Orimattila 1963 Kirjapaino R. Rahikka

VASAMA - SAILPLANE
OWNERS MANUAL

K.K. LEHTOVAARA Oy AIRCRAFTWORKS

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This manual must always be on board the sailplane

F-WCPS

Serial No. 22

Manufactured by K.K. LEHTOVAARA OY

Owner of the sailplane .....

.....

Holder of the sailplane .....

K. K. Lehtovaara Ltd.
Hämeenlinna, Finland

"V A S A M A"
Flight and Maintenance Manual

Contents:

I hereby attest having read this Flight and Maintenance Manual

Date Signature

I FLIGHT MANUAL

I. 1. Operational Data

– Maximum speeds permitted:

Winch launching	140 km/h
Aero-towing	160 ,,
Gusty conditions	170 ,,
Smooth conditions	250 ,,

– Weights:

Empty weight	about 190 kg
Max. permissible flying weight	300 ,,
,, ,, load	110 ,,
Min. ,, ,,	60 ,,
Max. permissible weight of non-bearing parts	185 ,,

– Flight operations permitted:

The glider is not suitable for elementary training.
Cloud fyling permitted provided the glider is equipped with instruments for cloud flying.
Limited aerobatic manoeuvres permitted (steep turns, stall turn, looping, spin, inverted flight).
Constructed in accordande with OSTIV (Organisation scientifique et technique internationale de vol à voile) requirements for standard class sailplanes.

– C.G.-positions:

C.G. of empty glider	about +400 mm
Foremost permissible in flight	+ 45 ,,
Aftmost ,, ,,	+165 ,,

Datum: front surface of the forward main rib of fuselage.
Levelling means: Centre line of the glider in the plane of the long pins, fixing the wings to the fuselage.

– Brake fuses:

A safety brake member must be fitted in the towing wire to prevent overloading of glider during towing.

Winch launching: brake fuse N:o II, tensile strength	500–600 kg
Aero-tow: brake fuse N:o I, ,,	300–400 ,,

I. 2. Flight Instructions:

– Winch launching:

At take-off, when the glider strives somewhat upwards push the stick slightly. It is safe to avoid to pull to much below 50 m altitude. It is further to be remembered that in case of winch launching a pull of the stick generally means an increase in speed.

– Aero-tow:

The towing line has to be attached to the bottom coupling in the glider. Use only textile line. It is recommended to attach an about 2 m long nylon line to the end of the towing line and to use an oblong steel link. which is longer than normal, at the end of the nylon line.

– Adjustment of pedals:

The pedals are released by pulling the adjusting button in te middle of the front edge of the seat. Keep pulling the button continuously and push the pedals forewards with the feet. The pedals are brought backwards by pulling steadily at the button and allow the pedals to follow. The adjustment can easily be performed during flight.

– Free flight:

As a result of instrument errors, of location of pitot-tube and static pressure openings the indicated airspeed generally differs from the true airspeed.
For obtaining the true airspeed a correction table indicating the instrument errors at different speeds must be installed in the cockpit.
If the glider goes in a side-slip the readings of the speed indicator get smaller when the angle of side-slip increases and can attain even zero.

Stalling speed by 275 kg flying weight	62 km/h
Minimum sinking speed obtained at	75 ,,
Maximum L/D at	85 ,,

Minium sinking speeds at different turn angles obtained at the following speeds:

30° turn	about 80 km/h
45° ,,	,, 90 ,,
60° ,,	,, 105 ,,

It is recommended not to go below these speeds in turns because the sinking speed then begins to increase. In the beginning it is preferable to fly at a speed of 90–100 km/h in turns as well as in straight flight until one has become familiar with the glider.
If the flight is conducted in air which is at rest the best gliding speeds with regard to the mean cruising speed are as follows:

Mean ascending speed of thermal	Straight flight velocity
0,5	about 100 km/h
1,0	,, 110 ,,
1,5	,, 120 ,,
etc.	etc.

As ascending and descending areas which may be encountered on the way have not been taken into consideration the above figures are approximate and must be ragarded as mean values. However differences of 10 km/h reduce the mean speed only very little.
At low speeds (65–120) the glider is so silent that the estimation of the speed only on the base of the noise produced is difficult. This is however not dangerous because the noise increases at higher speeds. At speeds of the range of 150–170 km/h the noise is so strong that an exeeding of the maximum permissible speed cannot remain unnoticed even in clouds and even if the speed indicator is stopped up by ice.

