

PIK-20 D Flight manual

SERIAL NO: [REDACTED]

REGISTRATION: [REDACTED]

This sailplane must be operated in compliance with this manual

THIS MANUAL MUST BE KEPT IN THE SAILPLANE AT ALL TIMES

National Board of Aviation

Approved: Matti Puhola

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Edition 1



EIRIAVION OY

Kisällinkatu 8
SF-15170 Lahti 17

PIK-20 D Flight manual

LOG OF REVISIONS

Any revision of the present manual must be recorded in the following table. 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 No. and date will be shown on the bottom of the page.

Rev. No.	Revised Pages	Description of Revision	Date	Signed

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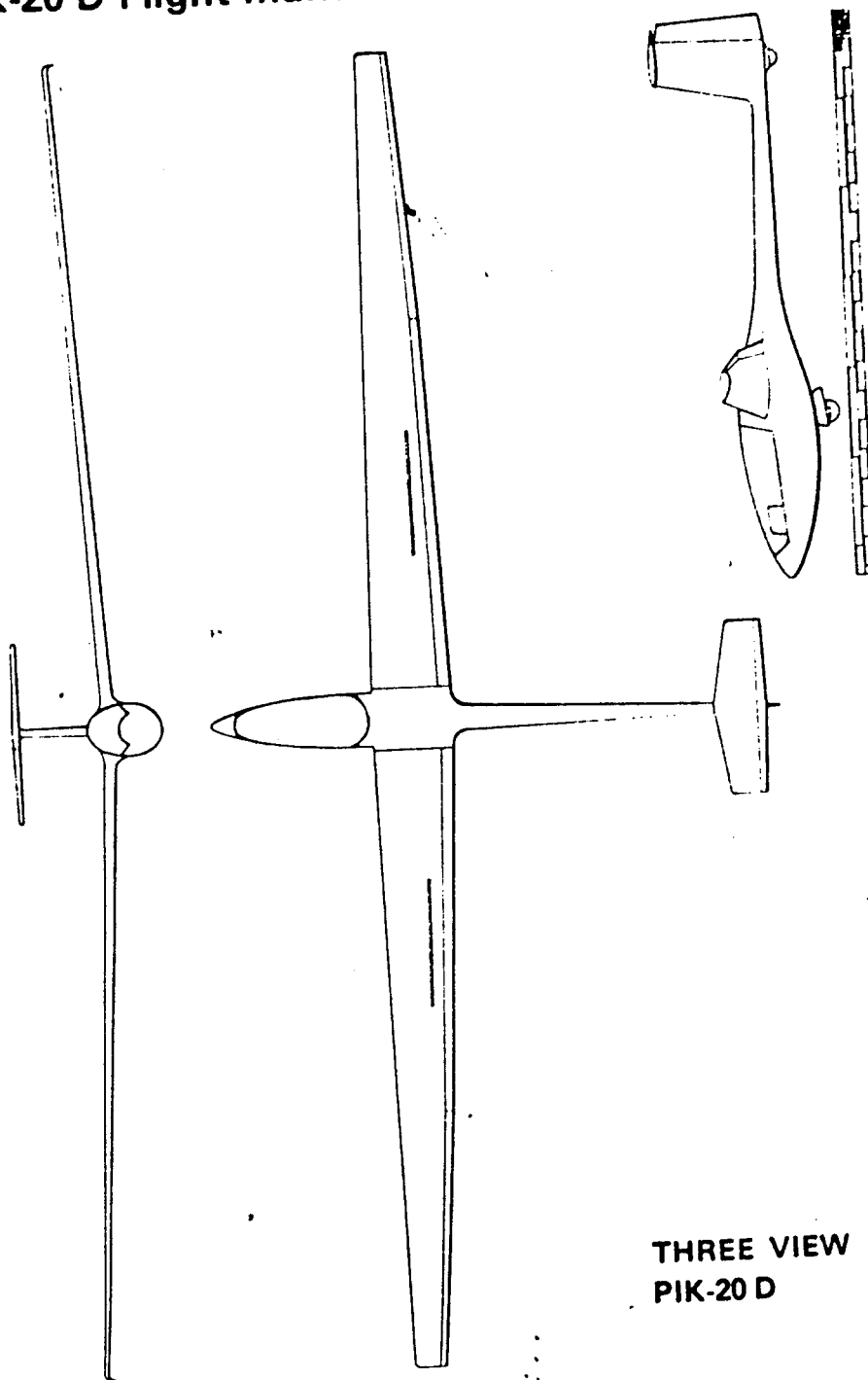
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THREE VIEW
PIK-20 D

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1. TECHNICAL DATA

1.1. Main technical data

— Span	15 m (49.2 ft)
— Length	6.43 m (21.10 ft)
— Height	1.34 m (4.40 ft)

1.2. Wing

— Wing area	10.0 m ² (107.5 sqft)
— Aspect ratio	22.5
— Dihedral angle	3°
— Sweep-back angle (quarterchord line)	0°
— Angle of incidence	1°
— Root chord	0.90 m (2.95 ft)
— Mean chord	0.65 m (2.13 ft)
— Tip chord	0.36 m (1.18 ft)
— Mean aerodynamic chord (MAC)	0.70 m (2.30 ft)
— Root profile	FX 67-K-170
— Tip profile	FX 67-K-150
— Flap area	2x0.80 m ²
— Flap movements	Up 12° ± 1° Down 16° ± 1°
— Aileron movements	Up 13° ± 2° Down 12,5° ± 2°
+ 16° flap	Up 12° ± 2° Down 11° ± 2°
0° flap	Up 11° ± 2° Down 9,5° ± 2°
— 12° flap	

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1.3. Horizontal stabilizer and elevator

— Area	1.00 m ² (10.76 sqft)
— Span	2.0 m (6.56 ft)
— Aspect ratio	4.0
— Angle of incidence	−2°
— Profile	FX 71-L-150/20
— Elevator movements	Up and down 20°±1°

1.4. Vertical stabilizer and rudder

— Area	1.02 m ² (10.98 sqft)
— Profile	FX 71-L-150/30
— Rudder movements	Right and left 33° ±2°

1.5. Fuselage

— Height	0.86 m (2.62 ft)
— Width	0.60 m (1.97 ft)
— Main wheel	5.00-5
— Tail wheel	200 x 50 mm (7.87 x 1.96 in)

1.6. Weights and loads

— Empty weight	approx. 225 kg (496 lbs)
— Gross weight	450 kg (992 lbs)
— Maximum water ballast	140 kg (309 lbs)
— Wing loading	30 . . 45 kg/m ² (6.14 . . . 9.21 lbs/sqft)

2. SAILPLANE DESCRIPTION

2.1. General description

The PIK-20 D is designed according to OSTIV — Airworthiness Requirements For Sailplanes 1971, single seat unlimited 15 m class Utility Category glider.

The whole sailplane is made of epoxy resin laminates. The shoulder configuration wing and the control surfaces are of rigid sandwich structure, PVC-foam between epoxy laminates. The wing spar caps are made of carbon fibre.

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The fuselage is made of epoxy laminates stiffened with eight ribs and by the cockpit with a double bottom and with two carbon fibre beams.

The retractable main landing wheel is equipped with a drum brake.

The tail wheel is located under the vertical stabilizer in an enclosed housing.

The whole trailing-edge flap (flaperon) is utilized as aileron and flap control. Aileron neutral position travels with flap setting up 12° to down 16°.

Flaps may be used for two purposes:

1. To improve performance while thermalling and gliding.
2. During landing as landing flaps.

The "T"-configuration tail unit has conventional elevator and rudder surfaces.

2.2. Flight control and flap system

The primary flight control surfaces (ailerons, elevator and rudder) are connected to a conventional control stick and rudder pedal arrangement.

The elevator trim is controlled by a green knob located on the left side console. It is connected to the elevator control system by a spring.

The trim is also connected to the flap deflection so that you have to trim the sailplane only once by your weight to fly with 0° flaps at 100 km/h. After that you trim the sailplane by moving the flap control arm, and you will then automatically have the optimum flap deflection for any speed. (see 7.2.1) The positive range is optimized for circling and the negative range for cruising. For landing, the sailplane has to be trimmed once again.

The black trailing-edge flaps control arm is located with the blue dive brake control to the left of pilot's seat. The markings for flap deflection are on the side panel. Full negative position is foremost.

The dive brakes are closed in the foremost position and fully open in the rearmost position.

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2.3. Landing gear system

The retractable main landing gear is operated by means of a lever located on the right side of the cockpit. It is lightened by a spring. In the forward position the main wheel is down — rear position the main wheel is up.

The wheel brake handle is attached to the control stick.

2.4. Other controls

The yellow tow coupling release knob is located uppermost on the left side auxiliary panel. The tow coupling hook is located below the fuselage in front of the landing gear.

The water ballast draining knob is located just under the release knob. The forward position is closed — the rear position open. The Air-conditioning knob is located under water ballast knob. The forward position is closed — the rear position open.

The canopy is hinged to the right side of the cockpit and can be opened by pulling the red knob on the left side of the cockpit. Jettisoning in an emergency occurs by pulling the above mentioned knob together with the red jettisoning knob on the right side of the cockpit and lifting the canopy.

The grey coloured pedal adjustment knob is located in front of the control stick on the right, below the instrument panel.

The seat back adjustment knob is on the right side of the cockpit. The neck rest can be adjusted by lifting the support rod and moving the neck rest to desired position.

5. Water ballast system

The four meter long, 70 litre nylon reinforced plastic bags are filled through the draining hole on the underside of the fuselage behind the geardoors with the special filling device. When filling, the draining valve must be opened and wings kept level.

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3. LIMITATIONS

3.1. Airspeed limits (I.A.S.)

Never exceed (V_{NE}) 292 km/h (181 mph, 158 kts)

Gusty conditions (V_G)

with full water ballast

or with 450 kg (990 lbs) weight 240 km/h (149 mph, 130 kts)

without water ballast 200 km/h (124 mph, 108 kts)

(airspeed limit changes linear

depending on the amount of water ballast

Maneuvering (V_A) 190 km/h (118 mph, 103 kts)

On aero tow (V_T) 190 km/h (118 mph, 103 kts)

On winch tow (V_W) 125 km/h (77 mph, 67 kts)

Flap speed (V_F)

(down deflected flaps) 150 km/h (93 mph, 81 kts)

All aerobatic maneuvers must be

accomplished with speeds less 190 km/h (118 mph, 103 kts)

than (see 5.7)

Flap deflections from neutral to 12° up allowed

3.2. Flight load factors

— Maximum positive + 5.3

— Maximum negative - 2.65

— Maximum positive with down deflected flaps + 4.0

3.3. Operating limits

— VFR day (See Service Manual, part 6 for equipment)

— Cloud flying, provided that the following instruments installed: Airspeed indicator, altimeter, compass, turn and slip indicator, variometer.

— Approved aerobatics:

Looping, stall turn, steep turn, lazy eight, chandelle and spin. Flap deflections from neutral to 12° up allowed.

— No snapped figures approved.

— Accelerometer mandatory for aerobatics.

— Aerobatic maneuvers with water ballast are prohibited.

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3.4. Weight and C.G. limits

- Empty Weight approx. 225 kg (496 lbs)
- Maximum gross weight 450 kg (990 lbs)
- Maximum water ballast 140 kg (309 lbs)
- Pilot and parachute 55 ... 110 kg (120 ... 240 lbs)
- Maximum balance weight in nose 10 kg (22 lbs)
- Maximum weight of nonlifting parts 220 kg (485 lbs)
(take off weight without wings)
- C.G. limits aft datum minimum 2.085 m (82.08 in.)
maximum 2.225 m (87.59 in.)
(20 ... 40 % MAC)

Datum: Vertical plane 1,90 m (= 74.80 in.) forward of wing leading edge at wing root rib.

