Airplane Manual

FK 12 S2 Comet

Certified as **LSA** or **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. 61158.4

Serial Nr.: _____

Manual Nr.:
12 S2-____-__E

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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 or www.flugservice-speyer.de 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 .

Valid Pages from 1. of December 2016

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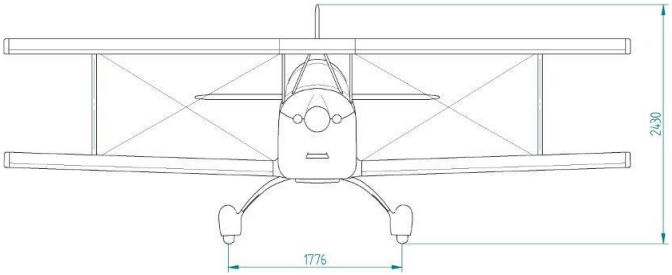
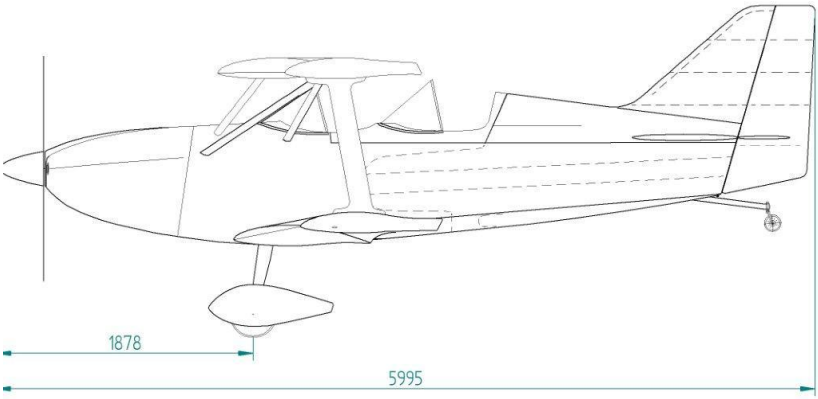
1. General

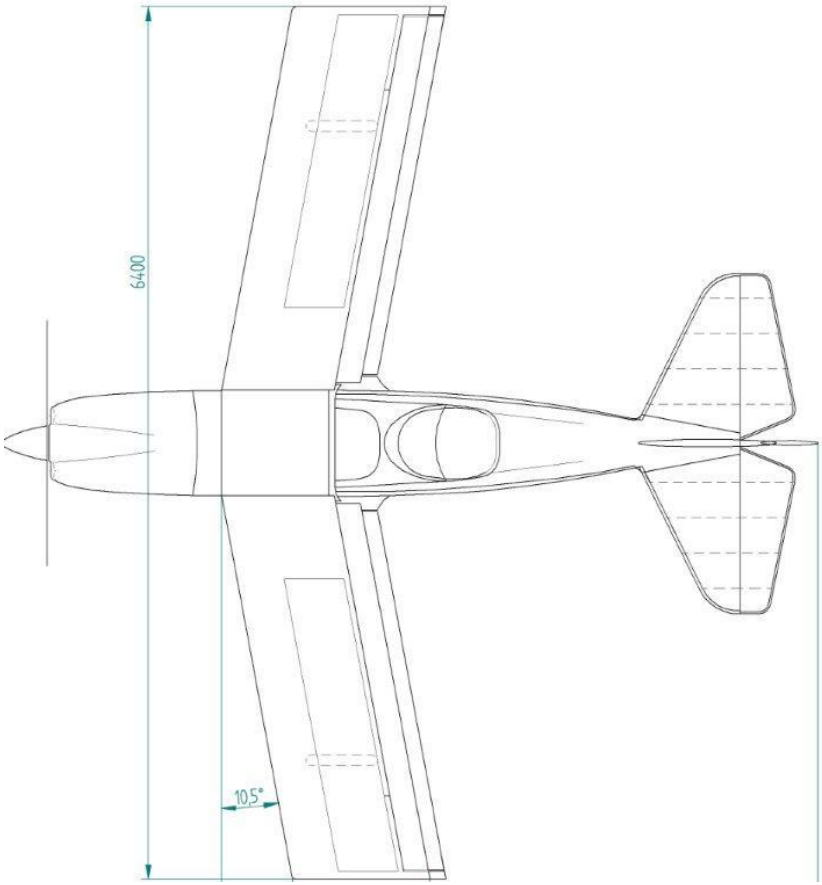
This manual must be read carefully by the owner and operator in order to become familiar with the operation of the FK 12 Comet. The manual presents suggestions and recommendations to help obtain safe and maximum performance without sacrificing economy.
The owner and operator should also be familiar with 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.