– Landing:

The most suitable landning speed is 80–90 km/h. The drag producing devices, by means of which the right glide angle is obtained, are effective and can easily be operated at all speeds. The best landing is obtained if the brakes are not entirely opened at the moment of touch-down. When the brake lever is in its backward position it puts the wheelbrakes into action. When landing on a grain field or a meadow with high grass the brakes must be completely drawn in at touch-down, otherwise they get asymmetrically entangled by the vegetation and the glider can make ground loop.

– Dangerous flight conditions:

From straight flight the glider stalls straight or to either side without any violent perturbations. When the glider stalls in turn it falls to the side of the bank.

When the stick is drawn slowly the glider does not stall before the stick is drawn backwards as far as it goes. When the glider stalls and begins to

fall it is sufficient to release the stick for recovery. If the stick is continuously kept back whilst the rudder is in its central position the glider goes into a beginning spin and recovery follows after approximately one turn by itself. The more foreward the C-G is located the sooner the glider recovers.

If full rudder is applied at the moment when stall occurs and kept in this position the stick being maintained back the whole time the glider spins a couple of turns and goes into a side slip. It is recommended not to apply the inner aileron during spin as the glider then makes an undesirable swing followed by a couple of violent spin turns before it recovers. If all controls are brought to their neutral position the glider recovers from any stall.

The glider is of a specially strong construction and is capable to be flown at speeds superior to normal. In gusty conditions it is however not allowed to surpass 170 km/h. Raindrops, frost and ice have a deteriorating action upon the lift capability of the wing and upon the stall characteristics. Therefore it is recommended to fly at speeds above normal at low altitudes and on approach and landing.

– Removing of canopy in emergency:

Canopy: open the front lock and push the canopy upwards.

– Cloud flying

The plane is suitable for cloud flying and flying in stormy conditions, provided:

1) The speed in no cases exceeds 170 km/h; the brakes are applied already when the speed exceeds 150 km/h.
2) The following minimum equipment is carried:
   – speed indicator (65–250 km/h)
   – electrical turn and bank indicator
   – sensitive altimeter
   – rate of climb indicator
   – compass
   – clock (can be a wrist watch)

Recommended are further:
– longitudinal inclination ind.
– gyro-horizon

Markings and placards in the cockpit and on the plane must be observed.

– Aerobatic manoeuvres permitted:
1) steep turn (more than 60° bank)
2) stall turn
3) inside loop
4) spin
5) inverted flight

During spin the speed will increase so that the spin soon stops and the glider goes into a side slip (stick backwards and full rudder). Centralizing of controls brings the plane bock to normal flight conditions.

If the speed increase too much the air brakes are to be applied.

Inverted flight is no normal flying attitude for a glider. Therefore only aerobatically thoroughly trained pilots should perform inverted flight. The Vasama accelerates rapidly even at slight diving angles and the velocity has a tendency to increase too much especially during inverted flight.

I. 3. Minimum equipment

1) speed indicator (up to 250 km/h)
2) altimeter
3) safety harness

4) placards in the cockpit, stating:
   – speed limitations
   – empty weight and maximum permissible flying weight
   – loading instructions to maintain the C/G within the limits
   – aerobatic manoeuvres permitted
   – brake fuses to be used
5) marking of tyre pressure on the side of the fuselage near the wheel
6) flight and maintenance manual.

I. 4. Maximum deflections and stop brackets of controls and drag producing devices

Rudder: + ~~40°~~ 35°; the rudder lever is stopped by stop bolt fixed in a bearing block on the stabilizer spar.

Elevator: + 20° and – 20°; the stick is topped by the edge of the box on the torque tube of the stick.

Trimtab: + ~~25°~~ 20° and – ~~35°~~ 30°; the operating lever is stopped fore and aft by the seat.

Ailerons: + 28° and – 13°; the stick is stopped by the seat on both sides.

Air-brakes: stoppers for both extreme positions are in the wings at the triangular locking lever of the brakes. The command wire of the wheel brake can also limit the movement of the air brakes when they are opened.

I. 5. Weights and C. G. -positions

The C. G. of the empty plane is normally in the position of 60 % M. A. C., which means 40 cm behind the front surface of the forward main rib. The location of the C. G. can vary very sensibly as a result of differencis in construction, age, repairs and accessory equipment.

