pro.mecc
AEROSPACE SYSTEMS

FRECCIA

AIRPLANE FLIGHT MANUAL

Ultralight airplane according to LTF-UL
Serial number: FRXXX
Number plate: D-MXXX

FOREWORD

Thank you for choosing a Promecc Aerospace ultralight airplane.

The FRECCIA is a very powerful yet easy to control ultralight model.

For safe and secure operation, it is absolutely necessary to read this manual thoroughly before starting to fly. Please familiarize yourself with all the details of this microlight.

This flight manual provides the pilot with knowledge in the operation of the ultralight airplane. However, it is no substitute for a thorough flight briefing or basic flying training. In addition, the pilot must be familiar with all valid airworthiness directives and the applicable aviation regulations.

The ultralight airplane may only be operated in compliance with the operating limitations and information contained in this Airplane Flight Manual.

The Flight Manual must be carried on board at all times.

The fuel consumption figures in this manual refer to average consumption under normal operating conditions. Actual fuel consumption may vary due to different operating conditions. It is recommended that an additional quantity of fuel be planned for as a safety reserve.

The manufacturer cannot be held responsible for pilot and crew misconduct, non-compliance with laws and poor maintenance of the aircraft.

Damage to the airplane caused by failure to follow the instructions in this flight manual is not covered by the warranty.

Manufacturer:

PROMECC AEROSPACE s.r.l.

Zona Artigianale S.S. 16 - Km 976 73022 - Corigliano
D'Otranto (LE) ITALY

www.promecc-group.com

To this manual

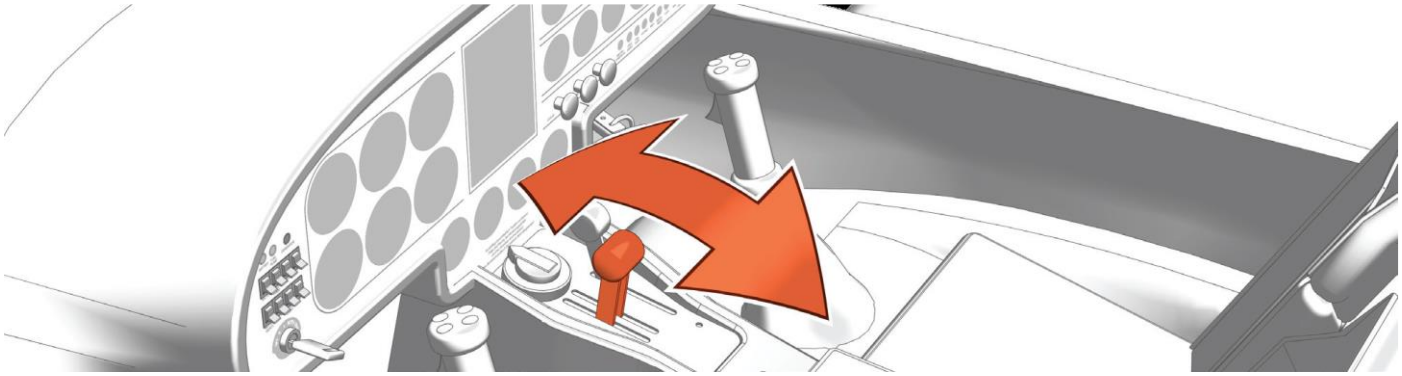
This AFM is regularly updated and current versions can be found on the web site of the manufacturer (www.promecc.com) can be downloaded as a PDF, the current version number is printed on each page in the header (V-).

This manual complies with the requirements of LTF-UL 1581 - LTF-UL 1585.

The graphics in this manual are deliberately shown in black/white cartoon style.

Actions and components concerning actions are colored orange.

Example:



Warnings and notices are included in this manual according to their safety relevance differently marked:

Warning!
Failure to comply immediately leads to a significant reduction in flight safety.

Attention!
Non-compliance can lead to a reduction in the Flight safety guide.

Hint
Notes that do not directly affect the operational safety of the microlight aircraft; yet are important and should be observed.

CONTENTS

1 General

This section contains general information for the pilot and owner help you get familiar with the aircraft and provide you with important information for loading, refueling, protecting and handling the aircraft on the this section contains definitions and explanations of symbols, abbreviations and terms, used in this manual.

1.1 Abbreviations and terminology

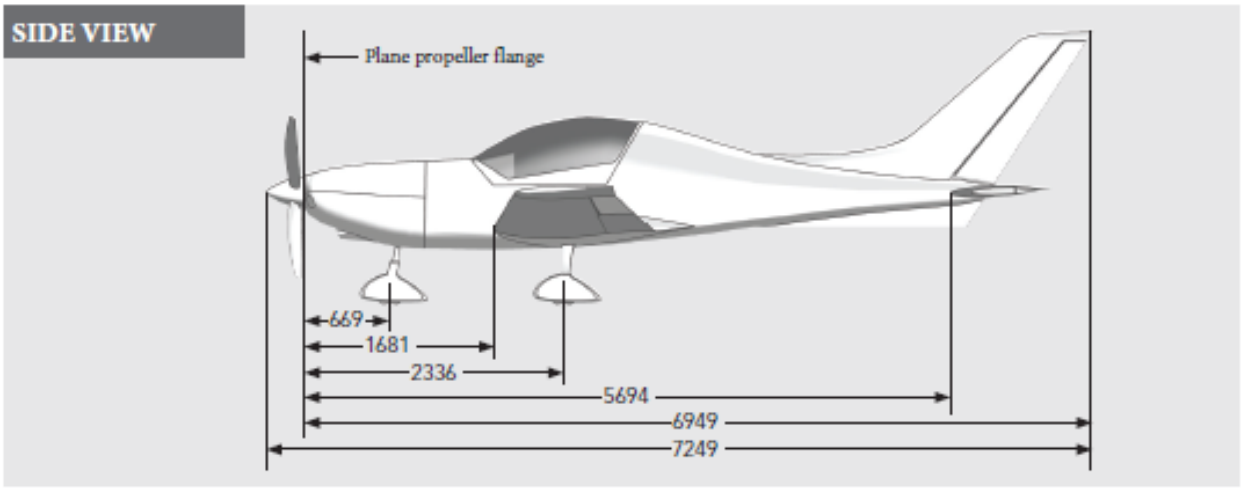
SPEEDS
CAS Calibrated Air Speed (Corrected Flight Speed) displayed speed corrected for installation and instrument errors
IAS Indicated Air Speed (Speed displayed) Speed displayed by the tachometer is displayed
TAS True Air Speed (True Speed) = CAS corrected for air pressure and temperature errors
VD Design speed
VDF highest speed proven in flight test
VNE permissible maximum speed
VH Maximum speed at maximum continuous power
VB Rated speed for maximum gust strength
VA Design Maneuver Speed
VRA max speed in strong turbulence
VF design speed with extended flaps
VFE allowed maximum speed for operating the flaps
VS0 overtaking speed in landing configuration / full flaps
VS1 Overtaking Speed in Travel Configuration
VSF calculated overrun speed at full flaps
VT allowed maximum speed in aircraft towing
VLO maximum speed for running gear operation
VC travel speed
VX Speed of the largest climbing angle
VY Speed of the best climbing

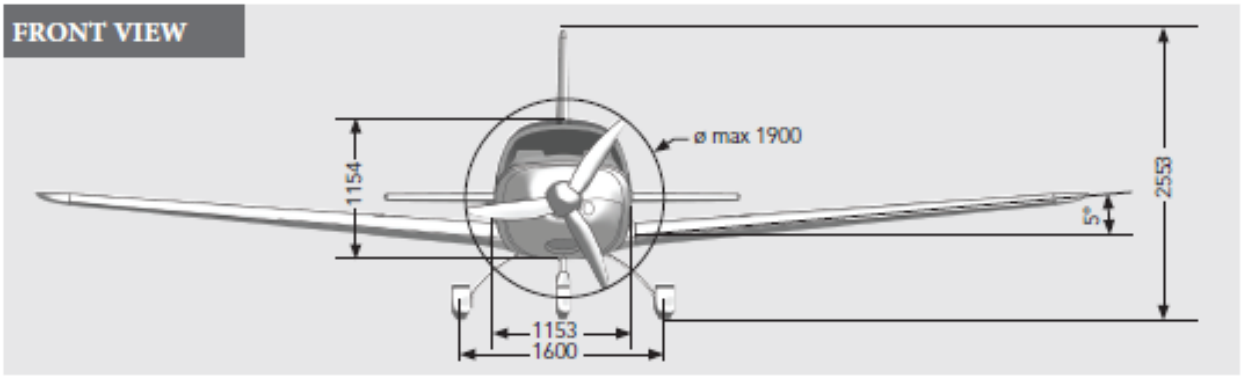
Not all information in this manual is used, it is only for the general information.

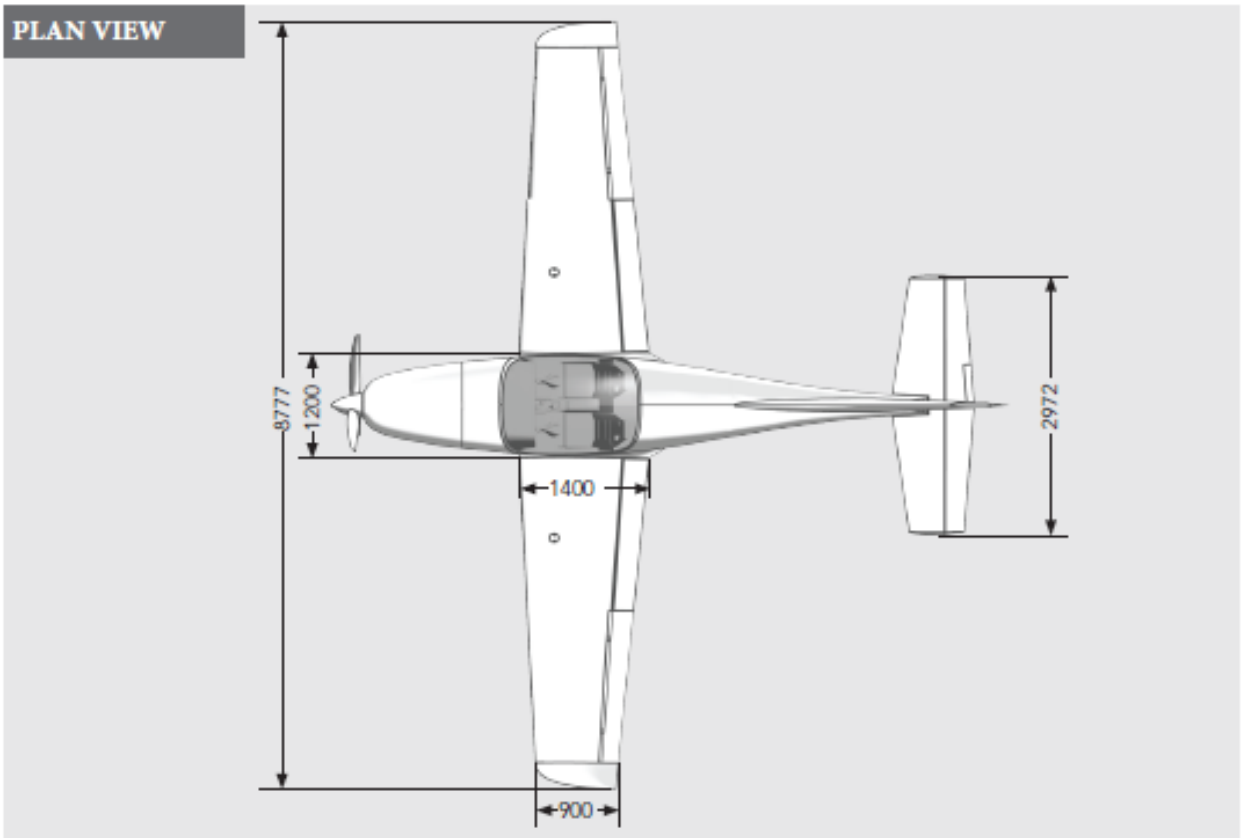
METRIC SYSTEM / CONVERSION SIZES		
knots (kts)	x 1.151	= miles per hour (mph)
miles per hour	x 0.8688	= knots (kts)
knots	x 1.852	= Kilometer
miles	x 1.609	= Kilometer
feet	x 0.3048	= Meter
inch	x 25.4	= Millimeter
kg/cm^2	x 14.3	= PSI
US Gallon	x 3.785	= Liter
ft/min.	x 0.00508	= m / sec
m / sec	x 196.8	= ft / min
pound	x 0.453	= kg
kg	x 2.208	= pound
°F	(°F - 32) x 1,1 / 2	= °C
°C	(°C x 2 / 1,1) + 32	= °F
kp/m^2	x 0.2041	= p.sq.f.
p.sq.f.	x 4.9	= kp/m2

UNITS USED ON UL AIRCRAFT	
Speed	km/h
Distances	km
Climbing speeds	m/s
Heights	ft

1.2 DIMENSIONS / THREEE SIDE VIEW







1.3. GENERAL DESCRIPTION

Low-wing aircraft with cantilevered wings in fiber composite construction (GRP/CRP), two-seater, cross tail, steered nose wheel landing gear, Rotax 912ULS engine with 3-blade fixed propeller.

Wing:
Fiber composite construction (GRP/CRP), aileron control via push rods, electric split flaps with max. positions 45°. Detachably attached to the fuselage with 4 points.

Hull:
5 layers of fiber composite material (GRP/CRP), reinforcements in the structural area, engine mount, chassis and fittings in Cr-Mo steel tube.

Tailplane:
Fiber composite material, rectangular shape. Mechanical or electrical trim on the elevator.

Rudder:
Fiber composite material Rudder control via push rods.

Landing gear:
Fixed landing gear, main landing gear swing arm made of CFRP. Main wheels braked by two disc brakes. The sprung nose wheel is steerable and connected to the rudder.

Cockpit:
Two-seater, seats made of fiber composite material (GRP/CRP), folding canopy with gas pressure absorbers.

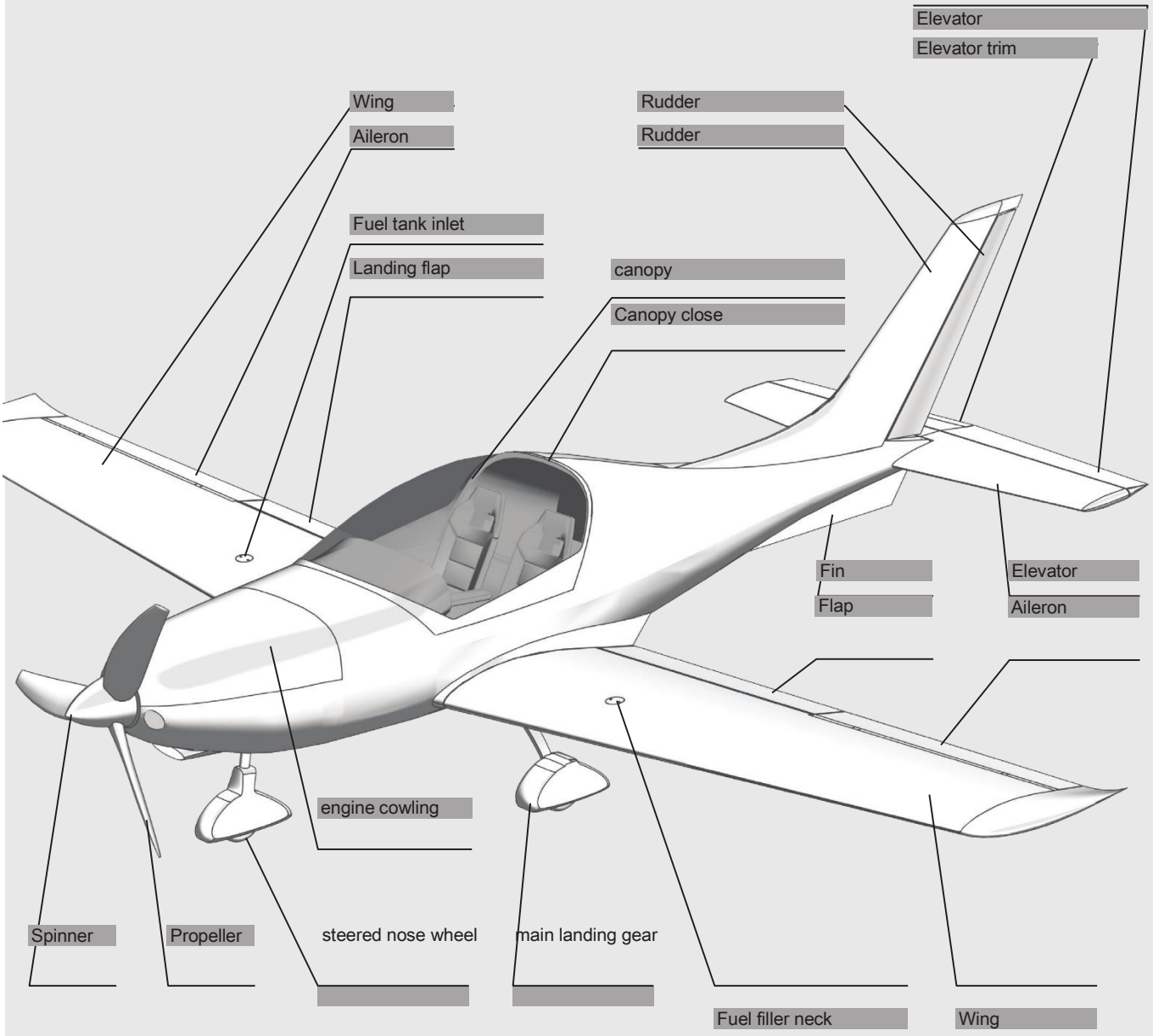
As an ultralight aircraft, the FRECCIA is not certified for aerobatics, cloud flight or night flight.