1.1. Airplane Three Side View






6400
10,5°

1.2. Technical Data

Wing span:	6,40 m	Wing area:	13,1 m²
Length:	5,99 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
VRA	Maximum speed in turbulence
VA	Maneuvering speed = max. speed at which application of full available aerodynamic control will not overstress the airplane
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

d) Conversions

1 Liter (Ltr)	=	0,264 USG	1 USG	=	3,785 Ltr
1 m	=	3,28 ft	1 ft	=	0,3048 m
1 km/h	=	0,54 kt	1 kt	=	1,852 km/h
1 cm	=	0,394 inch	1 inch	=	2,54 cm
1 bar	=	14,5 psi	1 psi	=	0,069 bar
1 kg	=	2,2 lbs	1 lbs	=	0,45 kg

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

	1042 lbs 472,5kg	1147 lbs / 520 kg
V_{NE} :	137 kt / 253 km/h	137 kt / 253 km/h
V_{RA} :	100 kt / 186 km/h	104 kt / 192 km/h
V_A :	100 kt / 186 km/h	104 kt / 192 km/h
V_X :	51 kt / 95 km/h	57 kt / 105 km/h
V_Y :	54 kt / 100 km/h	65 kt / 120 km/h
CWC :	10 kt / 18 km/h	
V_{FE} :	65 kt / 120 km/h	
$V_{FE\ 1}$:	76 kt / 140 km/h	
V_S :		42 kt / 79 km/h
V_{S0} :	35 kt / 65 km/h	37 kt / 68 km/h

2.3. Airspeed Indicator Markings

The airspeed indicator has following markings and shows IAS in [kt / km/h]:

	1042 lbs / 472,5kg	1147 lbs / 520 kg
white arc: 1,1*VSO to VFE full flap operating range	39 to 65 kt 72 to 120 km/h	40 to 65 kt 75 to 120 km/h
green arc: 1,1*VS1 to VNO normal operating range (flaps up)	45 to 100 kt 83 to 186 km/h	47 to 104 kt 86 to 921 km/h
yellow arc: VNO to VNE operate with caution only in smooth air	100 to 137 kt 186 to 253 km/h	104 to 137 kt 192 to 253 km/h
red radial: at VNE max. speed for all operations	137 kt 253 km/h	

2.4. Power Plant Limitations

This is summary of the engine manual. In case of any discrepancy the engine manual shall apply.

	ROTAX 912 ULS
Max. T/O power	73,5 kW (100hp) at 5800 RPM
Max. cont. power	69 kW (93hp) at 5500 RPM
Oil	automobile - oil (API SF or SG)
Oil level	2,6 Ltr / 2,76 quarts (min) to 3,05 Ltr / 3,24 quarts (max
Oil temperature	min 50°C (122°F) max. 130°C / (266°F)
Oil pressure	0.8 bar (12 psi) to 5 bar (73 psi) (cold engine start up to 7 bar (102 psi)
Fuel pressure	0,15 bar (2,2 psi) to 0,4 bar (5,8 psi)
CHT	max. 120°C (248°F) when using water / glycol mixture

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 ingested 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

Engine	Propeller	Diameter
ROTAX 912 S	Warp / DUC / Woodcomp	68 inch (1720 mm)
ROTAX 912 S	MT 183 R 140 - 2M	71 inch (1800mm)
ROTAX 912 S	Neuform 3-Blatt (constant speed)	67 inch (1700mm)

All propeller turn at least 4500 RPM with full throttle during takeoff in ISA conditions.

