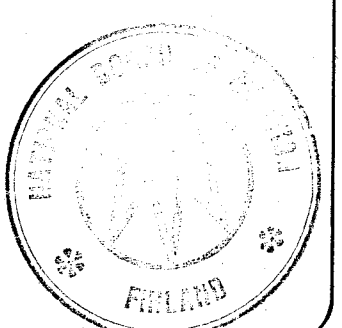
FLIGHT MANUAL
for
SAILPLANE PIK-20 D



EIRIAVION OY
Kauppinkatu 8
SF-15170 Lahti 17

ITALY

PIK-20 D Flight manual

SERIAL NO: REGISTRATION:

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: [illegible] Date Sep 21, 1976

NATIONAL BOARD OF AVIATION FINLAND

Edition 1

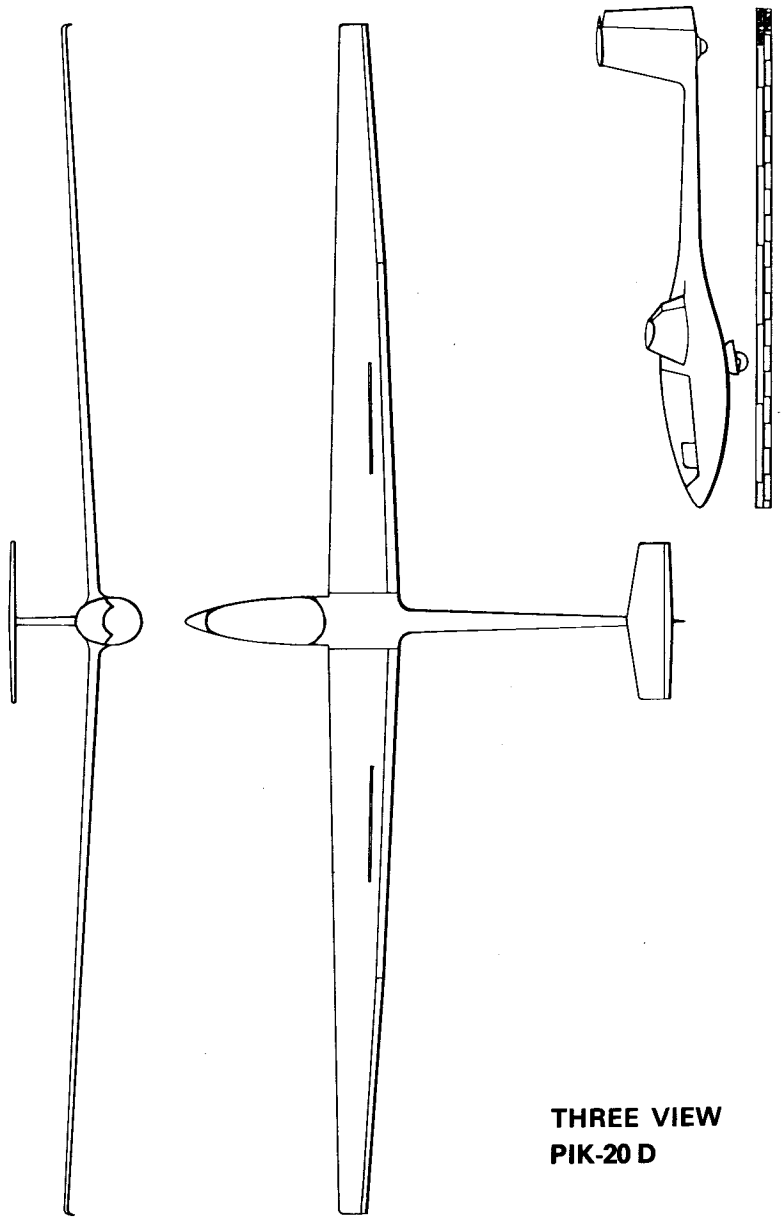
EIRIAVION OY
Kisällinkatu 8
SF-15170 Lahti 17