1.4. TECHNICAL DATA

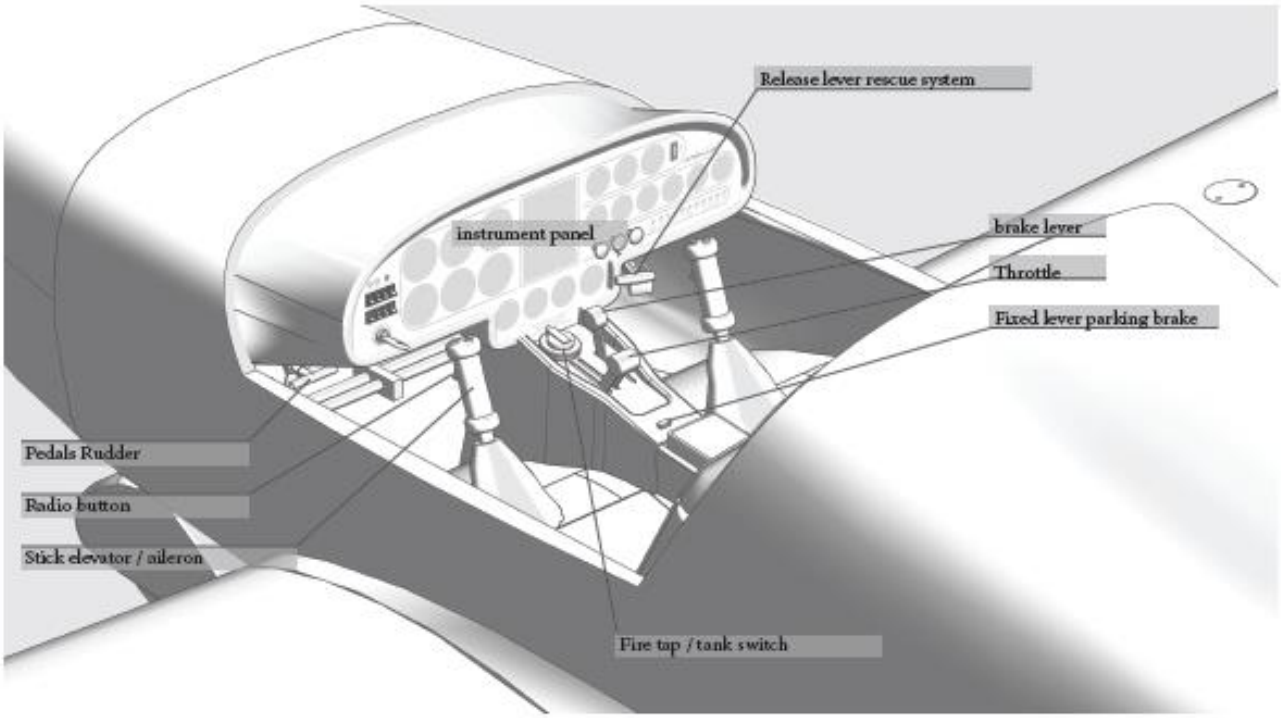
Maximum take-off weight including reserve parachute		600 kg
Minimum take-off weight		420 kg
Empty weight in basic configuration including reserve parachute		350 kg
Cabin	Witdh	1,16 m
	Lenght	1,7 m
	Height	0,9 m
Airplane	Lenght	7,25 m
	Height	2,55 m
Wing	Wingspan	8,76 m
	Medium chord	1,4 m
	Surface	10,13 m^2

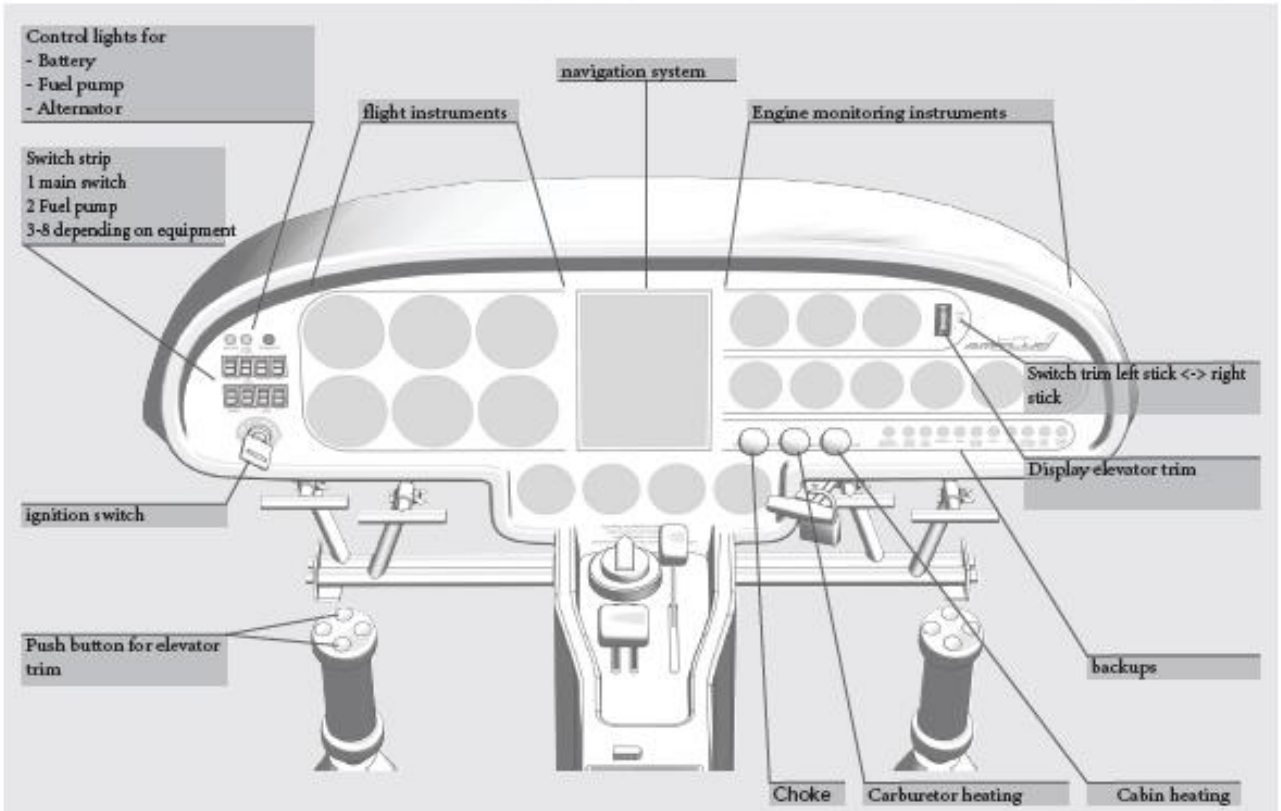
Attention: this is only an example, please regard the weight report for your airplane.

1.5. OVERVIEW OUTSIDE



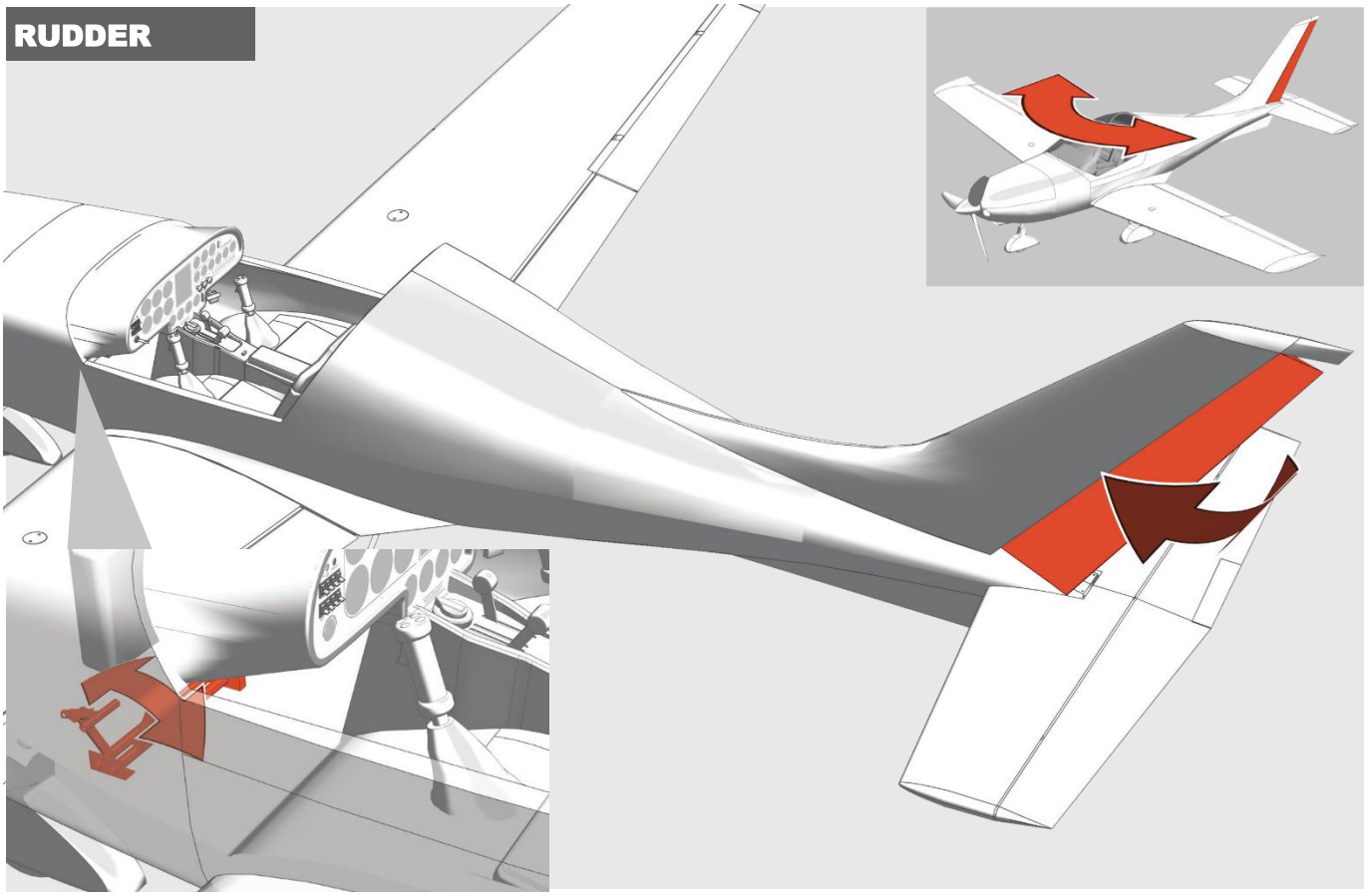
1.6 OVERVIEW COCKPIT

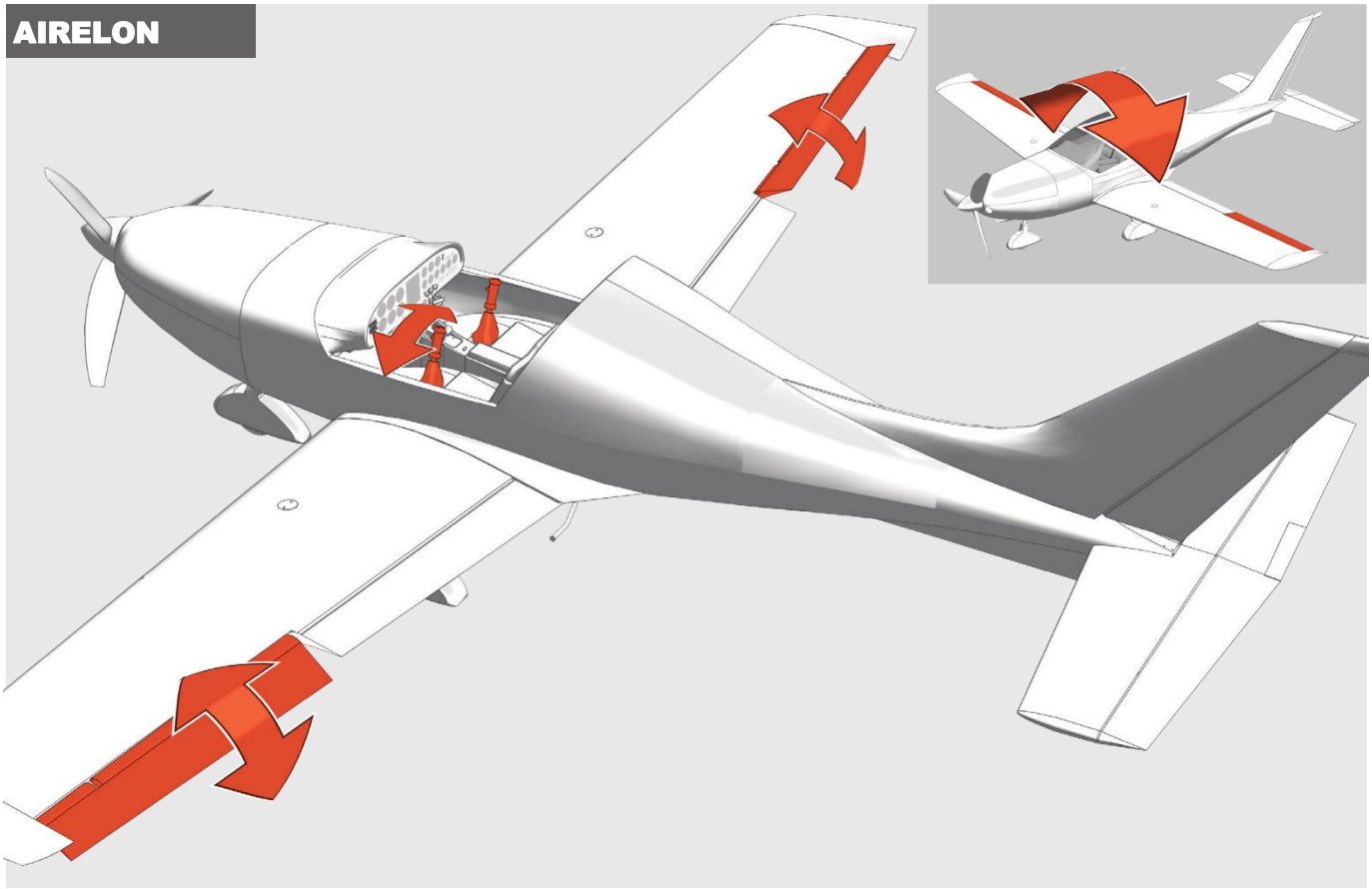


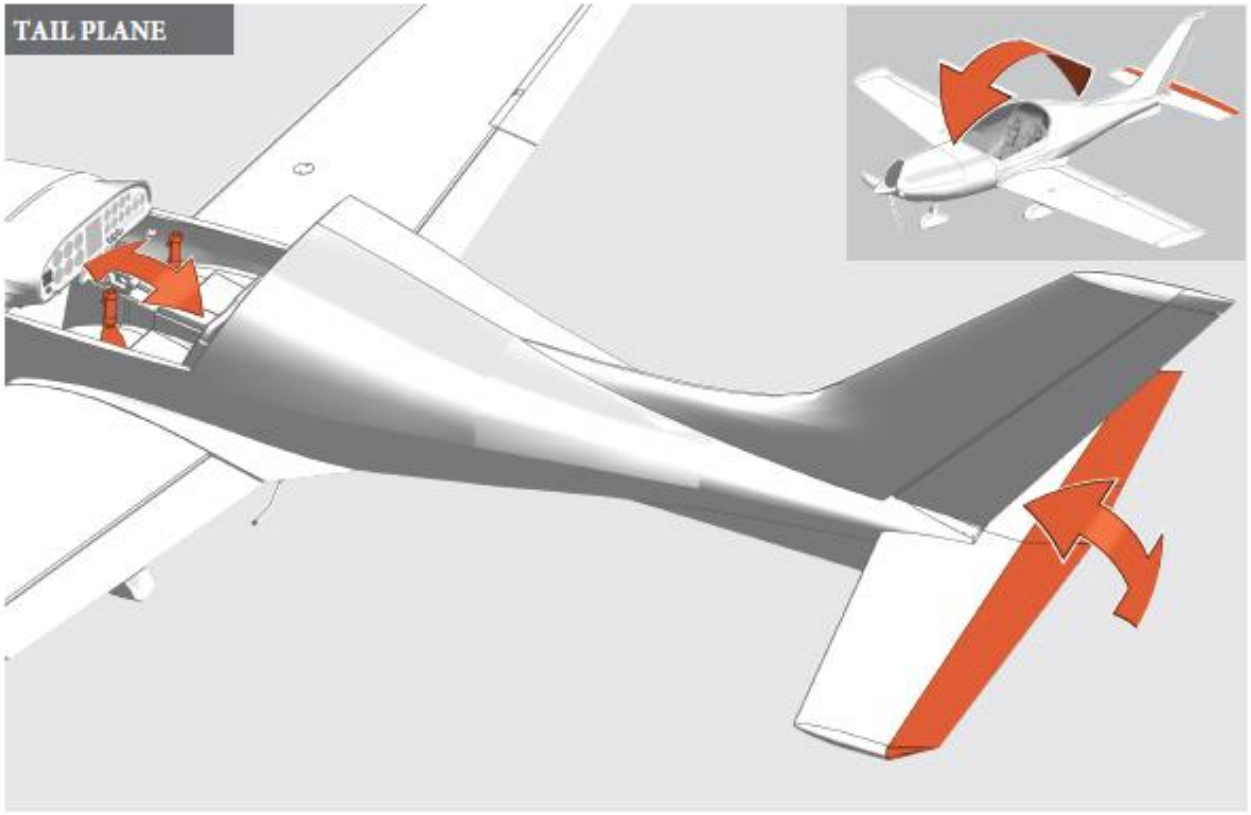


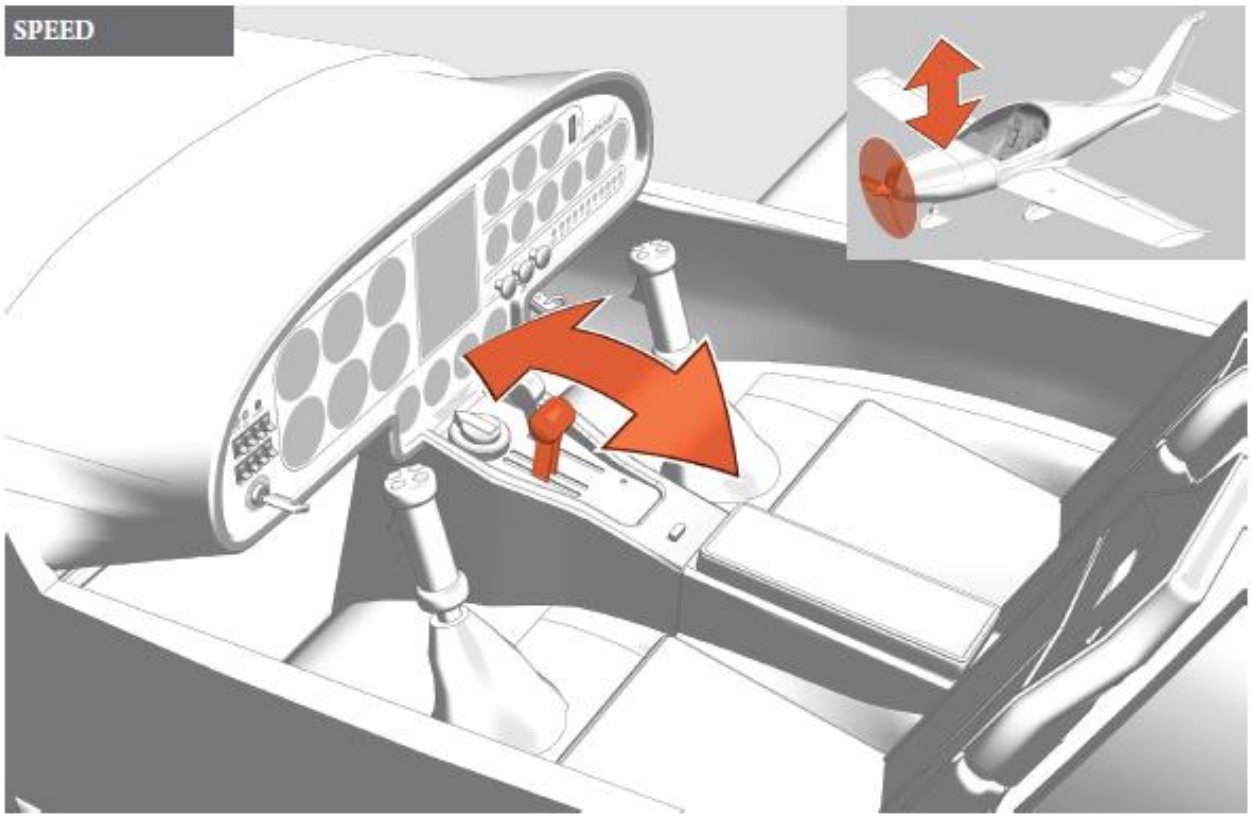
The cockpit shown here represents the maximum equipment with analogue instruments.
The equipment can be configured differently, so the actual configuration may differ from this figure.