2.6. Weights

Values given here are structural limits. Country regulations might be more limiting.

	normal	acro
Maximum weight per seat:	220 lbs (100kg) **observe limitations on weight & balance form**	
Baggage forward max:	18 lbs (8 kg)	
Glove compartment (aft) max:	3 lbs (1,5 kg)	
Maximum Takeoff Weight: Maximum Landing Weight	1147 lbs (520kg)	992 lbs (450kg)

2.7. C.G. Limits

Datum is leading edge of the wing in the center section.

Normal C.G. limit:

forward CG limit: 18,78 inch (477 mm) aft of datum
aft CG limit: 26,65 inch (677 mm) aft of datum

Acro C.G. Limit:

will be added later

2.8. Maneuvers

The FK 12 is certified as an LSA / Ultralight.
Acrobatic maneuvers, including spins, bank angles greater than 60°, as well as IFR and VFR night are prohibited.
Specific acrobatic maneuvers will be approved for the LSA version after completion of required flight tests.

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 aircrafts 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 operation 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 manoeuvre 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.

When flying off grass strips with long gras, the wheel pants must be removed to avoid damage.
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
Acro	+ 6g	-3g
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 12 is approved as LSA / Ultralight Aircraft for daytime VFR.

2.11. Fuel / Oil / Coolant

see engine operating manual also!

Tank	58 Ltr = 31,3 USG (2 Ltr = 1,08 USG not useable)
Fuel	Compare engine limitations Unleaded fuel without Bioethanol recommended 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. During solo flights the pilot occupies the aft seat.

2.13. Colour

The surface of the wing leading edges (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 1042lbs (472,5kg) max. TOW 1147lbs (520kg) depending on certification (UL/LSA) spins and acrobatics prohibited
Cockpit	Weighing date: Empty weight: Poss. load including fuel:
Cockpit sidewall	Type placard (metal)
Baggage compartment	max. load 18 lbs (8 kg)
Glove compartment (aft)	max. load 3 lbs (1,5 kg)
Fuel selector in flow direction	fuel open
Fuel selector closed position	close
Canopy handles	open / close
Flaps	flaps
Choke	CHOKE
Carburetor heat	CARB (option)
Cabin heat	HEAT (option)
Trim handle / Cockpit side wall	Trim / nose-up – nose down
Indicator light “stall”	stall (option)
Indicator light “low fuel”	low fuel (option)
Indicator light “low pessure”	fuel press (option)
Oil temperature indication VDO	OIL
CHT indication VDO	CHT
Wing bolts	OPEN / CLOSE
Vicinity of rescue system	placard Rescue system
Rocket Exit Area	Danger: Rocket Exit Area
Fuel cap	FUEL AVGAS / MOGAS
Fuel indication	Markings every 10l flight / ground
Firewall (from engine)	placard Rescue system
Wheel fairings main wheels	29 psi (2 bar)

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……..57 kt / 105 km/h flaps pos. 1
Emergency field…….select
Electrical fuel pump……ON
Fuel selector……check ON
Fuel remaining……check
Engine…….start
No restart possible:
Emergency landing…….perform

3.3. Fuel Pressure Low

In the event of a fuel pressure low indication, switch ON the electrical fuel pump.

3.4. Generator Fault

In the event of a power generator fault (red generator light ON with RPM >1800), switch OFF all non-essential devices in order to save battery power.

3.5. Glide

Glide ratio is about 1:8 for best glide speed 57 kt / 105 km/h (flaps pos. 1).

3.6. Emergency Landing

Glide speed……57 kt 105 km/h flaps pos. 1
Emergency field…….....select
Emergency call (121,5 MHz)…….....perform
Throttle…….....close
Electrical fuel pump……..OFF
Fuel selector……..OFF
Ignition / Battery switch……OFF
Safety belts…….....pull tight

Final, landing assured:

Flaps ……..…...full down
Approach speed……..…….……54 kt / 100 km/h

The glide can be controlled by changing airspeed, flap setting or slip. 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 procedure

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
Fuel selector……OFF
Emergency call (121,5 MHz)……..perform
Battery switch…….....OFF
Safety belts…….pull tight

