Airplane Manual

FK 9 Mark IV

Certified as Ultralight according
BFU 95 / LTF-UL 2003

This manual must be carried in the aircraft at all times.

This is the Pilot's operating manual and approved flight manual.

Kennblatt Nr. 61102.2

Serial Nr.: ____

Manual Nr.:
9-____-1E

Manufacturer: FK Lightplanes

Important service informations / bulletins can be obtained from our website. Check our website regularly as automatic update by mail is not assured.

FK Lightplanes

REVISIONS

The following table contains a list of valid pages. This table will be updated with every revision. The pilot is responsible for keeping all pages of this manual to the revision status indicated in the table, by exchanging the relevant pages when a new revision has been published.
For updates check the homepage of FK Lightplanes under www.fk-lightplanes.com regularly. New revisions can be downloaded there. If you do not have an internet connection, revisions can be ordered from FK Lightplanes.
Revisions and Service Bulletins for the ROTAX engine are available on www.rotax-aircraft-engines.com .

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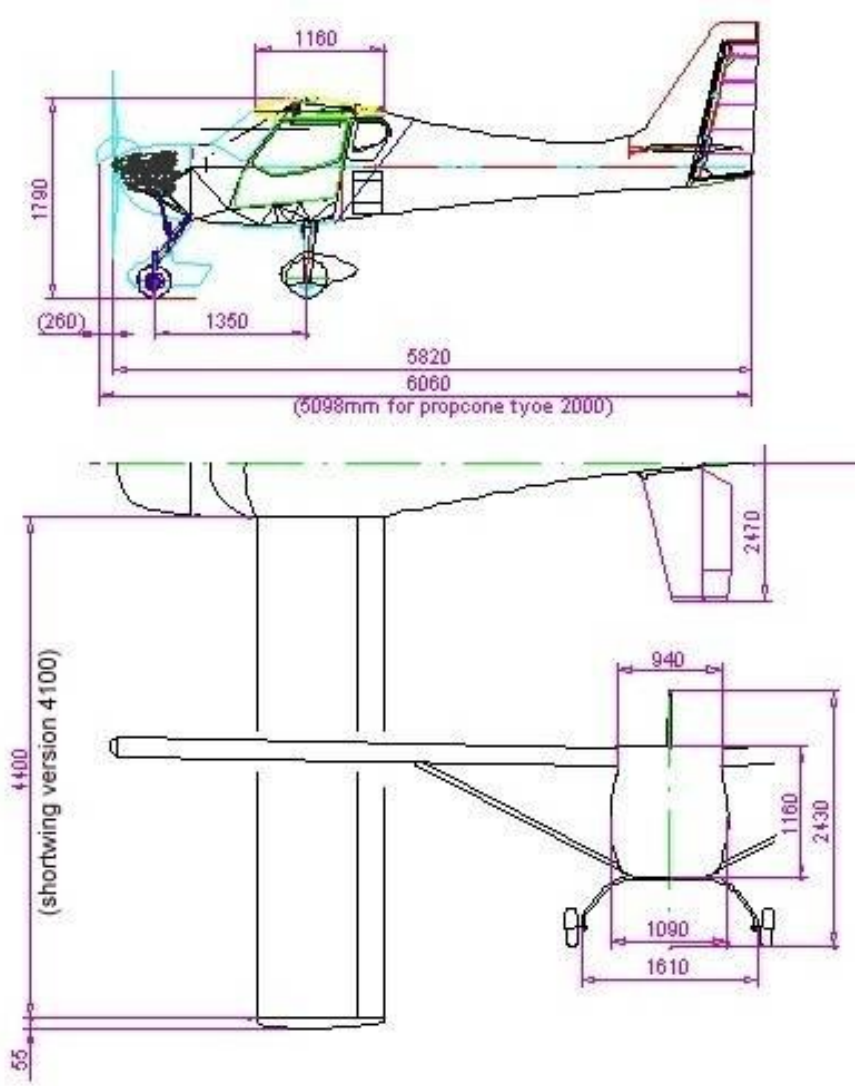
1. General

This manual must be read carefully by the owner and operator in order to become familiar with the operation of the FK 9. The manual presents suggestions and recommendations to help obtain safe and maximum performance without sacrificing economy.
The owner and operator should also be familiar with the applicable aviation regulations concerning operation and maintenance of this airplane.
All limits, procedures, safety practices, servicing, and maintenance requirements contained in this manual are considered mandatory for the continued airworthiness of the airplane.
All values in this manual are based on ICAO Standard Atmosphere conditions and maximum takeoff weight (MTOW).
The pilot in command has to make sure that the airplane is airworthy and operated according to this manual.

Non-compliance with handling, maintenance and checking instructions as indicated in the flight and maintenance manuals as well as the respective updates which are published in the manufacturer's website, will void warranty and/or guarantee claims.

This manual applies to both versions, FK 9 Mark 4 and FK 9 Mark 4 Utility. The difference between both versions lies in wing construction. The "Utility" is ceconite-covered in the aft wing section unlike the composite cover of the basic Mark 4.
The FK 9 SW (shortwing) is a variant with less wingspan.
All variants of airframes and powerplants can be combined as certified.

1.1. Airplane Three Side View



1.2. Technical Data

	normal	shortwing		
Wing span:	9,85 m	9,25 m	Length:	5,94 m
Wing area:	11,42 qm	10,73 qm	Height:	2,43 m

1.3. Abbreviations and Terminology

a) Speeds

IAS	Indicated airspeed = speed as shown on the airspeed indicator
CAS	Calibrated Airspeed is the indicated airspeed, corrected for position and instrument error. CAS is equal to TAS in standard atmosphere at sea level
TAS	True airspeed = speed relative to undisturbed air
VA	Maneuvering speed = max. speed at which application of full available aerodynamic control will not overstress the airplane
VRA	Maximum speed in turbulence
VNE	Never exceed speed is the speed limit that must not be exceeded at any time
VNO	Maximum structural cruising speed is the speed that should not be exceeded except in smooth air and only with caution
VS	Stalling speed or the minimum steady flight speed at which the airplane is controllable
VSO	Stalling speed in landing configuration (full flaps)
VX	Best angle of climb speed which delivers the greatest gain of altitude in the shortest possible horizontal distance
VY	Best rate of climb speed which delivers the greatest gain of altitude in the shortest possible time

b) Meteorological

ISA	International Standard Atmosphere: OAT in MSL 15°C; pressure in MSL 1013,2hPa; air a perfect dry gas; temperature gradient of 0,65°C per 100m
MSL	Mean sea level
OAT	Outside air temperature

c) Weight and Balance

Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes
Arm	The horizontal distance from the reference datum to the center of gravity of an item
Moment	The product of the weight of an item multiplied by its arm
Airplane center of gravity (C.G.)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane
C.G. arm	The arm obtained by adding the airplane's individual moments and dividing the sum by the total weight
C.G. limits	The extreme center of gravity locations within which the airplane must be operated at a given weight
Empty weight	Weight of the airplane including unuseable fuel, full operating fluids and full oil; equipment as indicated

2. Limitations

2.1. General

This chapter contains limitations, instrument markings and placards required for the safe operation of the aircraft.
Limitations valid for additional equipment can be found in chapter 9 (supplements).