1.7. CONTROLS





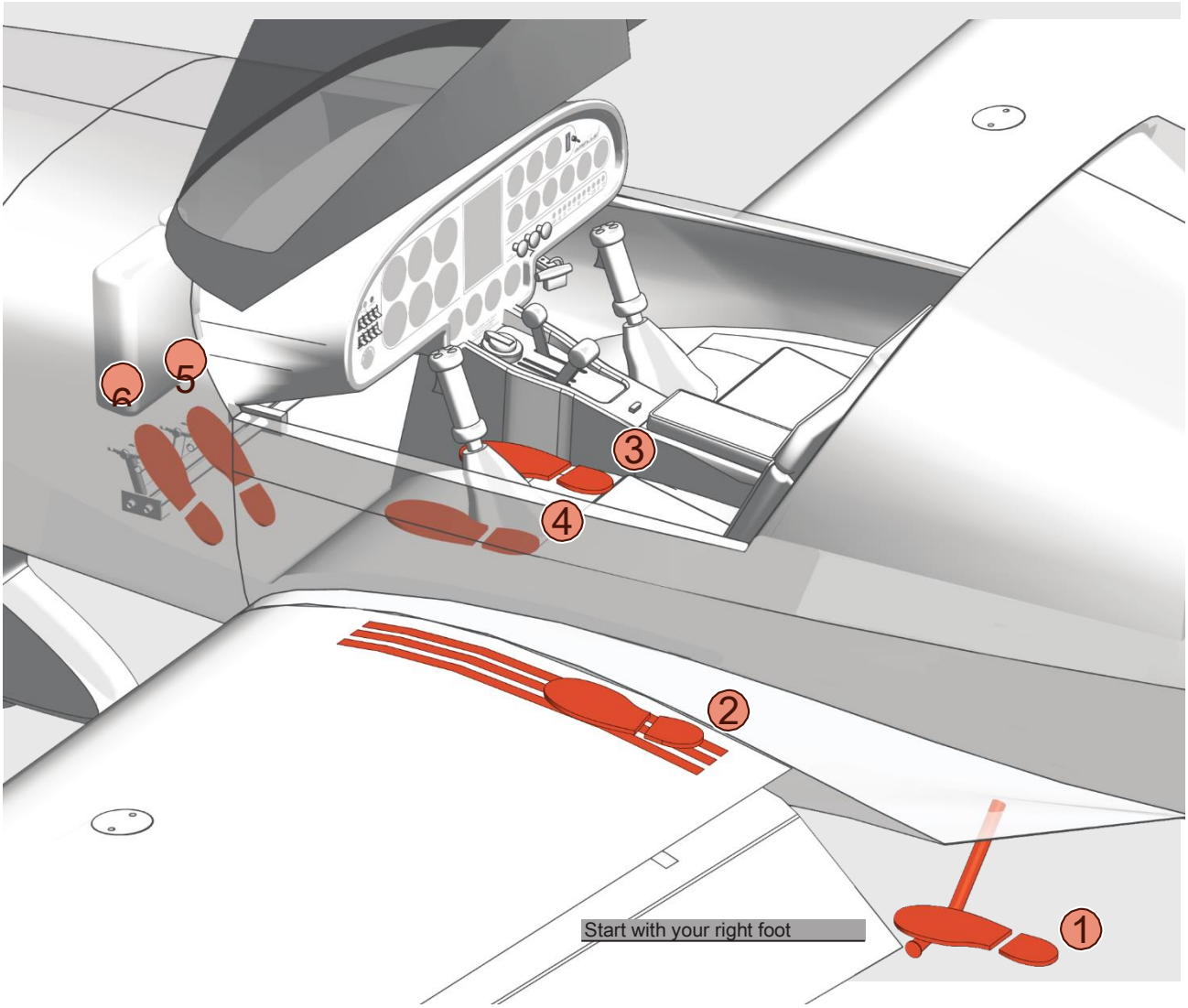

TAIL PLANE


SPEED

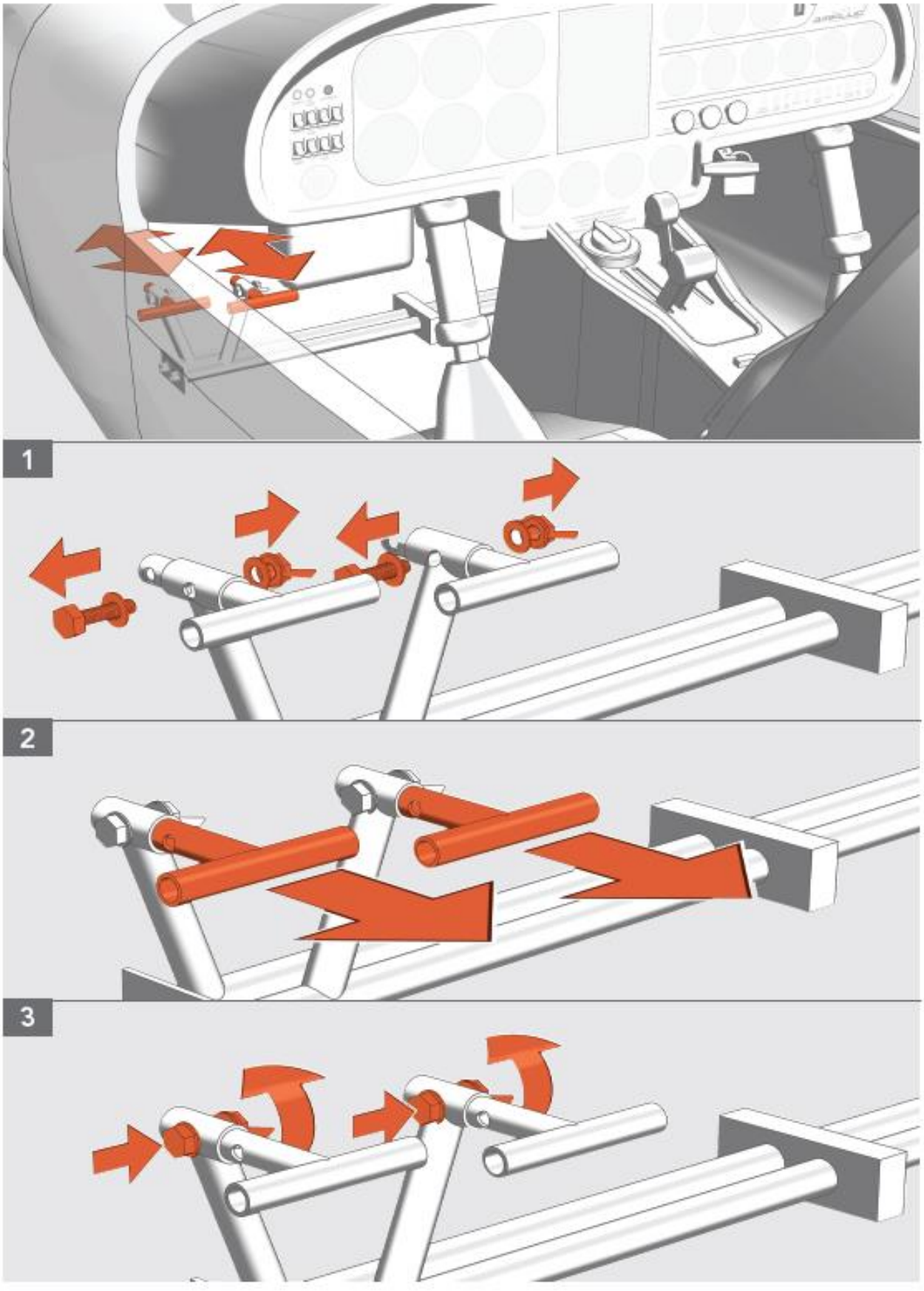
1.8 START

Low-wing aircraft are not only sportier in flight. Getting into the plane is also a bit more demanding. But if you follow the steps below, that's not a problem.

Please do not hold onto the canopy, seat or controls when boarding.
Step on the wing only in the area of the step strips.
Move the flaps to position 3 (35°), this makes boarding easier.

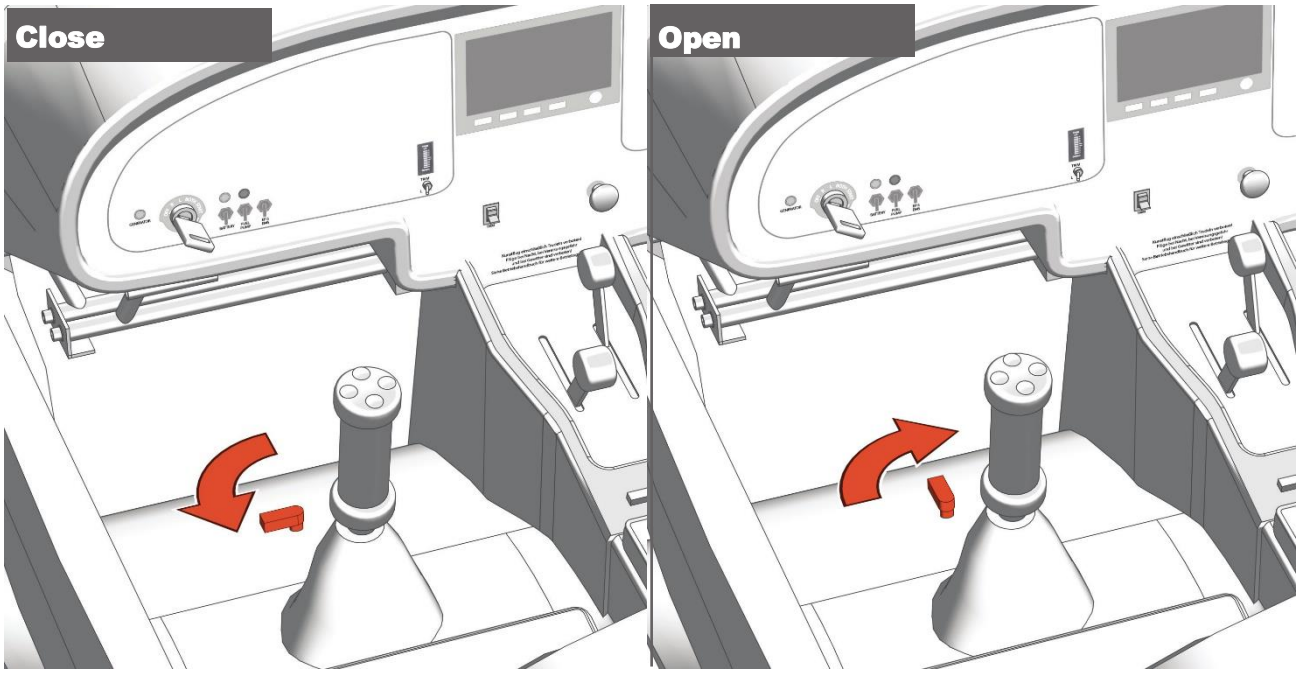


1.9 SET PEDALS



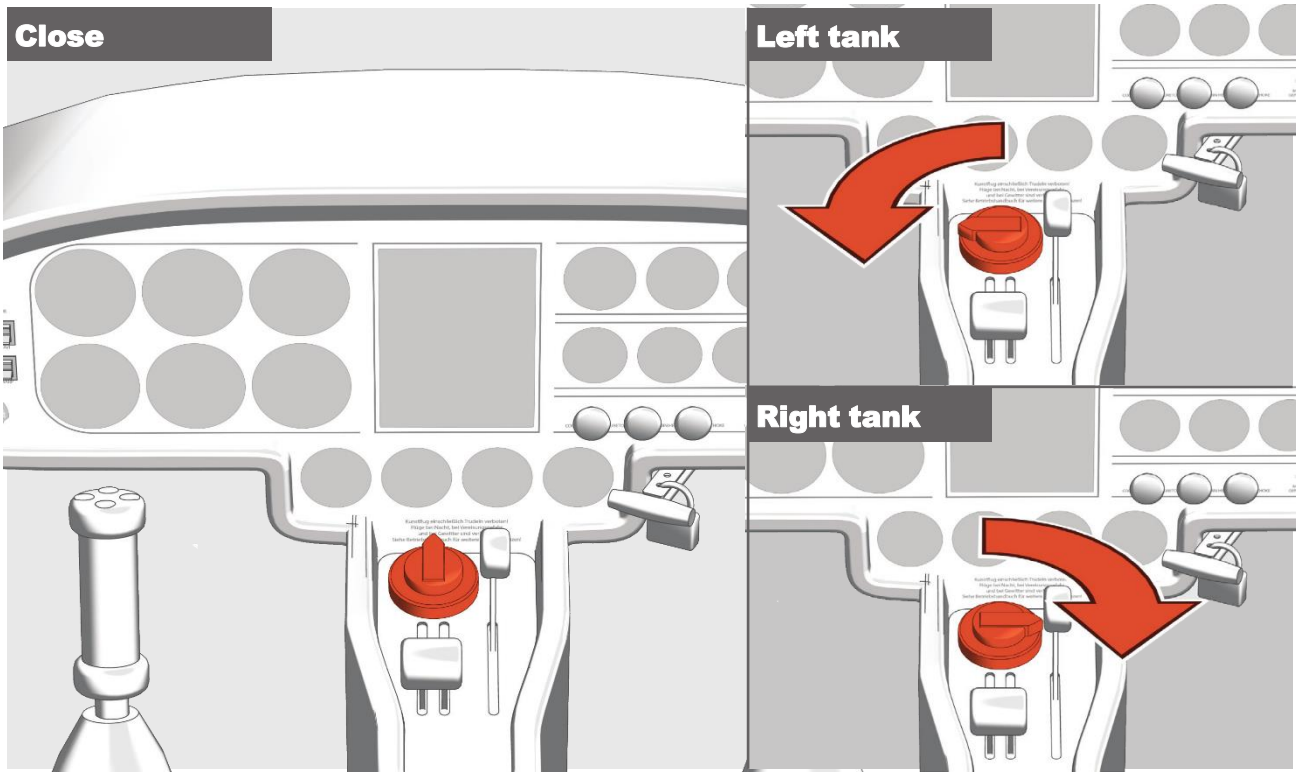
1.10. FUEL TAP / TANK SWITCH

In the basic version with one tank, the fuel cutoff switch is in front of the left stick.
Never fly the tank completely empty.



In the version with two tanks, the fuel selector switch is located in the center console.

The fuel supply can be blocked at the tank switch and you can choose between the right or left tank. Fly the tanks evenly empty. To do this, switch between the right and left tanks approx. every 30 minutes. Never fly the tank completely empty.



1.11. FUEL TANK

In the basic version, the tank is located in the left wing.

Filling quantity: 50 l per tank, 1.5 l not available.

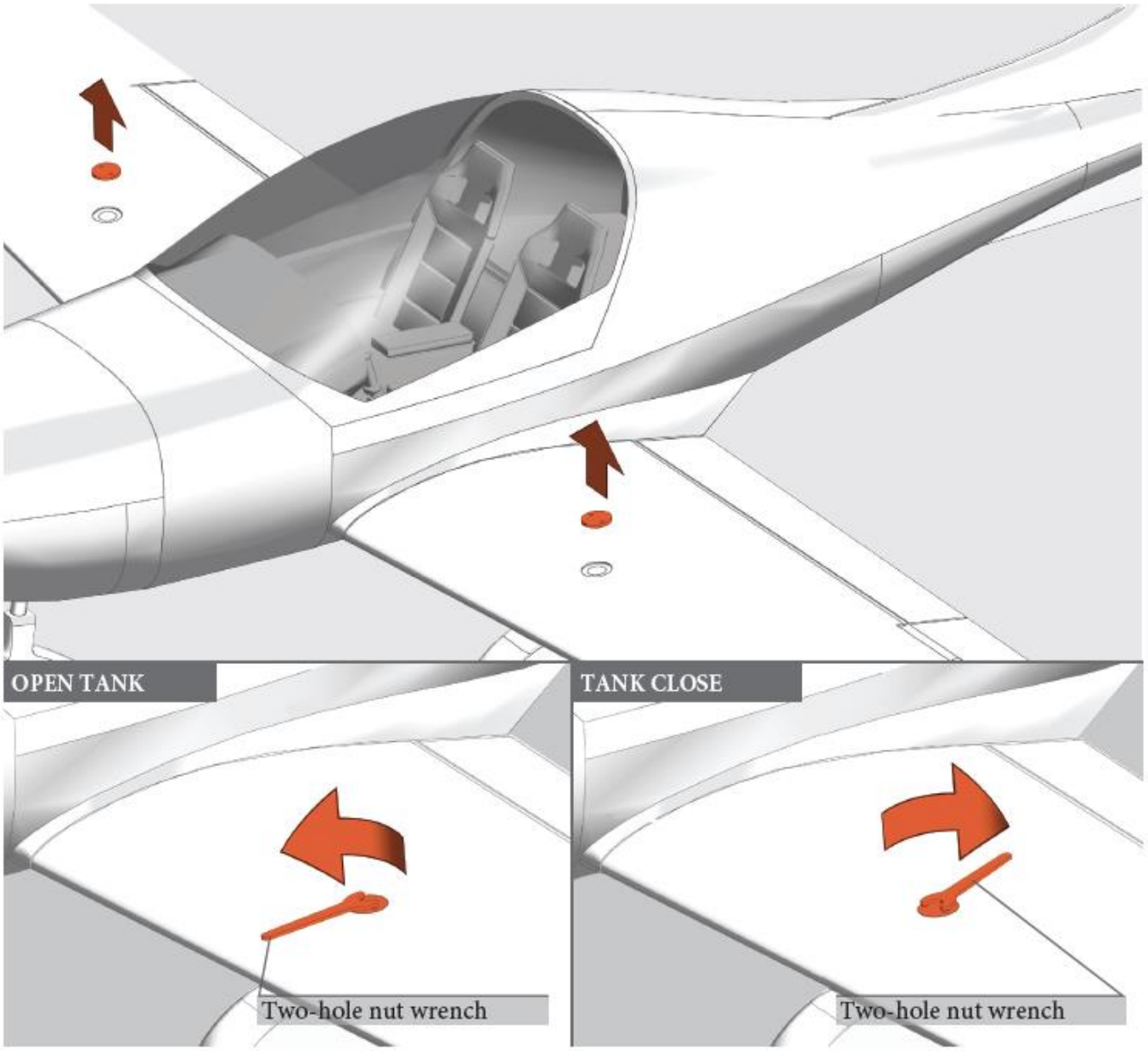
EN 228 Super min RON 95

EN 228 Super plus min RON 95

ASTM D4814 min AKI 91

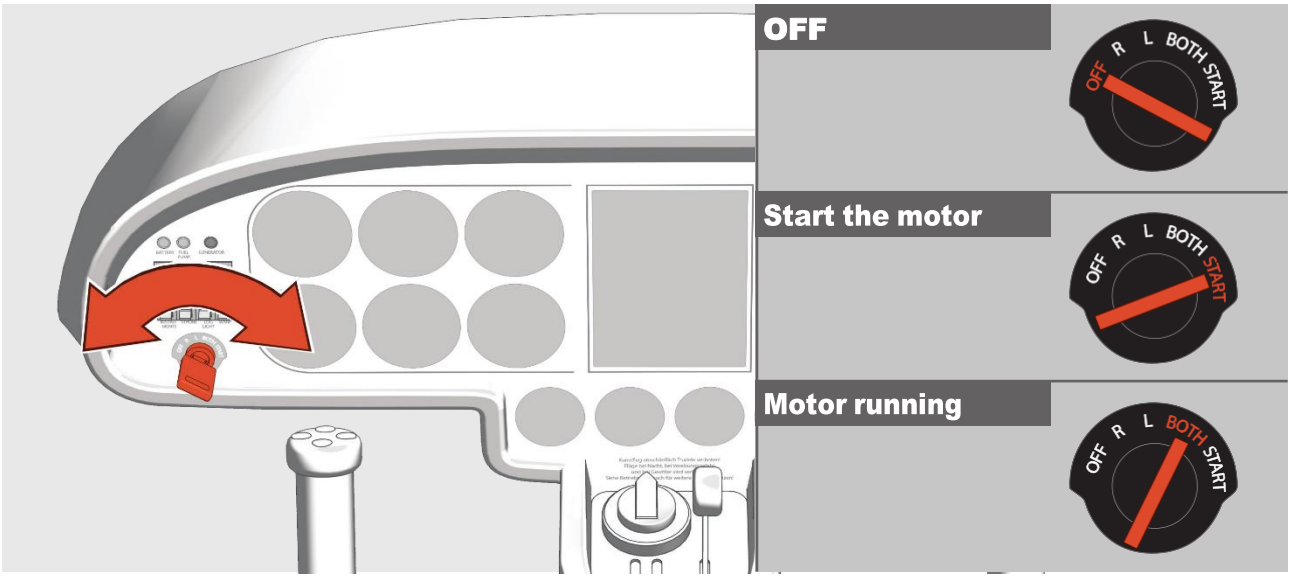
AVGAS 100 LL (ASTM D910)

Super lead-free is recommended. Only refuel with AVGAS if MOGAS is not available, as with AVGAS, due to the high lead content, the valve seats are loaded and increased combustion chamber deposits are formed.



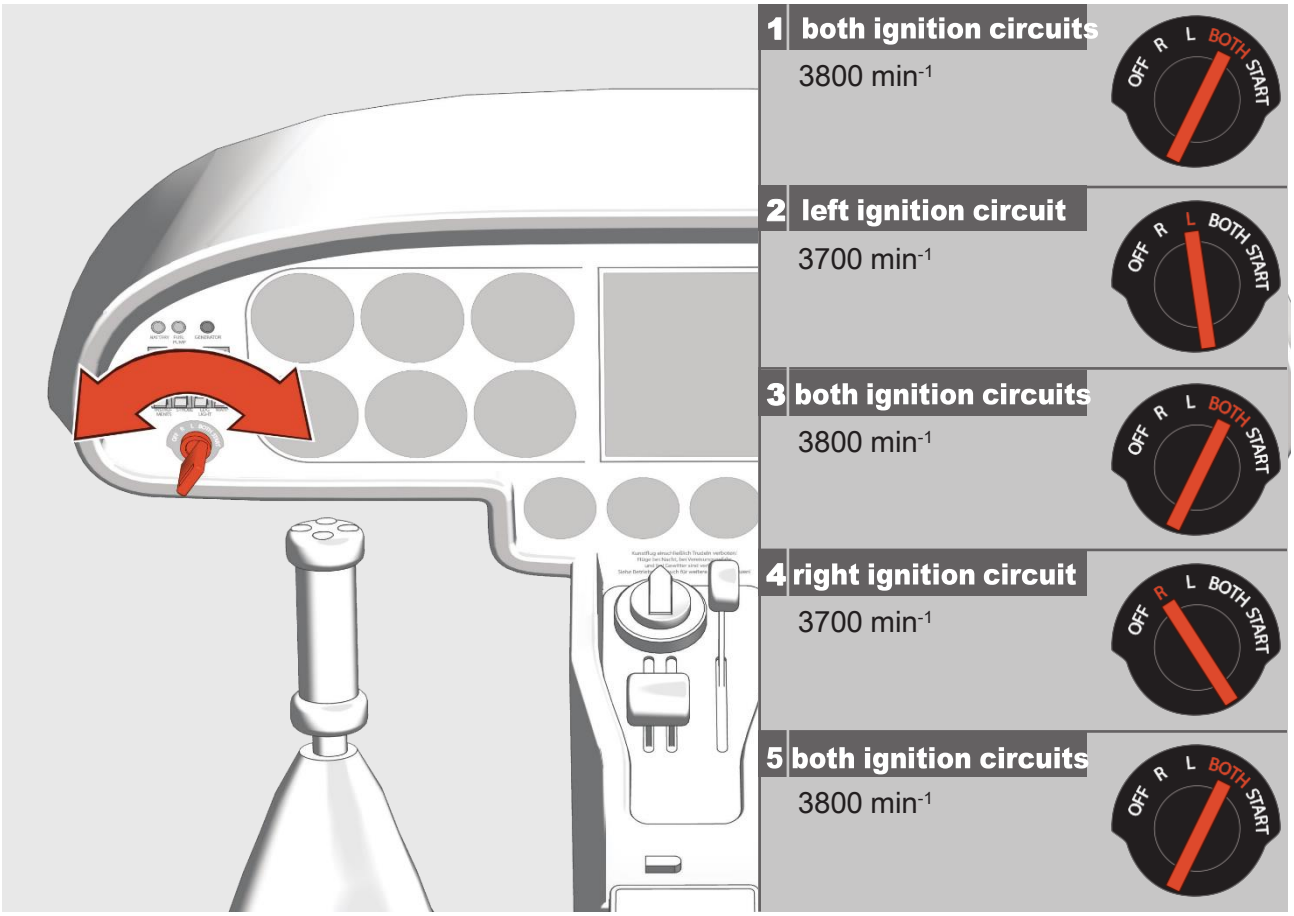
1.12.IGNITION SWITCH

Warning! Before starting the engine, you must always ensure that the propeller is free and that no person or animal can be endangered!