3.9. Engine / Carburetor Fire

fuel selector……..……OFF
throttle……...full open
electrical fuel pump……...OFF
cabin heat……..OFF
in flight:..perform **Emergency Landing** or consider use of Rescue System
on ground:……..……..stop the aircraft
if required:
starter…….engage

3.10. Fire and Smoke (Elecric)

all electrical systems ……..…….OFF
cabin heat……..OFF
landing……as soon as possible, if required perform **Emergency Landing**
rescue system …….activation only, if immediate landing not possible

3.11. Stall recovery

A stall can be recognized by light buffeting.
Elevator……..push
Wings……..level
Aircraft……recover

Normally the FK 12 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 (values for 1147lbs / 520kg):

Configuration	V_S	Altitude loss	Pitch after stall
flaps up (pos. 0)	42 kt / 78 km/h	200ft (60m)	- 15°
flaps pos. 1	39 kt / 73 km/h	200ft (60m)	- 15°
flaps pos. 2	37 kt / 68 km/h	165 ft (50m)	- 15°

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 12.

4.2. Regular Inspection

If there is damage it is recommended to consult a certified maintenance facility or contact the manufacturer. This applies especially to the composite and aluminum structures.

4.3. Preflight Inspection

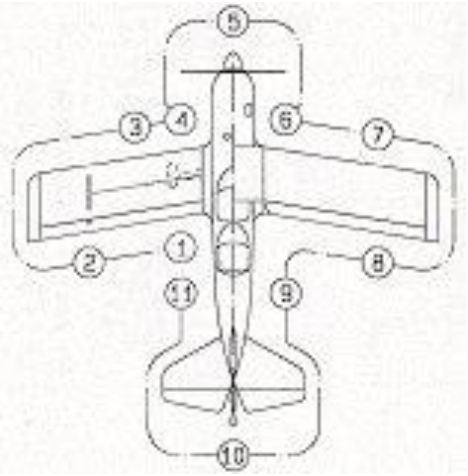
During preflight inspection, the aircraft has to be inspected for its general condition. Snow, ice, frost and dirt have to be removed completely from the aircraft as they impair aerodynamics and also increase weight.

Items marked by * must be performed prior first flight of the day only.

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
* Cowling	install
Cooling system / air inlets	clean, inlets clear



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. battery / ignition	OFF
2. flaps / ailerons	clean, no damage, freedom of movement; connections OK + secured
3. landing gear / tires	axle / strut OK; tire pressure 29 psi / 2bar check main attachment screws
4. wing bolts / fuel cap	secured closed / closed
5. Propeller, Cowling	no damage, nicks / cowling closed
6. wing bolts / inspection cap	secured closed / closed
7. pitot tube	clean, cover removed
8. flaps / ailerons	clean, no damage, freedom of movement; connections OK + secured
9. static port	clear
10. Elevator, rudder, tailwheel	clean, no damage, freedom of movement; connections OK + secured
11. canopy	clear, no cracks

4.4. Engine Starting

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

4.5. Taxi

Brakes	check
Stick	push to relieve tailwheel
Rudder	do not move if aircraft is not moving

4.6. Before Take-off

Brakes	set; brakes must hold at least 3200 RPM
Instruments	check
Choke	OFF
Magnetos	check at min. 2800 RPM; variance between magnetos max. 115 RPM, max. drop 300 RPM
Electrical fuel pump	ON
Flaps	takeoff position (Pos. 0 or 1)
Flight controls	check
Trim	takeoff position
Canopy	closed and locked
Oil temperature	min. 122°F (50°C)
CHT	min. 140°F (60°C)

4.7. Takeoff

Brakes	apply
Carburetor heat	cold
Throttle	advance slowly to full power
Engine instruments	check, min. 4500 RPM
Brakes	release
Elevator	neutral
at 51 kt / 95 km/h	lift off
Climb (1042lbs / 472,5 kg)	54 kt / 100 km/h with flaps in Pos. 1 65 kt / 120 km/h with flaps in Pos. 0
Climb (1147lbs / 520 kg)	57 kt / 105 km/h with flaps in Pos. 1 70 kt / 130 km/h with flaps in Pos. 0
Clear of obstacles, at safe altitude:	
Flaps	up
Electrical fuel pump	OFF

At full power, the engine / propeller torque is relatively high. About 1/3 rudder input is required to keep the aircraft straight. In crosswind conditions (from the left) and when the tailwheel is off the ground, even more rudder is required.