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

TABLE OF CONTENTS



THREE VIEW
PIK-20 D

EIRIAVION OY
Kisällinkatu 8
SF-15170 Lahti 17

1. TECHNICAL DATA

1.1. Main technical data

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

1.2. Wing

— Wing area	10.0 m² (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 m²
— Flap movements	Up 12°∓1°
	Down 16°∓1°
— Aileron movements	
+ 16° flap	Up 13° $^{+2°}_{-1°}$
	Down 12,5° $^{+2°}_{-1°}$
0° flap	Up 12° $^{+2°}_{-1°}$
	Down 11° $^{+2°}_{-1°}$
−12° flap	Up 11° $^{+2°}_{-1°}$
	Down 9,5° $^{+2°}_{-1°}$

EIRIAVION OY
Kisällinkatu 8
SF-15170 Lahti 17

1.3. Horizontal stabilizer and elevator

— Area	1.00 m² (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 m² (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/m² (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.

The fuselage is made of epoxy laminates stiffened with eight ribs and by the cocpit 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.

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 auxilliary 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 positon 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 cocpit. 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.

3. LIMITATIONS

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

Never exceed (V_{NE})	292 km/h	(181 mph, 158 kts)
Gusty conditions (V_B)		
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 than (see 5.7)	190 km/h	(118 mph, 103 kts)
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.

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 (take off weight without wings)	220 kg (485 lbs)
— 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).

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

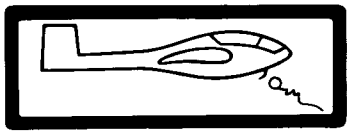
Preflight check

— 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

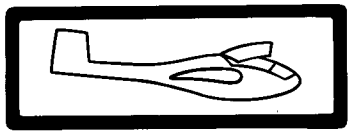
Before landing

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

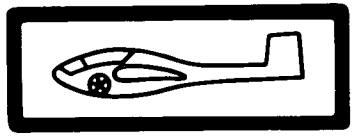
4.2. Symbols of the Controls



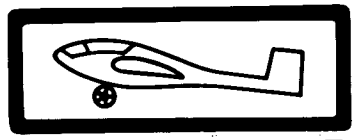
Tow release



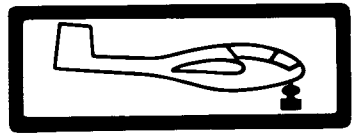
Canopy Lock and Jettison Control



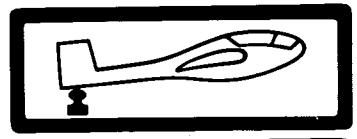
Landing Gear up



Landing Gear down



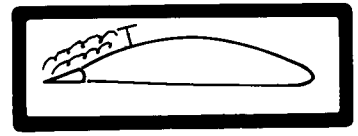
Trim control — Nose down



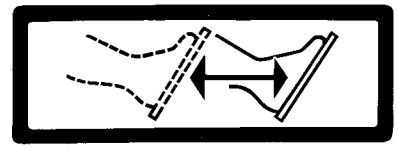
Trim control — Nose up

Flaps — down

Flaps — up

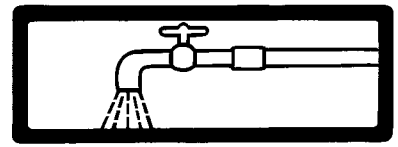


Airbrakes — open



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

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)

5.4. Flight

- At a safe altitude retract landing gear
- At weight 300 . . . 450 kg(661lbs . . . 990lbs)

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 accur. (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.

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.

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:

