FLIGHT DESIGN

Pilot's Operating Handbook (POH)

Airplane Type	**:**	**CT**
Airplane Model	**:**	**CTLS-LSA**
Airplane Registration Number	**:**	**_________**
Airplane Serial Number	**:**	**_________**
Document Number	**:**	**AF 0430 0017_02**
Date of Issue	**:**	**26-Jul-12**

This Pilot's Operating Handbook is approved on the Basis of Manufacturer Self Declaration

I RECORD OF MANUAL REVISIONS

Manual revisions are provided by Flight Design GmbH as available and approved through the Agency (if applicable). The updates shall be manually entered to the individual printed version of the POH by the owner/operator of the aircraft.

Manual updates are provided in electronic format (pdf file) directly to aircraft owners/operators, when the owner/operator leaves the correct contact information with Flight Design GmbH. Manual updates are also provided through the webpage of Flight Design GmbH, in the section Service Documents: http://www.flightdesign.com/index.php?page=service.

It is the duty of the aircraft owner/operator to ensure that the manual contains all updates applicable to his aircraft serial number. Updates are done by manually removing invalid pages and inserting new or updated pages. Manual update must be logged in the subsequent table.

Rev. No.	***Date***	***Pages Removed***	***Pages Inserted***	***Signature***
00	*12-Nov-11*	*none*	*all*	
01	*10-Feb-11*	*II-1; II-2; IV-1; 1-1; 2-6; 2-7; 3-2; 3-3; 3-6; 3-7; 3-9; 3-11; 4-2; 4-5; 4-8; 5-11; 5-18; 7-2; 7-3; 7-13; 7-20; 8-4*	*II-1; II-2; IV-1; 1-1; 2-6; 2-7; 3-2; 3-3; 3-6; 3-7; 3-9; 3-11; 4-2; 4-5; 4-8; 5-11; 5-18; 7-2; 7-3; 7-13; 7-20; 8-4*	
02	*26-Jul-12*	*2-1; 9-2*	*2-1; 9-2*	

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IV INTRODUCTION

As a pilot you must familiarize yourself with the specific characteristics of each Light Sport aircraft that you will fly. This Pilot's Operating Handbook (POH) must be studied in detail before the first flight. The same applies to the operating handbooks and manuals of the engine and all other equipment installed in the aircraft.

In case you purchased this aircraft second-hand, please provide us with your contact data, so that we can supply you with the publications necessary for the safe operation of your airplane. Please find the template to do this in the aircraft log book or at the Flight Design website.

As with all single-engine aircraft, the flight route should always be chosen to ensure emergency landing in case of engine failure.

The CTLS-LSA may be operated under visual meteorological conditions. Operation at night is only permitted when the aircraft installed and functional equipment does satisfy the applicable national minimum equipment requirements for this type of aircraft. It is the duty of the pilot / operator to verify if this is the case, before operating at night.

Due to the high cruise speed and the great range, pilots may encounter critical weather conditions more often. Flying into IMC conditions without adequate training is extremely dangerous. The pilot in command is responsible for the safety of the passenger and of any third parties as well as for his own safety.

IV.1 Approval

The contents of this POH is approved on the basis of Manufacturer Self Declaration against the applicable ASTM industry standard.

IV.2 Certification Basis

The aircraft is in conformance with ASTM F2245-10c.

The Pilots Operating Handbook is in compliance with ASTM F2746-09.

IV.3 Manufacturer Contact

The aircraft is manufactured by:

Flight Design GmbH
Sielminger Str. 51
70771 L.-Echterdingen
Germany
Web: www.flightdesign.com
e-mail: info@flightdesign.com

IV.4 Recovery of Certification Data

In case the original manufacturer loses the ability to support the make and model of this aircraft, certification documentation can be recovered through the following contact:

E-UA Engineering Ukraine Ltd.
Rabochaya 82a
73000 Kherson
Ukraine

IV.5 Warnings, Cautions and Notes

Please pay attention to the following symbols used throughout this document, emphasizing particular information:

▲ **Warning:** Identifies an instruction, which if not followed may cause serious injury or even death.

■ **Caution:** Denotes an instruction which if not followed, may severely damage the aircraft or could lead to suspension of warranty.

● **Note:** Information useful for better handling.

“Shall”, “will”, “should” and “may”:

The words “shall” or “will” are used to express a mandatory requirement or instruction. The word “should” is used to express non-mandatory provisions that are nevertheless highly recommended. The word “may” is used to express permissible provisions.