Hint:

Recommended climb speed in clean configuration is higher than Vy. This is for better visibility and engine cooling, the performance loss is negligible.

4.8. Climb

Oil temperature	max. 266°F (130°C)
CHT	max. 248°F (120°C)

4.9. Cruise

Oil temperature	max. 266°F (130°C)
CHT	max. 248°F (120°C)
Speed	as required
Trim	set
Fuel	monitor

For values of fuel flow and range check chapter 5.
During flights in sunny weather conditions, it is recommended to assure proper protection against heatstroke.

4.10. Descent

Carburetor heat	warm
Oil temperature	min. 122°F (50°C)
CHT	min. 140°F (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 65 kt / 120 km/h
Flaps	set Pos. 1
Speed	57 kt / 105 km/h (rain + 3 kt / 5 km/h)
Electrical fuel pump	ON
Short prior touchdown	start flare to achieve touchdown at minimum speed (in 3 point position)
Throttle	idle
Short Field Landing	
Speed	reduce to 65 kt / 120 km/h
Flaps	set Pos. 1
On final	reduce speed to 59 kt / 110 km/h
flaps	set Pos. 2
Speed	51 kt / 95 km/h (rain + 3 kt / 5 km/h)
Short prior touchdown (not to early!)	start to flare to achieve touchdown at minimum speed (all 3 wheels together)
Throttle	idle
Go Around	
Throttle	advance slowly to full power
Speed	min. 51 kt / 95 km/h
Flaps	retract to Pos. 1
Carburetor heat	cold
Speed	57 kt / 105 km/h
Trim	set
Clear of obstacles, at safe altitude:	
Flaps	up
Electrical fuel pump	OFF
Speed	65 kt / 120 km/h or higher

During strong and/or gusty winds it is recommended to use flaps Pos. 1 for approach and landing and to select flaps up when touching down.

4.12. Touch and Go

Flaps	retract to Pos. 1
Carburetor heat	cold
Trim	set takeoff position
Throttle	advance slowly to full power
at 51 kt / 95 km/h	rotate
Speed	57 kt / 105 km/h
Clear of obstacles, at safe altitude:	
Flaps	up
Electrical fuel pump	OFF
Speed	65 kt / 120 Km/h or higher

4.13. After Landing / Parking

Flaps	up
Trim	takeoff position
Carburetor heat	cold
Electrical fuel pump	OFF
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 1147 lbs (520kg), flaps Pos. 1.

Propeller	Engine	Takeoff run	to 50ft Height
Warp / DUC	ROTAX 912 ULS	590ft / 180m	1014ft / 309m
MT 183 R 140 - 2M	ROTAX 912 ULS	590ft / 180m	1014ft / 309m
Neuform	ROTAX 912 ULS	558ft / 170m	935ft / 285m

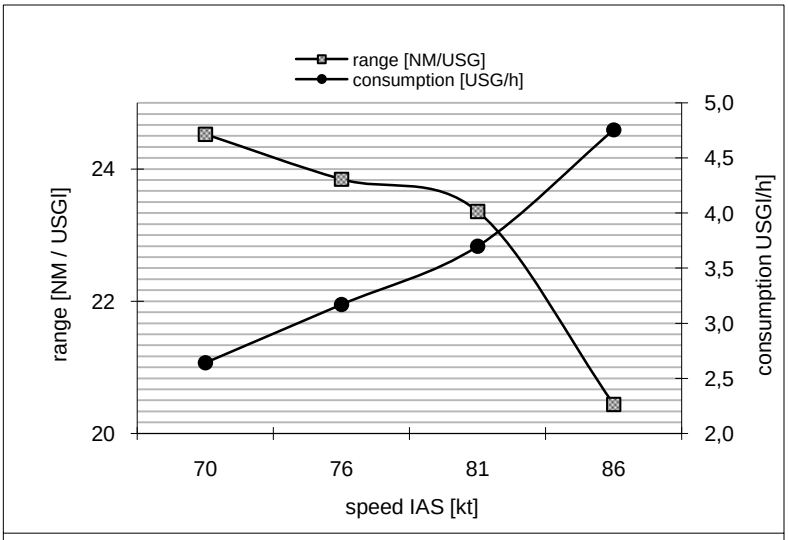
Correction for differing conditions:

