspeed	
	/ kts /	
	one person	two persons
Looping, stall turn	86 - 97	90 - 105
Spiral	65	70
Quick half-roll-half-loop	51	54
Chandelle	81	97
Lazy eight	81	97
Cuban eight	86 - 97	90 - 105
Leaf slides	stalling speed	

RECOMMENDATIONS FOR MANOEUVRES

- 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, stall-turn, spiral - Performing is conventional

- Quick half-roll-half-loop - At the initial airspeed of 51/54 kts the autorotational half-turn is obtained when the stick is resolutely pulled full with simultaneous full deflection of rudder. The further rotation is braked by means of neutralization of controls. Recovery is performed by means of semi-loop downwards.

Chandelle - At the initial air speed of 81/97 kts. the glider should be entered into the sharp climbed turn with 45° bank with such an attention that when recovered for the returned direction /180°/ the airspeed ranged 38-43 kts .

Lazy eight - At the initial airspeed of 81/97 kts the glider should be centered into the sharp climbed turn with 45° bank with such an attention that when the direction changed by 180° the turning airspeed was about 43 kts. After the next 45° the glider should be recovered out of the turn the airspeed of 75,5/81 kts gained once-more and the same manoeuvre performed into the reversal direction, then recovered into the original direction.



Cuban eight - At the airspeed of 85 - 97/ 90-105 kts the looping should be initiated. In the upper /inverted/ attitude, when the inverted horizon is seen, pull the stick full and deflect the rudder full.

The glider continues the loop and passes into 3/4 attitude making the quick autorotational vertical turn /towards the deflected rudder/. When the turn reached 180° the stick should be resolutely pushed and the rudder neutralized to brake the further turn and to retain the glider in diving in direction reversal in respect to original one.

When the airspeed reached 90 kts perform the second looping and recover into the normal flight.

Leaf-slides - /dallying with stall/. Enter the stalling on the same way as for the spinning and immediately break the turn using the opposite rudder deflection and short pulling the stick.

Then pull the stick once-more and deflect the rudder till to the stalling into the opposite direction etc.

4.5.2. The following manoeuvres can be performed only when the correct location and fastening of all 5 belts of pilot's harness is observed.

	Initial airspeed	
	/ kts /	
	Crew	
	one person	two persons
Entering the inverted flight by means of half-roll	75,5	81
Entering the inverted flight by means of half-loop	90	97
Straight inverted flight	70	75,5
Turns in inverted flight	70	75,5
Recovering from inverted into normal flight by means of half-roll	75,5	75,5
Recovering from inverted into normal flight by means of half-loop	59	65
Controlled roll	90	98
Controlled half-roll-half-loop	75,5	81
Half-loop-half-roll	108	113
Flick roll	57	59

To perform the above manoeuvres by the rear occupant of two persons crew the installation of rear instrument panel is obligatory.

#### RECOMMENDATIONS FOR MANOEUVRES

- Entering the inverted flight by means of half-roll.

At the initial airspeed of 75,5/ 81 kts the glider should be slightly pulled above the horizon and simultaneously the rotation initiated using the full aileron deflection. Before passing the 90° position the glider should be hold above the horizon by means of deflection the rudder in direction opposite to bank /using the "upper leg"/. Then gradually release the elevator /the full deflection, if necessary/ and neutralize the rudder. In the 180° position break the rotation of the glider /neutralize the aileron/ and recover the airspeed to 65 kts retaining the "above horizon" attitude. Correct the eventual bank.

- Entering the inverted flight by means of half-loop

At the initial airspeed 90/ 97 kts perform the first half-loop. In the inverted position prior to the nose drop below the horizon pull the stick resolutely and set the inverted flight airspeed into 65 kts in "above horizon" position. In case the airspeed increases unintended, open the airbrake in advance.

In respect to a low tolerance of angle in the moment of breaking the loop and the low margin of permissible airspeed in inverted flight this manoeuvre can be learned when the inverted flight is completely familiar to the pilot.

- Straight inverted flight.

The glider should be retained in "above horizon" attitude with the airspeed of 65 - 70 kts. When correcting the banks pay attention that the stick side movement e.g to right results the RIGHT wing to be elevated above the horizon and vice versa.

In the prolonged inverted flight the trimming, if necessary, should be set into "nose heavy" position, using even the full range of trimming.

In the straight flight the stalling at about 59 kts. airspeed is possible. It requires the full stick movement forwards. When the glider drops down the stick should be slightly pulled for a moment then once more pushed to get the "above horizon" attitude.

- Turns in inverted flight

The bank of glider, when introduced into the turn, is obtained by means of side deflection of the stick in the direction opposite to the intended turn direction.

It is recommended to control the glider with the small deflections of aileron and rudder.

The airspeed in turn is 75,5 kts .

- Recovering from inverted into normal flight by means of half-roll.

Increase the airspeed in inverted flight up to 75,5 kts . Then push the stick to obtain the above horizon position and move the stick to aileron direction /full aileron deflection/. When passing the 270° position retain the glider above the horizon by means of smooth deflection of rudder /in accord to aileron deflection/ and neutralize the elevator.

In normal position neutralize the aileron and rudder and return to the steady flight.

- Recovering from inverted into normal flight by means of half-loop.

In the inverted flight with the airspeed below 59- 65 kts gently pull the stick. In the diving the airspeed should be controlled and the glider recovered into the normal flight on the arc-path of semi-loop.

In case the airspeed increases considerably, the air brake should be extended in advance.

- Controlled roll In the normal flight at the airspeed of 97 kts the glider should be elevated slightly above the horizon. In the same time the rotation should be initiated by means of aileron deflection. Before passing the 90° position the glider should be retained above the horizon using the smooth rudder deflection in the direction opposite to bank /use of "upper leg"/.

Then gradually release the stick and neutralize the rudder.

When the 180° position passed, gradually deflect the rudder in accord to the aileron.

When passing the 270° position retain the glider on horizon using the rudder deflection in accord to the aileron. In the normal position neutralize the aileron and rudder and return to the steady flight.

NOTE: Having some experience the rolls can be performed with the initial airspeed of 85 kts

- Controlled half-roll-half-loop.

Perform the first half of controlled roll with initial airspeed of 75,5/ 81 kts . In the inverted position decrease the airspeed up to 59 kts .

Then pull the stick passing into the half-loop.

Pay attention that the airspeed must not exceed 116 kts. - if necessary extend the air brake in advance.

Recover the glider from diving into the normal flight.

- Half-loop-half-roll

At the initial airspeed of 108 kts perform the first half of looping in such a way that the airspeed in the inverted position would not drop below 59 kts .

In the inverted position push the stick forwards resolutely and then perform the second half of controlled roll /deflect the aileron, retain the glider above the horizon by means of rudder deflections in accord to the aileron/.