IV.6 List of Abbreviations

Abbreviation	*Meaning*
AMM	Airplane Maintenance Manual
ATC	Air Traffic Control
CAS	Calibrated Airspeed (indicated airspeed, corrected for installation and instrument errors. CAS is TAS at ISA standard atmosphere at MSL)
CG	Center of Gravity
EASA	European Aviation Safety Agency
ELT	Emergency Locator Transmitter
IAS	Indicated Airspeed (the speed shown by the airspeed indicator)
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
ISA	International Standard Atmosphere
LSA	Light Sport Aircraft
MAC	Mean Aerodynamic Chord; for CTLS-LSA this is equal to the wing chord
MSL	Mean Sea Level
MTOM	Maximum Take-Off Mass
POH	Pilot's Operating Handbook
rpm	Revolutions Per Minute
TAS	True Airspeed (the speed of the airplane relative to the air)
TBO	Time Between Overhaul
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

1. GENERAL INFORMATION

1.1. Introduction to the Airplane

The CTLS-LSA is a two seat aircraft of composite construction. The aircraft is arranged as a high wing monoplane with cantilevered wings and a conventional empennage. The aircraft incorporates a tricycle landing gear. The wings are easily removable. However removal of the wings may only be done by qualified personnel according to the maintenance manual and to the valid national regulations.

The horizontal tail of the CTLS-LSA is a Stabilator (all-moving horizontal tail). To improve control feel, the stabilizer is equipped with an anti servo tab that moves in the same direction as the Stabilator. The anti servo tab is attached to the horizontal tail with a composite membrane. The anti servo tab can be adjusted by the pilot to provide pitch trim.

The spacious cockpit is comfortably accessible for the pilot and the passenger via two large gull wing doors held open by gas struts. The extensive acrylic windshield offers outstanding visibility for a high-wing aircraft. The rear side windows allow rearward vision. Skylight windows allow excellent view in the upward direction.

Behind the cockpit there are baggage compartments on the right hand and hand left side with standard tie-downs. The baggage compartments are accessed via lockable hatches on the side of the aircraft to facilitate loading and unloading. Loading through the cabin is also possible.

1.1.1. Propulsion System

The CTLS-LSA is equipped with the ROTAX® 912 ULS or S engine with 100 rated BHP. More detailed information on the engine is available from ROTAX® for the specific engine serial number.

Engine type	horizontally opposed, four cylinder, 4 stroke
Cooling	water-cooled cylinder heads, air cooled cylinder shafts
Horsepower rating	73.5 KW / 100 rated BHP at 5800 rpm engine speed
Carburetor type	constant pressure carburetor
Ignition	electronically controlled dual ignition
Propeller gear reduction	2.43 : 1

The CTLS-LSA is equipped with the following ground adjustable three blade propeller:

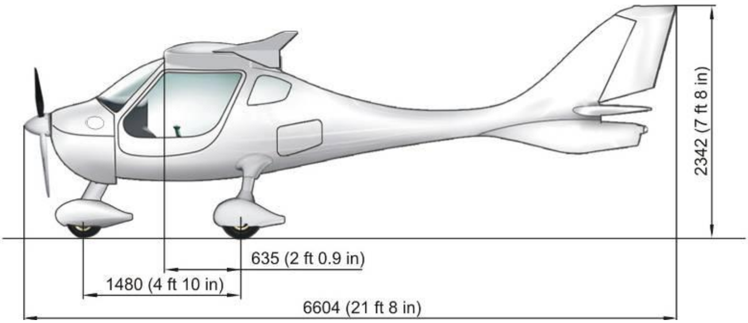
Neuform	CR3-65-47-101.6, 3 blade, composite propeller, ground adjustable

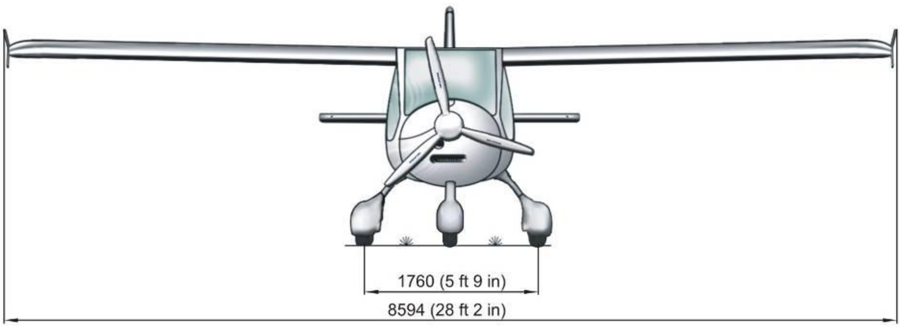
The propeller is type certified as component of this aircraft.