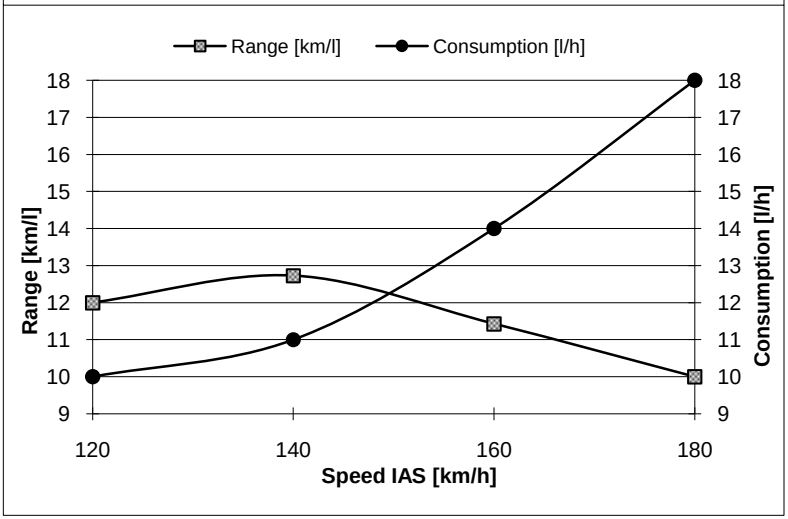
Correct above mentioned values for differing conditions as follows:

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 presents data for fuel consumption and range. For flight planning purpose add a safety margin of at least 10%.





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 might be 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)
All changes to the airplane affecting weight and balance (installation of new equipment etc.) require a new weighing.

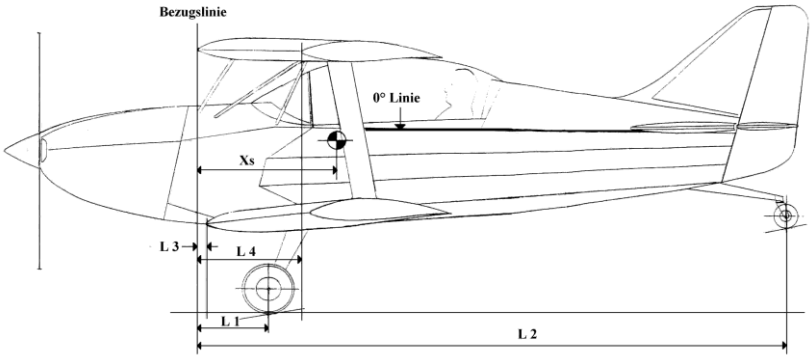
Formula to compute the center of gravity (X):

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

GG = total weight
GH = weight aft

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

GR = weight right
GL = weight left



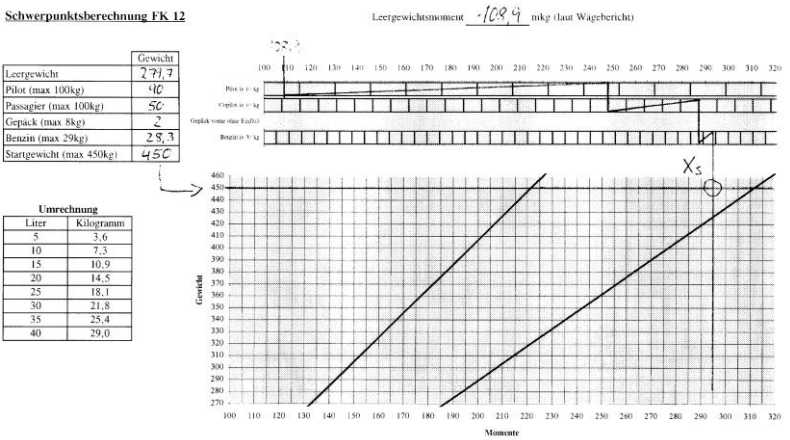
Arms (Datum: wing leading edge):