If the C. G. of the empty plane is too much forward then **either** a) reduce the maximum permissible load by 3.5 kg for each cm difference between the actual location of the C. G. and its normal location, **or** b) add to the tail skid sufficient quantity of lead to bring back the C. G. into its normal location.

If the C. G. of the empty plane is too much behind then

either a) increase the minimum permissible load by 3.5 kg for each cm difference between the actual location of the C. G. and its normal location.
b) place a corresponding quantity of lead sheets under the sat pad. Very light pilots must always use lead sheets.

The minimum permissible load is normally 60 kg = pilot (50 kg) + parachute (10 kg). In calculating the load the weight of the oxygen device and accessory equipment must be taken into account.

Special attention must be paid to the C. G.-position because a wrong position of the C. G. deteriorates the flight characteristics of the glider.

The weight of wooden planes has a tendency to increase with the age and accordingly the C. G. is displaced backwards. The plane ought therefore always to be weighed in connections with the yearly inspection and the C. G.-position of the empty plane determined.

Note: Never fly without a parachute!

II MAINTENANCE MANUAL

II. 1. Assembling

1. Clean all fixing pins, T-bars (main brackets) and U-bars. As these parts are made of stainless steel they require no greasing, except the horizontal stabilizer ball links in the fuselage, which are to be greased slightly.
The long pins fixing the wings to the fuselage should also be slightly greased,

excessive greasing deteriorates the woodwork.

2. Begin by fixing one of the wings to the fuselage with the corresponding long pin, the fuselage and the wing being maintained in their right position. The long pins are exchangeable.
3. The second wing is then fixed to the first one. Apply first the U-bars and fix them with screws **before** the second long pin is put in. If **both** pins are inserted before the U-bars are fitted it may easily lead to a breaking of fuselage main ribs. Take care that the guiding pins in one of the upper T-bars go into the corresponding holes in the other T-bar because otherwise the T-bars will not get close together.
4. The U-bars connecting the T-bars together are also exchangeable. The upper U-bars are to be applied first and fixed. Thereafter avoid to lift the wing tips because the T-bar coupling is stiff and may not be bent. The bolts joining the U-bars together shall not be tightened stronger than can be done **by hand.**
5. The lower U-bars are then applied and fixed. Stop-pins at the forward ends of the U-bars facilitate the mounting. Take care not to spoil threads of fixing bolts. If these threads get spoiled the corresponding bolt is to be renewed and a bored and threaded plate is fixed on the under side of the U-bar. Each plane is delivered with one spare fixing bolt and two threaded plates.
6. When all U-bars are fitted the second long pin is installed.
7. The upper U-bar fixing bolts are secured by a long locking needle and the lower bolts in the same way. The long pins fixing the wings to the fuselage are secured by a locking pin behind the rear main rib of the fuselage.
8. The aileron and air brake push rods are fixed to the corresponding levers and secured by locking pins.
9. The air brake control devices in the baggage compartment and the bare aileron control devices before forward main rib of fuselage are covered with their protecting covers.
10. The horizontal tail is installed, the front fixing screw is tightened and secured. Take care that both elevator halves get connected to the control lever.
11. Check the function of controls, air brakes and the towing hook. The controls shall move free and light up to their maximum deflections.

II. 2. Daily inspection

After the assembly and every day before first start check that all parts are properly attached and locked. Check also that the plane has not been damaged in hangar or during flight operations. Check further that there are no foreign objects in the plane. Check the function of controls, air brakes and the towing hook. Each time the plane is assembled and a few flights achieved check tightness of U-bar fixing bolts. The fixing bolts are to be tightened by hand – do not use any tools. However if the locking holes of the bolts are not in the right position a tool may be carefully used.

To get the maximum performance out of the plane special attention must be given to smoothness and cleanliness of surfaces and tightness of joints. The wing surfaces should preferably be polished. Any roughness or unevenness (e.g. dead insects) shall be removed. Wavelike character of wing surfaces near their thickest section should not appear.

II. 3. Disassembly

The actions mentioned in the assembly instructions 1–12 are carried out in the inverse sequence.

Note! One of the long pins fixing the wings to the fuselage shall be removed before the main brackets are disengaged.

Grease slightly all metal parts which are not of stainless steel. Removed parts are placed in a bag to protect them against dust and humidity.