Levelling means: Slope of rear top surface of fuselage 1000:28

- 3.5. Rated load in aero and winch tow 500 kg (1100 lbs)

4. MARKINGS

4.1. Placards

4.1.1. In full view of the pilot

Maximum airspeed

In calm weather (V_{NE}) 292 km/h 181 mph 158 kts

In turbulent weather (V_B)

with full waterballast

or with 450 kg (990 lbs) weight 240 km/h 149 mph 130 kts

without waterballast 200 km/h 124 mph 108 kts

Maneuvering (V_A)

190 km/h 118 mph 103 kts

On aero tow (V_T)

190 km/h 118 mph 103 kts

On winch tow (V_W)

125 km/h 77 mph 67 kts

Flap speed (V_F)

(down deflected flaps) 150 km/h 93 mph 81 kts

Weights

Maximum gross weight 450 kg (990 lbs) including water ballast.

If the pilot's weight with the parachute is below 75 kg (165 lbs)

ballast weights must be installed in the nose (see Flight Manual and Weight and Balance Data Sheet).

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Operating limitations

This sailplane must be operated in compliance with the operating limitations as stated in the form of markings, placards and in the PIK-20 D Flight Manual.

All aerobatic maneuvers including spins must be accomplished in accordance with the PIK-20 D Flight Manual.

4.1.2. In full view of the pilot

Preflight check

- Tail dolly removed
- Barograph (if installed) on
- Loading and ballast checked
- Parachute secured
- Seat and rudder pedals adjusted
- Safety belts secured
- Canopy locked
- Altimeter set
- Electrical instruments on
- Flaps in take-off position
- Airbrakes closed and locked
- Trim set for take-off
- Tow rope coupled on
- Controls free

Before landing

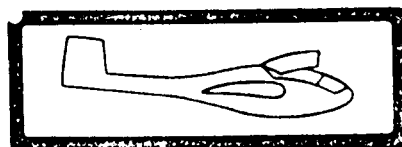
- Water ballast drained
- Landing gear down
- Flaps 12° . . . 16° down
- Trim set for landing

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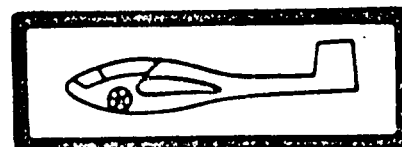
4.2. Symbols of the Controls



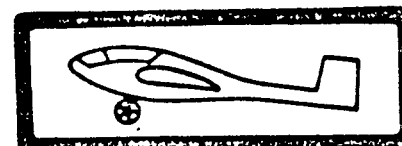
Tow release



Canopy Lock and Jettison Control



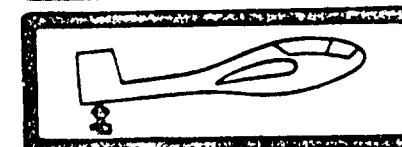
Landing Gear up



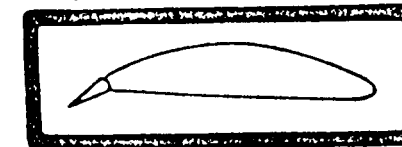
Landing Gear down



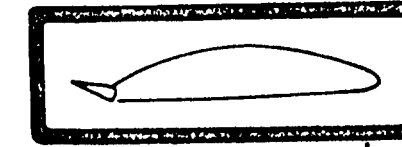
Trim control — Nose down



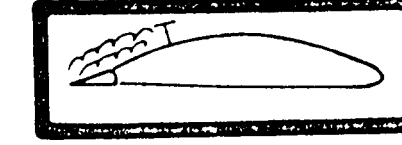
Trim control — Nose up



Flaps — down



Flaps — up

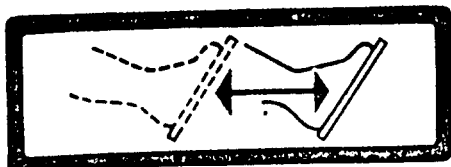


Airbrakes — open

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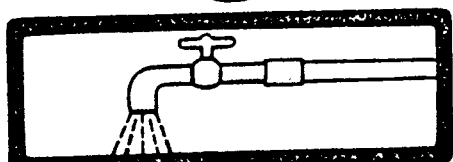
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Pedal adjustment



Cabin ventilation



Water ballast

4.3. Other markings

- Adjacent to tow coupling **RATED LOAD** 500 kg (1100 lbs)
- Above the main wheel 2.5 Aty (35 psi)
- Above the tail wheel 2.0 Aty (28 psi)
- Adjacent to static pressure entry on fuselage skin **STATIC PRESSURE KEEP CLEAR**
- Adjacent to oxygen control valve (if installed) **DURATION TABLE**
- On fuselage nose (inside) **BALLAST**

4.4. Flight Instrument Markings

4.4.1. Air Speed Indicator

- Maximum;
Red radial 292 km/h (181 mph, 158 kts)
- Caution range;
Yellow arc 200...292km/h (124...181 mph, 108...158 kts)
- Normal range;
Green arc 83...240km/h (52...149 mph, 45...130 kts)
- Operating range for down deflected flaps;
White arc 83...150km/h (52...93 mph, 45...81 kts)
(airspeed limit in turbulent weather changes linear 200 ... 240 km/h depending on the amount of water ballast see 3.1.)

4.4.2. Accelerometer

- Maximum positive; Red radial + 5.3
- Maximum negative; Red radial - 2.65

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5. NORMAL PROCEDURES

5.1. Preflight inspection

- Tail dolly removed
- Barograph on (if installed)
- Loading and ballast checked
- Parachute secured
- Seat and rudder pedals adjusted
- Safety belts secured
- Canopy locked
- Altimeter set
- Electrical instruments on
- Flaps in take-off position
- Airbrakes closed and locked
- Trim set for take-off
- Tow rope coupled on
- Controls free

5.2. Take-off on winch launch

- Trim 1/3 from the foremost position with mean C.G.
- Flaps 0° with 300 kg (661 lbs) 4° down with 450 kg (990 lbs) weight
- Recommended airspeed
110 ... 125 km/h (68 ... 77 mph, 59 ... 67 kts)
- Maximum airspeed 125 km/h (77 mph, 67 kts)
- During climb after 100 m (300 ft) altitude flaps-airbrakes can be taken 12° down with 300 kg (661 lbs) 16° down with 450 kg (990 lbs) weight

Note: If the flaps are deflected more than 4° down the sailplane takes off too rapidly and control becomes difficult.

5.3. Take-off on aerotow

- Trim 1/3 from the foremost position with mean C.G.
- Flaps neutral or 4° up
- Recommended airspeed
with 300 – 450 kg (661 – 990 lbs) weight
100 ... 120 km/h (62 ... 75 mph, 54 ... 65 kts)
- During the tow recommended flap deflection is down 4° – 8°
- Maximum deflection is 12° down
- Maximum airspeed 190 km/h (118 mph, 103 kts)

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5.4. Flight

- At a safe altitude retract landing gear
- At weight 300 ... 450 kg (661 lbs ... 990 lbs)
- Best L/D ratio at 95 ... 117 km/h (59 ... 73 mph, 51 ... 63 kts)
40.5 ... 42.0
- Min. sink rate at 73 ... 86 km/h (46 ... 53 mph, 39 ... 46 kts)
0.56 ... 0.66 m/s (110 ... 130 t/min)

Stall speed flaps

- down 16° 60 ... 74 km/h (38 ... 46 mph, 33 ... 40 kts)
- down 16° and airbrakes fully open
69 ... 84 km/h (43 ... 52 mph, 37 ... 45 kts)
- In stall the nose drops smoothly without natural warning:
inadvertent spins don't occur. (the loss of altitude is less
than 30 m (100 ft))

Note: At speeds over 190 km/h (118 mph, 103 kts) full control movements are not acceptable. As the speed is increased to V_{NE} from V_A the control movement shall be decreased to 1/3 of maximum movement. The elevator control force is low and that is why it must be used carefully to avoid excessive g-loads.

5.5. Landing

- Water ballast drained
 - Landing gear extended
 - Approach speed about 90 km/h (56 mph, 49 kts)
 - Flaps down 12° ... 16°
 - Trim 1/3 from the foremost position
 - Airbrakes as desired
 - On the ground wheel brake as desired.
- Approach speed with full water ballast approx. 110 km/h (68 mph, 59 kts).

To avoid damaging the undercarriage doors with outlandings in soft ground or long grass, you may keep the landing gear up. If the ground roll is going to be too long it is preferable to push the nose down in order to shorten the ground roll. This can be done because of the strong construction of the fuselage.

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5.6. Cloud flying

- IFR instruments on and monitored
- Air speed within green range
- At air speed exceeding 200 km/h (124 mph, 108 kts) extend the dive brakes
- Observe icing

5.7. Aerobatics

The following aerobatic maneuvers are approved with entry speeds listed below:

Maneuver:	Recommended entry speed		
Steep turn	120 km/h	(75 mph	65 kts)
Looping	185 km/h	(115 mph	100 kts)
Stall turn	170 km/h	(106 mph	92 kts)
Lazy eight	170 km/h	(106 mph	92 kts)
Chandelle	185 km/h	(115 mph	100 kts)
Spin	Use slow deceleration		
Stall (except Whip Stalls)	Use slow deceleration		

Note: Max. entry speed for steep turn, looping, stall turn, lazy eight and chandelle is 190 km/h (118 mph, 103 kts.)

During aerobatic maneuvers monitor accelerometer.

The spin is possible at all C. of G. positions: however in the forward C. of G. position, the sailplane enters a spin with great difficulty. The start of the spin is conventional for sailplanes: Pull control stick fully back and at the same time apply rudder control to the desired direction, then apply full aileron to the same direction. Without aileron control the spin stops after one or two turns. The spin stops by neutralizing the controls. The spin recovers rapidly by applying full rudder opposite to the direction of rotation. Do not push the control stick forward of the neutral position so as to avoid an extreme speed increase. (the loss of altitude is less than 100 m (330 ft))

Note:

Drain the water ballast before aerobatic maneuvers.

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6. WEIGHT AND BALANCE

Before every flight check that the sailplane is loaded according to the weight and C. of G. limitations. Especially take into account proper weights of pilot, varying equipment, water ballast and nose ballast. Check that the water quantity in both wings is equal.

The following information will enable you to fly your PIK-20 D within the prescribed weight and center of gravity limitations. To calculate the weight and balance for your PIK-20 D, use the Sample Problem, Loading Graph and Center of Gravity Moment Envelope as follows:

Take the licensed Empty Weight and Moment from the Weight and Balance Data Sheet (Supplement), and write them down in the proper columns. Add all additional weights and their corresponding moments (using the Loading Graph) of items to be carried on the flight. Plot the total weight and moment on the Center of Gravity Moment Envelope and if the intersection point is within the envelope, the loading is acceptable. If necessary use ballast in the nose (Usually if the pilot's weight, with the parachute is below 75 kg (165 lbs) ballast weights must be installed). See chapter 3.4.

On the page I — 16 there is a graph giving minimum pilot weights depending on the sailplanes weight and moment with all equipment without the pilot and water ballast.

Note:

Emptying the water ballast moves the C. of G. backward. Loading with the water ballast has to be such, that the C. of G. is within the limits, even after the water ballast has been drained.

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SAMPLE LOADING PROBLEM	SAMPLE SAILPLANE		YOUR SAILPLANE	
	Weight (kg)	Moment (kgm)	Weight (kg)	Moment (kgm)
1. Licensed Empty Weight x)	225	558.0	225	600
2. Pilot and parachute	85	125.8	100	140
3. Water ballast	90	191.7		
4. Ballast in the nose				
5. Equipment xx)				
TOTAL WEIGHT AND MOMENT	400	875.5	325	780

In this sample case the point (400 kg at 875.5 kgm) falls within the Center of Gravity Envelope and the loading is acceptable.