2.2. Airspeed Limitations

The airspeed limitations for both versions except V_{NE} are identical. This table shows stall speed V_S and maximum speed V_{FE} for the respective flap setting (based on a weight of 472,5 kg):

Flap pos.	V_S	V_{FE}	Remark
2	65 km/h	105 km/h	short field landing
1	70 km/h	117 km/h	takeoff / normal landing
0	75 km/h *Utility*	230 km/h *215 km/h*	cruise

never exceed speed	**V_{NE} :**	**230 km/h**
Version Utility (or with Junkers Rescue System)	***V_{NE} :***	***215 km/h***
max. speed in turbulence	**V_{RA} :**	**184 km/h**
maneuvering speed	**V_A :**	**151 km/h**
best angle of climb (flaps pos. 1)	**V_X :**	**95 km/h**
best rate of climb (flaps up)	**V_Y :**	**110 km/h**
maximum crosswind component	**CWC:**	**27 km/h**
with door(s) removed		**100 km/h**

2.3. Airspeed Indicator Markings

Every aircraft must be equipped with an airspeed indicator type “Winter FK 9 Mk3/Mk4”, which is calibrated to the aircraft. This is the master airspeed indicator, even with an EFIS installed.
The airspeed indicator has following markings and shows IAS in [km/h]:

white arc	1,1*VSO to VFE 72 to 105 km/h	full flap operating range (flaps in pos. 2)
green arc	1,1*VS1 to VRA 83 to 184 km/h	normal operating range (flaps in pos. 0)
yellow radial	at VA 151 km/h	maneuvering speed
yellow arc	VRA to VNE 184 to 230 km/h *Utility or Junkers Rescue System 215 km/h*	operate with caution, only in smooth air
red radial	at VNE 230 km/h *Utility 215 km/h*	max. speed for all operations

2.4. Power Plant Limitations

This is summary of the respective (ROTAX or M160) engine manual. In case of any discrepancy the engine manual shall apply.

	M160 (SMART)	
	60 KW	**74 KW**
Oil	automobile - oil (API SG)	
Oil capacity	3,2 l; difference MAX - MIN 0,5 l **Note: never fill up above MAX**	
Oil temperature	min 50°C, max. 140°C normal 100 - 130°C	
Oil pressure	1,5 bar to 4,5 bar	
Fuel	**Unleaded** car fuel without bioethanol (min 95 ROZ)	
Manifold press	1,9 (+0,1/-0,2) bar	2,3 (+0,1/-0,1) bar
Water temp.	normal 90°C; maximum 105°C	

	ROTAX 912 UL	ROTAX 912 ULS
Oil	automobile - oil (API SF or SG)	
Oil capacity	2,6 Ltr (min) to 3,05 Ltr (max)	
Oil temperature	min 50°C, max. 140°C	min 50°C, max. 130°C
Oil pressure	1,5 bar to 5 bar (engine start 7 bar)	
Fuel	car fuel without bioethanol (min 95 ROZ) MOGAS, AVGAS 100LL	
Fuel pressure	0,15 bar to 0,4 bar	
CHT	max. 120°C when using water / glycol mixture	
Magneto check	min. 2800 U/min	
Max. drop	300 U/min	

Note: Subject: Oil system, Engine lubrication system
Engines which have had the prop spun for more than 1 turn in reverse direction allow air to be injested into the valve train.
Action:

1. It is forbidden to spun the prop in reverse direction for more than 1 turn.
2. Inspection for correct venting of the oil system has to be performed in cases when the prop has been spun in reverse direction for more than 1 turn.

2.5. Propeller

Pos.	Engine	Propeller	Diameter
01	ROTAX 912 UL	Junkers PR-170-3R	1700 mm
02	ROTAX 912 UL	Warp / DUC 3 – blade	1720 mm
03	ROTAX 912 UL	Kremen SR 2000 (adjustablel)	1700 mm
04	ROTAX 912 ULS	Sport Prop Klassik 3 blade	1710 mm
05	ROTAX 912 ULS	Warp / DUC 3 – blade	1720 mm
06	M 160 (60 KW)	Warp / DUC 3 - blade	1720 mm
07	M 160 (74 KW)	Warp / DUC 3 - blade	1720 mm
08	ROTAX 912 ULS	DUC FC 3 - Blatt	1727 mm

2.6. Weights

Maximum weight per seat:	100 kg	
Baggage aft max:	10 kg	
Total of fuel + baggage max.:	46,5 kg	
Empty weight:	acc. actual weighing	
Maximum Takeoff Weight:	472,5 kg	if certified acc.
Maximum Landing Weight	472,5 kg	LTF-UL 2003

2.7. C.G. Limits

forward center of gravity:	0,22m behind datum
aft center of gravity	0,44m behind datum

Datum is the leading edge of the wing.

2.8. Maneuvers

The FK 9 is certified as an Ultralight aircraft.
Acrobatic maneuvers, including spins, bank angles greater than 60°, as well as IFR and VFR night are prohibited.

Note regarding spins: In the light aircraft/ultralight category spinning is strictly prohibited and is not required to demonstrate during flight test program.
Despite this, all FK aircraft have also been tested regarding their general spin characteristics. In general it is important to know that a spin is a very complex flight condition and relates to many individual factors like weight, centre of gravity, mass distribution, aerodynamic conditions, number of spin turns already performed, kind of control deflections already made and so on.
For example, the spinning characteristic of the same aircraft on the same day can differ significantly because of differences in mass distribution or dirt on surfaces. This can cause a "non recoverable" spin-condition!
In practice this means that flying into stalls on purpose must be avoided and recovery procedures have to be performed immediately!

Spinning any aircraft which is not certified for this maneuver is extremely dangerous! The onset of a stall is indicated to the pilot by many factors like IAS, stick pressure, horizon level. Stalls can also be result from abrupt control deflections / changes in angle of attack!
In strong turbulence the airspeed must be reduced below V_A (151 km/h).
When flying off grass strips with long grass, the wheel pants must be removed to avoid damage.
When flying with doors removed, maximum speed is 100 km/h. Flight with door open is prohibited.
Maneuvers with zero or negative load factors must be avoided under all conditions. These maneuvers may cause a fire due to fuel spill when using ROTAX engines with carburetors.

2.9. Flight Load Factors

	positive	negative
Maximum load factor at V_A	+ 4g	- 2g
Maximum load factor at V_{NE}	+ 4g	- 1,5g
Maximum load factor with flaps down	+ 2g	0g

2.10. Kind of Operation

The FK 9 is approved as Ultralight aircraft for VFR day (Nfl 1-96/82).

2.11. Fuel / Oil / Coolant

Engine operating manual is the governing one!

Tank	Capacity 60 Ltr; 1 Ltr not useable
Fuel	Compare engine limitations Unleaded fuel without bioethanol recommended, **mandatory for M160 (smart)** AVGAS should only be used if MOGAS is not available or in case of problems caused by vapour locks
Oil	Compare engine limitations synthetic oils preferred; *do not use aircraft oil !*
Oil capacity	Compare engine limitations
Coolant	Compare engine limitations

2.12. Passenger Seating

The aircraft has 2 seats. It can be flown from either seat.

2.13. Colour

The surface of the structure (composite structure) must be white or yellow. Local coloured decoration is possible. Complete painting in different colours only with agreement of the manufacturer.

2.14. Electric

The electrical system is designed for a maximum load of 12 A.