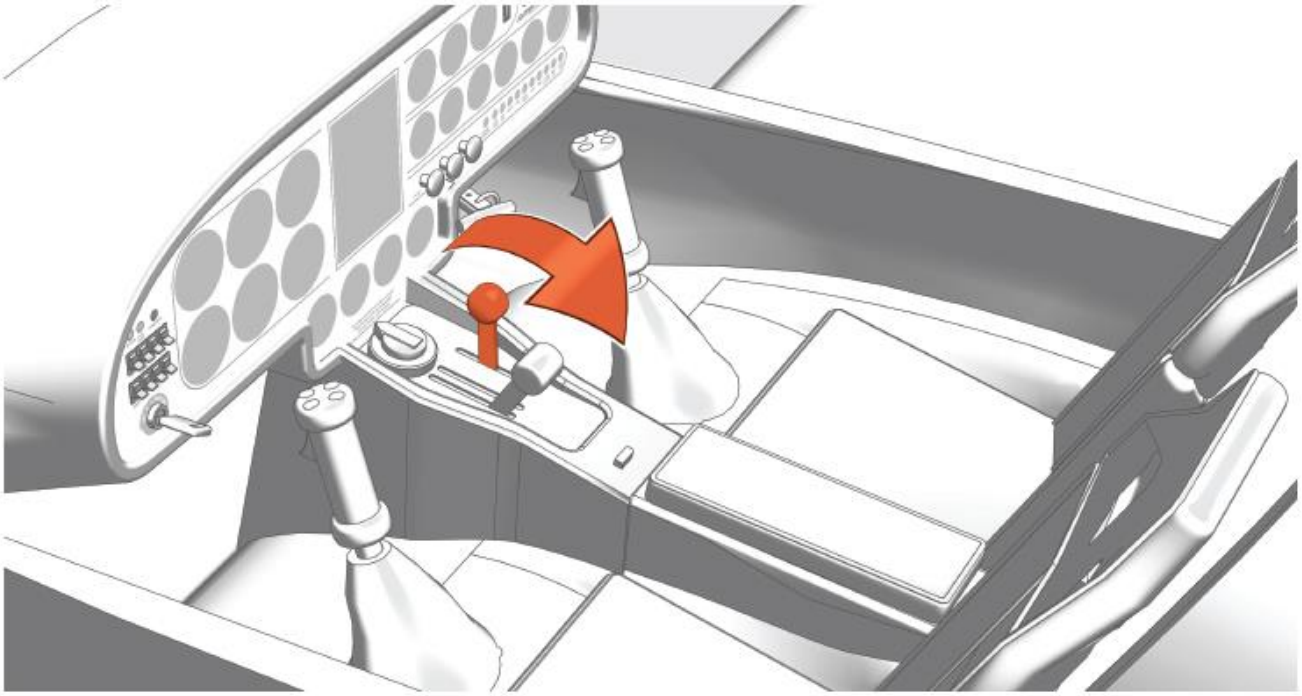


MAGNETO TEST

The magneto test is used to check whether the two ignition circuits are working properly. Set engine speed to 3800 rpm. When switching to an ignition circuit (L / R), the RPM speed must drop by approx. 100 rpm.



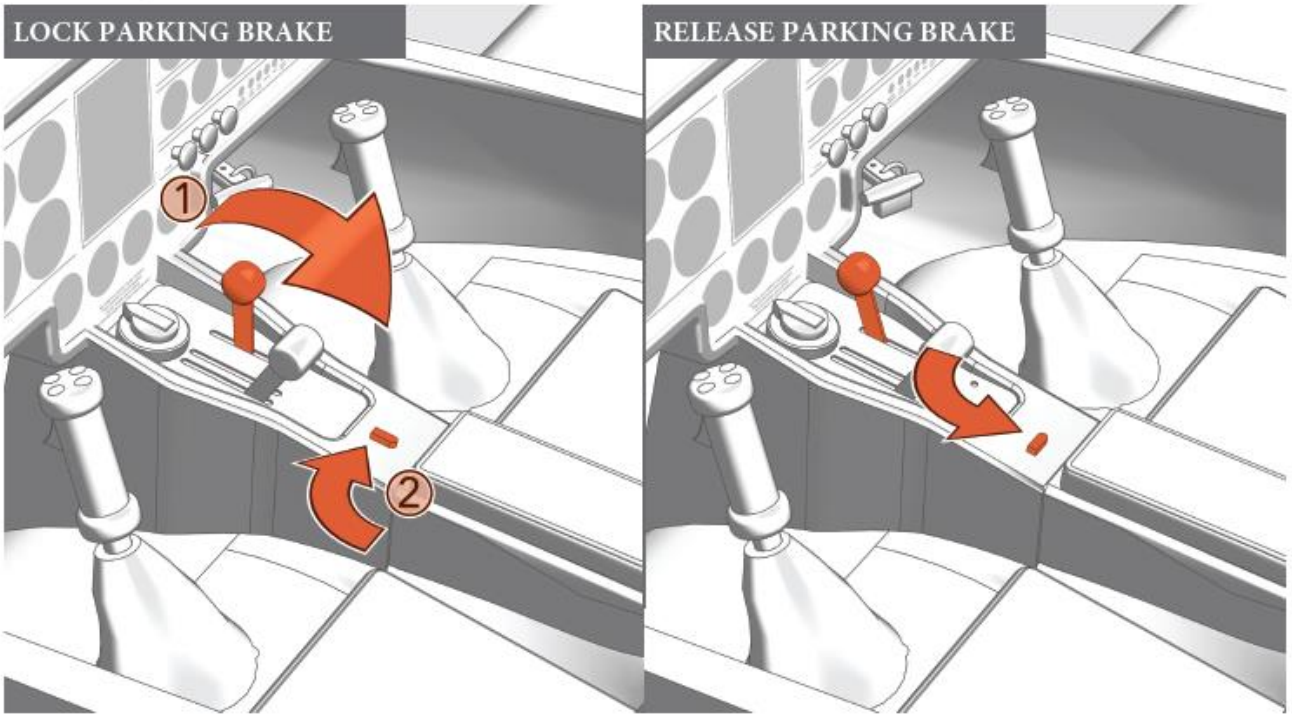
1.13. BRAKES



1.14. PARKING BRAKE

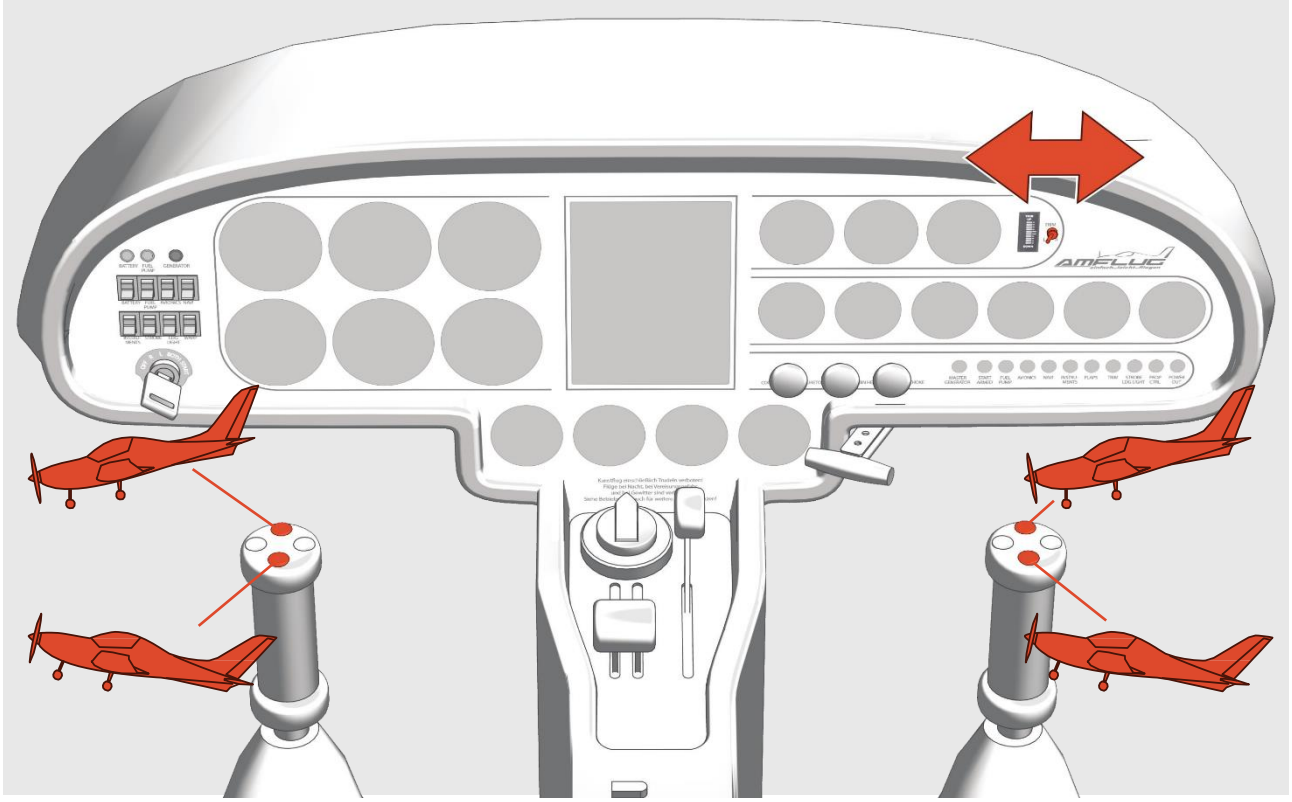
The brakes can be hydraulically locked for parking.

If the braking effect is too low in the locked state (for example, for the magneto test) and the aircraft rolls forward, it is not enough to pull more on the brake lever! In this case the lock must be released, then pull the brake lever harder and close the lock again.

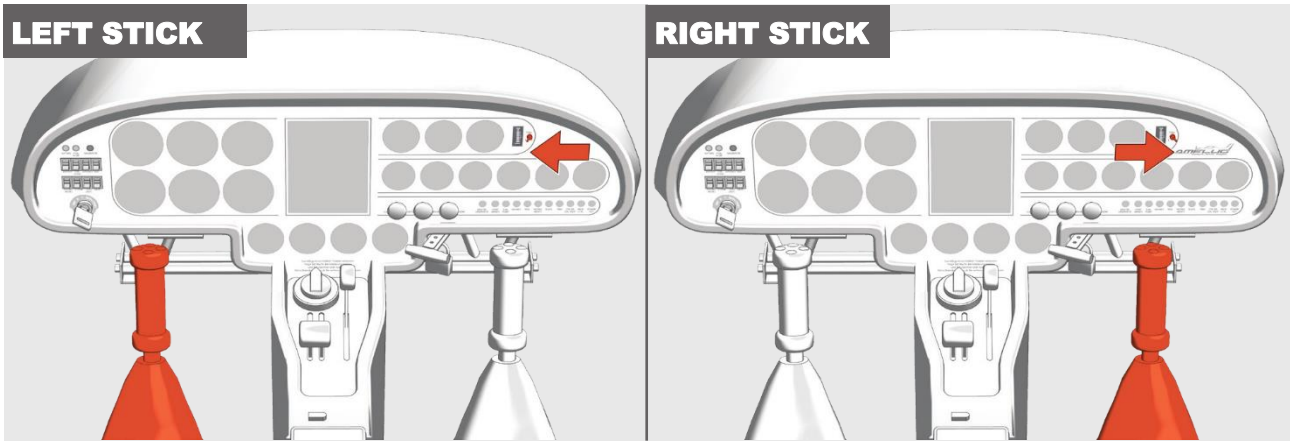


1.15.ELEVATOR TRIM

The elevator trim is operated by buttons on the stick.
The left and right buttons on the stick are not assigned.



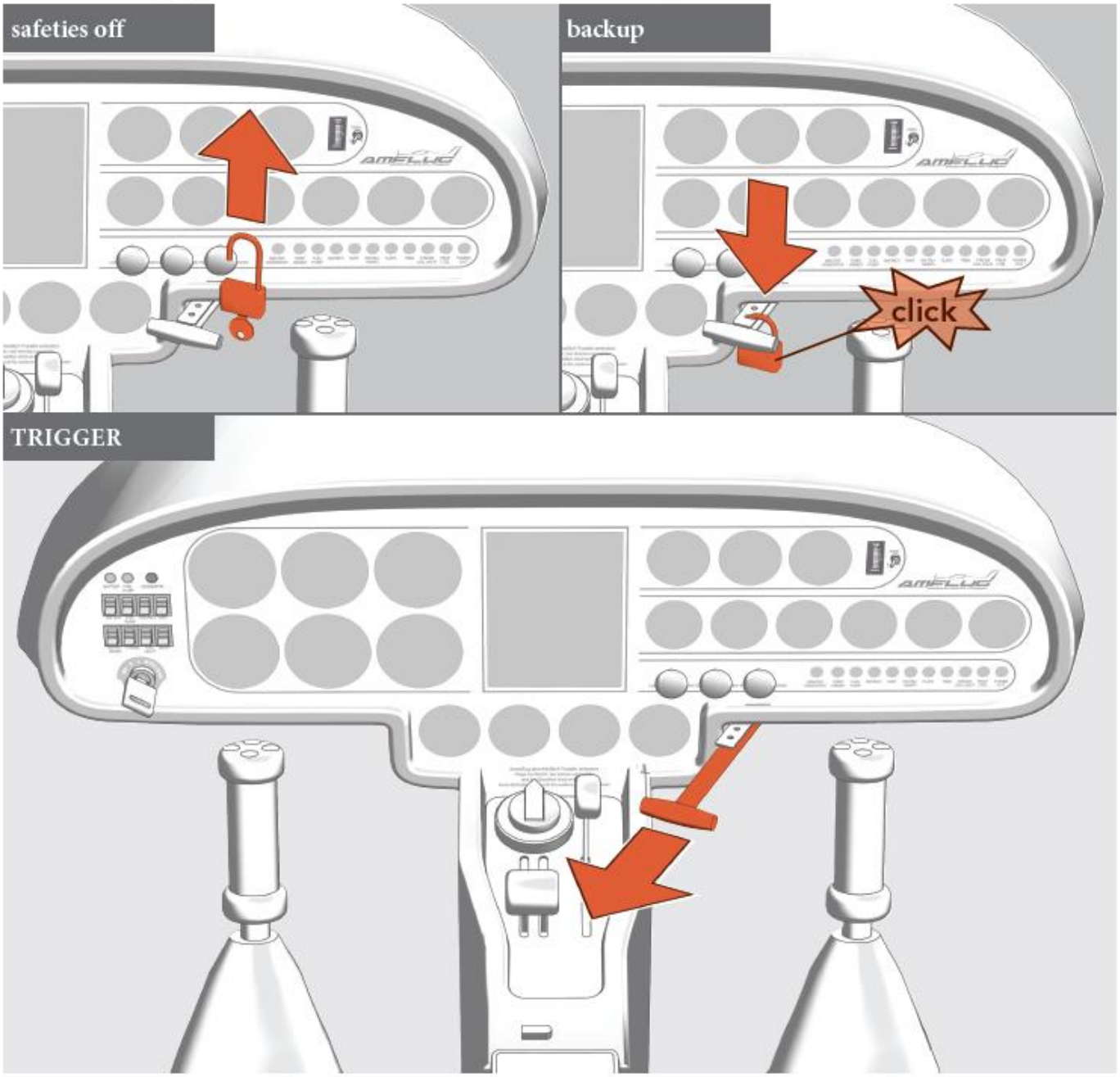
The switch next to the trim display can be used to switch from the right to the left stick.



1.16. RESCUE SYSTEM

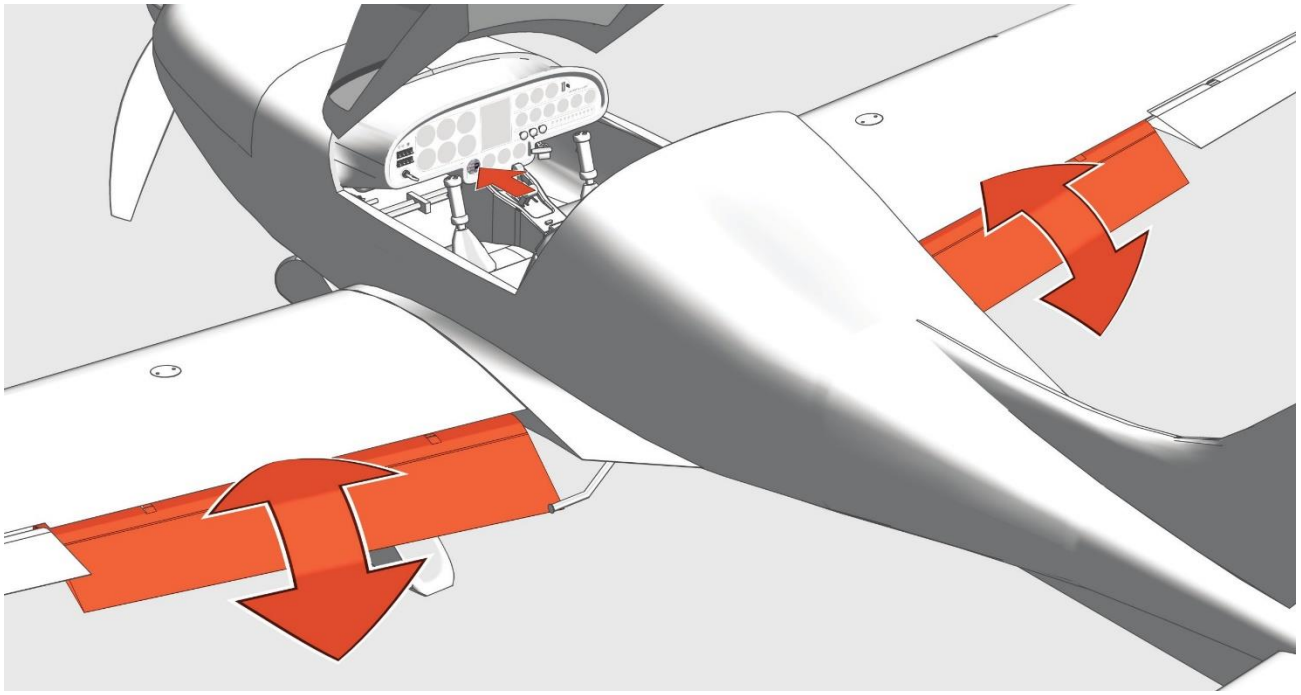
The decision to operate the rescue system depends on the emergency situation.
The loads on the occupants and the damage to the aircraft caused by the high sink rate under canopy can be considerably greater than in an emergency landing on a sufficiently large and suitable emergency landing field.

Attention! The rescue system must be unlocked before each flight. After the flight, secure the rescue system again to avoid accidental triggering on the ground.