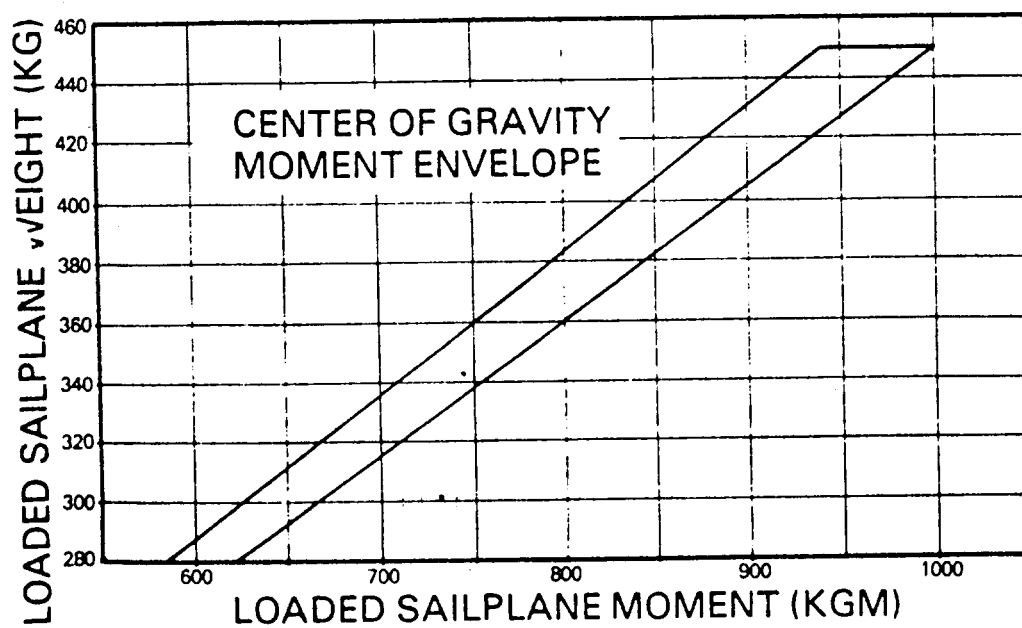
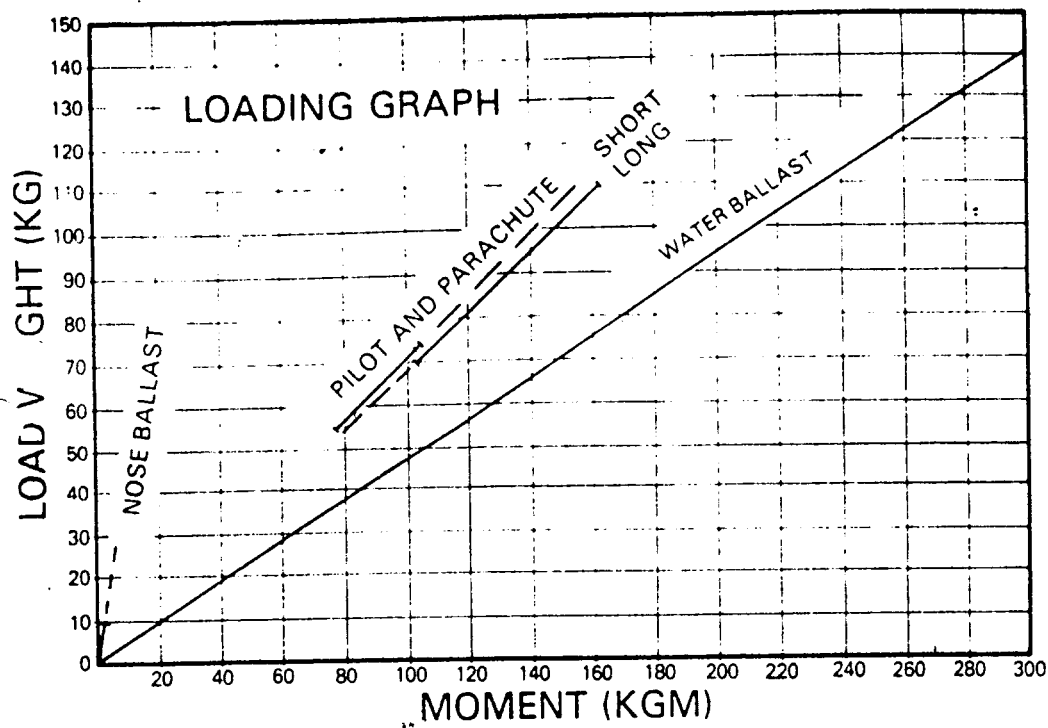
x) See the Weight and Balance Data Sheet

xx) See the weights, arms and moments of the removable equipments at the end of the Service Manual.

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MINIMUM PILOT WEIGHT

The minimum allowable pilot's weight varies depending on the sailplane's equipment and the nose ballast.

The weight graph shows at which weight the plane is flying at the rearmost C. of G. position.

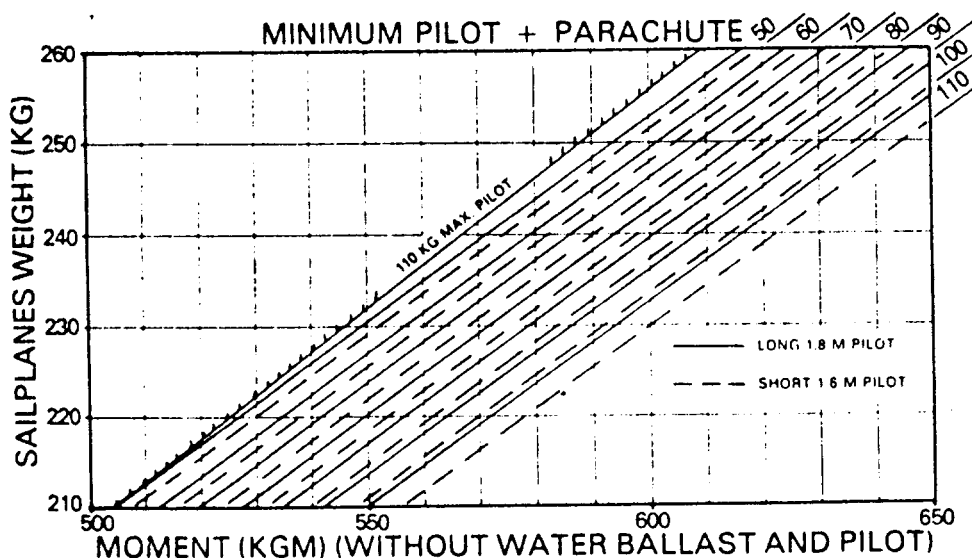
The sailplane's weight and the moment must be known without the water ballast and the pilot with all equipment (See I-14). The C. of G. position must be within the limits without the water ballast.

The C. of G. position of the pilot can vary from 1.40 m to 1.50 m depending on the pilot's size.

The graph is based on 1.42 m and 1.48 m C. of G. positions.

When the equipment or the nose ballast has been changed, you must plot the point and the date next to it on the graph. Then the minimum pilot weight is easily checked from the graph as a part of the preflight check.

In the same graph there is also a limit line for the foremost C. of G. with 110 kg pilot weight.



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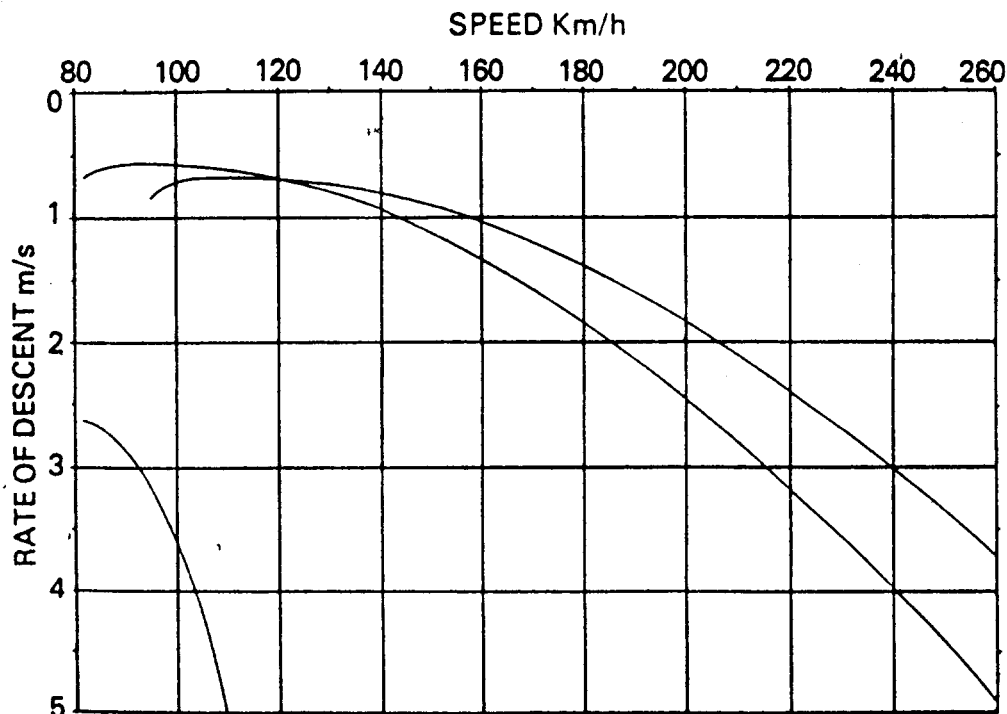
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7. PERFORMANCE

7.1. Performance at sea level

	Weight 300 kg (661 lbs)	Weight 450 kg (990 lbs)
– Stall speed (flaps down 16°)	60 km/h (38 mph, 33 kts)	74 km/h (46 mph, 40 kts)
– Stall speed with 16° down flaps, landing gear down and airbrakes fully open (landing configuration)	69 km/h (43 mph, 37 kts)	84 km/h (52 mph, 45 kts)
– minimum rate of descent.		
	0.56 m/s (110 fpm)	0.66 m/s (130 fpm)
at speed	73 km/h (45 mph, 40 kts)	86 km/h (53 mph, 46 kts)
– Maximum gliding ratio at speed	40.5	42.0
	95 km/h (59 mph, 51 kts)	117 km/h (73 mph, 63 kts)



PERFORMANCE AT SEA LEVEL

W = 300 kg and W = 450 kg (661 lbs and 990 lbs)

Landing polar curve W = 300 kg

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7.2. Flap operation table

7.2.1. Optimum flap deflections when gliding.

7.2.2. Recommended flap deflections in circling flight

- Light plane wide thermal 4° down
- Light plane narrow thermal 8° down
- Heavy plane wide thermal 8° down
- Heavy plane narrow thermal 12° down

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8. SPECIAL FLIGHT CONDITIONS AND EMERGENCY PROCEDURES

8.1. Flying in the rain and icing conditions

Raindrops, ice or frost on the sailplane's surfaces will considerably reduce its performance: The stall speed increases 10 to 20 percent and also the rate of descent is greater than normal. This must be taken into consideration in particular during approach and landing.

The gliding performance of the sailplane in the rain is improved if there is no wax on the wing surface.

Watch the water ballast for icing.

8.2. Flying at high altitude

If you fly above 3500 m (11000 ft) altitude use oxygen.

Note: The water ballast freezes rather quickly if the temperature is below zero. Frozen ballast will cause serious damage to the wings.

8.3. Landing on uneven or soft ground

Landing on uneven or soft ground may be done with the landing gear extended or retracted depending on the circumstances. Usually the sailplane is not damaged by landing on grass with the landing gear retracted.

8.4. Jettisoning of the canopy

To jettison the canopy pull the red locking control and the red knob on the right hand side of the cockpit and lift the canopy.