2.15. Placards

Location:	**Placard:**
In the Cockpit	max. TOW 472,5 kg spins and acrobatics prohibited
Cockpit	Weighing date: Empty weight: Poss. load including fuel:
Cockpit rear section	Type placard (metal)
Door handles (inside + outside)	OPEN / CLOSE
Fuel selector in flow direction	fuel
Fuel selector closed position	close
Aft baggage compartment	max. load 3 kg with 60L fuel
Choke (ROTAX only)	choke
Carburetor heat	carb. (option)
Cabin heat	cabin heat (option)
Throttle friction	throttle friction
Trim handle	trim
Trim markings	Neutral; nose up; nose down
Park brake valve	Park
Brake handle	Brake
Flap indication	“110” / “95” close to indication LED
Oil temperature indication VDO	OIL
CHT indication VDO	CHT
Fuel cap	FUEL AVGAS / MOGAS
Fuel indication	markings every 10l + tank full
Vicinity of rescue system	placard Rescue system
Rocket Exit Area	Danger: Rocket Exit Area
Safety pin rescue system	Remove before flight
Top of vertical fin	Company logo
Wing tip (ext. wing connection mechanism installed)	OPEN / CLOSE
Wheel fairings main wheels	2,0 bar
Wheel fairing nose wheel	1,5 bar
Towing version only:	
Vicinity of airspeed indicator	Care for tow speed !
Handle for cowlflap	Cowlflap
Towing clutch	max. break load 200kp
Handle for towing clutch	TOW

3. Emergency Procedures

3.1. General

The following information is presented to enable the pilot to form, in advance, a definite plan of action for coping with the most probable emergency situations which could occur in the operation of the airplane.

3.2. Engine Failure

Glide speed	100 km/h flaps pos. 1
Electrical fuel pump	ON (ROTAX only)
Fuel selector	check ON
Fuel remaining	check
Ignition (SMART only)	OFF then ON (electronic reset)
Engine	start
No restart possible:	
Emergency landing	perform respective procedure

3.3. Fuel Pressure Low

In the event of a fuel pressure low indication, switch ON the electrical fuel pump (ROTAX only).

3.4. Generator Fault

In the event of a power generator fault, switch OFF all non-essential devices in order to save battery power.
With Smart engine installed, land immediately as the engine ignition is powered by battery. The engine will stop as soon as the battery charge is exhausted. Depending on the rating and charge status of the built-in battery as well as engine RPM, this might happen after 5 to 8 minutes.

3.5. Glide

Glide ratio is about 1:13 for best glide speed 100 km/h (flaps pos. 1).

3.6. Emergency Landing

Glide speed	100 km/h flaps pos. 1
Emergency field	select
Emergency call (121,5 MHz)	perform
Throttle	close
Electrical fuel pump	OFF (ROTAX only)
Fuel selector	OFF (ROTAX only)
Ignition / Battery switch	OFF
Safety belts	pull tight
Final, landing assured:	
Flaps	full down
Approach speed	90 km/h

The glide can be controlled by changing airspeed, flap setting or slip. Use caution, flaps in position 2 cause a lot of drag. Airspeed indication remains valid during slip. Touchdown should be achieved at minimum speed.

3.7. Strong Vibrations

Caused by engine or propeller:	
Ignition	OFF
Airspeed	reduce
Emergency landing	perform respective Abnormal List
Caused by the fuselage / wings:	
Airspeed	reduce

3.8. Steering Problems

Aircraft uncontrollable with remaining flight controls:	
Throttle	close
Ignition	OFF
Rescue system	activate
Electrical fuel pump	OFF (ROTAX only)
Fuel selector	OFF (ROTAX only)
Emergency call (121,5 MHz)	perform
Battery switch	OFF
Safety belts	pull tight
Doors	unlatch

3.9. Fire and Smoke

All electrical systems	OFF
Emergency landing	perform respective Abnormal List
Rescue system	activation only, if immediate emergency landing not possible

3.10. Stall recovery

A stall can be recognized by light buffeting.

Elevator	push
Wings	level
Aircraft	recover

Normally the FK 9 does not enter a spin out of a slowly initiated stall.
Spin recovery (if a spin is entered inadvertently):

Power	idle
Stick	neutral
Full rudder	opposite to direction of spin
Flaps	up
Wings	level
Aircraft	recover

To avoid overstressing the flaps, they must be retracted immediately.

Altitude loss and pitch during stall:

Configuration	V_S	Altitude loss	Pitch after stall
flaps up (pos. 0)	75 km/h	40m	- 5°
flaps pos. 1	70 km/h	40m	- 5°
flaps pos. 2	65 km/h	35m	- 5°

Stalls (especially with power on), spins and all maneuvers with zero or negative g-load must be avoided under all circumstances, these maneuvers may cause a fire, especially when using ROTAX engines with carburetors.

For all other emergencies use standard procedures!

4. Normal Procedures

4.1. General

This chapter deals with the normal procedures recommended for the safe operation of the FK 9.

4.2. Regular Inspection

As Ultralight aircraft are designed to be lighter than normal aircraft but must withstand similiar loads, the structure and the engine must be inspected regularly.
If there is any damage it is recommended to consult a certified maintenance facility or contact the manufacturer. This applies especially to the composite and aluminium structures.

4.3. Preflight Inspection

During preflight inspection, the aircraft must be inspected for its general condition. Snow, ice, frost and dirt must be removed completely from the aircraft as they impair aerodynamics and also increase weight.

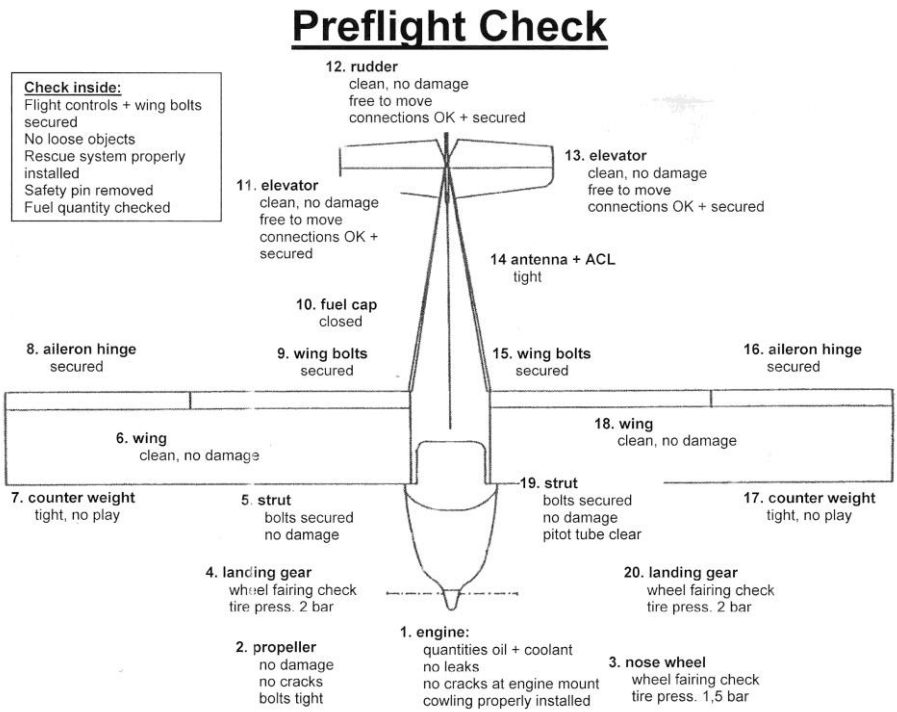
Preparation	
Aircraft condition	Airworthy, papers available
Weather	Sufficient
Baggage	Weighted and safely stowed
Weight and balance	Checked
Navigation and charts	Prepared and available
Performance and endurance	Calculated and safe

Cockpit	
Battery / ignition	OFF
Cabin	no loose objects
Flight controls	connected and secured
Belts, seats	check
Fuel quantity	check
Fuel lines, tank mounting	check
Rescue system	remove safety pin
Instruments	check