1.17.FLAPS

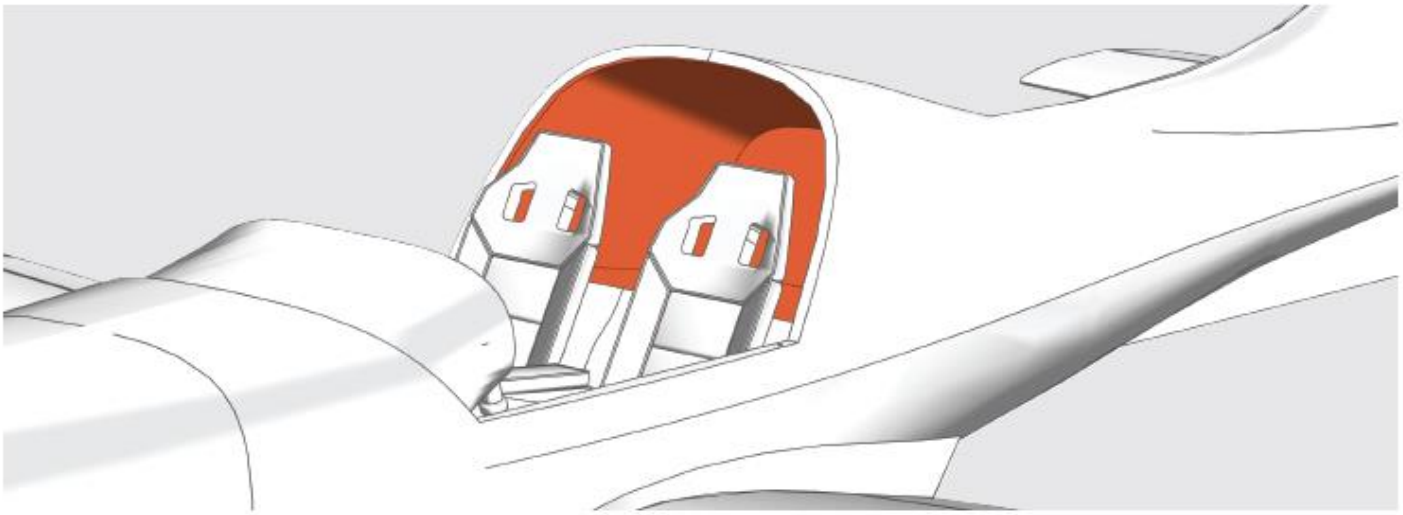
The flaps are operated electrically.



In the basic version, the flap angle is set manually.
To do this, keep the button pressed until the desired flap angle is reached.
In the electronic version, four flap stages can be preselected.
Each time the button is pressed, the next flap position is approached automatically.

Flap stage	Flap angle	Configuration	Minimum speed VS (IAS)	Basic Version	Electronic Version
0	0°	Trip	93 km/h		
1	15°	Start			
2	25°	Land on normal runways			
3	35°	Landing on short runways	72 km/h		

1.18. LUGAGGE COMPARTMENT



1.19 SEATS AND SEAT BELTS

The seats are made of padded fibre composite material (GRP/CFRP) and are not adjustable.

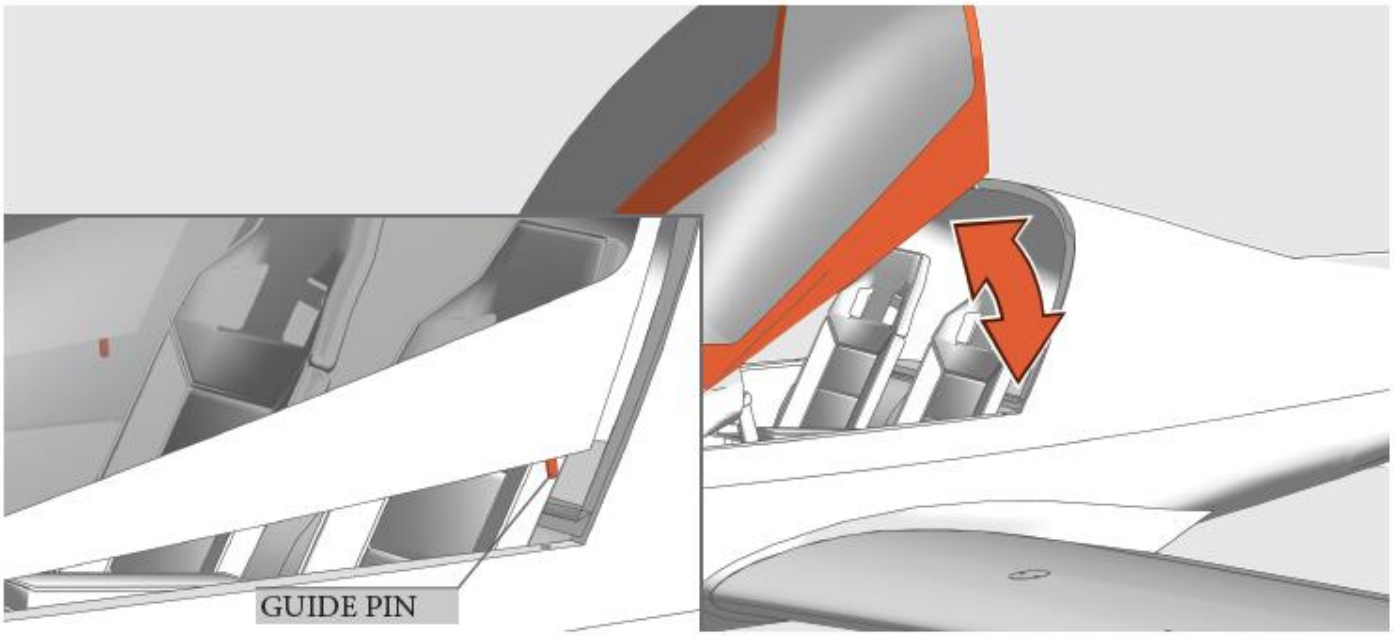
Seat shells of different heights can be ordered according to the pilot size.

The 4-point seatbelts can be adjusted to any height and the lock opens by pressing the red button.

1.20 CABIN COVER

The canopy is locked in the middle above the seats, the canopy opens forward and is held by gas springs.

The canopy should always be closed after leaving the aircraft, because the open hood exposes a large surface to the wind.
When closing, make sure that the guide pins snap into place.



1.21 ENGINE

Manufacturer: BRP Powertrain
Designation: Rotax 912 ULS

- 4-cylinder four-stroke engine in boxer configuration
- Liquid-cooled cylinder heads
- Ram-air cooled cylinders
- Dry sump lubrication
- 2 CD carburetors
- Mechanical fuel pump
- Additional electric fuel pump
- Propeller drive via integrated gearbox with mechanical vibration damping and overload clutch.
- Direction of rotation to the right (seen from the cockpit)
-

1.22 ELECTRICAL SYSTEM

- Contactless magneto-capacitor dual ignition (two independent ignition circuits)
- Electric starter (12V, 0.7 kW)
- Alternator with regulator rectifier (12V, 20 A DC)
- 12 V Li-Ion high-performance battery

If the red alternator indicator lamp lights up at speeds above 1800 rpm, all consumers that are not absolutely necessary must be switched off because the battery is discharging and is no longer being charged.

1.23. LUBRICANT

Branded motorcycle engine oil with gear additives

Only use oils classified as SG or higher according to the API system.

-5°C ... 40°C	SAE 20W-50; SAE 20W-40
-15°C ... 40°C	SAE 15W-40, 15W-50,
-26°C ... 40°C	SAE 10W-40
-30°C ... 40°C	SAE 5W-50; SAE 5W-40

Do not use unalloyed aircraft engine oil!

Since the transmission gears must also be lubricated, high-performance motorcycle lubricating oils with a special gear lubricating capacity are required.

Oil consumption max 0.06 l/h Oil quantity 3 l

1.24. COOLANT

Antifreeze coolant for engines EVANS NPG+

1.25. FUEL

EN 228 Super min RON 95

EN 228 Super plus min RON 95

ASTM D4814 min AKI 91

AVGAS 100 LL (ASTM D910)

Super lead free is recommended. Refuel with AVGAS only if MOGAS is not available.

1.26. PROPELLER

DUC 3-blade fixed propeller. The propeller is adjustable on the ground and is factory set to achieve a good compromise between optimal climbing and travel performance.

Manufacturer: DUC HELICES

Model: 3-blade Inconel SWIRL right-turning

Diameter: 1730 mm

2. OPERATING LIMITS

The structure of ultralight aircraft is dimensioned for a safe load factor of +4/-2 g. Larger accelerations can lead to premature fatigue and/or fracture of the structure.

- Aerobatics are not permitted!
- Turns exceeding bank rates of 60° are not permitted.
- The maximum speed V_{NE} must never be exceeded.
- In rough or turbulent air, airspeed must not exceed V_{RA} (green arc).
- The speed V_{FE} must not be exceeded with extended flaps.
- Flights in icing conditions are not permitted.
- Flight operations must be stopped in strong gusty winds or wind speeds of over 40 km/h.

The limit values are marked on the instruments in the cockpit. In addition, there are signs in the cockpit that state the operating limits. These signs must not be removed!

2.1. FLIGHT SPEEDS

Indication of airspeeds in IAS (indicated airspeed)

SPEEDS		IAS	NOTES
V_{NE}	Maximum allowed speed	260 km/h	This speed must not be exceeded under any circumstances.
V_{RA}	Max. speed in strong turbulence	210 km/h	This speed must not be exceeded in rough air or heavy turbulences.
V_A	Maneuver - speed	176 km/h	Above this speed, no full or abrupt rudder deflections may be applied.
V_{FE}	permissible maximum speed for actuating the flaps	130 km/h	The flaps must not be extended above this speed.
V_{SO}	Stall speed in landing configuration full flaps	72 km/h	Lowest speed with full flaps (35°)
V_{S1}	Stall speed in clean configuration.	93 km/h	Lowest speed with retracted flaps (0°).
Vy	Speed for best climb	145 km/h	Rate of climb 4,6 m/s
Vx	Speed for best climb angle	120 km/h	Rate of climb 4,1 m/s

OTHER IMPORTANT SPEEDS	
Approach speed when landing	110 - 120 km/h
Cruising speed at 75% power	210 km/h
Maximum speed at full continuous power	230 km/h
Speed for the best glide	120 km/h

2.2 TACHOMETER MARKINGS

White arc:	(1,1Vs0 - Vfe)	79 km/h	-	130 km/h
Green arc:	(1,1Vs1 - Vra)	102 km/h	-	210 km/h
Yellow arc:	(Vra - Vne)	210 km/h	-	260 km/h
Red line:	(Vne)	260 km/h		
Yellow line:	(Va)	176 km/h		

2.3 Aerobatic flight and intentional spins

Warning! Aerobatic flight and intentional spins are prohibited !

2.4. LOAD Limitations

V_A +4g / -2 g

V_{NE} +4g / -1,5g

Warning! Exceeding the load limitations can lead to structural failure!

2.5 CROSSWIND COMPONENT DURING TAKE-OFF AND LANDING

Limitations for permissible wind conditions

The highest tested crosswind component for take-off is:	25 km/h
The highest tested crosswind component for landing is:	25 km/h

2.6. TAKE-OFF DISTANCE

The take-off distance on a short-mown grass runway over a 15m obstacle is approx. 380m at sea level and in a standard atmosphere.

Remarks :

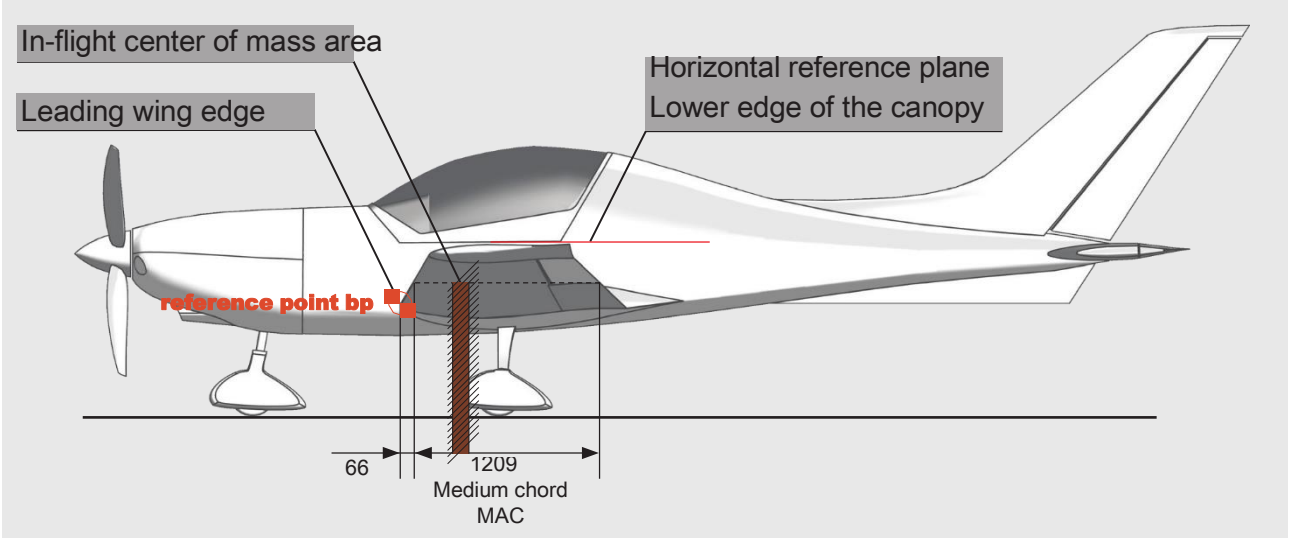
For every 14° C above standard temperature, the distances mentioned for the relevant altitudes are to be increased by 10%.

Headwind: for every 10 km/h the take-off distances can be reduced by 10%.

Tail wind: for every 10 km/h the take-off distances is to be increased by 10%.

2.7. CENTER OF GRAVITY

Empty mass center of gravity area	at 320 kg	252-278 mm BP
	at 385 kg	264-309 mm BP



2.8. WEIGHT

Empty weight	approx. 350 kg in standard equipment	
max TOW	600 kg	
min TOW	420 kg	
max payload	250 kg	
max pilot weight	110 kg	
min pilot weight	70 kg	
max luggage	20 kg	
max amount of fuel	50 l	standard equipment 1 Tank optional 2 Tanks

2.9. INSTRUMENT MARKING

	Red marking lower limit	Yellow bow	Green bow	Yellow bow	Red marking upper limit
	Minimum	einge-schränkt	Normal-bereich	einge-schränkt	Maximum
Rev counter (min^{-1})		0-1400	1400 - 5500	5500 - 5800	5800
Fuel pressure (psi) Fuel pressure (bar)	2,2 0,15		2,8 - 5,8 0,15 - 0,4		5,8 0,4
Oil pressure (bar)	0,8	0,8 - 2	2,5 - 5	5 - 7	7
Oil temperature (°C)	50	50 - 90	90 - 110	110 - 130	130
Cylinder head temperature (°C)		50 - 90	90 - 110	110 - 135	135
Exhaust temperature (°C)			600-850	850 - 880	880 -900

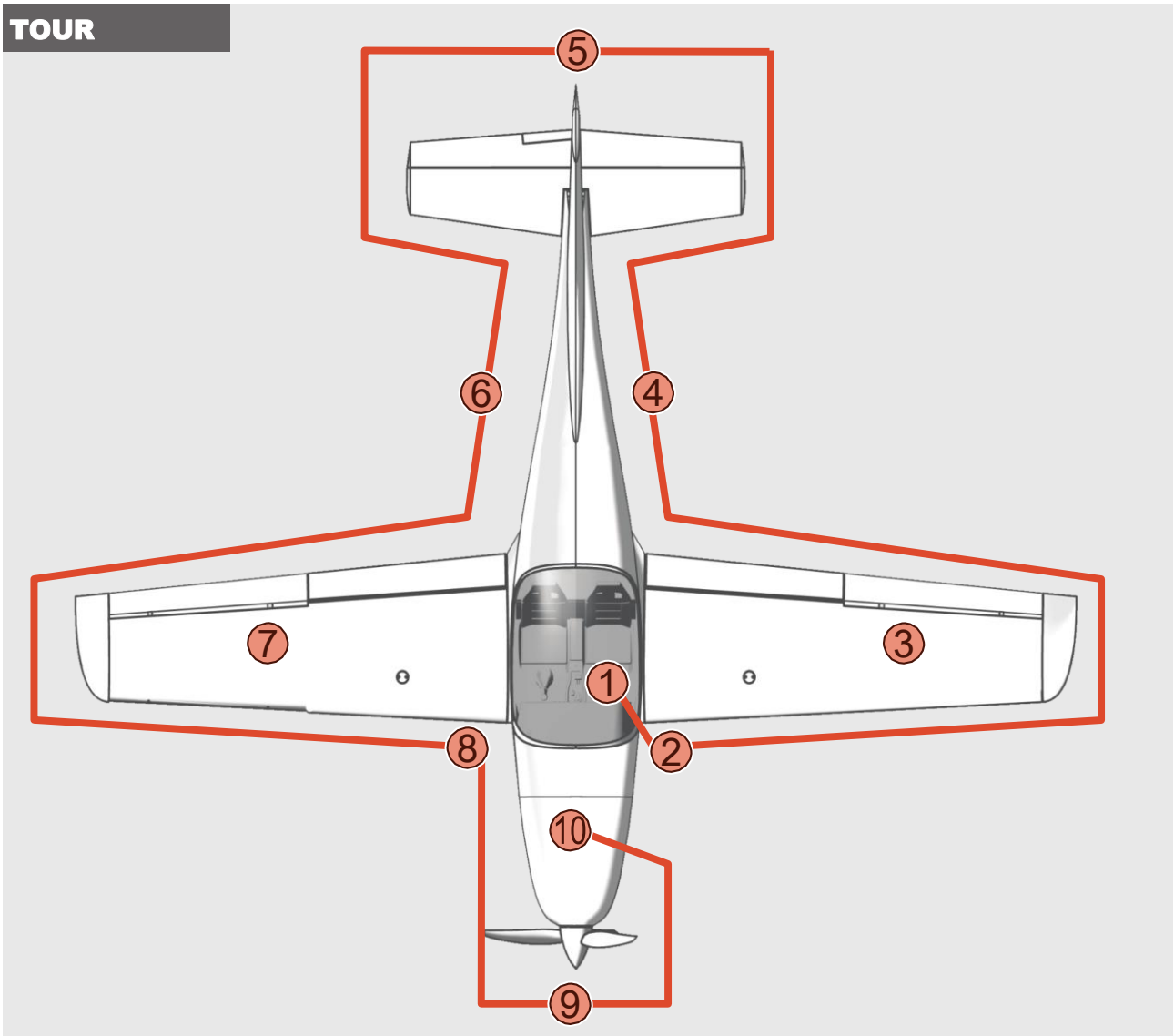
2.10. ENGINE

Bore		84 mm
Hub		61 mm
displacement		1352 cm^3
Compression ratio		11:1
Fuel consumption		
Starting power		27 l/h
Highest continuous power		25 l/h
75% continuous power		18,5 l/h
Specific consumption at maximum continuous output		285 g/kWh
performance	starting power	59,6 kW (100 PS) at 5800 min^{-1} (max 5 min)
	maximum continuous power	69 kW (93,7 PS) at 5500 min^{-1}
oil pressure	max	7 bar (temporarily permitted at cold start)
	min	0,8 bar (under 3500 min^{-1})
	normal	2,0 - 5,0 bar (over 3500 min^{-1})
oil temperature	max	130 °C
	min	50 °C
	optimal range	ca. 90 °C - 110 °C
Exhaust temperature max.		880 °C
coolant temperature A permanent display of the coolant temperature is necessary!		max. 120 °C
Cylinder head cooling system A permanent display of the cylinder head temperature is necessary!		max. 135 °C

3. NORMAL OPERATING PROCEDURES CHECKLISTS

This section contains checklists for preparing and conducting normal operation of the microlight. Before flying, an aircraft, it must be carefully checked for operational safety. In flight, even the smallest malfunction can have serious consequences.