II SERVICE MANUAL

1. ASSEMBLY AND DISASSEMBLY

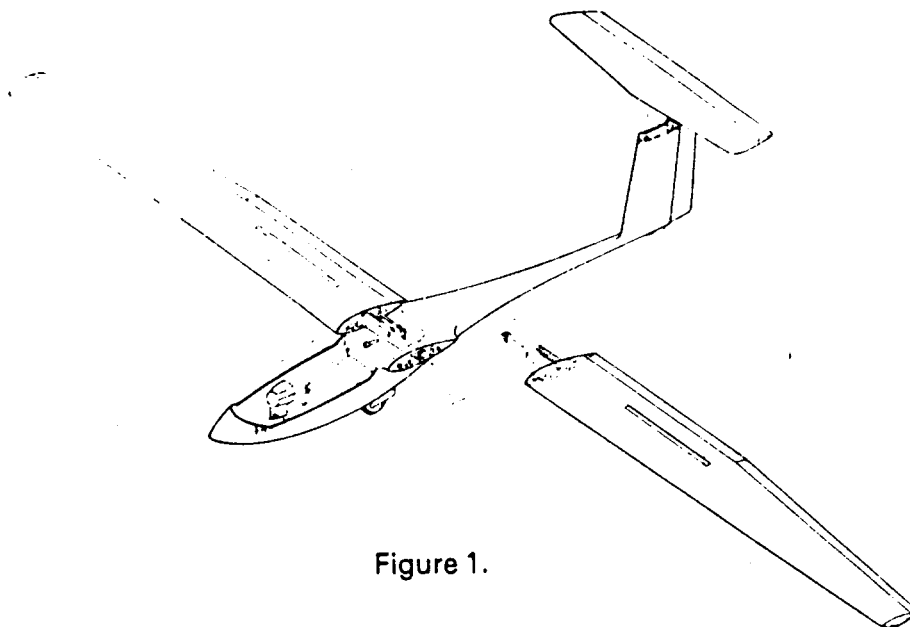


Figure 1.

1.1. Preparation

Three or even two persons can easily assemble and disassemble the PIK-20 D. Before assembly remove the canopy and prepare the wing assembly tool, clean clothes, grease of mineral or synthetic basis. Clean and grease all fitting surfaces, bolts, pins and control system connections.

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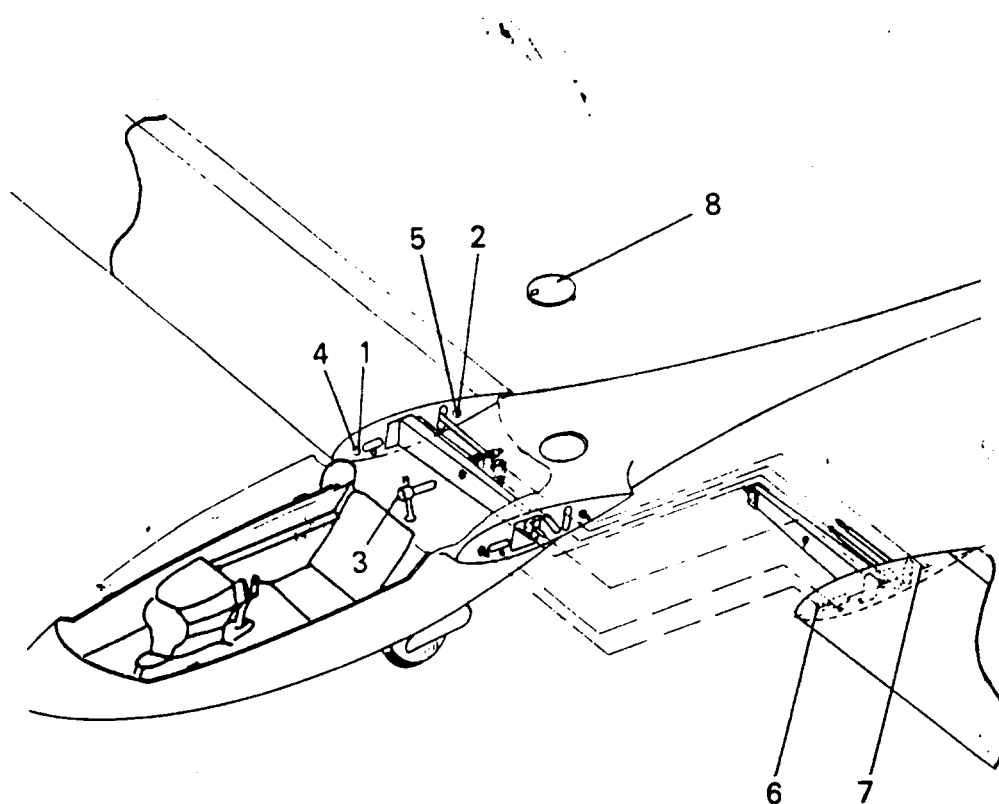


Figure 2

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1.2. Wing assembly (Figure 2)

- Insert the right-hand wing ensuring that the wing bevel pins (1) and (2) are in the seats (4) and (5) in the fuselage.
- Insert the left-hand wing in the same way and watch that the bevel pins (6) and (7) go correctly into their seats. Draw the wings together with the wing assembly tool and install the main wing pin and secure it using a Fokker-pin. It is necessary to lift the wing tips when using the assembly tool.
- Connect the flap and airbrake control rods with quick release locks and secure them with Fokker pins. Close the inspection opening (8) on the top of the fuselage.
- Connect the water ballast hoses to the fuselage.
- Install the venturi tube.

1.3. Tailplane assembly (Figure 3)

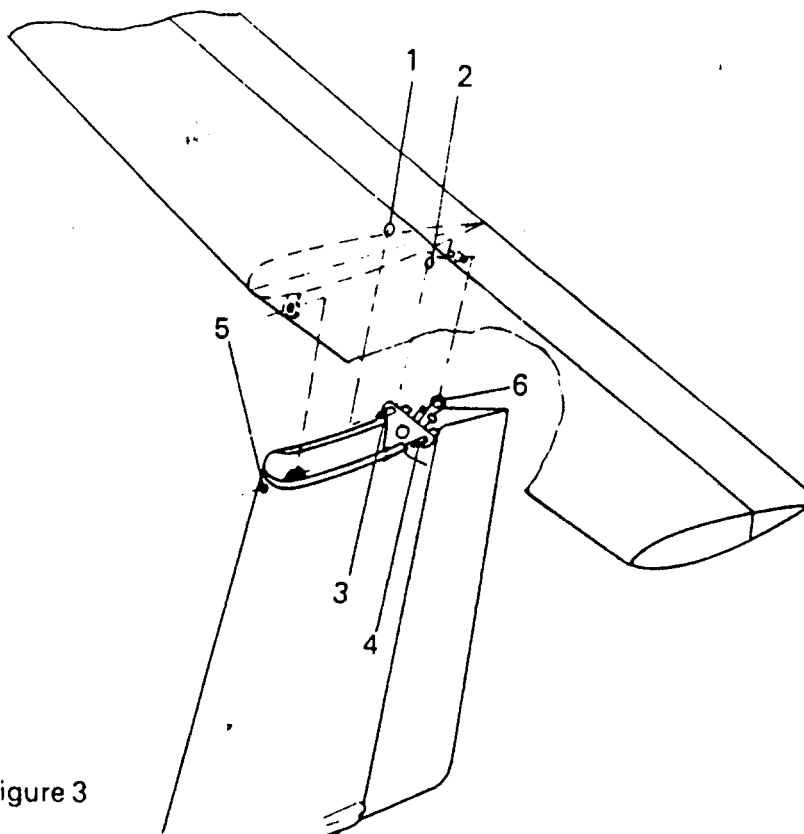


Figure 3

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- Insert the horizontal stabilizer by moving the trim and flap lever to the foremost position and by lifting the leading edge up a little and by pushing the ball bearings (1) and (2) on to the pins (3) and (4) on the vertical stabilizer.
- Pull out the locking pin (5) with a tool (Fokker-pin of the wing bolt) and push the leading edge into place. Remove the tool and push the locking pin in. Ensure that the safety spring is engaged and secure the pin using a Fokker-pin.
- Deflect the elevator upwards and connect the elevator control rod (6) and secure it using a Fokker-pin.

1.4. Disassembly

- The wings and horizontal stabilizer are removed in the reverse sequence to assembly.
- Put the Fokker-pins back in their places.

1.5. Waterballast filling

- The waterballast filling has been described in Flight manual in the paragraph "Sailplane description". For the right loading of the sailplane the weight of the water ballast must be known. The amount of water in the tanks has to be equal.

2. PREFLIGHT CHECK

After the sailplane has been rigged, and before the first flight of the day carry out the following checks:

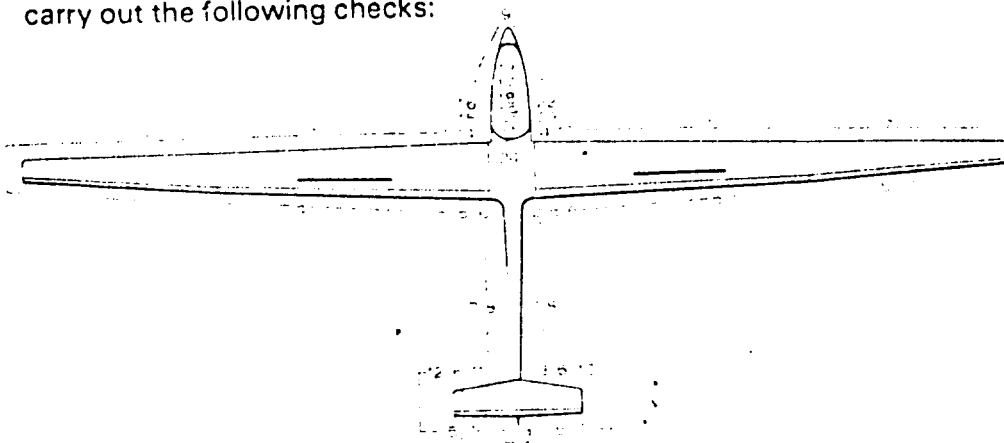


Figure 4

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1. Main wing pin secured.
2. Quick release locks connecting flaps and airbrakes secured.
3. Horizontal stabilizer attachment pins correct and locking pin all the way in and secured. Quick release for elevator control rod secured.
4. Tow coupling clean and functioning properly.
5. Flaps, ailerons, airbrakes, elevator and rudder correct, free and full travel and without slackness.
6. Tapes over wing roots and horizontal stabilizer for adherence (if fixed).
7. Wings, fuselage and empennage for damages to the skin, dents or cracks.
8. Static pressure vents free.
9. Pitot tube free.
10. Tyre pressures correct.
11. Tail dolly removed.
12. Venturi tube correctly installed.
13. Ballast properly fastened.
14. Canopy clean and locking mechanism for condition.
15. Water ballast system for condition and proper functioning.
16. No foreign or loose particles in the cockpit.
17. Control stick and pedals free and full travel.
18. Flaps full travel.
19. Airbrakes full travel and locked.
20. Trim for condition.
21. Safety belts for condition.
22. Instruments for condition and correct indication.
23. Wheel brake for condition.
24. Documents in the sailplane.

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3. TRANSPORTATION OF SAILPLANE AND HANDLING ON GROUND

3.1. Transportation

For transportation, the use of the special PIK-20 trailer is recommended. If the sailplane is being transported in another vehicle, the following should be checked:

- Depending on the transportation van, the sailplane may be fixed and supported by the following elements: Wing spar root shanks; bushings of the fuselage for the wing attachment, bevel pins for the horizontal stabilizer attachment; Undercarriage wheel (take care of the gear doors) and the tail wheel. Besides this the wing, fuselage and horizontal stabilizer may be placed in appropriate holding clamps.
- It is advisable to use nylon sleeves when using wing fitting points or horizontal stabilizer fitting points for the fuselage support.
- Fix all control surfaces using gust locks.
- Lock the air brake and flaps rods using cords or rubber bands.
- Take care of that no shifting jamming or deformation can arise and avoid entry of dirt and water into the sailplane.
- On an open trailer, protect the canopy, the area of the horizontal stabilizer attachment and the wing roots and cover the pitot tube, static pressure vents and the venturi-tube hole.
- Ensure that all components cannot move during transportation.