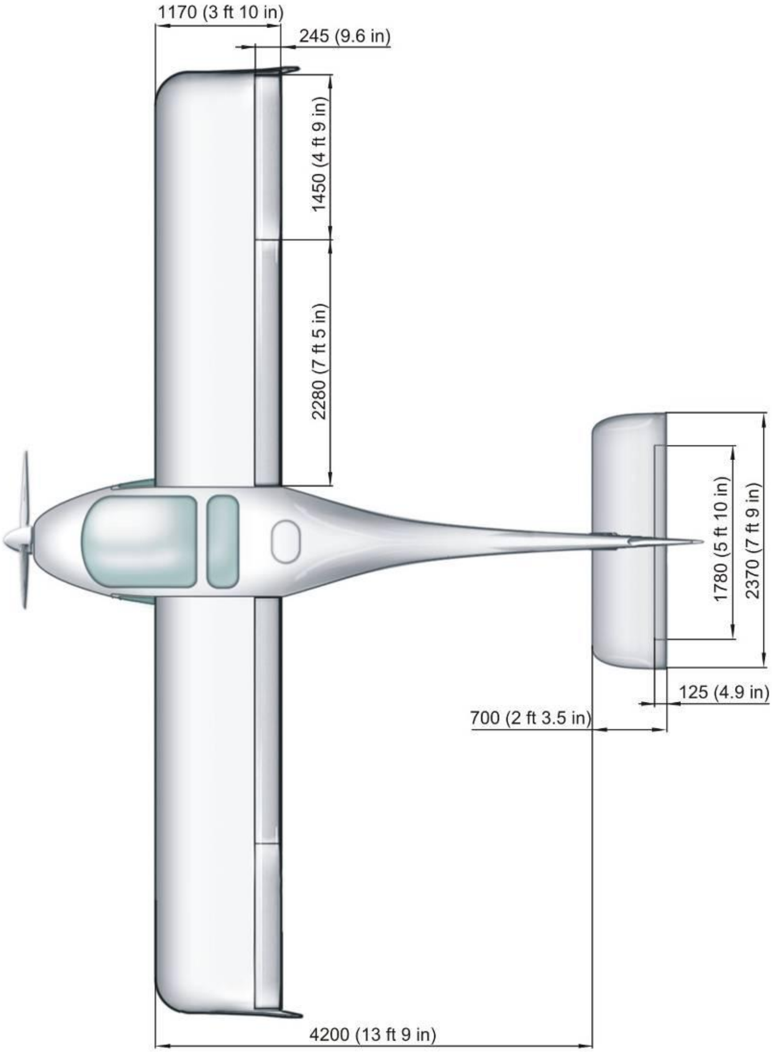
1.1.2. Three-View Drawing

Main Dimensions:

Wing span	8.60 m (28 ft 2 in.)
Length	6.61 m (21 ft 8 in.)
Wing area	9.98 sq. m (107.4 sq. ft)







1170 (3 ft 10 in)
245 (9.6 in)
1450 (4 ft 9 in)
2280 (7 ft 5 in)
1780 (5 ft 10 in)
2370 (7 ft 9 in)
125 (4.9 in)
700 (2 ft 3.5 in)
4200 (13 ft 9 in)

1.2. Summary of Performance Specifications

Maximum gross weight	600 kg (1320 lbs)	
Fuel capacity	130 l (34 gal)	
Total usable fuel	128 l (33 gal)	
Range with 30 min reserve	720 NM (1330 km), Flap -6°, 3000 ft, 4250 rpm, 80 kt (148 km/h) TAS	
Maximum endurance	10,0 hrs, Flap 15°, 3000 ft, 3750 rpm	
Maximum speed	235 km/h (127 kt) IAS at 5500 rpm at sea level	
Speed for best rate of climb (Vy)	Flaps -6°	71 kt (131 km/h) IAS
	Flaps 0°	69 kt (127 km/h) IAS
	Flaps 15°	61 kt (112 km/h) IAS
Speed for best angle of climb (Vx)	Flaps -6°	56 kt (104 km/h) IAS
	Flaps 0°	55 kt (101 km/h) IAS
	Flaps 15°	51 kt (94 km/h) IAS
Stall speed for flaps -6°	50 kt (93 km/h) IAS	
Stall speed for flaps 0°	47 kt (88 km/h) IAS	
Stall speed for flaps 15°	42 kt (78 km/h) IAS	
Stall speed for flaps 30°	40 kt (74 km/h) IAS	

2. LIMITATIONS

Chapter 2 of this POH includes operating limitations, instrument markings, and placards necessary for safe operation of the airplane, its power-plant, standard systems and standard equipment.

The limitations included in this Chapter are approved.

▲**Warning:** Operation of the airplane outside of the approved operating limitations is not permissible.

2.1. Airspeed Indicator Speed Range Markings.

Marking	*IAS*	*Significance*
White Arc	40…62 kt (74…115 km/h)	Positive Flap Operating Range Flaps in Landing Configuration (30°)
Green Arc	47…120 kt (88…222 km/h)	Normal Operating Range
Yellow Arc	120…145 kt (222…269 km/h)	Maneuvers must be conducted with caution and only in smooth air
Red line	145 kt (269 km/h)	Maximum speed for all operations -

2.2. Airspeed Limitations

2.2.1. Stalling Speeds at Maximum Takeoff Weight

Flaps -6°: V_S = 50 kt (93 km/h) IAS

Flaps 0°: V_{S1} = 47 kt (88 km/h) IAS

Flaps 15°: V_{S1} = 42 kt (78 km/h) IAS

Flaps 30°: V_{S1} = 40 kt (74 km/h) IAS

2.2.2. Flap extended speed range

Flaps 0°: V_{FE} = 105 kt (195 km/h) IAS

Flaps 15°: V_{FE} = 80 kt (148 km/h) IAS

Flaps 30°: V_{FE} = 62 kt (115 km/h) IAS

2.2.3. Design Cruising Speed

Design Cruising Speed V_C = 120 kt (222 km/h) IAS

▲**Warning:** Up to V_C the aircraft can safely withstand a vertical gust of 3000 fpm (15 m/s). Above V_C the aircraft can withstand the load of a vertical gust of 1500 fpm (7.5 m/s).