L 1 main wheel	
L 2 tailwheel	acc. empty weight
L 3 leading edge lower wing (fuselage)	form
L 4 leading edge upper wing (wingtip)	
L 5 aft seat	57,87 inch / 1,47 m
L 6 front seat	23,62 inch / 0,60 m
L 7 fuel tank / forward baggage	3,15 inch / 0,08 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 with the above mentioned formula or by using the following graph. The C.G. must always be within limits (compare chapter 1)!



Example:

First the Basic Empty Moment (example 108,9 mkg) must be taken from the respective Basic Empty Weight and Balance Form (Wägebericht). The graph must be entered with this value to the row PILOT. Here the weight of the pilot has to be taken into consideration (for 90 kg about 9 units to the right), the next lower row takes care of the weight of the passenger (for 50 kg about 5 units to the right). The weight of the forward baggage need not to be applied here, it must only be observed by calculating total weight.The next row is for the fuel (1 unit for 28,3 kg).

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 FK12 S2”
(DIN A4) here.

7. Systems Description

7.1. General

The FK 12 is a two-seat ultralight biplane with tailwheel and aerodynamic steering. The wings have flaperons which can be set to three positions. The tailwheel is connected to the rudder. The aircraft is equipped with dual controls, however the pilot in command has to occupy the rear seat.

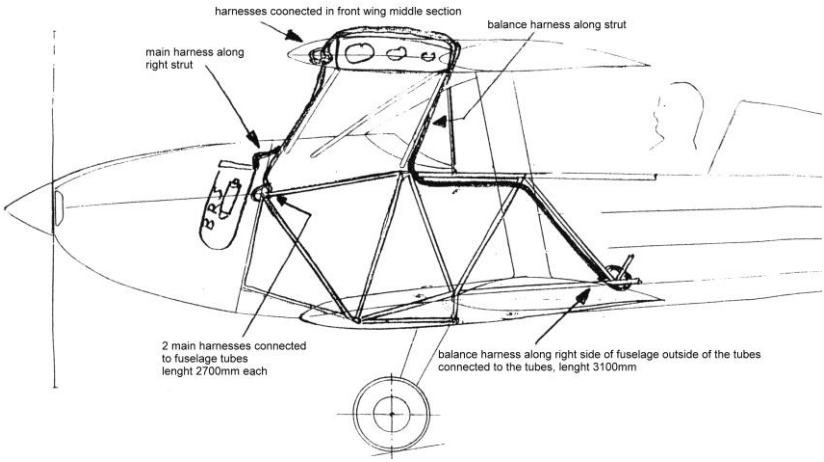
7.2. Instrument Panel

The instrument panel consists of all required flight and engine instruments. This describes a standard equipment configuration, on request there are different options can be provided availableon request.

Controls to operate flaps, throttle and trim are located at the sidewall.
Controls to operate rescue system, choke, cabin heat and carburetor heat are located at the center console. The brake handle for both wheels is at the control stick, or the aircraft is equipped with single wheel brakes activated by the rudder pedals.
This describes a standard equipment, on request there are different options available.

7.3. Rescue system

The FK 12 is equipped with a rescue system mounted into the fuselage ahead of the firewall. Only container systems are allowed. The installation can be seen from the picture. The middle of the canister cap has to be 155mm in front of the firewall.
Detailed information concerning max. speed, capacity and maintenance cycles are provided in the respective rescue system manual.



The system is activated by pulling the red handle in front of the pilot at the center console. Optional, a second handle is installed in front of the forward seat. *The safety pin **must** be removed before flight.* The safety pin should be replaced during storage / parking of the aircraft to avoid inadvertent activation.

7.4. Tyres

Wheel	Size	Pressure
Main	6.00 x 6 or 4.00 x 6	29 psi / 2 bar
Tail	125 x 40	

7.5. Baggage

There is one baggage compartment ahead of the front instrument panel with a maximum capacity of 18 lbs (8 kg).