3.2. Handling on ground

To make the handling on ground easier, attach the tail dolly. It saves the sailplane from damage on rough airfields. The sailplane must not be pushed from the trailing edge because of the flaps, and so it is easier to move it backwards. The easiest way to move the sailplane is to pull it from the tow coupling. If the sailplane is pulled by car the speed must not be higher than normal walking speed.

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4. CARE AND MAINTENANCE

The PIK-20 fiberglass sailplane requires minimal maintenance.

4.1. General care

The outside of the sailplane can be kept bright and smooth simply by washing with water and mild soap. Avoid abrasive or harsh detergents. Rinse with clean water and dry with terry-cloth towels or a chamois. If you choose to wax your sailplane, use a good automotive-type wax, however, not one containing silicone.

When gliding in rain the performance of the sailplane is better if wax is removed. The wax can be removed with wax-remover (car motor detergent) or by sanding paper number 600, until the glossy finish of the wings is removed.

The canopy surface may be cleaned according to the following instructions:

1. Use plenty of water to rinse the canopy surface.
2. Wash the acrylic sheet with dish washing detergent or mild soap-water. Use a sponge in spreading the soap-water. Don't rub because dirt scratches the acrylic sheet.
3. Grease and oil spots can be removed with kerosene and a soft cloth.
4. Never clean with a dry cloth.

Note: Never use gasoline, benzine, alcohol, acetone, carbon tetrachloride, lacquer thinner or glass cleaner to clean plexiglass.

In the hot sunshine it is recommended that the sailplane is protected with a light coloured covering.

Prior to hangaring, the water drain holes, shown in Figure 5 should be inspected for free outlets and cleaned if necessary.

4.2. Before assembly

Clean and grease points marked "X" in Figure 6.

4.3. Every week

Clean cabin and wheel box e.g. with vacuum cleaner.

4.4. Every month

Check the water ballast system for leaks.

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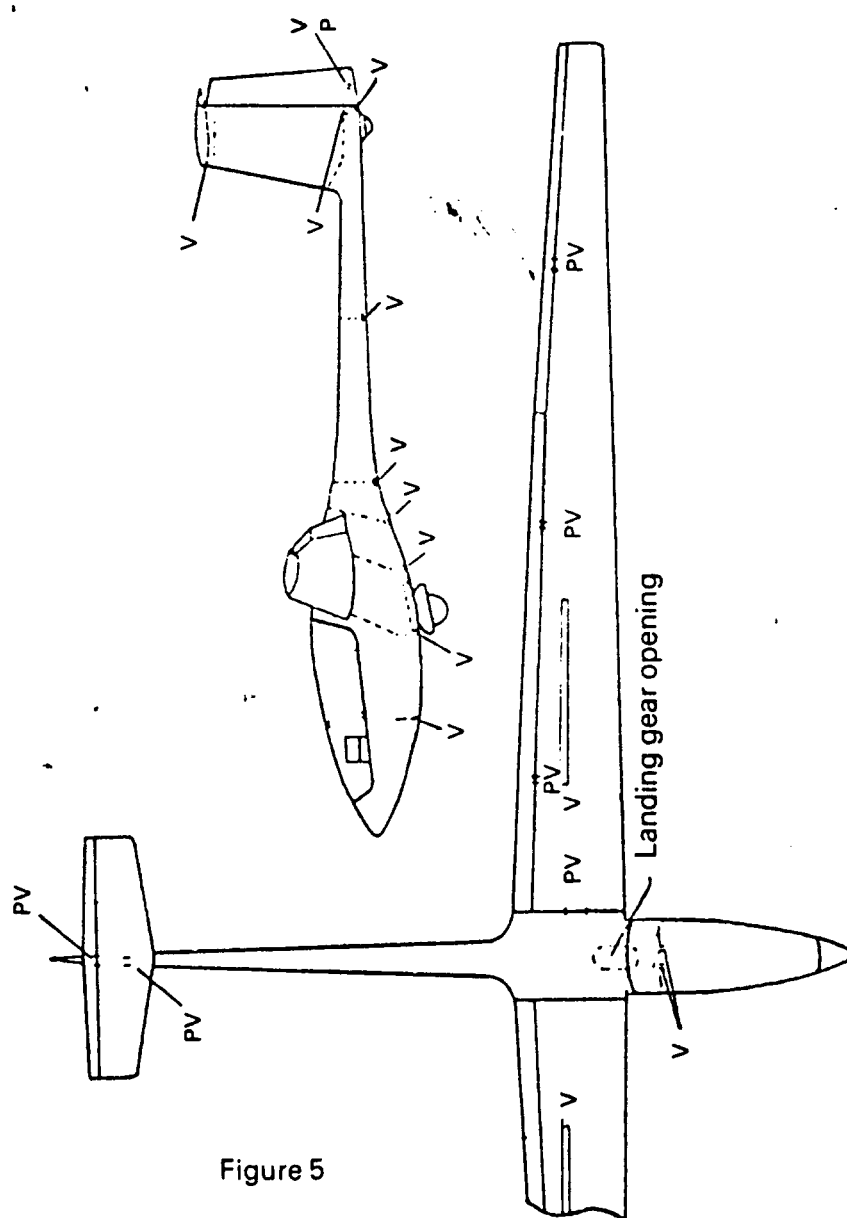


Figure 5

Water drain (v) and pressure relief (p) holes

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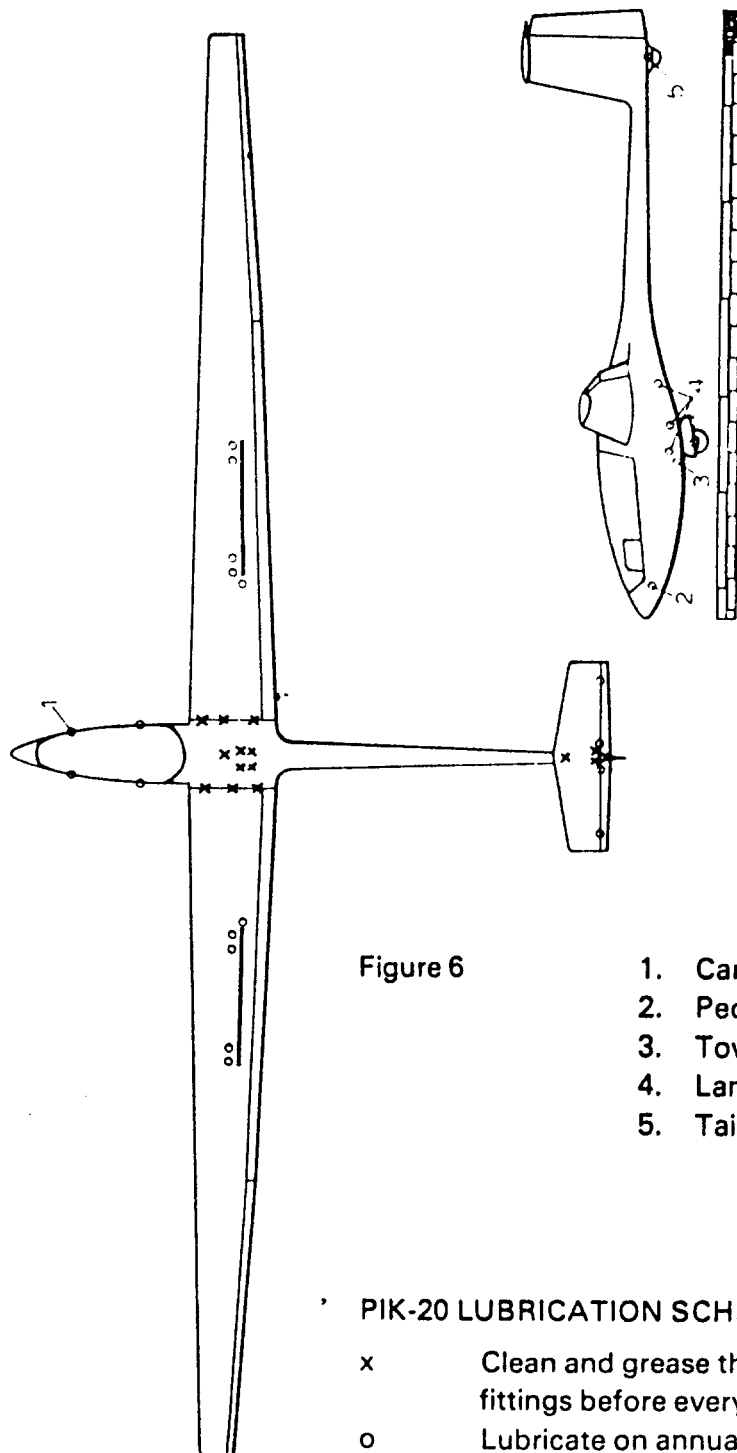


Figure 6

1. Canopy hinges
2. Pedals
3. Tow coupling
4. Landing gear
5. Tail wheel

PIK-20 LUBRICATION SCHEME

- x Clean and grease these fittings before every assembly
- o Lubricate on annual inspection

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4.5. Annual inspection

- Inspect all hinges, bearings and rod ends for slackness (less than 0,1 mm)
- Lubricate "0" marked points with molybdenum sulphite containing grease using a greasing press. Use an extension if needed. All the rod ends and the main part of bearing bushings are lined with PTFE and are service free. Other lubrication than lithium base grease is forbidden in PTFE lined bearings.
- Inspect the ends of the rudder cables and especially the section going through the S-tube (change after 1000 flight hours).
- Inspect the Bowden control cables of the tow release and wheel brake and the push-pull cables of the pedal adjustment, cabin ventilation and the water ballast valve.
- Inspect and lubricate the tow release coupling. Change after 2000 starts or 3 years.
- Inspect the wing attachment points and tightness of attachment (slackness less than 0,1 mm)
- Inspect the horizontal stabilizer attachment points.
- Inspect and clean the pitot-static system.
- Inspect other instrumentation tubing for leaks.
- Check the control surface deflections (see Flight Manual 1.2)
- Inspect the water tanks and ballast system for leaks.
- When the sailplane is assembled check the locking of the airbrakes one at a time (release the other airbrake operating rod). The force on the handle has to be reasonable (about 10 lbs).
- The locking position can be adjusted from the short control rod in the brake box by unscrewing the lock nuts and by screwing the rod 20 — 30° at a time (both ends are right handed). The small inspection hole is for to have enough thread in the push rod.
- Check the free play of the moving control surfaces to be less than the following:
 - 1 Elevator a) stick locked ± 3 mm
b) the push rod in the fin locked ± 1 mm
 - 2 Flaps stick and flap lever locked:
 ± 5.0 mm from flap to flap
 ± 2.5 mm from aileron to flap
 ± 2.5 mm moving together both flaps up and down

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4.6. After gear-up landing

If you make a gear-up landing check the skin and ribs of front fuselage and clean and check the tow coupling.

Note: If the sailplane is damaged, the structural repair schemes are given in the PIK-20 D Repair Manual.