2.2.4. Maneuvering Speed (V_A)

Maneuvering Speed

… at Gross Weight 600 kg (1320 lb) V_A = 105 kt (195 km/h) IAS

… at Minimum Weight 369.5 kg (816 lb) V_A = 82 kt (153 km/h) IAS

▲**Warning:** Up to V_A full control movements of only one control at a time may be made. Above V_A all control surfaces may only be deflected to a third of their maximum displacement.

2.2.5. Never Exceed Speed

Never Exceed Speed V_{NE} = 145 kt (269 km/h) IAS

2.3. Engine Limitations

Maximum take-off power	73.5 kW at 5800 rpm (100 HP) (max 5 min)
Maximum continuous power	69 kW at 5500 rpm (95 HP)
Minimum take-off engine speed	5800 rpm (fixed pitch propeller)[1]
Maximum continuous engine speed	5500 rpm
Idle engine speed	min. 1400 rpm, typ. 1500 rpm
Max. Cylinder head temperature[2]	120°C (248°F)
Oil temperature, minimum	50°C (120°F)
Oil temperature, maximum	140°C (285°F)
Recommended oil temperature	90…110°C (190…230°F)
Oil pressure, normal operation	2.0…5.0 bar (29…73 PSI)
Oil pressure, minimum	0.8 bar (12 PSI)
Oil pressure, short-term maximum	7.0 bar (101 PSI), during extreme cold start conditions
Negative g-load limit	-0.5 g for max. 5 seconds

[1] Engine limitation only. RPM during takeoff with fixed-pitch propeller is in the range 4800 – 5000 rpm

[2] This value is equivalent to the coolant temperature (value measured at the measuring point of the hottest cylinder.

2.3.1. Engine Instrument Markings

2.3.2. Tachometer

Marking	*Value*	*Significance*
Red Line	5800 rpm	Maximum engine speed
Yellow Arc	5500 … 5800 rpm	Limited maximum 5 min
Green Arc	1800 … 5500 rpm	Normal operating range
Yellow Arc	1400 … 1800 rpm	Idle range
Red Arc	0 … 1400 rpm	Engine stopped (no ignition by electronic ignition below 1400 rpm)

2.3.3. Oil Pressure Indicator

Marking	*Value*	*Significance*
Red Line	7,0 bar (102 PSI)	Maximum oil pressure
Yellow Arc	5,0 … 7,0 bar (73 … 102 PSI)	Only during extreme cold start
Green Arc	2,0 … 5,0 bar (29 … 73 PSI)	Normal operating range
Yellow Arc	0,8 … 2,0 bar (12 … 29 PSI)	Low caution range
Red Line	0, 8 bar (12 PSI)	Minimum oil pressure

2.3.4. Oil Temperature Indicator

Marking	*Value*	*Significance*
Red Line	130°C (266 F)	Maximum oil temperature
Yellow Arc	110 … 130°C (230 … 266 F)	Upper caution range
Green Arc	90 … 110°C (190 … 230 F)	Normal operating range
Red Line	50°C (120 F)	Minimum temperature

2.3.5. Cylinder Head Temperature Indicator

Marking	*Value*	*Significance*
Red Line	120°C (248 F)	Maximum oil pressure
Yellow Arc	110 … 120°C (230 … 248 F)	Only during extreme cold start
Green Arc	74 … 110°C (165 … 230 F)	Normal operating range

2.3.6. Voltmeter

Marking	*Value*	*Significance*
Red Line	15.0 V	Maximum voltage
Green Arc	12.5 … 15.0 V	Normal operating range
Yellow Arc	12.0 … 12.5 V	Low voltage warning
Red Line	12.0 V	Minimum voltage

2.3.7. Engine Oil Spec and Capacities

Oil grade	brand automotive engine oils, no aviation oil – refer to the relevant ROTAX® operating handbook for information on viscosity. Do not use oil additives.
Oil tank capacity	2.0…3.0 l (2.1…3.1 quarts)
Oil consumption, maximum	0.06 l/h (0.06 q/h)

▲**Warning:** For detailed information refer to the relevant version of the ROTAX® engine manual.

2.4. Mass and Balance

Maximum mass per seat	118 kg (260 lb)
Typical empty mass [1]	330 kg (730 lb) (well equipped)
Maximum empty mass [2]	369.5 kg (816 lb)
Maximum take-off mass	600 kg (1320 lb) (MTOM)
Maximum baggage weight	
… in baggage compartment	25 kg (55 lb) per side; 50 kg (110 lb) total
… on hat rack	2.5 kg (5.5 lb) per side; 5.0 kg (11 lb) total
… in floor cabinet	2.5 kg (5.5 lb) per side; 5.0 kg (11 lb) total
Center of gravity range [3]	300 … 440 mm (11.8 … 17.3 in) (26 … 37 % MAC)

[1] Nominal empty mass with minimum equipment. The true empty mass depends greatly upon the equipment installed. The current mass of each aircraft is registered in the current weighing record. Refer to Section 6.