When loaded on trailer the wing root shall be supported by the main spar and the other end by a support formed to suit the wing nose and placed under the root of the aileron at the place were the wing nose is reinforced (painted mark on the wing nose). Never put down the wing on its nose.

II. 4. Maintenance

Humidity, excessive dryness and dust are the worst enemies of a wooden glider.

Humidity: Do not store the plane in the open air or transport it in an open trailer. If the plane nevertheless gets wet it shall be moved into a dry room or hangar to dry. During the drying turn the wing and the fuselage daily upside down.

Dryness: The planes are often stored in too dry and warm rooms. This should be avoided because woodwork shrinks considerably when it dries and the metalwood fittings get loose. If the storage room is too dry sprinkle water often on the floor.

Dust: The wind drives always dust on aerodromes and in hangars. Dust on the surfaces of the plane deteriorates the painting and may easily reduce its lifetime by several years. It is therefore practical to use coverings: wingbags for wings, cabin cover cockpit and forward fuselage and covers for rear fuselage and tail surfaces. At least wing bags and cabin cover ought to be used.

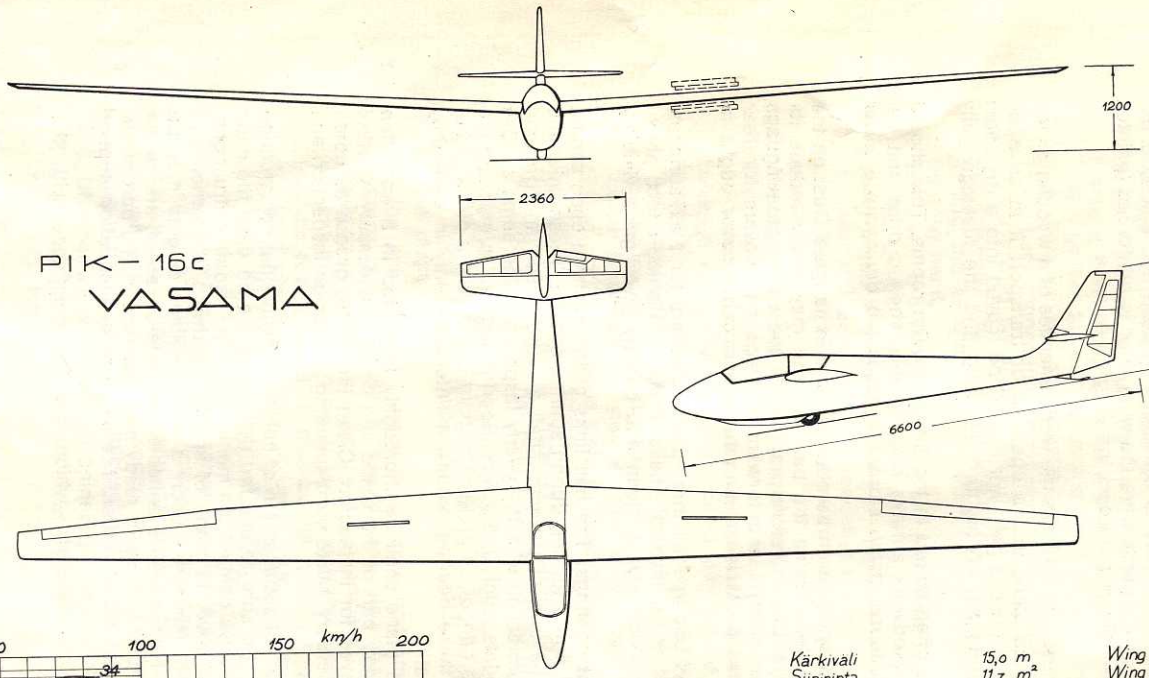
Cleaning of plexi-canopy: Use special three-phase cleaners for plexi-surfaces. Phase I fills the scores and scratches, phase II has a polishing effect, phase III removes the static electricity. A clean and canopy gives good visibility and flight security.

Cleaning and greasing of bearings: The ball links at the pushrod ends should be rinsed and greased now and then during soaring season. These links and also the bearings of the control surfaces shall also be rinsed and greased yearly (in winter) in connection with the yearly inspection. The same applies also to bearings of pedals, stick and levers. Bearing located in inaccessible places inside the plane cannot be greased without cutting out a piece of the outside covering, but these bearing require maintenance only in case they are too loose or too stiff.