Engine check (also perform the checks required as mentioned in the engine manual)	
Cowling	remove
Exhaust	check for cracks + check springs
Carburetor, accessories	check
Coolant	check, add if required
Oil quantity	check, add if required
Oil-, cooling- and fuel system	check for leaks
Spark plugs	check
Engine mount	check for cracks
Vibration damper	check for cracks
Fuel lines	check for damage
Cables, bowden-cables	check for damage
Float chamber (carburetor)	check for water / dirt
Cowling	install

Outside check Wings, fuselage and rudder must be checked for damage. In cold and moist weather conditions the ceconite can loose tension. If there is no structural damage it can be carefully treated with a hair dryer to bring up the tension.	
1. Engine	perform check as prescribed above
2. Propeller	no damage,cracks
3. Nose wheel	wheel fairings check; tire press. 1,5 bar
4. Right landing gear	wheel fairings check; tire press. 2 bar; check main attachment screws
5. Right strut	bolts secured, no damage
6. Right wing	clean, no damage
7. Counter weight	tight, no play
8. Aileron hinge	secured
9. Wing bolts	secured
10. fuel cap	closed
11. Right elevator	clean, no damage, freedom of movement; connections OK + secured
12. Rudder	clean, no damage, freedom of movement; connections OK + secured
13. Left elevator	clean, no damage, freedom of movement; connections OK + secured

14. . Antenna + ACL	tight
15. Wing bolts	secured
16. Aileron hinge	secured
17. Balance weight	tight, no play
18. Left wing	clean, no damage
19. Left strut	bolts secured, no damage; pitot tube clear, cover removed
20. Left landing gear	wheel fairings check; tire press. 2 bar; check main attachment screws
Tail wheel only	
tailwheel	Wheel OK; connection OK + secured



4.4. Engine Start

Seat belts	fastened
Doors	closed and locked
Fuel selector	OPEN
All electrical equipment	OFF
Circuit breaker	check
Instruments	check & set
Rescue system	check safety pin removed
Battery switch	ON
Ignition	ON
Electrical fuel pump	ON (ROTAX only)
Choke (ROTAX only)	pull (cold engine only)
Parking Brake	set
Throttle	idle (**ROTAX: hot engine ½ throttle!**)
Prop area	CLEAR
Starter	engage; set 1600 - 1700 RPM
Oil pressure	check
Choke (ROTAX only)	OFF
Avionics	ON
Electrical fuel pump	OFF (ROTAX only)

4.5. Taxi

Brakes	check
Stick	pull to relieve nosewheel
Rudder	do not move if aircraft is not moving
Tail wheel only:	
Stick	push to relieve tailwheel

4.6. Before Take-off

Brakes	set; brakes must hold at least 3200 RPM
Instruments	check
Choke (ROTAX only)	check OFF
Magnetos (ROTAX only)	check at min. 2800 RPM; variance between mags. max. 115 RPM, max. drop 300 RPM
Electrical fuel pump	ON (ROTAX only)
Carburetor heat	OFF (if installed)
Flaps	takeoff position (Pos. 0 or 1)
Flight controls	check
Trim	set
Doors	closed and locked; end of seatbelts inside the cockpit
Oil temperature	min. 50°C
CHT	min. 60°C

4.7. Takeoff

Brakes	apply
Throttle	advance slowly to full power
Manifold pressure (SMART only)	1,8 bar (60KW) or 2,3 bar (74 KW) $\pm$ 0,1 bar
Engine instruments	check, min. 4500 RPM
Brakes	release
Elevator	neutral
at 90 to 100 km/h	lift off
Climb	100 km/h with flaps in Pos. 1 120 km/h with flaps in Pos. 0
Clear of obstacles, at safe altitude:	
Flaps	up
Electrical fuel pump	OFF (ROTAX only)

It is not recommended to takeoff with full flaps as the flaps produce a lot of drag in this position.

4.8. Climb

	ROTAX	SMART
Oil temperature	max. 130°C	max. 140°C
CHT	max. 120°C	max. 105°C
Speed	120 km/h with flaps up	

Hint:
At CHT >115°C (ROTAX only) local condensation in the cooling system will cause continuous loss of cooling fluid. Reduce power setting and increase airspeed until CHT remains below 115°C.

4.9. Cruise

	ROTAX	SMART
Oil temperature	max. 130°C	max. 140°C
CHT	max. 120°C	max. 105°C
Speed	as required	
Trim	set	
Fuel	monitor	

For values of fuel flow and range check chapter 5.

4.10. Descent

Carburetor heat	ON (if installed)
Oil temperature	min. 50°C
CHT	min. 60°C

Hint:
If engine temperatures remain at or below minimum values during flight (winter operation), it is recommended to cover the radiators with tape.

4.11. Landing

Normal Landing	
Speed	reduce to 110 km/h
Flaps	set Pos. 1
Speed	100 to 110 km/h (rain + 5 km/h)
Electrical fuel pump	ON (ROTAX only)
Short prior touchdown	start flare to achieve touchdown at minimum speed
Throttle	idle
Tail wheel only	
Touchdown	in 3 point position
Control stick	keep full aft after tail wheel is on the ground
Short Field Landing	
Speed	reduce to 110 km/h
Flaps	set Pos. 1
Electrical fuel pump	ON (ROTAX only)
On final	reduce speed to 95 km/h
flaps	set Pos. 2
Speed	90 to 95 km/h (rain + 5 km/h)
Short prior touchdown (not to early!)	start flare to achieve touchdown at minimum speed
Throttle	Idle
Tailwheel only	
Touchdown	in 3 point position
Control stick	keep full aft after tailwheel is on the ground
Go Around	
Throttle	advance slowly to full power
Speed	min. 90 km/h
Flaps	retract to Pos. 1
Carburetor heat	OFF (if installed)
Speed	100 km/h
Trim	set
Clear of obstacles, at safe altitude:	
Flaps	up
Electrical fuel pump	OFF (ROTAX only)
Speed	120 km/h

The following table contains minimum and maximum speeds as well as the relevant VREF for all flap positions, valid for a weight of 472,5 kg:

Flap Position	VFE (max. speed)	VS (min. speed)	VREF (1,3 * VS)
2	105 km/h	65 km/h	85 km/h
1	117 km/h	70 km/h	91 km/h
0	230 km/h 215 km/h Utility	75 km/h	98 km/h

Under certain conditions (crosswind, turbulence, forward CG) it is recommended to retract flaps immediately after touchdown.

4.12. Touch and Go

Flaps	retract to Pos. 1
Carburetor heat	OFF (if installed)
Trim	set takeoff position
Throttle	advance slowly to full power
at 90 to 100 km/h	rotate
Speed	100 km/h
Clear of obstacles, at safe altitude:	
Flaps	up
Electrical fuel pump	OFF (ROTAX only)
Speed	120 km/h

4.13. After Landing / Parking

Flaps	up
Trim	neutral
Carburetor heat	OFF (if installed)
Electrical fuel pump	OFF (ROTAX only)
Avionics	OFF
Ignition	OFF
Battery switch	OFF
Rescue system	secure (insert safety pin)

5. Performance

5.1. General

The graphs and tables in this section present performance information corrected for the conditions of ICAO Standard Atmosphere. These data do not contain any safety margin and are based on a clean and well serviced aircraft as well as the application of the mentioned procedures.

5.2. Takeoff Distance

Conditions: Mean sea level (MSL), dry grass surface, takeoff weight 472,5kg, flaps pos. 1.