[2] Largest empty mass of the airplane, including all operational equipment that is installed in the airplane: mass of the airframe, powerplant, required equipment, optional and specific equipment, fixed ballast, full engine coolant and oil, hydraulic fluid, and the unusable fuel.

[3] Reference datum is the wing leading edge with the aircraft in the neutral position. Refer to Section 6.

2.5. Load Factors

Maximum flight load factor:

Up to V_A	+4g / –2g
Up to V_{NE}	+4g / –2g

2.6. Fuel Spec and Capacities

Fuel tank capacity:	130 l (34 gal) 2 wing tanks with 65 l (17 gal) each
Usable fuel:	128 l (33 gal)
Type of fuel:	Premium Automotive unleaded per ASTM D 4814 Minimum AKI 91. Alternatively AVGAS 100 LL.

▲**Warning:** Due to its high lead content AVGAS has a detrimental effect on valve seating and causes greater deposition in the combustion chamber. It should thus only be used if fuel vapor or octane problems arise or if MOGAS is not available.

▲**Warning:** When using AVGAS particular attention must be paid to type of oil used. For details refer to the relevant version of the ROTAX® engine manual.

2.7. Approved Maneuvers

Approved Maneuvers:	All normal flight maneuvers, Stalling (except for dynamic stalling), Lazy eights, Chandelles, Steep turns and similar maneuvers, with an angle of bank of not more than 60°.
Not approved maneuvers:	Aerobatics, Intentional Spinning Flight maneuvers with an angle of bank more than 60°. Flight maneuvers with pitch attitudes greater than 30°

■ **Caution:** Flying of not approved maneuvers can overstress the aircraft structure. This can lead to severe damages or even failure in flight.

2.8. Applicable Environmental Limitations

Flight into IMC is prohibited.

Flight into known icing conditions is prohibited.

Operation in the proximity of active thunderstorm cells is prohibited.

Operational fleet experience shows that the aircraft can be safely operated at temperatures as low as -21°C (-6 F).

2.9. Service Ceiling

The service ceiling at MTOM is reached at a density altitude of 12150 ft (3700 m). When reaching this altitude the aircraft climb rate falls below 100 fpm (0.5 m/s).

The maximum operating altitude at MTOM is reached at a density altitude of 13780 ft (4200 m). When reaching this altitude the aircraft climb rate reaches 0 fpm (0 m/s).

2.10. Kinds of Operation

The CTLS may only be operated under VMC conditions. Operation at night requires verification by the pilot / owner if the installed and functional equipment satisfies minimum national regulations.

Operation according to IFR flight rules is permitted if the aircraft is equipped with the appropriate instrumentation which is required by the national regulations.

2.11. Minimum Equipment

Flight Instruments:	Airspeed Indicator
	Altimeter with barometric adjustment
	Magnetic Compass with calibration card
Engine Instruments:	Tachometer,
	Cylinder Head Temperature Indicator
	Oil Temperature Indicator
	Oil Pressure Indicator
Safety Harness	Four-point; one per seat

2.12. Limitation Placards

Subject	***Contents** (example, not to scale)*	***Location***
General warnings and load limits	**Warnings:** **Do not remove safety belts in flight** **Read manuals before flight** max takeoff weight .... kg max cabin load .... kg max cabin load at full fuel .... kg	Instrument panel
Warnings	**WARNINGS:** **Maneuver Speed 105 kt (195 km/h) IAS** **No intentional spins** **Aerobatics prohibited**	Instrument panel
Fuel grade	APPROVED FUEL TYPES AND QUANTITY: **MOGAS** EN 228 Super min. RON 95 EN 228 Super plus min. RON 95 CAN/CGSB-3.5 Quality 3 min. AKI 91 US Gasoline Premium ASTM D4814 min. AKI 91 **AVGAS** AVGAS 100LL ASTM D910 AVGAS UL91 ASTM D7547 **65 l (17 US.gal) total, 63 l (16.5 US.gal) usable** - per side -	Adjacent to each fuel tank filler cap
Oil grade and amount	**Oil** Grade According To Rotax Manual Currently filled **Qty:** 3,2 liter (5,7 liq. pt) 3,4 liter (6 liq. pt) if oil thermostat installed	Inspection flap engine cowling
Baggage payload	**Baggage Compartment** max. 55 lb 25 kg each side	Both sides of the baggage compartment
Baggage payload	**Secure Baggage** hook in all 3 points max Weight: 2.5 kg 5,5 lb each side max Size: 25 x 25 x 8 cm 10 x 10 x 3 in each side	Both sides of the hat rack

Warning	The linked image cannot be displayed. The file may have been moved, renamed, or deleted. Verify that the link points to the correct file and location.	Both sides of the baggage compartment
Warning	This aircraft was manufactured in accordance with Light Sport Aircraft airworthiness standards and does not conform to standard category airworthiness requirements	Instrument Panel

2.13. Other Limitations

2.13.1. Tire Pressure

Main landing gear tires	2 – 2.2 bar (29 – 31.9 psi)
Nose wheel tire	2 – 2.2 bar (29 – 31.9 psi)

2.13.2. Smoking

Smoking is not permitted in the CTLS-LSA.