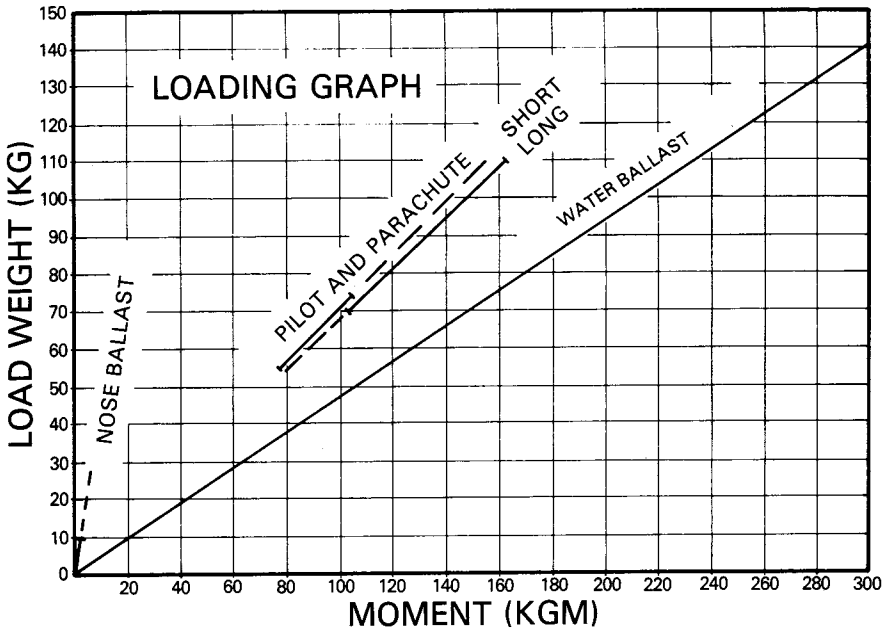
Emptying the water ballast moves the C. of G. backward. Loading with the water ballast has to be such, that the C. of G. is within the limits, even after the water ballast has been drained.

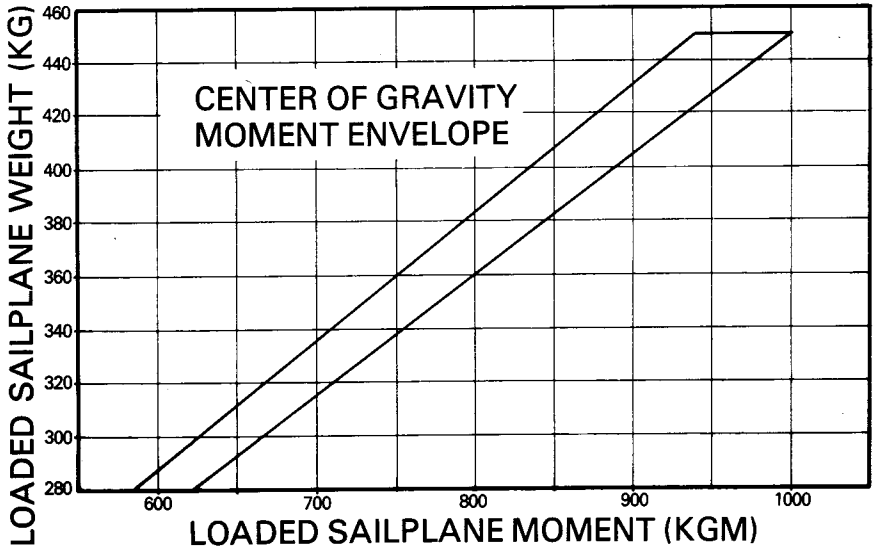
SAMPLE LOADING PROBLEM	SAMPLE SAILPLANE Weight (kg)	SAMPLE SAILPLANE Moment (kgm)	YOUR SAILPLANE Weight (kg)	YOUR SAILPLANE Moment (kgm)
1. Licensed Empty Weight x)	225	558.0		
2. Pilot and parachute	85	125.8		
3. Water ballast	90	191.7		
4. Ballast in the nose				
5. Equipment xx)				
TOTAL WEIGHT AND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

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.





MINIMUM PILOT WEIGHT

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

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

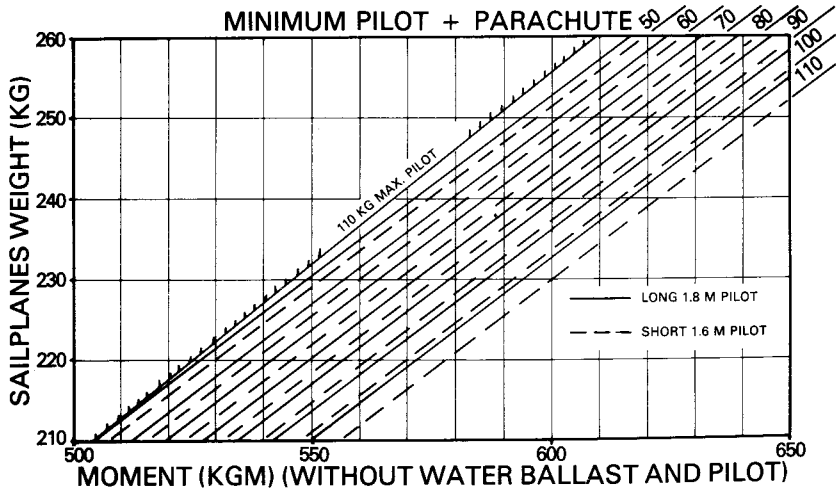
The sailplane's weight and the moment must be known without the water ballast and the pilot with all equipment (See I-14). The C. of G. position must be within the limits without the water ballast.