Propeller	Engine	Takeoff run	to 15m Height
Junkers	ROTAX 912 UL	120m	230m
Warp / Duc	ROTAX 912 UL	120m	230m
Kremen	ROTAX 912 UL	110m	200m
Sportprop	ROTAX 912 ULS	100m	185m
Warp / Duc	ROTAX 912 ULS	100m	185m
Warp / Duc	M160 (60 KW)	120m	230m
Warp / Duc	M160 (74 KW)	105m	190m
Duc FC	ROTAX 912 ULS	150m	285m

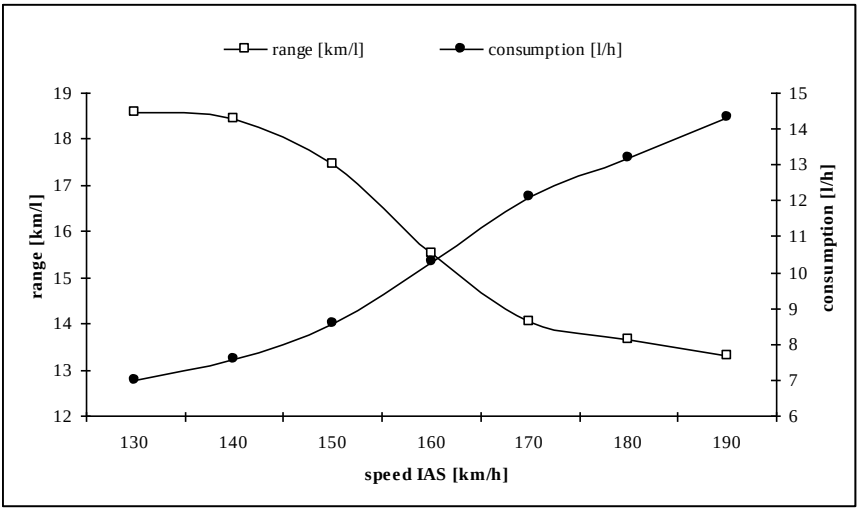
Correction for differing conditions:

Correct above mentioned values for differing conditions as follows:

Difference in	Correction	m
1. Pressure Altitude:	+ 10% per 1000ft Pressure Altitude (PA)	+ =
2. Temperature:	+/- 1% per°C temperature deviation	+/- =
3. Slope:	+/- 10% per 1% slope	+/- =
4. wet surface:	+ 10 %	+ =
5. soft surface:	+ 50%	+ =
6. high grass:	+ 20%	+ =

5.3. Cruise Performance

The following table (valid for ROTAX 912 UL; M160 (smart) is little better, ROTAX 912 ULS little worse) presents data for fuel consumption and range. For flight planning purpose, add a safety margin of at least 5%.



5.4. Service Ceiling

The maximum Altitide in ISA conditions is:

Engine	ceiling
ROTAX 912 UL	14500ft
ROTAX 912 ULS	16000ft
M160 (60 KW)	15000ft
M160 (74 KW)	16000ft

Please observe Oxygen requirements and respect any local regulations and rules!
When using the M160 engine do not overboost, observe the engine manual!

6. Weight and Balance

6.1. General

To achieve the mentioned performance data and flying abilities, the aircraft must be operated within certified weight and balance limits. Although the aircraft has a wide range for weight and balance, it is not possible to fly with full baggage load, full fuel and 2 heavy pilots at the same time.
Wrong loading has consequences for every airplane:
an aircraft exceeding weight limits will need longer takeoff- and landing distances, climb performance will be decreased and stall speed increased.
A wrong center of gravity will change the flying abilities. A forward C.G. may cause problems during rotation, takeoff and landing. An aft C.G. may cause instability, inadvertent stall or even spin.
The pilot in command must assure prior to each takeoff, that the aircraft is operated within the certified weight and balance limits.

6.2. Basic Empty Weight

Prior to delivery, each aircraft has been weighted with fuselage level, (reference line see drawing below), including oil and coolant, as well as equipment as indicated but no fuel (except un-drainable fuel). During this procedure the respective arms are determined as well.
By using the following formula, the C.G. is computed. Reference line (datum) for all arms is the leading edge of the wing. All these data are transferred to the Basic Empty Weight and Balance Form (Wägebericht). This “Wägebericht” contains a list of equipment installed and is part of this manual.
All changes to the airplane affecting weight and balance (installation of new equipment etc.) require a new weighing.

Formula to compute the center of gravity (X):

Center of Gravity in [m] $CG = \frac{\sum M}{\sum G}$

GG = total weight
GR = weight right
GL = weight left

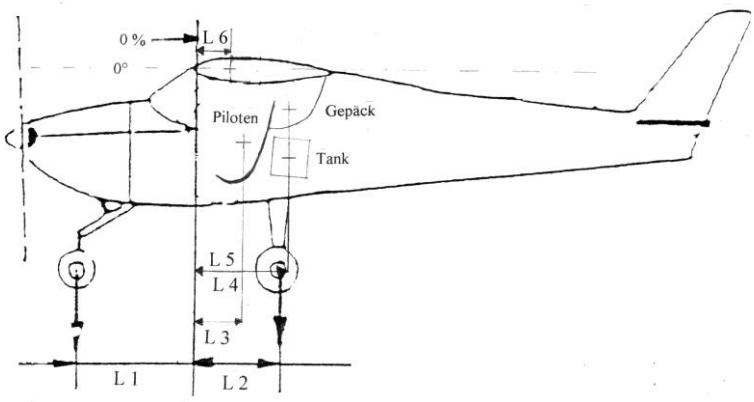
$$X = \frac{-L1 \bullet GV + L2 \bullet (GR + GL)}{GG}$$

Tricycle
GV = weight front

$$X = \frac{(GR + GL) \bullet L1 + GH \bullet L2}{GG}$$

Tailwheel
GH = weight aft

L 1 = from datum to the axle of the main wheels
L 2 = from datum to the axle of the tailwheel



Arms (Datum: wing leading edge):

L 1 nosewheel	Weight form	L 4 tank	1,05 m
L 2 wheel	Weight form	L 5 baggage	1,19 m
L 3 seat	0,43 m	L 6 Wingtank	0,21 m

6.3. Determination of C.G. for the Flight

The Pilot is responsible for proper loading of the aircraft.
The C.G. can be determined by computation or by using the following graph. The C.G. must always be within limits (compare chapter 2)!

Example for computation:

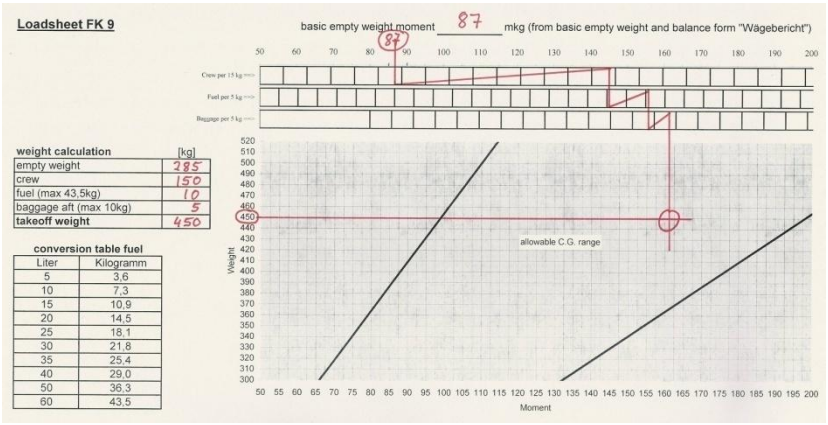
Method 1 “Calculation”:
Data in the shaded area are taken from the “Wägebericht”.