2.13.3. GPS Database Usage

Use of the maps and terrain information for pilotage navigation or obstacle avoidance is prohibited. These data are intended only to enhance situational awareness.

▲ **Warning:** Database information loaded to the GPS unit has strictly limited validity durations. Validity may differ from database to database. It is in the sole responsibility of the pilot to ensure that current databases are loaded on the unit prior to commencing a flight and using the GPS unit

3. EMERGENCY PROCEDURES

3.1. Introduction

3.1.1. General Information

This chapter contains the recommended procedures to be followed in the event of an emergency. The information is provided in checklist style. This way the key information is better visible. The Flight Training Supplement may enhance on some topics with additional guidance.

Engine failure or other airplane-related emergencies are most unlikely to occur if the prescribed procedures for pre-flight checks and airplane maintenance are followed. If, nonetheless, an emergency does occur, the guidelines given here should be followed and applied in order to solve the problem.

As it is impossible to foresee all kinds of emergencies and cover them in this POH, a thorough understanding of the airplane by the pilot is an essential factor in the solution of any problems which may arise.

You shall familiarize yourself with these detailed procedures before starting flight operations.

- **Note:** Unless otherwise identified, all speeds are indicated airspeeds (IAS).
- **Note:** Unless otherwise identified, all provided speeds refer to an aircraft with the actual flight mass being equal to the maximum permitted mass of 600 kg (1320 lbs).

3.1.2. Airspeeds for Emergency Procedures

Speed for Best Glide Angle (aircraft flight mass 600 kg (1320 kb)):

	Mass 400 kg (882 lb)	***Mass 500 kg (1100 lb)***	***Mass 600 kg (1320 lb)***
Flaps -6°	60 kt (111 km/h) IAS	67 kt (124 km/h) IAS	73 kt (136 km/h) IAS
Flaps 0°	58 kt (107 km/h) IAS	65 kt (120 km/h) IAS	71 kt (132 km/h) IAS

Approach Speed in Emergency Landing:

	Mass 400 kg (882 lb)	*Mass 500 kg (1100 lb)*	*Mass 600 kg (1320 lb)*
Flaps -6°	53 kt (99 km/h) IAS	59 kt (110 km/h) IAS	65 kt (121 km/h) IAS
Flaps 0°	50 kt (93 km/h) IAS	56 kt (104 km/h) IAS	62 kt (114 km/h) IAS
Flaps 15°	45 kt (83 km/h) IAS	50 kt (93 km/h IAS)	55 kt (102 km/h) IAS
Flaps 30°	42 kt (78 km/h) IAS	48 kt (88 km/h) IAS	52 kt (96 km/h) IAS

3.2. Engine Malfunctions

3.2.1. Engine Failure during Takeoff on Ground

- Throttle — idle
- Brakes — apply
- Ignition — off
- Fuel shutoff valve — closed

3.2.2. Engine Failure during Takeoff in the Air

3.2.2.1. … if enough runway for a safe landing is available:

- Throttle — idle
- Flaps — as required
- Brakes — apply after touch down

3.2.2.2. … if not enough runway for a safe landing is available:

▲**Warning:** Do not attempt to restart the engine at altitudes below 300 ft (100 m)

▲**Warning:** Do not attempt to return to the airfield if engine failure occurs immediately after take-off below an altitude of 750 ft (250 m).

- Landing field — choose (within +/- 30° of runway heading)
- Flaps — as required
- Speed — as required
- Ignition — off
- Fuel shut off valve — closed

- Master switch — Batt and Gen off
- Doors — unlocked
- Landing — perform
- Aircraft — evacuate

3.2.3. Engine Failure in Flight

▲Warning: Attempt restart only if altitude and time permits. Do not attempt to restart the engine at altitudes below 300 ft (100 m)

▲Warning: The engine restarting requires full attention of the pilot/operator. The stress factor in the cockpit increases considerably and simple mistakes may be made by even the most experienced pilot/operator. Therefore, it is imperative that you continue to fly the aircraft! Be careful of controlled flight into terrain and other hazards of distraction.

■ Caution: The ROTAX® 912 engine ignition is only active above a minimum propeller RPM of 1200 RPM. This may not be reached by windmilling alone. In this case you shall use the starter.

- Speed — as required
- Fuel shutoff valve — check open
- Fuel amount — check both tanks if level visible in sight gage
- Ignition — check both
- Fuel visible both tanks — ensure wings level
- Fuel visible one tank — ensure wing with fuel is not low
- Fuel visible no tank — lift low wing and check if fuel gets visible
- No fuel remaining — Perform emergency landing
- Fuel remaining — Continue procedure
- Propeller low rpm — Ignition key to start
- Engine fails to restart — Perform emergency landing

3.2.4. Loss of Engine Power in Flight

▲Warning: Do not attempt to return to the airfield if engine failure occurs immediately after take-off below an altitude of 750 ft (250 m).