5. WEIGHING PROCEDURE

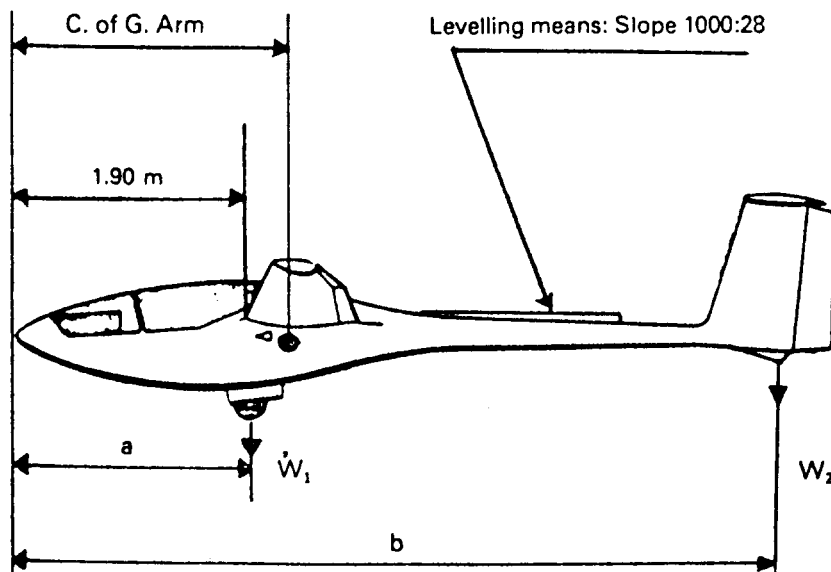
5.1. Preparation

- Ensure that all items marked in the sailplane equipment list are installed in their proper location in the sailplane.
- Remove dirt, moisture, foreign items such as rags and tools from the sailplane before weighing.
- Weigh the sailplane inside a closed building to prevent errors in scale readings due to wind.

5.2. Weighing

- Level sailplane (see diagram). Levelling means: Slope of top surface of rear fuselage between stations 3.5 m and 4.5 m 1000 to 28 tail down.

Datum: Vertical plane 1.90 m (74.80 in.) in front of leading edge of wing root rib.



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- With the airplane level, record the weight shown on each scale.
Deduct the tare, if any, from each reading.

Scale Position on Symbol	Scale Reading (kg)	Tare (kg)	Net Weight (kg)
Main wheel (W_1)			
Tail wheel (W_2)			

Empty weight and moment	Net Weight (kg)	Arm (m)	Moment (kgm)
W_1	2000	$a = 2.02$	4040
W_2	200	$b = 5.82$	1164
Licensed Empty Weight	2000	C. of G.	601

$$C. of G. = \frac{W_1 a + W_2 b}{W_1 + W_2}$$

NOTE:

Emptying the water ballast moves the C. of G. backward.

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6. EQUIPMENT

The following list shows equipment items which may be installed in the PIK-20 D. Items marked "X" are included in the Empty Weight recorded in Weight and Balance Data Sheet.

Item	Part	Weight (kg)	Arm (m)	Moment (kgm)
	<u>I Minimum Equipment</u> (Standard USA)			
	Airspeed indicator Model:			
	Altimeter Model:			
	Compass Model:			
X	Safety belts Model: <i>AUTOLIV</i>			
	Seat cushion Model:			
X	Tow coupling Model: <i>TOST</i>			
	Slip indicator Model: (not std. USA)			
	<u>II Cloud Flying</u> <u>Equipment</u>			
	Variometer Model:			
	Compensating bottle			
	Clock Model:			

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Item	Part	Weight (kg)	Arm (m)	Moment (kgm)
	Turn and slip indicator Model:			
	<u>III Optional Equipment</u>			
	Variometer Model:			
	Compensating bottle Variometer Model:			
	Compensating bottle Artificial horizon Model:			
	Aux. unit for Art.h Accelerometer Model:			
	Radio: Model:			
	Battery: Model:			
	Oxygen Equipment Model:			
	Oxygen bottle Model:			
x	Water ballast tanks Model: PIK-20			
	Water Ballast system Model:			

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PIK-20 D Repair manual

1. FOREWORD

The intention of this repair manual is to give the basic advice needed for repairing small structural damage to the PIK-20 D sailplane made of glass- and carbon fibre reinforced plastic (GRP and CFRP). Basic information about GRP and CFRP is not given in this manual because the repair worker is assumed to have professional knowledge of repairing items of GRP and CFRP. The repairing of sailplanes is not a proper field for practising GRP and CFRP laminating.

Before starting the work, study carefully what kinds of material, supplies, tools and work methods are required. You will find the answers in this manual. To maintain the excellent performance figures of the sailplane the surface quality should be equal to the original one.

If there are doubts about repairing structural damage always contact the manufacturer to find out what can and what cannot be done.

The information given in this booklet applies to minor repairs, such as a hole in the bottom of the fuselage caused by a gear-up landing, a handling accident in hangar etc.

Major repairs must not be accomplished before contacting the manufacturer or their representative. Typical repairs that must be considered major are:

1. Damage to the wing spar
2. Damage to the wing root rib
3. Damage to the fuselage main bulkheads
4. A hole in the wing trailing edge that damages the rear spar of the wing
5. Damage to the vertical stabilizer/fuselage fitting and bulkhead
6. Damage to the horizontal stabilizer fitting
7. Damage to the control surfaces that includes holes, cracks or other damage that reach 20% of the chord into the structure
8. Holes, cracks or other damage in the wing that are larger than 15 cm (6 in) in diameter or 25 cm (10 in) in length

Additional information about repairing of laminates is given in FAA Advisory Circular AC 43.13 1A.

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2. REPAIRING IN GENERAL

During rough landings, ground loops or when exceeding the permitted load factors during flight the largest calculated state of load might be exceeded. Damage arising in this way can be difficult to observe but it can cause the structure to become weaker so that the sailplane is strong enough, in normal circumstances, but not in situations with increased load. After these cases the sailplanes must be properly examined because the lamination may be broken. In disintegration of GFRP laminates, part of the fibres break and one part becomes loose from the plastic bond. The lamination becomes partly or completely white and opaque depending on how large the damage is. The structure must be repaired because of its incapacity for load in all situations. Repair the damaged section by laminating the necessary cloths on top of the structure or remove the damaged place and relaminate the whole area.

These kinds of breaks are also sensitive to humidity because water can permeate into the lamination along the fibres and the bond between plastic and the fibre becomes weaker, therefore making the lamination also weaker.

NOTE

After a rough landing or ground loop the area surrounding the main wing pin, landing gear and its fittings, elevator fittings and the bonding lines of the ribs in the fuselage and in the root of the fin must be thoroughly examined for possible damage.

When starting the repair the quality of cloth used, the amount and the direction of fibres must all be known. To find this out sand the lamination with sandpaper or burn some plastic from a little piece which has been removed. In this way you can see the cloth directions clearly.

It is important to remember from which place and direction the piece of lamination has been removed. Paragraph 7 in this manual treats the structures used in most important surfaces and also the quality of cloth, amount and direction of laying.

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Let us remind that in repairing the laminated structure it is a question of bonding the patch on the structure with the resin, thus the repaired section is not equal to the original one. If the bevels and relaminations are broad enough, the new joint is also firm enough to carry the same stresses as the original structure.

TOOLS

- Accurate scales for preparing the right mixture of resin
- Jars and sticks for mixing
- Brushes for spreading of resin
- Mohair roller for spreading of resin on large area
- Iron roller for damping fibres and eliminating air bubbles
- Scissors for cutting glass fibre cloth
- Tape
- Plastic film for high temperature tent
- Hot air blower (hair drier)
- Sandpapers of different degree of fineness
- Knife
- Hack-saw blades for cutting of reinforced plastic
- Protective gloves

3. REPAIRING OF REINFORCED PLASTIC LAMINATES

Cases of damage that can be self-repaired are usually one of the following three:

Broken monocoque structure

Broken surface of sandwich plate

Hole in sandwich plate

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3.1 BROKEN MONOCOQUE STRUCTURE

(Fuselage)

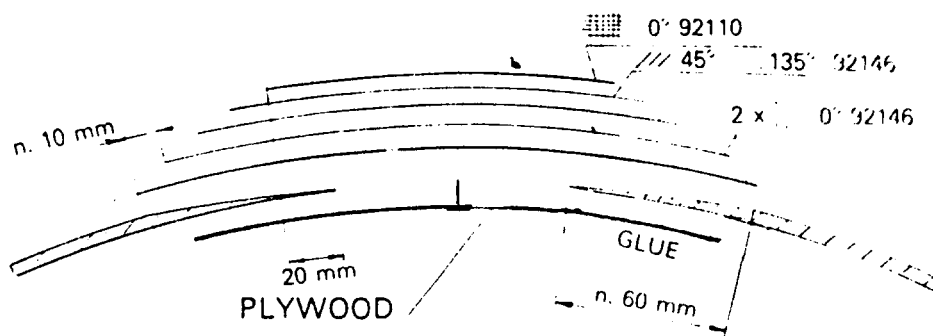


Figure 1

Firstly determine how large the damage is by carefully sanding the surface paint to where the lamination seems to be unbroken. No whitening or capillary chinks allowed. Then remove the broken area and bevel the edges approximately 60 mm. It is a good practice to roughen the area outside the bevel about 30 mm wide so that the cloths outside the bevel bond as well.

In general the area under repair must be kept clean from dirt (dust, humidity, grease) already before the first opening is made. Be sure that the area is kept clean between laminations.

Hands and tools must also be kept clean. Brushes must be washed with grease soluting solvent (acetone, trichlorethylene) and be dried before lamination. Protective gloves are recommended.

The principle of bevelling is that the smallest (uppermost) cloth is 20 mm larger than the hole and the next cloth is always 10 mm larger than the upper one. In this case the bevel to be made is 60 mm.

The order of lamination is the same as in the original structure, however, the undermost cloth is largest (at least the same size as the bevelled area).

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The quality and direction of the cloths must always be the same as in the original lamination. Use an iron roller to eliminate air bubbles: in this way the cloths also become better wetted. During this period use some film (celiophane, or usual plastic film) to cover the area you are patching, and remove the air under the film using a trowel. This way you will get a smoother surface and there is less finishing to do. Remove the film when the resin has hardened. If the hole is big the area should be propped in some way in order to obtain good results when laminating. This can be done for instance by fastening a thin sheet of plywood with glue on the inner side. (See Figure 1). The sheet of plywood can be left there because being glued it will not come loose from the lamination.

If you cannot reach the hole from the inner side, make an oval hole and have a prop which can be layed on place through the oval hole. Before placing the prop set a fastening pin or iron wire (See Figure 1) so that the prop can be held in place during lamination.

3.2 BROKEN OUTER SURFACE OF SANDWICH PLATE

(Wing and control surfaces.)

In principle this is done just as in the previous case above. The width of the patched area is defined by the outer surface and the broken PVC-foam area. Remove the broken (= softened) PVC-foam and fill the hole with a mixture of microballoon and resin which in the following is called "balloon". The viscosity of the balloon has to be thick enough to stay on a stick without dropping. After the resin has hardened the area should be ground smooth and cleaned from dust. After this the surface laminate will be repaired as in the previous section "Broken monocoque structure".

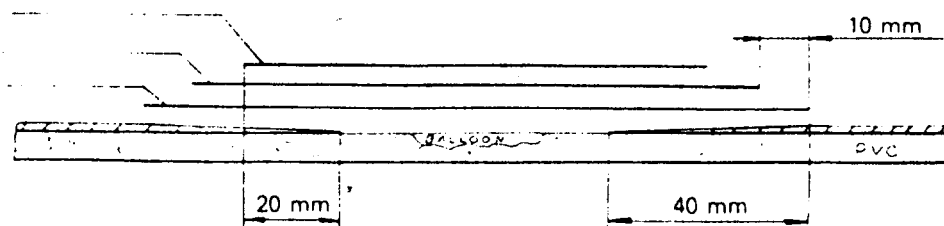


Figure 2

(cloth ref. see pages 13 — 16)

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3.3 HOLE IN SANDWICH PLATE

(Wing and control surfaces.)

First make the hole larger so that the edges are solid. Remove enough PVC-foam so that a strip approximately 20 mm wide is left around the hole. (See Figure 3). Roughen the strip. After this the manner of proceeding is the same as in paragraph "Broken monocoque structure". A thin sheet of plywood can be used for support. After this you can laminate (45° 92125) on the support and on the inner solid cloth. Let it harden. Thicker glass weave (92125) is used as inner cloth instead of the original one (92110 or 90070) so that laminating is easier. Glue a same size PVC-foam piece (Lynicell, 60 kg/m³) in the hole with balloon. Put carefully a load on the piece of foam to make it bond better in lamination.