Position	Weight [kg]	Arm [m]	Moment [mkg]
Left wheel	GL = 120,1	L 2 = 0,527	63,29
Right wheel	GR = 119,1	L 2 = 0,527	62,77
Nose wheel	GV = 45,8	L 1 =- 0,854	- 39,11
Empty weight-data	Empty weight **285**	C.G. **0,31**	**86,95**
Pilot(s)	150	L 3 = 0,43	64,5
Fuel	10	L 4 = 1,05	10,5
Fuel Wing	0	L 6 = 0,21	0
Baggage	5	L 5 = 1,19	5,95
Total	Total Weight **450**	C.G. (0,22 to 0,44) **0,373**	Total Moments **167,9**

Form:

Position	Weight [kg]	Arm [m]	Moment [mkg]
Left wheel	GL = _____	L 2 = _____	_____
Right wheel	GR = _____	L 2 = _____	_____
Nose wheel	GV = _____	L 1 =-_____	_____
Empty weight-Data	Empty weight	C.G.	
Pilot(s)	_____	L 3 = 0,43	_____
Fuel	_____	L 4 = 1,05	_____
Fuel Wing	_____	L 6 = 0,21	_____
Baggage	_____	L 5 = 1,19	_____
Total	Total Weight	C.G. (0,22 to 0,44)	Total Moments

Method 2:



Example:
Enter the graph from the top with the Basic Empty Moment (example 87 mkg) from the respective Basic Empty Weight and Balance Form (Wägebericht). Draw a vertical line to the row CREW. Here the weight of the crew has to be taken into consideration (for 150 kg about 10 boxes to the right), the next lower row takes care of the weight of the fuel (for 10 kg about 2 boxes to the right).The next row is for baggage (for 5 kg about one box to the right). **The sum of fuel in the main tank and baggage weight must not exceed 46,5 kg.** If there is fuel in the optional wingtanks, it has to be considered in the same way in the next row.
Draw a vertical line from this point to the lower graph and a horizontal line with the actual takeoff weight in this graph. The intersection of those lines indicates the actual C.G., it must lie within the thick lines indicating the forward and aft C.G. limits.

Insert
“Loadsheet FK9”
(DIN A4) here.

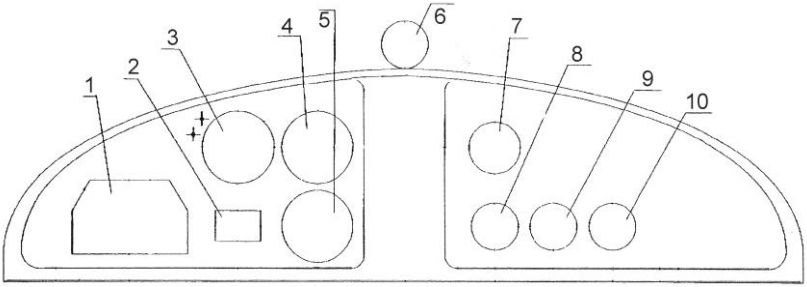
7. Systems Description

7.1. General

The FK 9 is a two-seat high wing ultralight aircraft with aerodynamic steering. It is available in tricycle or tailwheel configuration. The wing has flaps which can be set to three positions. The front- / tailwheel is connected to the rudder pedals. The aircraft is equipped with dual controls.

7.2. Instrument Panel

The instrument panel contains all required flight and engine instruments. This describes a standard equipment configuration, different ooptions can be provided on request.

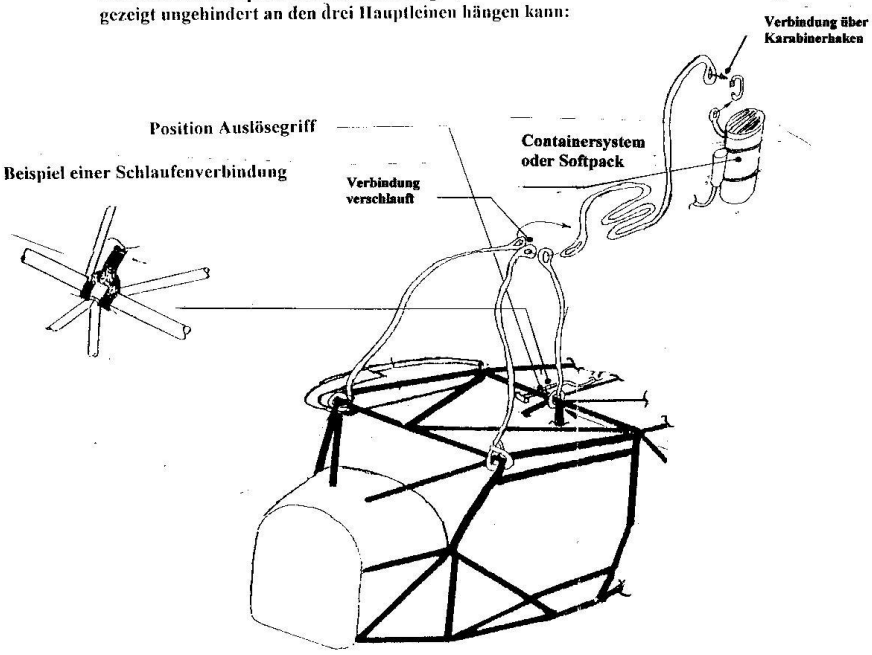


1	Electric panel	5	Variometer	9	Oil temperature
2	Slip indicator	6	Compass	10	Cylinder Head Temperature
3	Speed indicator	7	RPM indicator		
4	Altimeter	8	Oil pressure		

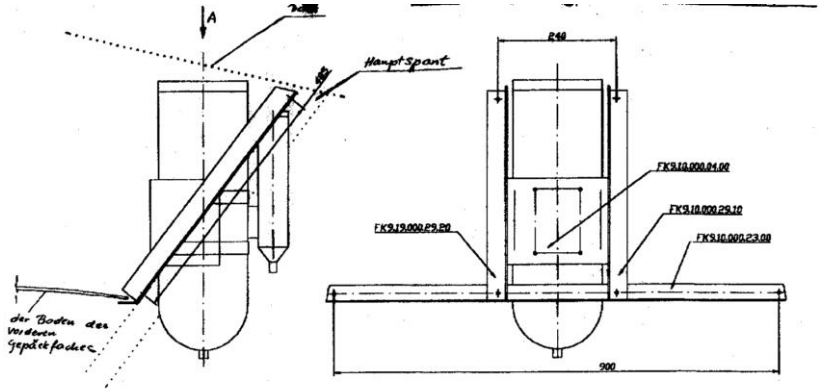
Controls to operate flaps, brakes and trim are located at the center console.

7.3. Rescue system

The FK 9 is equipped with a rescue system mounted into the fuselage behind the seats. Only original Kevlar harness parts must be used. There must be no obstructions for the deployment of the rocket.
Detailed information concerning max. speed, capacity and maintenance cycles are provided in the respective rescue system manual.



Canister system installation:



Softpack installation:

	The system is activated by pulling the red handle. It is located either overhead the pilots seats (see picture) or at the center console. *The safety pin **must** be removed before flight.* The safety pin should be installed again during storage / parking of the aircraft to avoid inadvertent activation.

7.4. Flaps

The flaps are operated mechanically. The respective flap position is indicated either by small diodes near the airspeed indicator or by electronic display systems.

7.5. Tyres

Wheel	Size	Pressure
Main	6.00 x 6 or 4.00 x 6	1,8 to 2 bar
Front	4.00 x 4	1,5 to 2 bar
Tail	120 mm	

7.6. Baggage

There is one baggage compartment aft of the pilots seats accessible from the outside by a small door. It has a maximum capacity of 10 kg. The sum of fuel and baggage weight must not exceed 46,5 kg. Smaller items must be put into bags. All things in the baggage compartment must be fixed in order not to touch / restrict the flight control rods.