▪	Landing field	choose
▪	Safety harness	tight
▪	Objects in cockpit	securely stored
▪	Emergency radio call	transmit
▪	Flaps	as required
▪	Airspeed	as required
▪	Master switch	Batt and Gen off
▪	Doors	unlock
▪	Flare	3 ft (1 m) above ground or tree tops
▪	Ignition during flare	off
▪	Fuel shutoff valve	closed
▪	Elevator on touchdown	pull - tail low
▪	ELT	check if transmission started automatically, start or stop as required

3.2.5. Loss of Oil Pressure

▲Warning: A loss of oil can be caused by oil leakage. This is a very serious condition because the hot oil can easily ignite if it drops on the hot exhaust system.

3.2.5.1. … on the Ground

- Engine — Turn ignition key to “off” and stop engine

Verify oil leakage; oil leakage to hot exhaust parts can cause fire.

3.2.5.2. … in Flight

- Engine — stop engine

Perform an emergency landing as soon as possible. After landing verify oil leakage; oil leakage to hot exhaust parts can cause fire.

3.2.6. High Oil Pressure

3.2.6.1. … on the Ground before Takeoff

The oil pressure may achieve maximum value for a short time during extreme cold engine start condition. Apply the following procedure:

- Throttle — moderate level to not further raise oil press.
- Let engine get warmer and the pressure might be reduced.

If oil pressure does not become normal, stop engine.

3.2.6.2. … in Flight

The oil pressure may achieve a high value in case of possible oil lines blockage. Apply the following procedure:

- Throttle — reduce to 50% of power
- Land as soon as possible.

3.2.7. Loss of Coolant

■ **Caution:** A loss of engine coolant does not require immediate forced landing. The coolant is used only to cool the cylinder heads. The cylinders are air-cooled. As coolant temperature is only indirectly indicated via the cylinder head temperature of the hottest cylinder, monitoring of the engine temperature is still possible even after a total loss of coolant.

▲**Warning:** If the temperature cannot be held within operating limits, then the engine damage must be taken in account in order to reach a suitable field for an emergency landing.

- Engine power — reduce
- Cylinder head temp. — maintain below 150°C (302 F)
- Landing — as soon as possible at a suitable airfield

3.3. Smoke and Fire

▲**Warning:** Every CTLS-LSA has the fire extinguisher in the pocket on the back of the passenger seat. It can be used to fight small fires in the cockpit.

▲**Warning:** By the nature of these types of fire extinguishers, they do not ensure functionality at very low temperatures. Verify the specified limitations for the extinguisher used on your specific aircraft.

▲**Warning:** Fire extinguishers have a limited lifetime. Make sure you replace the fire extinguisher against a suitable new one when the lifetime limit is reached.

3.3.1. Smoke and Fire on Ground

3.3.1.1. … during engine start

- Ignition off
- Fuel shutoff valve closed
- Master Switch Batt and Gen off
- Aircraft evacuate

3.3.1.2. … when engine is running

- Master switch Batt and Gen off
- Throttle idle
- Ignition off
- Fuel shutoff valve closed
- Aircraft evacuate

3.3.2. Smoke and Fire during Takeoff

3.3.2.1. … if enough runway for a safe landing is available:

- Throttle idle
- Cabin heat off
- Flaps as required
- Brakes apply after touch down
- Ignition off
- Fuel shutoff valve closed
- Master Switch Batt and Gen off
- Aircraft evacuate

3.3.2.2. … if not enough runway for a safe landing is available:

▲Warning: Do not attempt to return to the airfield if engine failure occurs immediately after take-off below an altitude of 750 ft (250 m).

- Landing field choose (within +/- 30° of runway heading)
- Cabin heat off
- Flaps as required
- Ignition off
- Fuel shut off valve closed

- Master switch — Batt and Gen off
- Doors — unlocked
- Landing — perform
- Aircraft — evacuate

3.3.3. Smoke and Fire in Flight

▲**Warning:** If the fire is extinguished and an emergency landing cannot be performed without engine power, you may attempt to restart the engine. Perform an emergency landing at the fastest possibility.

- Ignition — off
- Fuel shutoff valve — closed
- Throttle: — full open
- Descend — as fast as possible, side slip to hold flames or smoke away from cabin. Observe speed limitations.
- Landing field — choose
- Safety harness — tight
- Objects in cockpit — securely stored
- Emergency radio call — transmit
- Flaps — as required
- Airspeed — as required
- Master switch — Batt and Gen off
- Doors — unlock
- Flare — 3 ft (1 m) above ground or tree tops
- Elevator on touchdown — pull - tail low
- ELT — check if transmission started automatically, start or stop as required
- Aircraft — evacuate

3.4. Emergency Landings

3.4.1. Precautionary Landing with Engine Power

- Landing field — choose
- Safety harness — tight
- Objects in cockpit — securely stored

- Emergency radio call — transmit
- Flaps — as required
- Airspeed — as required
- Master switch — Batt and Gen off
- Doors — unlock
- Flare — 3 ft (1 m) above ground or tree tops
- Ignition during flare — off
- Fuel shutoff valve — closed
- Elevator on touchdown — pull - tail low
- ELT — check if transmission started automatically, start or stop as required

3.4.2. Emergency Landing without Engine Power

▲Warning: During an emergency landing without engine power, you may not extend the glide path. Due to effectiveness and side-slipping of flaps, the glide path can be shortened considerably. You shall choose the landing field, if you are sure that you are able to glide to this field.