3.1. PRE-FLIGHT INSPECTION



1	**INTERNAL CONTROL**	
	Main Switch / Ignition	OFF
	Cabin space	Check for loose parts or foreign objects
	Straps, seat attachment	Check
	Rescue system	Remove safety pin
	Canopy	Clear, no cracks, lock closes
2	**LEFT MAIN LANDING GEAR**	
	Gear legs	fixed, tight, no damage
	Wheel / Tire	undamaged, check air pressure
	Brake	undamaged, no signs of fluid leakage
3	**LEFT WING**	
	Fuel tank	check
	Fuel cap	closed, tight
	Wing surface	clean, undamaged
	Wing tips	clean, undamaged
	Strobe (if available)	inspect
	Aileron	clean, free-moving, little lateral play, check connections
	Flaps	clean, undamaged, little lateral play
		check connections

4	**LEFT FUSELAGE**	
	Fuselage	clean, no damage
	Step tube	fixed
	Static port	clean, free

5	**TAIL UNITS**	
	Horizontal stabilizer	clean, no damage
	Elevator	moving free, little lateral play
		check connections
	Trim	clean, no damage, connections ok
	Rudder	clean, no damage
	vertical tail	moving free, little lateral play
		check connections

6	RIGHT FUSELAGE	
	Fuselage	clean, no damage
	Step tube	fixed
	Static port	clean, free

7	RIGHT WING	
	Aileron	clean, moving free, little lateral play, check connections
	Flaps	clean, little lateral play, connections ok
	Wing surface	clean, undamaged
	Wing tips	clean, undamaged
	Strobe (if available)	inspect
	Pitot tube	clean, free of pollution, not bent
	Fuel tank	check
	Fuel filler cap	closed, tight

8	RIGHT MAIN LANDING GEAR	
	Gear legs	fixed, tight, no damage
	Wheel / Tire	undamaged, check air pressure
	Brake	undamaged, no signs of fluid leakage

9	PROPELLER, NOSE LANDING GEAR	
	Propeller	clean, no nicks, no damage, not misaligned, little movement
	Spinner	clean, undamaged
	Nose gear	Landing gear leg without deformation
	Nose wheel tire	undamaged, check air pressure
	Wheel fairings (if available)	Screw connection tight, no cracks

10	ENGINE	
	Cowling	remove top of cowling
	Exhaust	check springs, check for cracks,
	Carburetors	firm fit
	Coolant fluid	check, if necessary add
	Oil reservoir	turn engine sufficiently, check oil level,
	Oil- cooling- fuel systems	check for leaks
	Spark plugs	check for firm fit
	Engine mount	check for cracks, bends ...
	Fuel lines	no leakage, no chafing
	Bowden cables	no chafing
	Drain valve	take fuel sample and check for water
	Cowling	mount

3.2. CHECKLISTS STANDARD PROCEDURES

Before the start			
1	Pre-flight check	carried out	
2	Stick	controls free	
3	Seat belts	adjusted and locked	
4	Canopy	closed and locked	
5	Rescue system	unlocked	
6	Parking brake	engaged	
7	Fuel tank switch	select fullest tank	
8	Throttle lever	idle position	
9	Switches	all off	
10	Main switch (BATTERY)	on	Battery light is on
11	Fuel pump	on for 5 seconds then off again	Fuel pressure indicator in the green range
12	Choke	cold engine: pulled out warm engine: pushed in	when the engine is running, push it back in
13	Propeller	free	
14	Ignition key	start max 5 seconds	
15	Engine RPM	2500-3000 min^{-1}	Battery light goes out
16	Oil pressure	within 10 sec in the green range	
17	Throttle lever	to idle position	engine rpm 1600-1900 min
18	Altimeter	set	
19	Navi. system	on	
20	Radio	on	
21	Transponder	on	

BEFORE TAKE OFF		
1	Brakes	set
2	Magnetos	3800rpm, max drop 300, max diff 150
3	Fuel selector	fullest tank
4	Oil pressure	1,5 - 5 bar
5	Oil temperature	min 50°
6	Controls	free
7	Flaps	set
8	Trim	set

TAKE OFF		
1	Engine	min 5000rpm
2	Airspeed	alive
3	Initial climb	min 110 km/h

CLIMB OUT		
1	Engine power	adjust
2	Best climb speed	120 km/h
3	Flaps	retract at safe height
4	Instruments	check

CRUISE FLIGHT			
2	Cruise RPM	4600-5000 min^{-1}	cruising speed
3	Fuel pump	off	indicator light off
4	Trim	trim for level flight	

LANDING			
2	Carburetor preheating (if available)	pull	in icing conditions
3	Airspeed	reduce	to 130 km/h
4	Trim	set	
5	Tank	switch to fullest tank	
6	Fuel pump	on	indicator light on
7	Landing light (if available)	on	
8	Flaps	stage 1 stage 2 for short fields stage 3	15° 25° 35°

9	Airspeed	reduce	110 km/h in turbulence, crosswind, rain 120 km/h
10	Trim	set	
11	Touch down	flare to min speed	

4.0 NORMAL OPERATING PROCEDURES DESCRIPTIONS

This section contains descriptions of the normal operation of the microlight aircraft.

The individual operating procedures are explained in detail here.

4.1 Starting the engine

Cold engine: pull choke, throttle lever in idle position.

Warm engine no choke, throttle slightly forward push.

Do not operate the starter for more than 5 seconds, then pause.

When engine runs - open throttle carefully until the engine runs smoothly at slightly higher RPM

Warm-up

The engine must be warmed up before take off.

Warm up 2 minutes at 2000 min-1, then 2500 min-1, until 50°C oil temperature is reached.

4.2. MAGNETO TESTING

The engine has two independently operating ignition circuits. If one ignition circuit fails, the engine continues to run and you can continue the flight to the nearest landing site.

Set the engine RPM to 3800 min^{-1}.

First magneto	switch OFF	-->	RPM drop 100 - 300 rpm	-->	switch ON
Second magneto	switch OFF	-->	RPM drop 100 - 300 rpm	-->	switch ON

Difference between the rpm-drop should not be more than 150rpm.

4.3. TAXI

Check brakes and steering (rudder pedals) when taxiing.

Taxi at walking pace (5-7 km/h), max. 20 km/h. Reduce speed if there is a crosswind.

4.4. TAKE OFF

Flaps set to position 1 (15°).

Push the throttle lever forward continuously to full throttle.
Check that engine rpm reaches min. 5000/min.

Pull gently on the stick to relieve the pressure on the nose wheel.

After take-off, build up speed to approx. 100 km/h, then go to climb speed at approx. 120 km/h.

After passing an altitude of approx. 150ft AGL and after passing all obstacles, retract the flaps to position 0 (0°),
Reduce RPM slightly and continue climb out at approx. 140km/h.

TAKE OFF DISTANCES

The take-off distance on a short-mown grass runway over a 15m obstacle is approx. 380m at sea level and in a standard atmosphere.

Attention! Higher altitude and higher temperature increase the take-off distance.

Remarks :

For every 14° C above standard temperature, the distances mentioned for the relevant altitudes are to be increased by 10%.

Headwind: for every 10 km/h the take-off distances can be reduced by 10%.

Tail wind: for every 10 km/h the take-off distances is to be increased by 10%.

4.5. TAKE OFF IN CROSSWINDS

The highest tested crosswind component for take-off is: 25 km/h

In case of very gusty wind or wind speeds above 40 km/h, flight operations shall be suspended

4.6. STALLS

Stall speeds in different configurations:

V_{S1}	93 km/h (IAS)
V_{S0}	72 km/h (IAS)
V_{SF}	72 km/h (IAS)

Recovery from stalled flight:

To exit stalled flight

==> Move stick forward

==> Aileron in center

==> Rudder neutral

ONLY move the stick forward, NO aileron input and NO rudder input.

Loss of altitude when recovering from stalled flight approx. 120ft (35m)

Greatest pitch attitude below the horizon when recovering from stalled flight about 20°

4.7

4.8. LANDING

Approach speed 110 km/h
Landing distance 400m over 15m obstacle.

Do not fly below 100 km/h on approach

Reduce airspeed to flap speed (max. 130km/h), to the top of the white arc.

Set flaps to flap position 1 (15°) on the downwind leg.

Fuel selector switch to fullest tank, fuel pump on, landing lights (if fitted) on.

On final approach, set flaps to flap position 2 (25°), on short runways to flap position 3 (35°), reduce airspeed to 110 km/h and trim out the aircraft.
Touch down at minimum speed.

Hold the stick to release the nose wheel and brake carefully with the brake lever.

In strong headwinds, turbulence or rain, approach at higher speed.
The flap position (2 or 3) on approach depends on the length of the runway and the prevailing wind conditions. Do not land with maximum flap setting in strong headwinds.

4.9. LANDING WITH CROSSWIND

In crosswinds and turbulence, approach at a slightly higher speed.

Crosswind landings can be performed using two procedures:

- Approach with a lead angle (nose into the wind) and straighten the aircraft just above the ground.
- Approach with low wing into the wind, to hold direction compensate with rudder input to achieve a straight approach to the runway. Keep the wing low until touch down.

Never exceed the maximum demonstrated crosswind component of 25 km/h!

In crosswinds of more than 20 km/h it is recommended to land with retracted flaps (flap setting 0 or 0°).

5.0 EMERGENCY PROCEDURE

The described procedures are recommended as the best possible course of action for coping with the respective situation. However, they are no substitute for common sense and general mindfulness and cannot cover every conceivable emergency situation.
Since emergencies are rare in modern aircraft, their occurrence is usually unexpected. You should therefore familiarize yourself intensively with the emergency procedures and be prepared for them at all times.

Correct behavior in an emergency can be trained! Internalize the following emergency procedures and simulate an emergency landing more often in flight.

5.1ENGINE FAILURE

The engine in this UL aircraft is not certified. Be constantly aware of this fact and plan your flight so that you always have the opportunity to carry out a safe landing.

Flight altitude and flight speed are rarely sufficient to carry out the 180° curve required for a return to the airfield. Consider a reversal curve only from 500 ft altitude.

DURING THE FLIGHT		
1	Gliding flight	Speed 110 km/h, flaps retracted (0°)
3	Fuel pump	on
4	Fuel selector switch	fullest tank
6	Engine	start, cranking attempts max. 2-3
7	If the engine does not start:	
8	Throttle lever	off
9	Fuel pump	off
10	Fuel selector switch	off
11	Ignition switch	off
12	Radio	Send emergency message on 121.5 MHz
	Search for an emergency landing field, observe the airspeed, watch out for obstacles and land against the wind or slope if possible. In case of high vegetation, consider the upper edge of the vegetation as the ground.	
13	Fully extend the flaps on final approach to the selected emergency landing field.	
14	Emergency landing	touch down as slow as possible

5.2. FIRE

Incorrect starting procedures, such as over-engaging the auxiliary fuel pump, can lead to engine overflooding and subsequent fuel spillage onto the parking area. This can sometimes occur with difficult cold weather starting when there is no possibility of preheating the engine. In such a case, the aircraft should be moved away from the fuel surface before attempting another start.

ENGINE FIRE ON THE GROUND		
1	Fuel selector switch	OFF
2	Throttle lever	Full throttle (so that the engine stalls)
3	Cabin heating	OFF
4	Ignition switch	OFF
5	Main switch	OFF
6	Leave airplane and extinguish fire with fire extinguisher	

ENGINE FIRE DURING THE FLIGHT		
1	Fuel selector switch	OFF
2	Ignition switch	OFF
3	Speed	reduce

4	gliding flight	initiate (speed 110 km/h, flaps retracted 0°)
5	air vents (if available)	close
6	Select a suitable field for emergency landing	
7	If the fire is not extinguished, to find a speed at which a combustible mixture no longer arises.	
8	Perform an emergency landing (see "Emergency Landing with Standing Engine" section) Do not attempt to restart the engine!	
9	Leave plane.	

CABIN BURN		
1	main switch	from
2	air vents (if available)	close
3	emergency descent	perform (see section Emergency descent)
4	emergency landing	perform (see section Emergency landing)

WINGBURN		
1	main switch	from
2	air vents (if available)	close
3	Perform emergency descent (see section Emergency descent) Slip to keep the flames away from the fuel tank and cab and perform an emergency landing (see section Emergency landing).	

CABLE FIRE IN FLIGHT		
	The first sign of a cable fire is the smell of burning or scorching insulation. Immediately turn off the main switch and reduce the fresh air supply, if feasible, to reduce the possibility of continuous fire. If electrical energy cannot be dispensed with during the flight, one can try to identify the damaged circuit in the following way and then switch it off:	
1	main switch	from
2	all of the other switches (except ignition switch)	from
3	Check the condition of the circuit breakers in order to find the defective circuit, leave it switched off	
4	Main switch	ON
5	Switch on the other switches one by one with certain pauses until the short circuit is found in the circuit	
6	Make sure the fire is extinguished before the fresh air supply is reopened	

5.3. EMERGENCY DESCENT

EMERGENCY DESCENT		
1	Throttle lever	Idle
2	Descending flight	Do not exceed the maximum permitted speed VNE (260 km/h)!
3	Emergency landing	Perform an emergency landing (see section Emergency Landing)

5.4. GLIDING FLIGHT

GLIDING FLIGHT		
1	Landing flaps	Position 0 (0°)
2	Speed	120 km/h
	Glide ratio 1:8. This means that from a height of 300 m (1000 ft) above ground, the glide distance is approx. 2.4 km (in calm conditions).	

The glide distance increases with a tailwind and decreases with a headwind.

5.5. SAFETY LANDING

Safety off-airfield landings should be initiated if a hazard to the aircraft and occupants cannot be ruled out as a result of operational malfunctions (e.g. rough, out-of-round engine running) or for weather reasons.

Before attempting an off-field safety landing, fly slowly over the landing area at a safe altitude, but low enough to check the terrain for conditions and obstacles. Proceed as follows:

SAFETY OUTLANDING WITH ENGINE POWER		
1	Fly over the selected area at 110 km/h, observing the preferred touchdown area for the next approach. Land against the wind. Watch for obstacles. If possible, land uphill.	
2	Approach at 110 km/h	
4	Ignition switch	off
5	Main switch	off
6	Fuel selector switch	off
7	Seat belts	tighten

5.6 EMERGENCY LANDING

Emergency landing with standing engine		
1	at high altitude	Check the power reserve and the position of the fire cock, start the engine, max 2-3 tests
	at low altitude	Initiate emergency landing immediately
2	Radio	Set emergency message to 121.5 MHz
3	ignition switch	off
4	Fuel Valve	to
5	Tighten seat belts	
6	Look for an emergency landing field, pay attention to driving, observe obstacles and, if possible, land against the wind or slope. With high vegetation, consider the top edge of the vegetation as soil.	
7	In the final approach to the selected emergency landing field flaps fully extend	
8	Perform emergency landing	

If no suitable emergency landing field with a stationary engine can be reached, operate the rescue system (see section Rescue system).

5.7

5.8. FAILURE OF THE CONTROL SYSTEM

It may still be possible to fly the airplane in the event of a control failure using the remaining control surfaces and the engine power. The failed control can be replaced as follows:

Elevator failure	Align with trim, control altitude and cruise with engine power.
Aileron failure	Control with the rudder via the sliding roll moment.
Rudder failure	Hold direction with the aileron. Landing with rudder control down should only be done directly into the wind, crosswind landings should be avoided.

5.9. MOTOR: ROUGH MOTOR RUNNING OR LOSS OF POWER

Magneto interference

Sudden rough engine running or misfire is usually a sign of ignition magneto malfunction.
By switching the ignition switch from BOTH to L or R, you can determine which of the two ignition magnetos is not in order.

By adjusting the throttle lever to different power settings, you can determine whether continuous operation with both ignition magnetos (BOTH position) is possible. If this is not the case, switch to the correct magneto and fly to the next airfield.

Low oil pressure

If low oil pressure occurs together with normal oil temperatures, this indicates the possibility of a malfunction of the oil pressure gauge or relief valve. A landing at the nearest airfield is advisable to determine the cause of the malfunction.
If a complete loss of oil pressure occurs together with an increase in oil temperature, engine failure may be imminent. Therefore, immediately reduce engine power and perform an off-field safety landing.

Fuel

Check the fuel selector switch position and try to restart the motor.

If this is ineffective, perform an emergency landing.

5.10. FAULTS IN THE ELECTRICAL SYSTEM

The cause of such failures is usually difficult to determine. The most likely cause for a failure of the DC generator is broken or loose wires. For example, a damaged or incorrectly adjusted voltage regulator can cause faults. All electrical faults of this type create an "electrical emergency" that requires immediate action.

INADEQUATE CHARGING CURRENT CONTROL LIGHT RED

If the red indicator light is illuminated in flight, this indicates that the generator is not supplying power to the system. All non-essential systems should be switched off.

Problems with the charging current can be fixed after landing at the destination. There are no safety-related systems on board that require an immediate landing

5.11.RESCUE SYSTEM

There is no standard procedure for triggering the rescue system. The decision depends solely on the encountered danger situation. At a low altitude, it is definitely important to make a quick decision so that safe operation of the rescue system is still possible. A hazardous situation at high altitude leaves the pilot considerably more time to make a decision.

TRIGGER RESCUE SYSTEM		
1	Radio	Set emergency message to 121.5 MHz
	Make an emergency report only if there is still enough time, priority is always a timely triggering of the rescue system!	
2	Ignition switch	OFF
3	main power switch	off
4	Fuel Valve	close
5	Tighten seat belts	
	cockpit canopy	unlock
6	before landing	Prepare for impact, strap your head down on your
7	after landing	chest, leave the plane as soon as possible

Attention! The release force of the rescue system can be high, possibly pull the release handle with both hands

5.12. SPIN

Intentional spins are prohibited.

In case of an unintentional spin, activate the rescue system.

5.13.FLIGHT IN ICING CONDITIONS

Flying under known icing conditions is strictly prohibited.

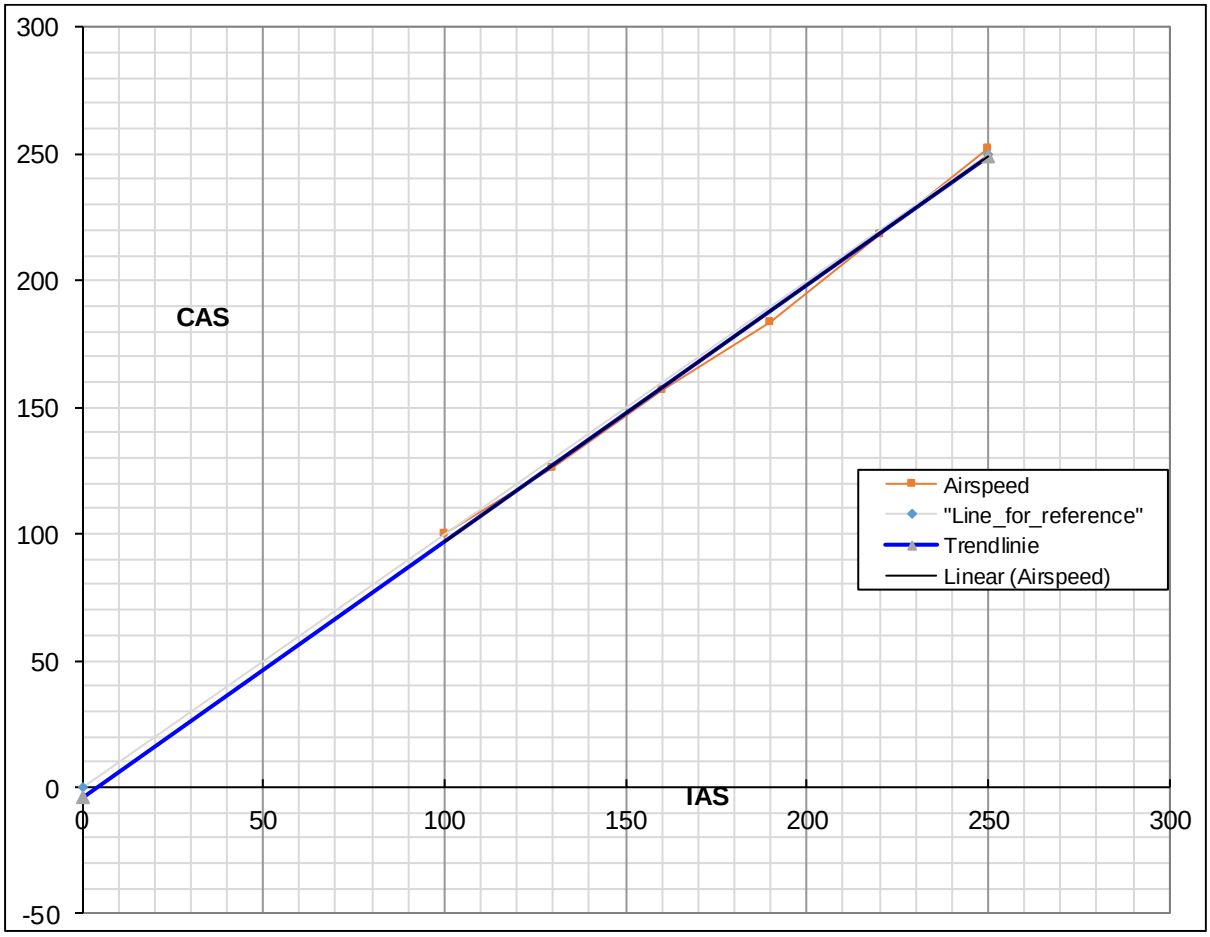
6. FLIGHT PERFORMANCE

The flight performance information in this chapter is based on flight measurements that have been corrected for standard atmosphere conditions.

The data given does not include a safety margin and assumes compliance with the specified flight procedures and a well-maintained and clean aircraft.

6.1. Velocity Conversion (CAS vs. IAS)

This diagram allows the conversion from IAS (Indicated Air Speed) to CAS (Calibrated Air Speed) and vice versa. It is assumed that the instrument itself has no error.



6.2.

6.3. TAKE-OFF DISTANCE

The take-off distance on a short-mown grass runway over a 15m obstacle is approx. 380m at sea level and in a standard atmosphere.