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.

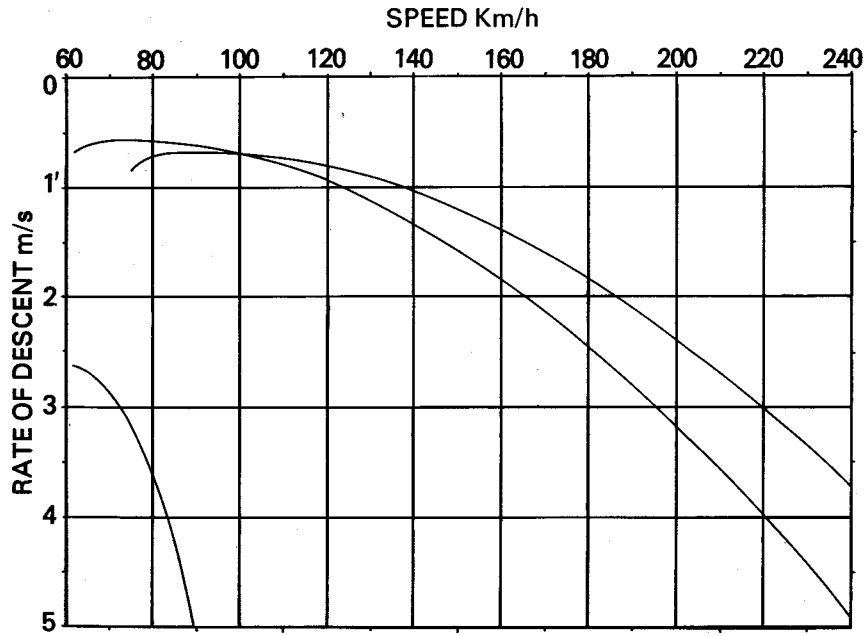
In the same graph there is also a limit line for the foremost C. of G. with 110 kg pilot weight.



7. PERFORMANCE

7.1. Performance at sea level

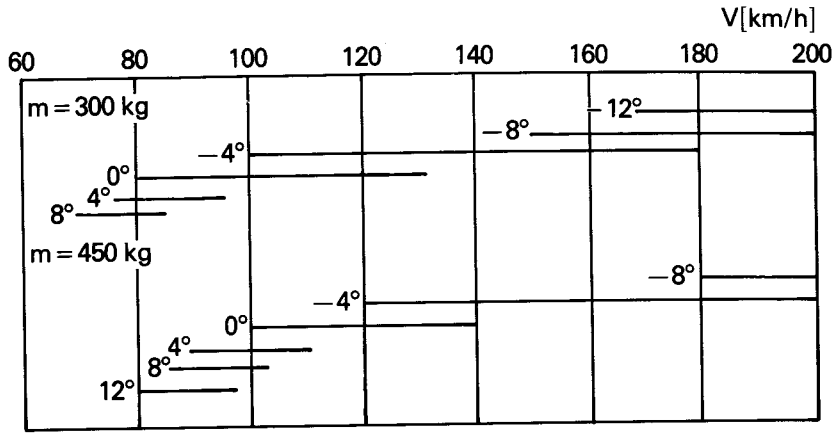
	Weight 300 kg (661 lbs)	Weight 450 kg (990 lbs)
— Stall speed (flaps down 16°)	60 km/h (38 mph, 33 kts)	74 km/h (46 mph, 40 kts)
— Stall speed with 16° down flaps, landing gear down and airbrakes fully open (landing configuration)	69 km/h (43 mph, 37 kts)	84 km/h (52 mph, 45 kts)
— minimum rate of descent.	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 95 km/h (59 mph, 51 kts)	42.0 117 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

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

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 precent 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.