7.7. Seats and seatbelts

The backrests of the seats can be adjusted. The handle has to be moved upwards to unlock the backrest. Then the backrest can be moved to the desired position and must be locked again by moving the handle downwards. The 4-point seatbelts can be adjusted to fit every size. The lock is released by pressing the red button.

7.8. Doors

The doors can be opened and locked from inside with a handle. The pilots door can also be opened / closed from outside. Both doors have a small vent. Doors can be removed completely. Without doors, the airspeed must be limited to 100 km/h.

7.9. Engine

The engine is a ROTAX 912 UL / 912 ULS four-cylinder, or a three cylinder M160 (smart) engine with turbocharger. The ROTAX has a combined cooling by liquid and air, the smart is liquid cooled. To shutdown the ROTAX it is recommended, to switch off one ignition circuit by using the ignition test switch before shutting down the engine completely.
The control levers for choke (ROTAX only), carburetor heat (ROTAX only, if installed) and throttle are located below the instrument panel.
The engine cowling can easily be removed for maintenance and checks. Oil and coolant can be checked by opening a small cap on the right upper part of the cowling.

7.10. Fuel System

There are two fuel tanks with a total capacity of 60 liters mounted behind the pilots seats. The fuel valve (ROTAX only) is located at the center console with positions ON and OFF. The version with SMART engine has no additional fuel valve because its electrical fuel pump closes the fuel line as soon as the ignition is switched off. One (optional) fuel drain valve is located at the lower fuselage aft of the main landing gear. There is one fuel pump normally providing fuel to the engine.

ROTAX only: Additionally there is an electrical fuel pump which should be ON during takeoff and landing.

One (optional) fuel pressure warning light indicates fuel pressure below minimum. In this case switch on the electrical fuel pump.

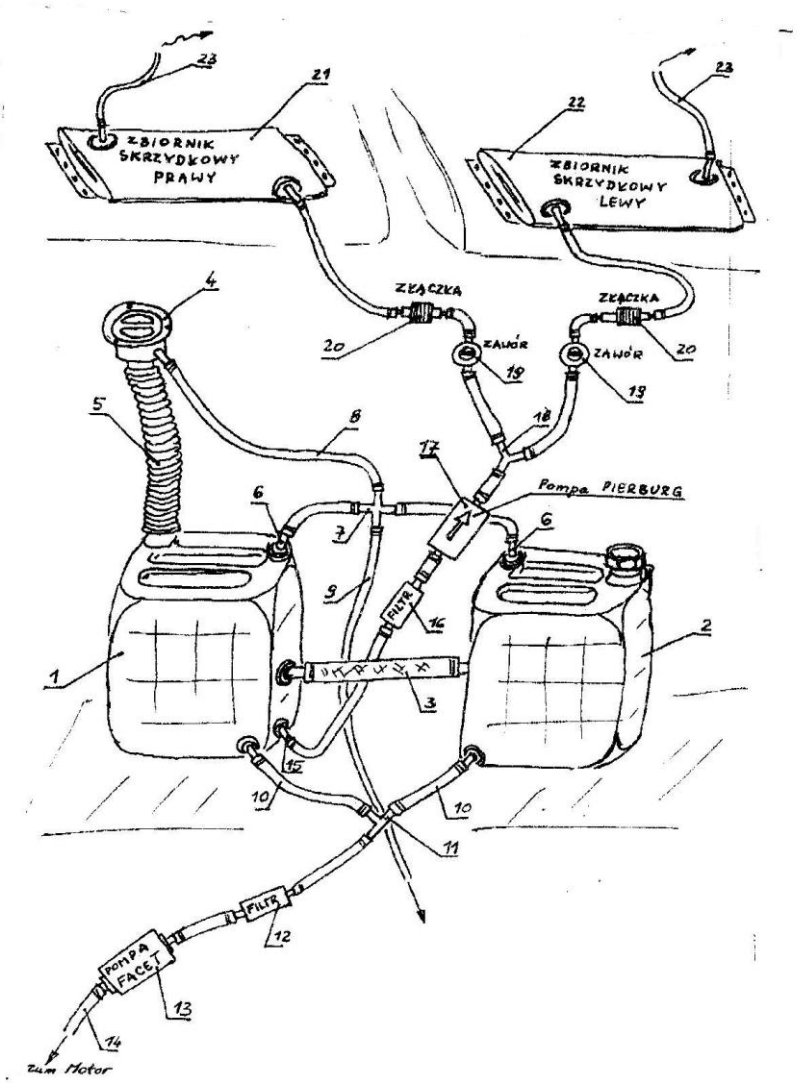
Fuel quantity is indicated by a gauge at the tank. After refuelling, this indication is accurate after both tanks have levelled. This can take up to 5 minutes.

Additionally installed is an electrical gauge on the center console. This gauge offers a rough estimate of the current fuel quantity. The accuracy of the gauge is not sufficient for flight planning purposes. This gauge indicates less than full with tanks completely filled.

Although the fuel cap has a water drain, it is recommended to secure the cap from water entering during strong rain by putting an extra cover on top of the cap when the aircraft is parked. The same applies to the openings on top of the engine cowling.

Additional Wingtanks (option)

Additional flexible fueltanks (capacity 20 Liter each) can be installed in the wings of the FK 9. They are connected to the main tank and are filled and emptied by using an electrical pump. The overflow / vent (23) is connected to the vent system (8) of the main tank. Each tank has a fuel valve (19).


ZBIORNIK SKRZYDŁOWY PRAWY
ZBIORNIK SKRZYDŁOWY LEWY
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Handling of the wingtank:

To fill or empty the tank, the respective fuel valve (19) must be open and the pump must be switched to the ”up“ or “down” position.
Filling of the wintank has to be done on ground with at least 20 liter of fuel in the main tank. The wingtank is full as soon as fuel is flowing via the overflow / vent (23) into the vent system (8) of the main tank. Now the pump has to be switched off and the valve must be closed.
During flight, the fuel can be pumped out of the wingtank as soon there is space of at least 20 liter in the main tank.

7.11. Brakes

Brakes are controlled by a handle at the center console. Brakes are applied to both main wheels at the same time.
By closing a valve at the center console when pressure has been applied, the hydraulic brake can be function as a park brake.
CAUTION (only models manufactured before November 2005): if the valve is closed (park brake set), the brake handle is without function. In case the aircraft starts to move with park brake set, the valve must be opened and the brake handle pulled. Thereafter the valve can be closed again.

7.12. Heating and Ventilation

The FK 9 is optionally equipped with cabin heating. By pulling the lever below the instrument panel, heated air is allowed to enter the cabin through the front of the pilots feet. The cabin is ventilated by the vents in the doors.

7.13. Electrical System

A detailed schematic of the electrical system is available under www.fk-lightplanes.com, section ”manuals“.
A 12V engine-driven alternator delivers the required electricity.
If the red generator control light lights up above 1800 RPM, (or SmartMIP gives a warning) shut off all electrical equipment not required for flight as the battery is discharged.
With Smart engine installed, land immediately as the engine ignition is powered by battery. The engine will stop as soon as the battery charge is exhausted.
Depending on the rating and charge status of the built-in battery as well as engine RPM, the engine can be expected to work for the indicated periods following a power generator fault (assuming that the battery is fully charged):

Battery rating	5.7 Ah	8 Ah	13 Ah
Period	5 to 8 minutes	10 minutes	15 minutes

The electrical panel contains most of the switches and electric fuses.
The electrical system is designed for a maximum load of 12 A. Connecting a lot of high drain components (landing lights etc.) may result in a higher load. This can lead to overheating and / or an electrical smoke / fire condition and must be avoided under all circumstances.