Yearly maintenance: The plane shall be thoroughly inspected in a workshop once a year. Check every part of the plane and repair if necessary. Control cables are to be removed for inspection. Clean the plane, grease as noted before and paint if necessary. Make corresponding entries on inspection and repairs in the log book.

Repairs: Fuselage and control surfaces are of normal conventional contsruction and are easy to repair. Be sure to use the right materials. In case the main spar box is damaged always contact the manufacturer for repair instructions. The wing leading edge cover is made of special sandwich, the veneers of which are consecutively laminated upon a mould. Minor defects may be mended in any way which appears suitable, but i large areas are to be repaired it is recommended to order a ready made corresponding part of the surface covering from the manufacturer. The same recommendation applies to repairs of upper surface covering behind the spar box.

On repairs use only such materials, which are in compliance with the specification below.



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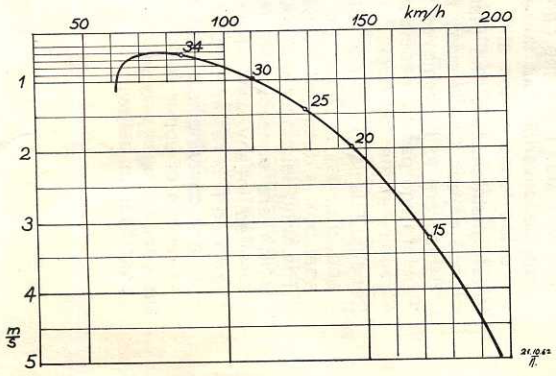

Kärkiväli	15,0 m	Wing span
Siipipinta	11,7 m²	Wing area
Sivusuhde	19,2	Aspect ratio
Tyviprofiili	14% lam	Root section
Kärkiprofiili	NACA 63-615	Tip section
Tyhjäpaino	190 kg	Equipped weight
Max. kuorma	110 kg	Max load
Siipikuormitus (keskim)	22,5 kp/m²	Wing loading, average
Sallitut nopeudet		Permissible speeds
puuskissa	170 km/h	gusty cond.
tyynellä	250 "	smooth cond.
Siiven kuormituskerr	+7,0 −4,0	Load factor

Valmistaja Manufacturer

K.K. Lehtovaara OY, Hämeenlinna, Finland

MATERIAL USED IN VASAMA-SAILPLANE

Part	Mean dimens.	Standards		Strength requirements			Remarks	Ref.
		European	USA	Tension	Compr.	Modulus of elastic		
Wood material				950 kp/cm²	450 kp/cm²	1,1 x 10⁵ kp/cm²	Finnish pine (Pinus silvestris)	
Plywood		GL I		820 kp/cm²	320 kp/cm²	1,1 x 10⁵ kp/cm²	Birch plywood	
Fabric (rudder, elevator, and wing trailing edge under side		FAA Material	Spec. 04.415				FAA "lightweight fabric"	
Bolts		Bofors RO 653	SAE 4130	60 kp/mm²				
Control cables	ø 2,5 ø 3/32"	DIN L 9	MIL C-5424					
All welded parts, such as control columns, brackets, etc.		Bofors RO 653 25 Cr Mo 4 VLS 1452	SAE 4130 AISI 4130	60 kp/mm²				
Shells of wing primary structure				1250 kp/cm²	540 kp/cm²	1,5 x 10⁵ kp/cm²	Laminated wood specially developed for VASAMA	1)
Leading edge							Special sandwich-construction	2)
Trailing edge, upper side							Special plywood developed for VASAMA	3)
Main fittings of wing, machined steel parts		Bofors RE 39	SAE 51431	88 kp/mm²			Stainless steel	
Rivets of main fittings	ø 5/32"						CONVAIR-rivet Q 4310-C5-5	
Main fitting attaching bolts		Bofors RE 39	SAE 51431	88 kp/mm²			Stainless steel	
Glue							Resorcin resin adhesive	

TURN

1) Shells of wing primary structure are made of birch layers in a 40 t hydraulic press. Thickness of birch layers is: in the spanwise direction 2,0 mm and in chordwise direction 0,5 mm. In case of damage it is recommended to contact manufacturer for repair instructions. Repair is not difficult, but requires some special knowledge.

2) Leading edge is made of following sandwich: 0,8 mm birch plywood (upper side) – 2,0 mm balsa wood – 0,4 mm birch plywood.

3) Trailing edge is covered with special 2,5 mm plywood developed for VASAMA. This plywood is light and gives good wing surfaces.