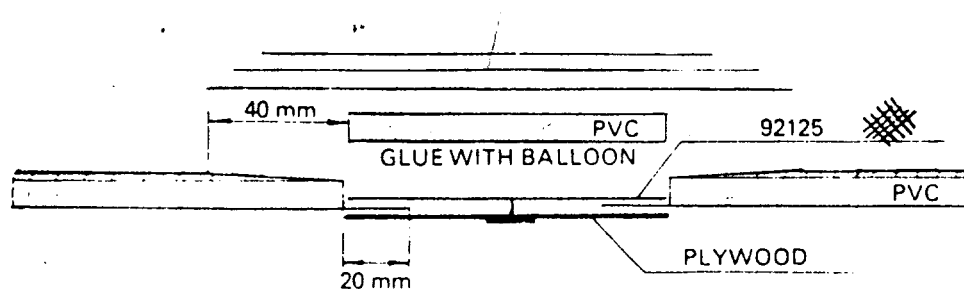


Figure 3

(cloth ref. see pages 13 – 16)

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When the glue has hardened, sand the area smooth and make a bevel the same way as in the paragraph "Broken monocoque structure". Fill the pores of the PVC-plate and laminate the cloths immediately.

When the hole is larger first glue the inner laminate to the PVC-plate. To begin, the manner of proceeding is the same as in the previous case. Fill the pores of the PVC-plate with balloon and fit the plate to suit the hole, then laminate the cloth of the inner surface immediately to the PVC-plate. When this has hardened glue a sheet of plywood as a prop and draw a nail or iron wire through the plate and plywood. Then glue the PVC-plate on the area with balloon (see Figure 4).

Use a load or iron wire to accomplish pressing. Do not use too much force because then the inner laminate may come loose from the PVC-plate.

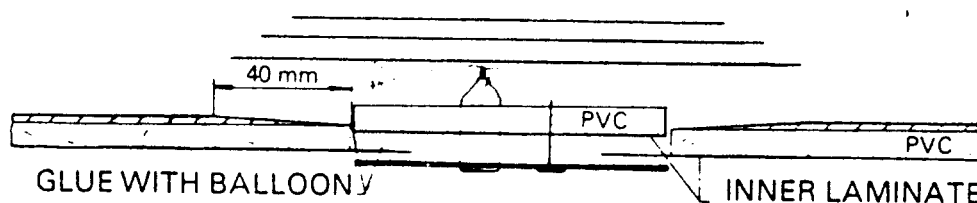


Figure 4

(cloth ref. see pages 13 — 16)

The third way to patch a hole in sandwich plate is to first prepare the patch and bond line together. Remove all broken parts of the hole and leave no inner laminate as an edge. Shape the PVC-plate to the hole and glue the previously prepared piece of cloth laminate to the PVC-plate. The piece of laminate consists of two cloths (/// 45° 92146 + \\\ 135° 92146 or 2 x 92140 or 3 x 92125 $\pm 45^\circ$), which overlap the edge by approximately 40 mm (See Figure 5). Perform the lamination of the cloth on a table on top of plastic film or 2 — 3 layers of wax and one layer of PVA. After glueing, cut the pieces of laminate to a suitable size.

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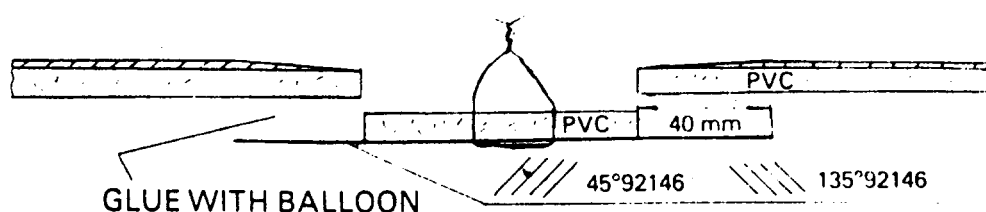


Figure 5

(cloth ref. see pages 13 — 16)

Roughen the bond lines. Then glue the patch with balloon. Make an oval for reaching the hole from the inner side. Use iron wire to accomplish pressing. When the resin has hardened continue the work as usual.

NOTE

Especially when you are glueing "blindly" use enough balloon so that air is eliminated from the bond line. For this purpose make the bond line approximately 40 mm wide.

NOTE

When repairing the control surfaces it is important to prevent an increase in the weight. This usually causes the center of gravity to shift and so that control surfaces should be massabalanced again.

3.4 FINISHING

The repair has to be done so that the patched area is no higher than surrounding surface. The right shape is obtained by filling the area with balloon which sticks better than the polyester putty used for finishing. A long straight splint is used for spreading the balloon. Before every spreading, the surface has to be roughened with sandpaper number 100. Use polyester putty on the surface after the shape is accurate enough (Lesonal, Pakla, P2/55, Plastic Padding) and finish the surface with sandpapers up to 320. Watch that the uppermost cloth will not be damaged. If the cloth comes into sight during grinding the patch is too high and has to be done again or make the surrounding surface thicker with putty, but in this case, the patch will be seen afterwards. Regarding the fuselage, a small overthickness is not harmful.

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A paint sprayer is recommended for the painting and the layers should be thick enough that the polishing can be done without all of them (5 to 6 layers crossway) being sanded away. The surface is then sanded wet with sandpapers up to 600 and finished with paint polishing agent and waxed if necessary. For waxing the sailplane, a normal car wax is good enough but not, however, one which contains silicone.

3.5 Balancing of the control surfaces

The C. of G. positions for the control surfaces must be below or equal following, measured from the hinge-line.

- 1 aileron 29.0 mm
- 2 flap 35.0 mm
- 3 rudder 20.0 mm
- 4 in elevator so that the distance multiplied by the weight of it is below 40 kgmm.

4. REPAIRING OF CRACKS IN ACRYLIC SHEET

Before starting the work, prevent the progression of the crack by drilling a 2 mm hole at both ends of the crack. Then open the crack and fill it with acryl glue starting from the bottom of the V. (See Figure 9). Use Tensol no. 7 for glueing. Fill the crack layer by layer and let the layers harden in between to prevent air bubbles because the glue shrinks while hardening. When the crack has been filled and the glue is hard, grind the patch smooth first with fine wet and dry sandpaper and afterwards with grinding pastes and liquids so that the bond line becomes transparent. To begin use sadpaper no. 600 for eliminating scratches and defects of the surface if they are deep. Fasten the paper on a soft grinding tool which has curved edges. Do the grinding by gently rotating with help of the weight of the fingers. After this use grinding paste ("Perspex" Polish no. 1) which is also good for starting to repair very small cracks. Spread the paste with a soft piece of cloth or grinding disc if a grinding

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machine is available. Change the cloth every five minutes; the paste must not dry on the cloth. The grinding pressure must be very light. Remove the paste with a clean piece of cotton cloth. After this, polish with polishing liquid ("Perspex" Polish no. 2A). Use the same piece of cloth both for spreading and polishing. Take care that the piece of cloth is clean from dust and dirt during the work. Use "Perspex" Polish no. 3 to remove possible static electricity due to grinding and polishing. If necessary use water to make the Polish thinner and spread the Polish on the

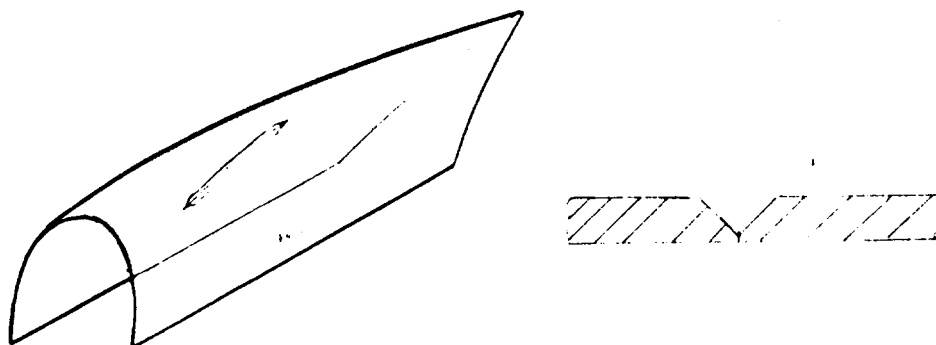


Figure 6

canopy with a soft, humid cloth. Use a clean, soft and dry cloth for rubbing the canopy shiny. You can also wash the canopy with a solution consisting of 10 % "Perspex" Polish no. 3 and 90 % water. If necessary you can go on as stated in Service Manual section 4.

The use of organic solutions (as solvents of paint and turpentine) is forbidden.

PIK-20 D Repair manual

5. REPAIRING OF METAL PARTS

The steel parts of the sailplane are made of chrome molybdenum steel A1SI 4130 MIL-S-18729C or MIL-T-6736B, LN 1.7214.4 or .9 or DIN 25CrMo4.

The steel plates and tubes have been in normalized condition. Temper hardened steel $\delta m = 90 \text{ kp/mm}^2$ has been used as the material for the turned parts. The main wing fittings are temper hardened to $\delta m = 100 \text{ kp/mm}^2$ and the wheel axle to $\delta m = 115 \text{ kp/mm}^2$. Other steel parts have been dimensioned according to the condition after gaswelding.

If an inert gas welding system (TIG) is used, it is necessary to carry out annealing afterwards. This can be done by warming the welded area with a gas flame. Thinner parts have to be cooled in hot sand.

If the part has been plated with cadmium, it must be completely removed from the welding area with removal bath or by careful sanding before welding.

After welding, jet 'blast with sand. A high quality metal primer is recommended (e.g. Herberts Standox Reaktionsgrund) before painting the surface with a second coat (e.g. Herberts carpaint). The interior surface of the warmed parts have to be protected once again against rust with protecting agent (Dinitrol ML or LPS 3).

NOTE

Only a qualified welder is allowed to weld airplane parts.

The push rods are made of aluminum (Din AlMgSi1T6) or steel (Din St35). All the bolts are millimetric high strenght bolts. The bolts used in the control system are of close tolerance and these are sold by the manufacturer. The rudder cable is 7 x 19 Ø 1/8" MIL-1511.

6. INSPECTION OF WATER TANKS

The water tanks of the sailplane are made of plastic, strengthened with nylon so they are very strong. It is, however, a good idea to inspect them annually.

Loosen the tanks from the main rib by loosening the tube connector from the inner end of the tank inside the wing and take the tank out from the hole in the main rib. The easiest way of inspecting the tanks is to look for humid areas or chafed places when the tanks are filled with water.

The tank can be repaired with original material by glueing a patch with contact glue (roughen carefully).

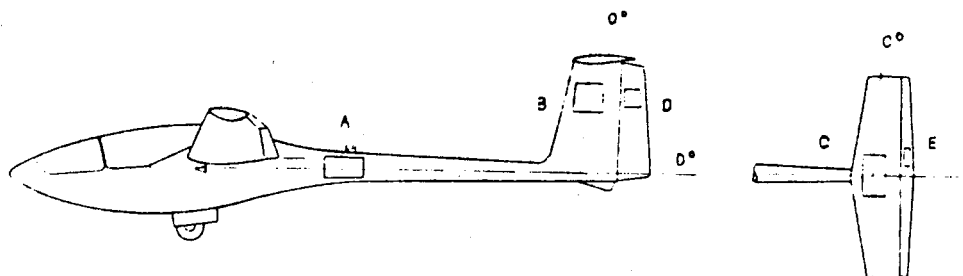
Tape the longitudinal seams of the tank against the bag. Fold the tank over in three parts. Push the tank into its place. Open the tank by blowing it full with air. The right installation is checked by filling the tank and measuring water quantity. Seal the main rib.

PIK-20 D Repair manual

7. OTHER REPAIRS

The repairs of instruments, radios and oxygen systems must be performed according to instructions of the manufacturers or aviation authorities.