Fuses:
Only fuses “with time lag“ should be installed

Main Panel

Ext. Power	Pump	Eng.Instr.	Generator	Navigation	Radio
2A	8A	500mA	500mA	2A	2A

Additional Panel

no	2A	5A	5A

Wingtank Panel

8A

8. Handling, Servicing and Maintenance

8.1. General

Every owner of an FK 9 should keep close contact to the manufacturer for best support.

8.2. Ground Handling

Aircraft should be parked with the nose facing into the wind and secured by putting chocks in front of the wheels. To tie down the aircraft, attach long straps to the bolts connecting the wing to the strut and also tie down the nose- / tailwheel.
The aircraft should not be parked in wet conditions or exposed to UV radiation for a longer period of time.
The windscreen should always be covered during parking to avoid getting dirty.
The FK 9 can be stored in a trailer. For details consult the manufacturer.

8.3. Cleaning

A clean surface is very important for aircraft performance. Therefore the whole aircraft and especially the leading edges of the wings and propeller blades should be kept as clean as possible.
Cleaning is preferably done by using a lot of water, if required a mild soap may be added.
Once a year the painted surface should be treated with a silicon-free polish.

8.4. General Advice

- The vibration dampers at the engine mount should be treated regularly with vaseline to prevent aging.
- Fuel lines, cables and bowden-cables must not be damaged.
- **Note: never turn the propeller for more than 1 turn in opposite direction**
- **Airplane maintenance must be performed following the manufacturer's latest maintenance schedule. The actual maintenance schedule can be downloaded from the website "www.fk-lightplanes.com/html/manuals___.html".**

8.5. Regular Maintenance and Lubrication Schedule

Maintenance action is due after certain flight hours or time intervals as applicable.
There are some actions which must be done for the first time after the very first 2 / 10 flight hours. The regular maintenance intervals are 100 / 200 / 500 flight hours or every year / every 2 / every 4 years.
Engine maintenance must be performed additionally according to the respective engine manual.

8.6. Time between Overhaul (TBO)

- For the main structure: none
- recommendation: engine overhaul according engine manual
- recommendation: propeller overhaul according propeller manual

insert
maintenance schedule FK 9 Airframe
(DIN A4) here.

8.7. Fuel System Check / Cleaning

If the fuel tanks are contaminated with dirt (check the inside by using a torch), they must be dismantled and cleaned. For this, drain the complete system (by using the electrical fuel pump) and dismantle all connections. Clean the tanks by using fuel or spirit / alcohol. Do not use water or solvents.

8.8. Control Surface Angle

	Angle [°]		Tolerance [°]
Elevator			
Up	-25		+2 / -0
Down	+11		+2 / -1
Rudder			
Right	18		+2 / -1
Left	18		+2 / -1
Aileron (Flaps –10°)		shortwing	
Up	-14	-20	+1 / -1
Down	+9	+17	+2 / -1
Flaps			
Position 0	-10		+1 / -1
Position 1	+5		+1 / -1
Position 2	+30		+1 / -1

8.9. Jacking / Towing / Storage

Use following points for jacking:

1. lower engine mount where connected to the fuselage or engine mount junctions (hanging up)
2. main gear beam where connected to the fuselage
3. nose- / tailwheel where connected to the fuselage

For towing (forward only), connect the rope to the main gear.

To stow the dismantled wings, use storage tools with a minimum contact area of 150 mm. The leading edge should have no contact to the storage tool in the first 20 mm.

8.10. Main / Subsidiary Structure

The main structure contains of:

1. fuselage structure (metal), tail unit structure, engine mount
2. landing gear (metal/carbon fibre composite)
3. control surfaces (metal)
4. main plane structure (metal/ carbon fibre composite)

Repairs at the main structure must only be performed by authorized facilities!

The subsidiary structure contains of:

1. front fuselage covers / cowlings (glass fibre composite)
2. wheel pants (glass fibre composite)
3. spinner
4. inside cockpit: covers / consoles / floor
5. skin

8.11. Materials for minor repairs

Repairs at the subsidiary structure may be performed by the owner, however it is recommended to consult the manufacturer or a certified repair center before commencing the work.

Materials available for fuselage repair:

1. Glass fibre layer „Köper“ 160g/sqm
2. Epoxy-resin
3. Covering Ceconite 102 + adhesives (i.e. Polytak) + common dope
4. 2-component acrylic paint

8.12. Special Repair and Check Procedures

Use common procedures applicable for aircraft build from metal, composite and covering.

8.13. Required Tools

No special tools are required for normal maintenance.

8.14. Weighing

Weighing has to be performed according to the Weighing Form. Weighing intervals according to applicable rules.

8.15. Mounting / Maintenance of the Rescue System

According to the respective manual.

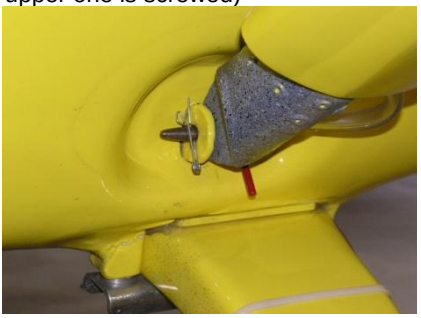
8.16. Assembly of the Aircraft

Assemble the aircraft as follows:

- Check all parts for damage
- Check fuselage and wings for loose or foreign objects
- Connect the wings to the fuselage (doors must be removed or closed)

- IMPORTANT for wing assembly:
  unfold the wing with the leading edge facing downwards; turn the wing into its normal position and push it towards the fuselage; close both wing bolts

- Install the strut with its two bolts (the upper one is screwed)



- Cover the gap between wing and fuselage with tape for better aerodynamics
- Secure all bolts

- Install the other wing in the same manner
- The storing device at the aft fuselage can be removed now
- Mount the outer parts of the elevator
- Connect and secure the rods for aileron and flaps
- Connect the pitot tube line
- Install the doors
- Install the strut covers (if available)
- Check the function of all flight controls and flaps

To disassemble the aircraft follow above mentioned steps in reverse order, observe the following steps.

- If required, remove the elevator tips
- install the storing device for the wings at the aft part of the fuselage
- Note: the screws at the main tube of the folding mechanism (overhead the pilots) are the stop for the folding mechanism; they must only be removed it is intended to remove the wings completely from the fuselage
- to fold the wing:
  pull the wing outside until the stop, turn it 90° (the leading edge facing to the ground), now fold it and store it into the device

9. Supplements

9.1. General

This chapter contains information concerning additional or differing equipment of the aircraft. Additional manuals and other useful information are indicated.

9.2. Engine Manual

A separate manual for the engine is supplied with every aircraft. Specifications of this manual are part of the airplane manual and must be observed.

9.3. Rescue System

A separate manual for the rescue system is supplied with every aircraft. Specifications of this manual are part of the airplane manual and must be observed.

9.4. Avionics / Special Engine Instruments

A separate manual for avionic components is supplied with every aircraft. Specifications of this manual are part of the airplane manual and must be observed. The equipment is installed according the manual and checked for proper operation.

9.5. Kremen Propeller

Limitations, normal / abnormal operation and maintenance of the Kremen propeller must be done according the propeller manual.

9.6. Sailplane Towing

9.6.1. Technical Data / Limitations

1.	max. sailplane gross weight*	650 kg
2.	takeoff distance to 15m	550m
3.	towing rope type: "200 Polyester / 6mm" max. mass of towing rope (including all parts) recommended designed fraction value max. fraction value towing aircraft rope lenght	600 daN 1,5 kg 150 daN 200 daN 45-55m
4.	min. towing speed	95 km/h

*check for further recommandations in the following chapters

Valid for ISA conditions.

For further information contact the manufacturer.