CORRECTION FACTORS

In the event of deviations from the standard conditions, the above values must be corrected in the following order:

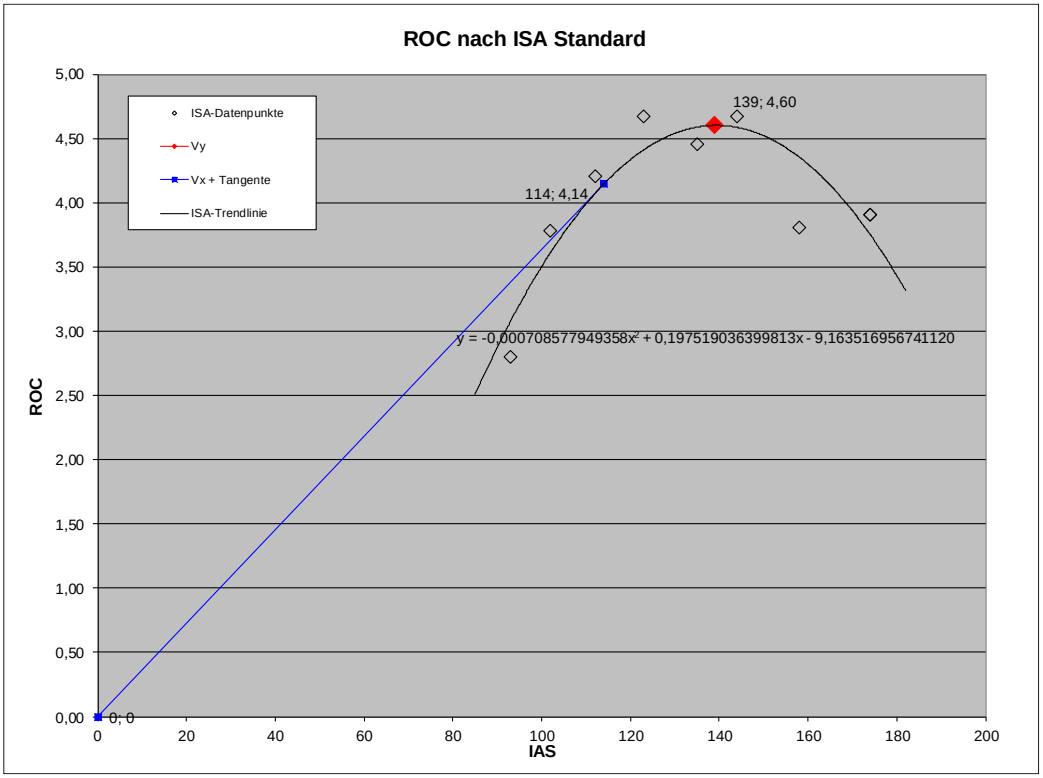
	DEPARTURE	CORRECTION
1	Pressure altitude:	+ 10% per 1000ft pressure altitude (PA)
2	Temperature	+/- 1% per °C temperature deviation
3	Inclination:	+/- 10% per 1% incline
4	Wet runway:	+ 10 %
5	Softened runway:	+ 50%
6	Long grass:	+ 20%

6.4. CLIMBING

Speed for best climg with MTOW at sea level and ISA

Speed for the "best climb" with MTOW (sea level / ISA)
Indicated Airspeed VY = 145 km/h (IAS) Rate of climb ROC = 4.6 m/s

Speed for the "steepest climb" with MTOW (sea level / ISA)
Indicated Airspeed Vx = 120 km/h (IAS) Rate of climb ROC = 4.1 m/s



6.5. CRUISE FLIGHT

SPEEDS		
	75% performance (Travel configuration)	maximum continuous power
rpm	5000 min^{-1}	5500 min^{-1}
IAS in 1000 ft	210 Km/h	230 km/h

6.6. RANGE

Take-off weight: 600 kg

Available fuel quantity 48.5 l

RPM	IAS	FUEL CONSUMPTION	FLIGHT TIME	RANGE
4300 min^{-1}	170 km/h	14,5 l/h	3 h 18 min	560 km
4800 min^{-1}	190 km/h	18,5 l/h	2 h 36 min	490 km
5000 min^{-1}	210 km/h	20,0l/h	2 h 24 min	500 km
5500 min^{-1}	230 km/h	25,5 l/h	1 h 54 min	435 km

7. WEIGHT AND CENTER OF GRAVITY

In order to maintain the intended performance, safety and flight characteristics, the aircraft must be operated within the permissible loading and inside the center of gravity (CG) range.
Although the aircraft has a large load and centre of gravity area, it cannot be flown simultaneously with maximum passenger load, full tank and maximum luggage load.
An incorrect centre of gravity changes the flight characteristics:
If the centre of gravity is too far forward, there may be problems with rotation on take-off and landing.
A center of gravity that is too far in the rear, the CG range can lead to instability and unintentional spinning.
The pilot-in-command shall ensure before each take-off that the aircraft is operated within the permitted loading and CG area.

Exceeding the maximum take-off weight is prohibited and leads to overloading of the aircraft and for the deterioration of flight characteristics and performance.

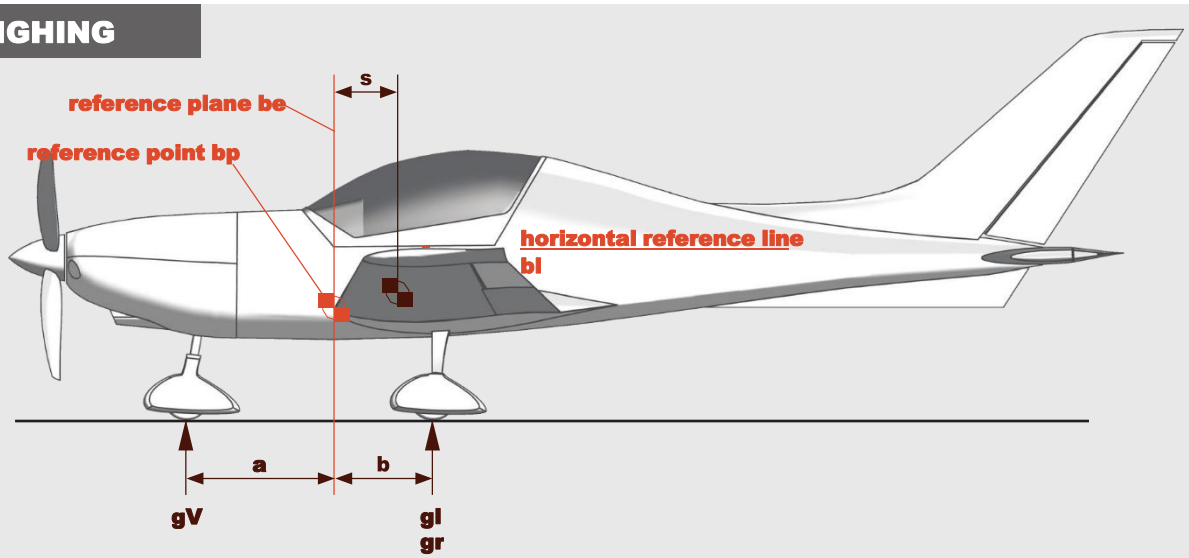
7.1. PROCEDURE FOR WEIGHING

LOAD STATUS OF THE AIRCRAFT DURING THE WEIGHING:

Equipment according to the equipment list.
Including lubricants.
Gasoline tank empty (except for the amount of unusable fuel).

When weighing, the aircraft must be horizontal in both axes.
The horizontal reference line is the lower edge of the cockpit.
The reference point is the leading edge of the wing at the transition to the fuselage.
Secure the aircraft against rolling away.
Place a scale under each wheel and determine the weight.

WEIGHING



BE Reference plane
BP Reference point
BL Horizontal reference

S Empty mass center measured from reference point BP
GV nose wheel weight
GL Weight main landing gear left
GR Weight main landing gear right

A Nose wheel lever arm
B Lever arm main landing gear left/right

Calculation of the empty mass center according to the following formula:

$$S = \frac{(GL+GR) \times B - GV \times A}{GL+GR+GV}$$

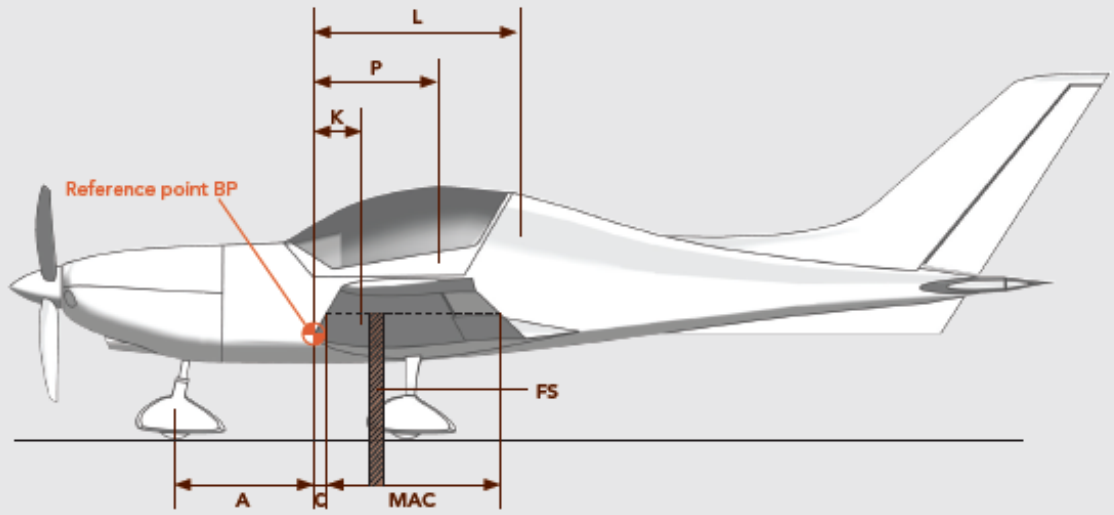
Empty mass center of gravity area:

at 320 kg	252-278 mm
at 385 kg	264-309 mm

7.2. DETERMINATION OF THE CENTER OF GRAVITY

The centre of gravity must be determined before each flight.
The flight may only be carried out if the centre of gravity is within the specified limits of the in flight centre of gravity range.

FLIGHT MASS CENTER



BP	Reference Point
K	Lever-arm fuel
P	Lever arm pilot/passenger
L	lever arm luggage
A	Distance nose wheel - reference point BP
C	Distance reference point - MAC
FS	Flight mass center of gravity
MAC	Medium wing depth

Center of gravity of flight = sum of all weights / sum of all moments

moments = lever arm x corresponding weight

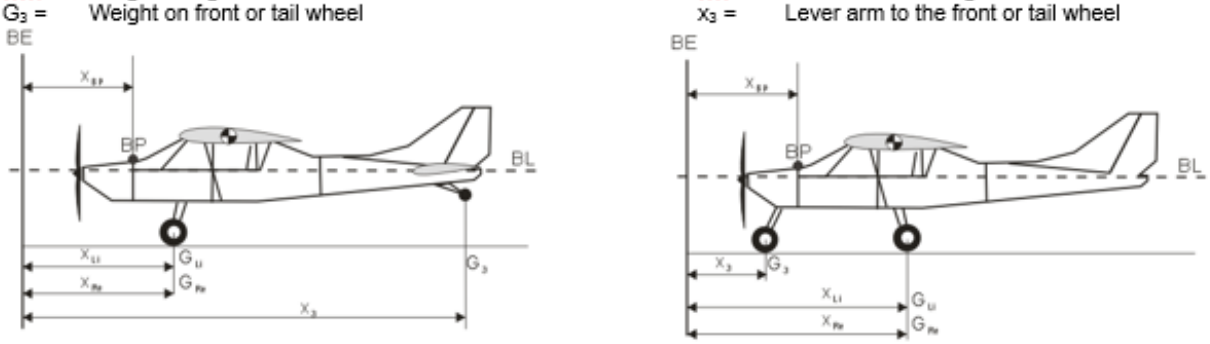
Weight report Freccia

Date: Call sign:

Manufacturer		Type	
Serial-No		Date of manuf.	

BP = Reference point BE = vert. reference plane
G_{Li} = Weight on left wheel
G_{Re} = Weight on right wheel
G_3 = Weight on front or tail wheel

BL = horizontal reference line
x_{Li} = Lever arm to the left wheel
x_{Re} = Lever arm to the right wheel
x_3 = Lever arm to the front or tail wheel



BL (horizontal reference line)	
BE (vertikal reference line)	

		Lever arms referenced to BE		
		Weight [kg]	Lever arm [m]	Moment [kgm]
Left wheel	$M_{Li} = G_{Li} * x_{Li}$	G_{Li}=	x_{Li}=	M_{Li}=
Right wheel	$M_{Re} = G_{Re} * x_{Re}$	G_{Re}=	x_{Re}=	M_{Re}=
Front or tail wheel	$M_3 = G_3 * x_3$	G_3 =	x_3 =	M_3 =
Empty weight	$G = G_{Li} + G_{Re} + G_3$	G =		
Total moment	$M = M_{Li} + M_{Re} + M_3$			M =
Empty weight CG	S = M / G		S =	

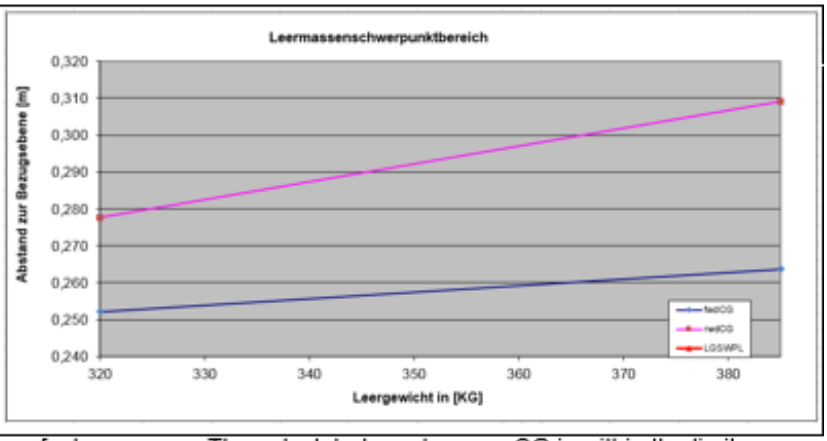
max. take off weight		kg
max. payload		kg
max. payload with full tanks		kg
min. pilot weight		kg

Date signature stamp

Am Armaturenbrett des UL muss ein Aufkleber mit den Angaben aus Tabelle 2 sichtbar angebracht sein.

permissable
empty mass CG range:

at 320 [kg] between **252** and **278** [mm]
at 385 [kg] between **264** and **309** [mm]



The weight report has been performed to manufacturer specs. The calculated empty mass CG is within the limits. Parts which were installed are listed in the attached list.

signature stamp

Weight report

Date: Call sign:

Basic equipment list gem. LTF-UL §29 3.		
These parts belong to the basic equipment and were installed during weight measurement.		
Component	Type / manufacturer	
Engine		
Prop		
Muffler		
Rescue system		
Radio		
Transponder		
Airspeed indicator		
Altimeter		
Compas		
Ol presure		
Ol temperatur		
Water temperatur		
Fuel gauge		
Fuel tank (amount, capacity)		

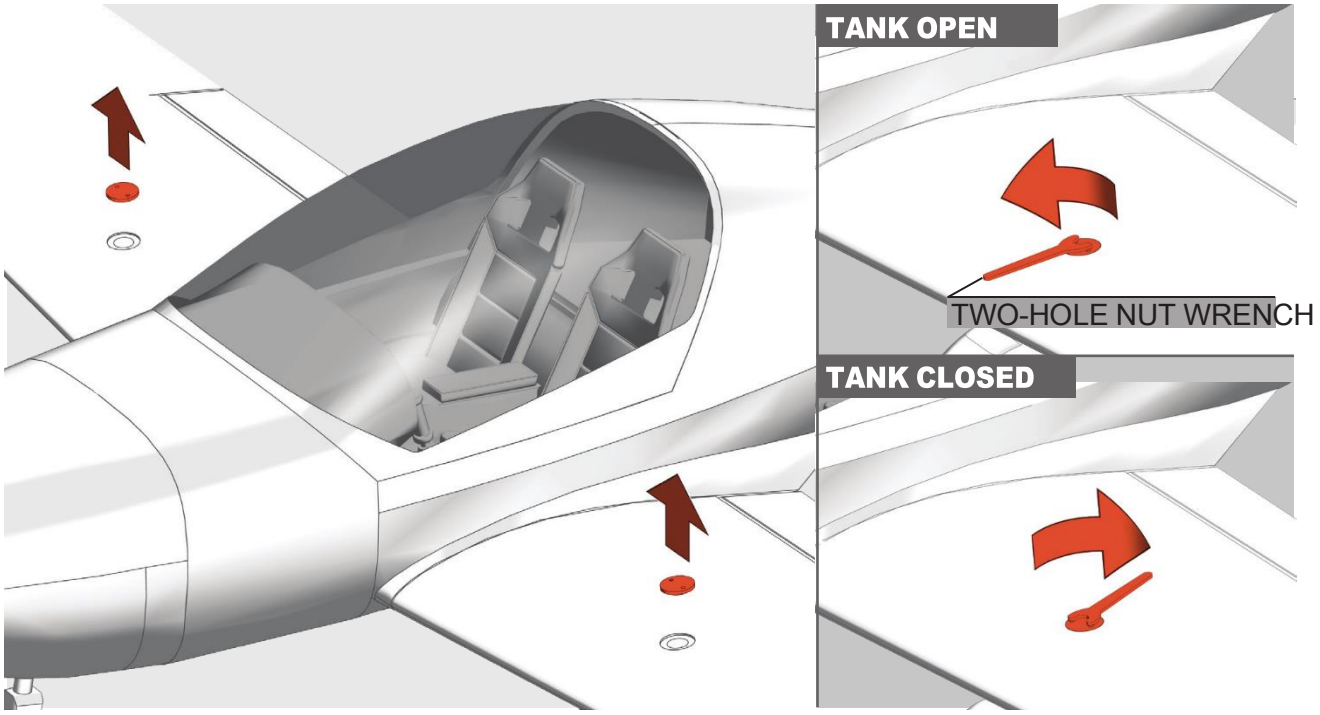
additional equipment list gem. LTF-UL §29 3.		
All additional parts, which do not belong to the basic equipment, are listed here.		
Component	Type / manufacturer	Weight [kg]
Total weight of the parts which do not belong to the basic equipment.		

signature stamp

8. HANDLING

This chapter describes the basic handling of the aircraft on the ground.

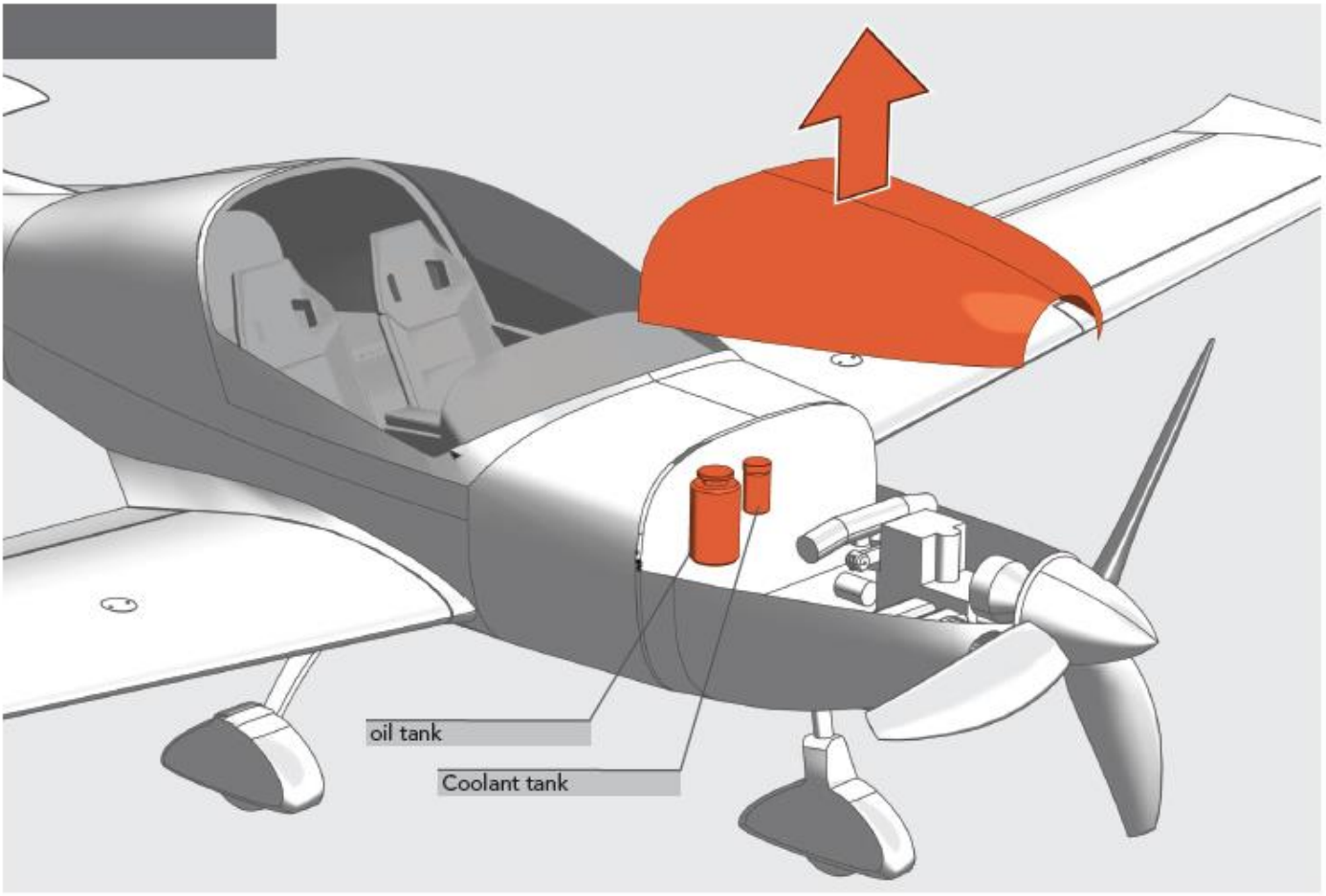
8.1. REFUEL



1	Secure the aircraft against unintentional rolling away.
2	Main switch off, remove ignition key.
3	Connect the ground wire to the exhaust pipe.
4	Open the tank cap with the two-hole nut wrench.
5	Refuel the machine with the approved fuel. Filling level max. approx. 1 cm below the filler neck.
6	After refueling, check the amount of fuel visually and with the fuel gauge.
7	Close the tank carefully with the two-hole nut wrench.
8	Check whether fuel has overflowed and wipe off carefully if necessary.