7.6. Seatbelts and Rudder Pedals

The 4-point seatbelts can be adjusted to fit every size. The lock is released by pressing the red button. The rudder pedals of the pilot can be adjusted in 3 positions.

7.7. Canopy

The cannopy is locked with a handle on the left side. The (optional) large canopy has an additional lock in the middle in front of the aft instrument panel. To open this large canopy, it must be unlocked here first and slided full backwards. Now the left lock has to be opened and the canopy can be opened to the right. Closing works in the reverse order.

7.8. Engine

The FK 12 is powered by a 912ULS four-cylinder, horizontally opposed engine rated at 100 HP at 5800 RPM. It has a combined cooling by liquid and air. The optional airbox allows to supply the carburetors with cold or preheated air to avoid carburetor icing.
The control levers for choke and carburetor heat are located on the centre console, the throttle lever is on the left sidewall.
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.

7.9. Fuel System

There is one fuel tank with 31,3 USG (58 Ltr) capacity mounted below the front instrument panel. The fuel valve is located at the center console with positions ON and OFF. One (optional) fuel drain valve is located at the lower fuselage in front of the landing gear. There is one mechanical fuel pump normally providing fuel to the engine. Additionally there is an electrical fuel pump which should be ON during takeoff and landing. Fuel quantity is indicated at a gauge at the tank.
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.

7.10. Brakes

Standard brakes are controlled by brake levers at the rudder pedals. As an option, there is a hydraulic disc brake available which applies brake pressure to both wheel simultaneously and is controlled by a handle at the control stick.

7.11. Heating and Ventilation

The FK 12 is optionally equipped with cabin heating. By pulling the lever on the center console, heated air is allowed to enter the cabin through the front of the copilots feet. The cabin is ventilated by opening of the windows in the canopy.

7.12. Electrical System

A detailed schematic of the electrical system is available under www.flugservice-speyer.de, .
A 12V engine-driven alternator delivers the required electricity.
If the red generator control light lights up above 1800 RPM, shut off all electrical equipment not required for flight as the battery is discharged.

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 12 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 wing struts via the wing's leading edge and also tie down the tailwheel.
The aircraft should not be parked in wet conditions nor exposed to UV radiation for a longer period of time.
The canopy should always be completely closed and covered during parking to avoid getting dirty.
The FK 12 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.
The aircraft should not be parked in wet conditions nor exposed to UV radiation for a longer period of time.
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.flugservice-speyer.de".**

8.5. Regular Maintenance and Lubrication Schedule

The following actions must be performed 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 / 25 flight hours. The regular maintenance intervals are 25 / 100 / 200 / 500 flight hours or every year / every 2 / every 5 years.
Engine maintenance is not part of this manual, it 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

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.

insert
maintenance schedule FK Airframe
(DIN A4) here.

8.8. Control Surface Angle

	Angle [°]	Tolerance [°]
Elevator		
Up	-20	+2 / -2
Down	+16	+2 / -2
Rudder		
Right	18	+1 / -1
Left	18	+1 / -1
Aileron (Flaps –10°)		
Up	-20	+1 / -1
Down	+20	+1 / -1
Flaps (Aileron neutral)		
Position 0	-10	+2 / -2
Position 1	0	+2 / -2
Position 2	+10	+2 / -2

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. tail wheel 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 5,9 inch / 150 mm. The leading edge should have no contact to the storage tool in the first 0,79 inch / 20mm.

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 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 pitot tube line (only if the wing has been removed completely)
- Unfold both wings and close / secure the upper and lower bolts
- Connect and secure the ailerons; access to the ailerons via caps beside the rudder pedals
- Fold up and close the fuselage covers
- Fold down the (optional) cover at the middle section of the upper wing's trailing edge
- Check the flight controls and the flaps

To disassemble the aircraft follow above mentioned steps in reverse order.
If the large closed canopy is installed, the wings can only be folded, if the rods between the lower and the upper aileron are disconnected. The upper ailerons must be moved up and the lower ailerons must be moved down, otherwise the canopy will be damaged.
The folded wings can be connected to the aft fuselage with the special stowing rod.
For transport in a trailer use additionally affixture to prevent wing damage.

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.