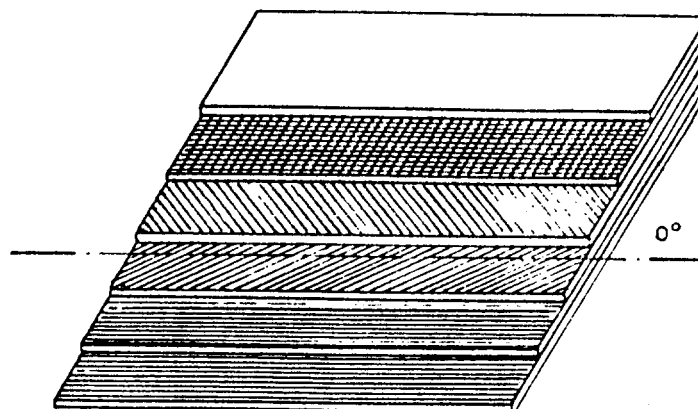
8. GLASS FIBRE CLOTHS USED IN DIFFERENT PLACES



A FUSELAGE

Surface paint

0°	90070
45°	92146
135°	92146
0°	92146
0°	92146



EIRIAVION OY

Kisällinkatu 8
SF 15170 Lahti 17

PIK-20 D Repair manual

B VERTICAL STABILIZER

Surface paint

90° 92110

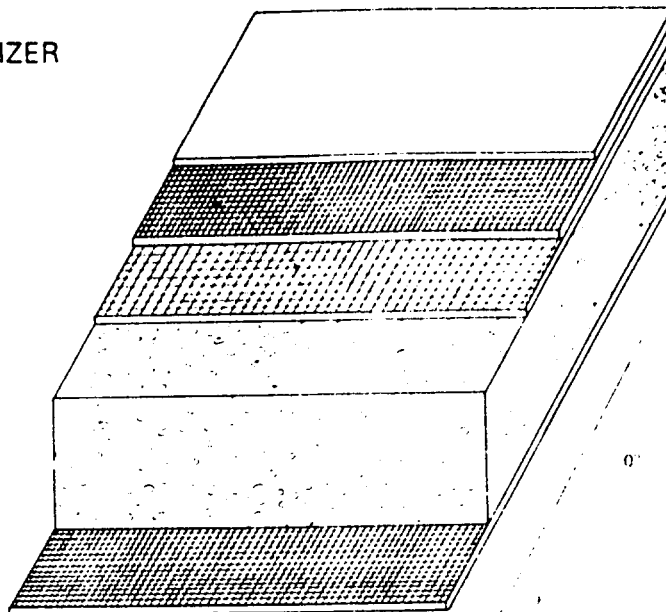
90° 92125

10 mm

Hard PVC-foam

Lynizel 4060

0° 92110



C STABILIZER

Surface paint

0° 90070

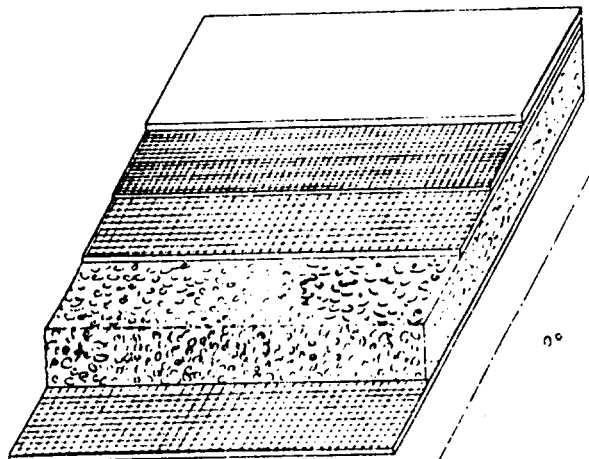
0° 92125

10 mm

Hard PVC-foam

Lynizel 4060

0° 92110



D RUDDER

Surface paint

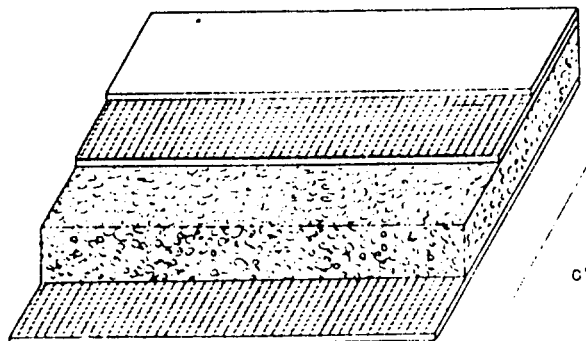
0° 92110

5 mm

PVC-foam

Lynizel 4040

0° 92110



EIRIAVION OY

Kisällinkatu 8

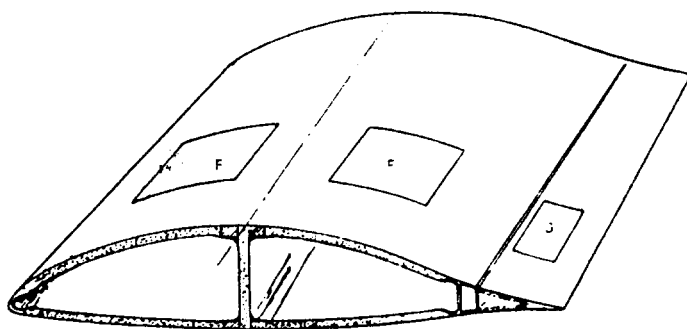
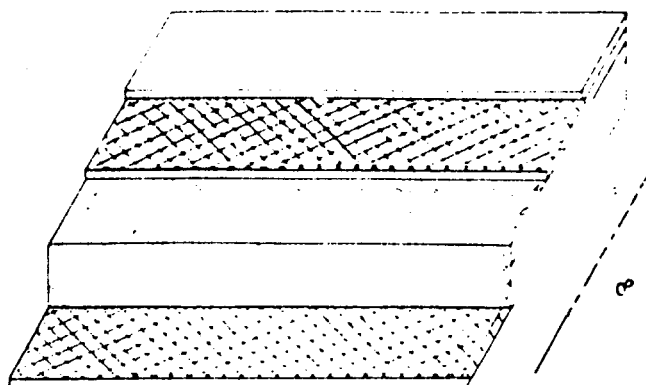
SF-15170 Lantti 17

PIK-20 D Repair manual

E ELEVATOR

Surface paint
45° 92110

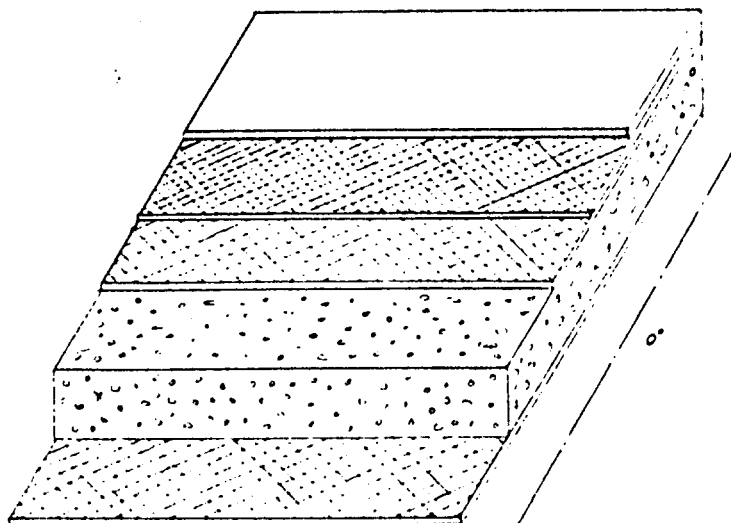
3 mm
PVC-foam
Lynizel 4040
45° 90070



F WING

Surface paint
45° 90070
45° 92125

10 mm
PVC-foam
Lynizel 4060
45° 92110



EIRIAVION OY

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SF 15170 Lahti 17

PIK-20 D Repair manual

G FLAPS/AILERONS

Surface paint

45° 90070

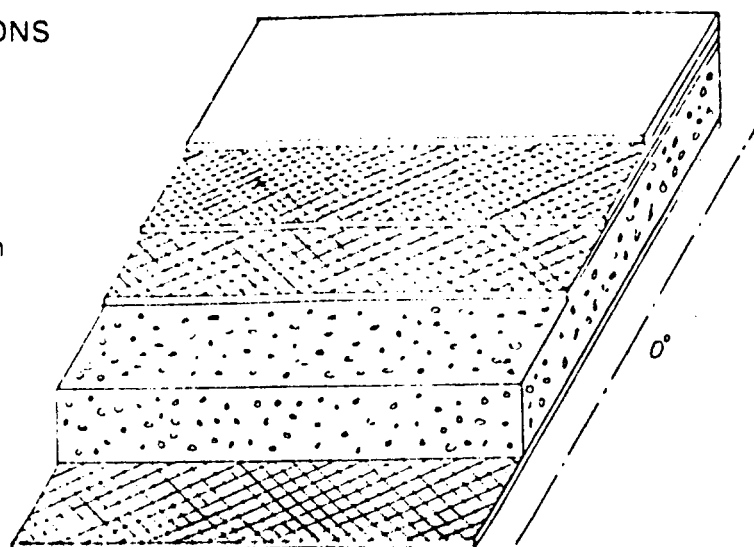
45° 92125

3 mm

Hard PVC-foam

Lynizel 4040

45° 90070



9. RAW MATERIAL LIST FOR PLASTIC STRUCTURES

Plastic

Resin

Rütapox L 02

Hardener

Rütapox H 91/SL (91, SL 50, SL)

Mixture

(mass parts):

34 H 91

100 L 02 + 38 SL 50

42 SL

Manufacturer:

Bakelite GmbH, Federal Republic of Germany

Glass fiber cloths

Manufacturer:

Interglas GmbH, Federal Republic of Germany

Interglas no.

(Finsihing I550)

weight g/m²±5%

90070

80

92110

116

92125

280

92140

395

92145

215

92146

440

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Rovings

RA 45T Z 4481/15

Manufacturer: Scandinavian Glasfiber, Sweden

Finishing: 150

Carbon Fibre

Grafil EAS

Manufacturer: Courtaulds Limited, England

Surface paint

Glassodur 21 — M25

Hardener 929 — 28

Solvent 352 — 91

Manufacturer: Glasurit GmbH,
Federal Republic of Germany

Core material of sandwich plates

Lynizel 4060 (60 kg/m³) and 4040 (40 kg/m³)

Manufacturer: Indewek GmbH, Federal Republic of Germany

Fillers

Microballoon: Eccospheres IG 101

Manufacturer: Emerson & Cumings, Belgium

Chopped fibres: EC 10-S

Manufacturer: Gevetex Textilglas GmbH, Federal Republic of
Germany

Release agents

Wax QZ 111

Manufacturer: CIBA Ag, Switzerland

Polyvinylalcohol: PVA Mould Release Agent No. 3

Manufacturer: Downland, England

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IK-20 D Repair manual

Protecting ointments for hands

(Suitable for epoxy resins)

Arretil Q (before lamination)

Stokolan (after washing and lamination)

Manufacturer: Stockhausen, Federal Republic of Germany

Acryl plate

Plexiglas 233 3 mm thick

Manufacturer: Röhm GmbH, Federal Republic of Germany

Repairing material for acrylic sheet

Acryl glue: "Tensol 7" and hardener

Grinding and polishing material for acryl

"Perspex Polish No. 1"

" " No. 2A

" " No. 3

Manufacturer: ICI, England

NOTE:

All constructive parts exposed to the sunshine may be painted in white and in the following colours (according to the German RAL colour code):

- a) Chrome yellow or brighter RAL 1007
- b) Red orange or brighter RAL 2002
- c) Gentian blue or brighter RAL 5010
- d) Bright green of brighter RAL 6018
- e) Bronze or brighter RAL 9006