8.2. CHECK OIL LEVEL AND COOLANT

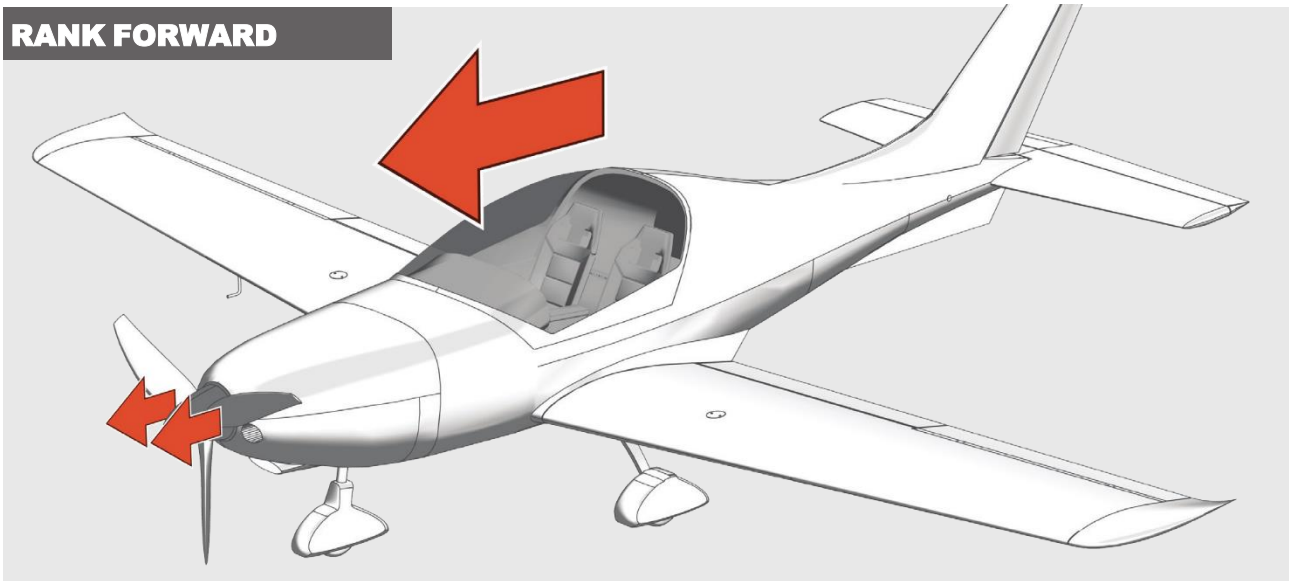
Caution! do not check the oil and coolant level when the engine is hot
- Risk of burns!

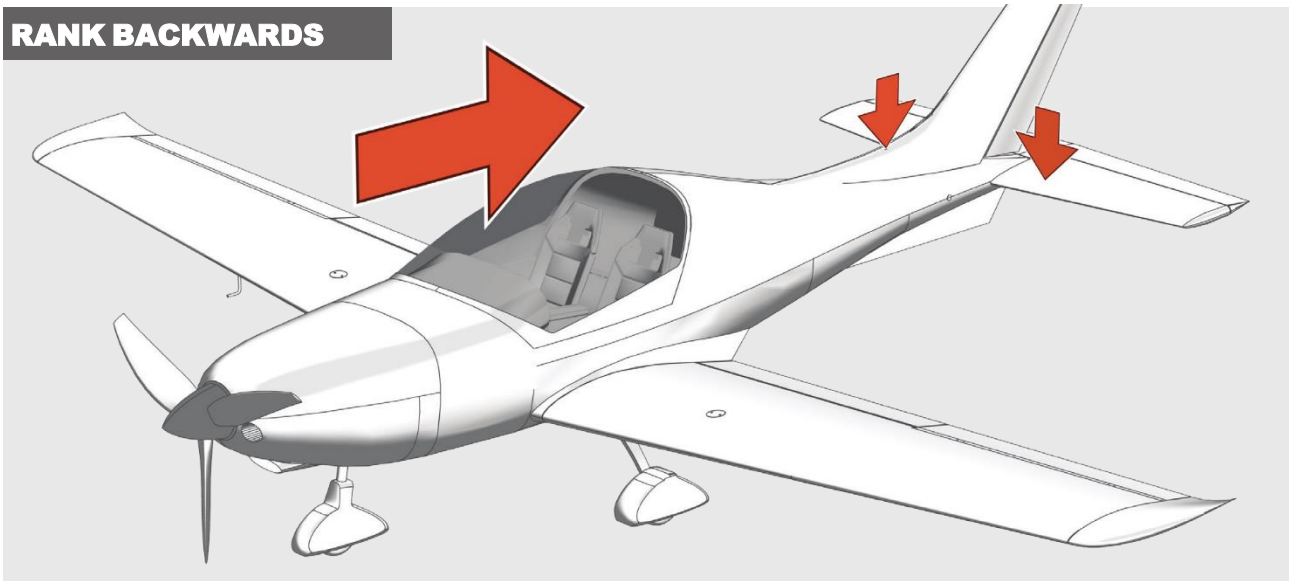


1	Main switch off, remove ignition key.
2	Remove the motor cover and twist the spring screws by 90°.
3	Open the lid of the oil container
4	Slowly turn the propeller only in the direction of rotation until a gurgling sound is heard Never turn against the direction of rotation!
5	Pull out the dipstick and wipe it off.
6	Check the oil level using the dipstick, the oil level must be between MIN and MAX.
7	Only use oils approved by Rotax!
8	Carefully seal the lid of the oil container.
9	Check the coolant at the reservoir, the liquid level must be between MIN and MAX.
10	If necessary, refill coolant, see Rotax manual
11	Fix the motor cover, twist the spring screws by 90°

8.3. SHUNTING

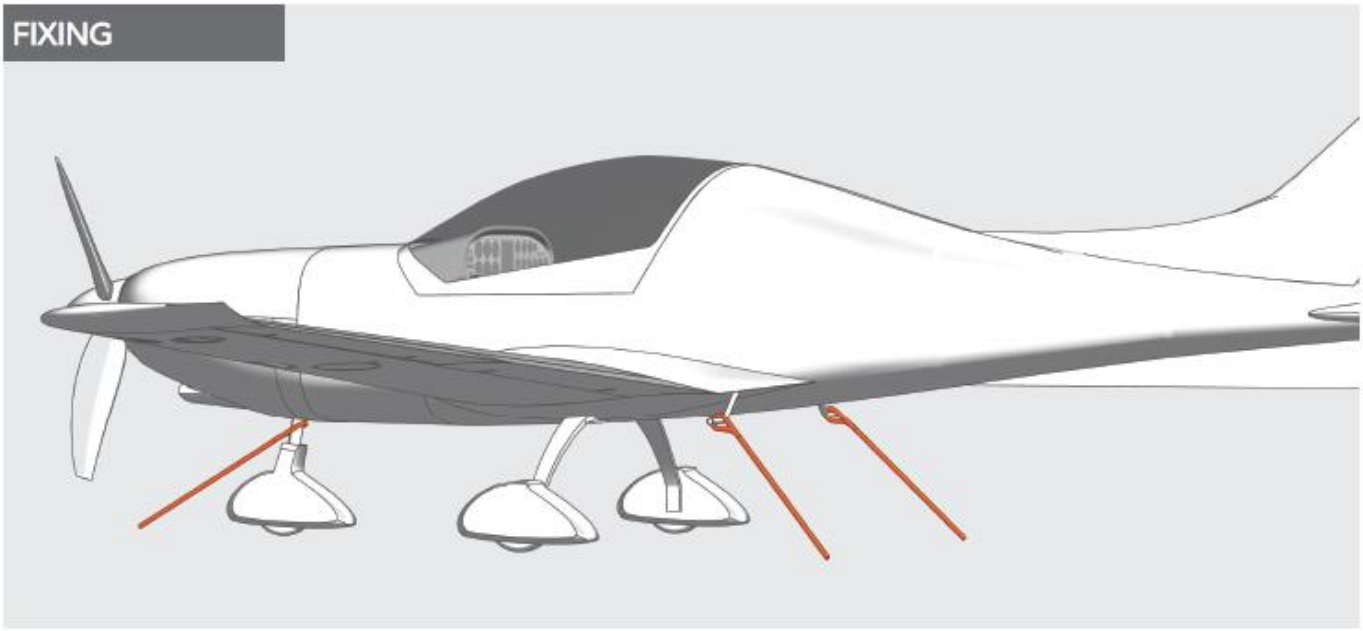
The FRECCIA can be maneuvered by one person.
Maneuvering without tools is described below. It is better to move the machine with the maneuvering fork if possible.





1	Release the brake
2	Make sure that there are no people or objects in the maneuvering area.
3	**BACKWARDS:** Press down on the fuselage in the tailplane area to lift the nose wheel off the ground. To avoid damage, only select the following positions: press down the fuselage with one hand in the root area of the vertical stabilizer and with the other hand at the transition from fuselage and vertical stabilizer. **FORWARDS:** Grasp the machine by the blade root of the propeller and pull. Do not push the propeller! Don't touch the spinner!
4	Rotate/push the machine to the desired position.

8.4 FIXING



1	Align the machine against the wind if possible
2	Activate the fixed brake and/or place the wheel chocks in front of the main gear
3	Attach lashing straps to the foot tubes located on the fuselage behind the wings
4	Fix stick in cockpit.
5	In case of very strong wind, additionally fasten the bow wheel.

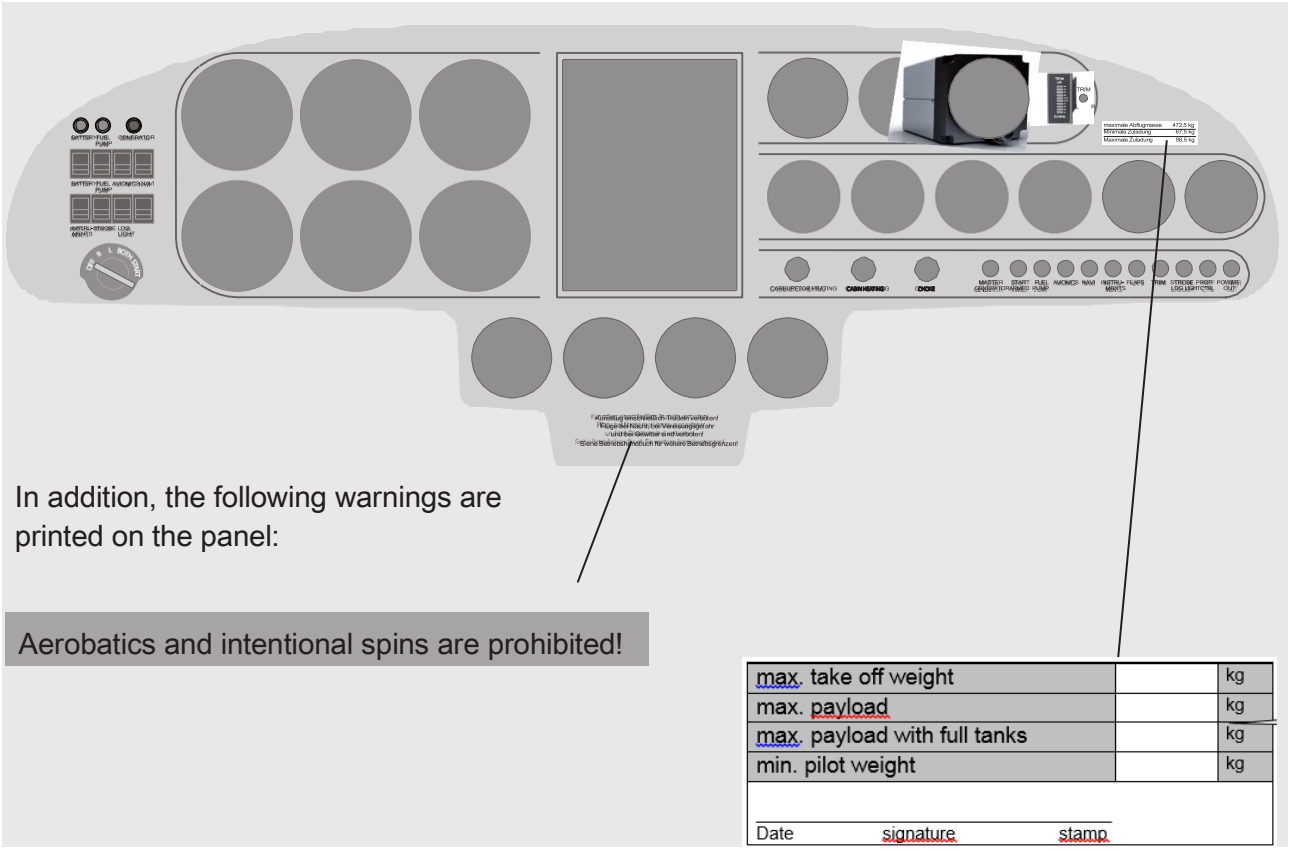
9. INFORMATION SIGNS AND MARKINGS

This chapter describes the lettering and location of information signs on the aircraft.

9.1. CONTROL PANEL

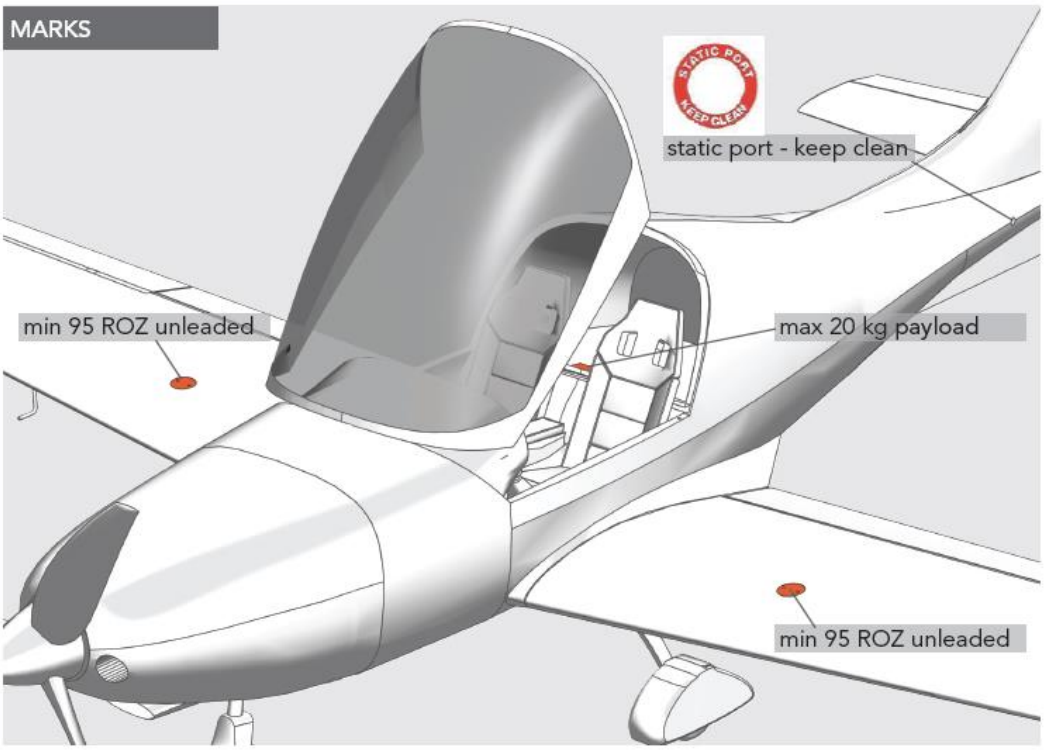
All designations for switches, controls and fuses are printed directly on the panel. The printing depends on the cockpit configuration.

Example of an analog configuration:



Depending on the configuration, the warning notices can also appear elsewhere on the panel, but are always clearly visible to the pilot and must not be removed.

9.2. OTHER MARKS

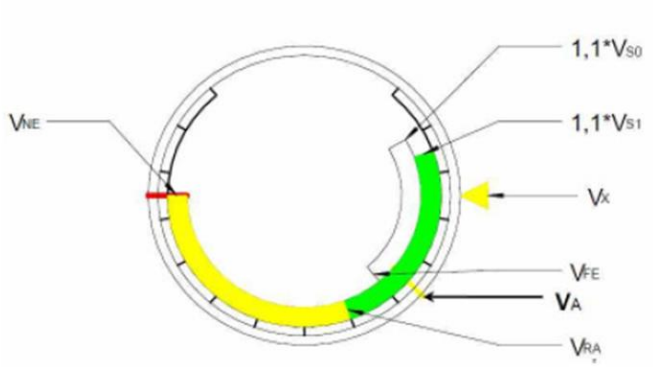


Fuel Caps: min 95 ROZ unleaded

Luggage compartment: max 20 kg load capacity

Static decrease: static port - keep clean

9.3.SPEEDMETER MARKINGS



white arc:	79	-	130 km/h	IAS	Operating range with flaps deployed
green arc:	102	-	210 km/h	IAS	Normal operating range
yellow arc:	210	-	260 km/h	IAS	Caution area, operation only in calm weather
yellow line:			176 km/h	IAS	manoeuvring speed
red line:			260 km/h	IAS	permissible maximum speed

8. EQUIPMENT LIST

These parts belong to the basic equipment of the airplane and were part of the type certification.

DESCRIPTION	TYPE / MANUFACTURER / REMARKS	KG
FLIGHT INSTRUMENTS AND INDICATORS		
Efis/Ems Flybox 7‘‘ Magnetic compass Airspeed indicator Altimeter Vertical speed indicator Bank indicator		
Artificial horizon		
Pitot and static system		
Trim position indicator		
ENGINE INSTRUMENTS		
Efis/Ems Flybox 7‘‘		
Fuel pressure		
Tachometer		
Hour recorder		
Oil pressure		
Oil temperature		
Cht		
Egt		
Oat		
Map		
Fuel quantity indicator		
FLIGHT CONTROLS		
Hydraulic brakes hand lever		
Parking brake		
Electrical flap		
Dual flight control		
Steerable nose wheel		
Elevator trim control (dual on the stick grips)		
Engine contol		
Throotle		
Choke		
Engine L-R-Both ignition switch + starter		
Fuel selector ON-OFF		

DESCRIPTION	TYPE / MANUFACTURER / REMARKS	kg
ELECTRICAL SYSTEM		
12V light battery		
Circuit breakers		
Switches		
FUEL SYSTEM		
One fuel tank capacity 50 liters		
Engine driven and electric fuel pump		
Fuel drain by gascolator		
INTERIOR		
Pilot and copilot carbon fiber seats integrated on the structure with light cushions		
Adjustable seat belts 3 points fixation		
Luggage compartment		
EXTERIOR		
Fumè colour canopy with ø80mm snap vents		
Main wheels 13x5.00-6"		
Nose wheel 4.00-4"		
Standard with colour		
POWERPLANT AND PROPELLER		
Engine		
Rotax 912 ULS (100hp)		
4 cylinders liquid/air cooled, integrated reduction gear		
Dual ignition system		
Air filter		
Oil filter		
Oil and water coolers		
Tubular steel engine mount – stainess exhaust gas system		
Propeller		
DUC Helices Swirl Inconel 3-Blades ø 1740mm		
PARACHUTE SYSTEM		
Junkers Magnum 601		
Total weight of the basic version		