- Landing field — choose
- Safety harness — tight
- Objects in cockpit — securely stored
- Emergency radio call — transmit
- Ignition — off
- Fuel shutoff valve — closed
- Flaps — as required
- Airspeed — as required
- Master switch — Batt and Gen off
- Doors — unlock
- Flare — 3 ft (1 m) above ground or tree tops
- Elevator on touchdown — pull - tail low
- ELT — check if transmission started automatically, start or stop as required

3.4.3. Emergency Descent

Emergency descent allows fast descent when flight controls are available.

▪ Throttle	Idle
▪ Flaps	negative
▪ Airspeed	below V_A
▪ Descent flight path	side slip with left wing forward / low, full right rudder, aileron left as needed to control flight path
▪ Stabilize descent	When reaching target altitude, bring rudder and aileron controlled back to neutral. Control speed

3.4.4. After Roll Over on Land

▲**Warning:** If urgent help is required after an emergency landing, manually activate the ELT (if installed) to alert the search and rescue services.

▲**Warning:** After a roll over on land fuel spillage is likely. Therefore the risk of fire is high. Move away from the aircraft as fast as possible.

- Brace yourself with legs against windshield
- Unhook safety harness
- Evacuate aircraft

3.5. Inadvertent Spin

▲**Warning:** This aircraft has a high aerodynamically performance with low drag. Airspeed increases rapidly during a dive. Pay full attention to airspeed limitations, angles of control surfaces deflection and flight load factors when recovering the aircraft from a steep dive.

▲**Warning:** Do not push the elevator control before the rotation has stopped. Only release elevator back pressure.

▲**Warning:** Do not reduce the power to idle before the rotation has stopped. It has been demonstrated that with power the rotation stops faster. When rotation has stopped, power can be reduced.

● **Note:** Should the spin recovery fail the AEPS (when installed) can be used.

- Aileron controls — neutral
- Rudder — opposite direction of rotation
- Rotation — stopped
- Elevator — release back pressure after the rotation stopped
- Throttle — retard
- Elevator — smoothly recover from dive

3.6. Other Emergencies

3.6.1. Alternator Failure

- Reduce electrical power consumption. Switch off all non-essential consumers.
- For consumers with (internal) backup battery:
    - Pull the relevant breakers.
    - Ensure they operate on (internal) backup power.
- Master switch — Batt and Gen off, when no electricity required
- Battery power — sufficient to support approx. 60 minutes
- Master Switch — Battery switch temporary on, when needed to do radio transmission or move flaps
- Landing — as soon as possible, on a suitable airfield

3.6.2. Overvoltage

The generator within the Rotax engine is connected to a voltage regulator. In case of rectifier failure overvoltage is possible.

- Generator Switch — off
- Perform procedure for alternator failure

3.6.3. Inadvertent Icing Encounter

▲**Warning:** Ice accumulation at the wing and elevator leading edges can cause a considerable change in the aerodynamics and lift of the aircraft, you should use higher speeds for the approach and landing.

- Flight path — leave icing area as soon as possible. Depending on condition, climb or descend into dry air

- Carburetor heat engage
- Landing as soon as possible

3.6.4. Loss of Primary Flight Instruments

- Power setting moderate level to not overspeed or underspeed
- Landing airfield select, long runway, unobstructed approach, favorable wind conditions
- Approach stay clear of stall speed
- Landing with moderate flaps (0° or max. 15°), little power applied. Flare careful.

3.6.5. Loss of Flight Controls

- **Note:** If safe landing is impossible, the AEPS (when installed) can be used.

3.6.5.1. Loss of Aileron Control

- Maintain directional control with rudder
- When aileron control lost only on one side, you may use the active aileron
- Only do very flat turns
- Do not operate flaps
- Avoid stalling speeds, also during approach and landing
- Adjust throttle carefully
- Attempt landing in large open field (long and wide) against the wind

3.6.5.2. Loss of Rudder Control

- Maintain directional control with Aileron
- Avoid steep turns
- Avoid stalling speeds, also during approach and landing
- Adjust throttle carefully
- Set flaps to -6°
- Avoid high pitch angles
- Select airfield with no crosswind for landing
- Conduct a long and stabilized final approach
- Avoid directional corrections in short final

3.6.5.3. Loss of Elevator Control

- When elevator not blocked, you may carefully control pitch using pitch trim. Only make very moderate inputs
- Use throttle setting to adjust climb or descent rate; adjust throttle carefully
- Only do very flat turns
- Do not operate flaps
- Avoid stalling speeds, also during approach and landing
- Attempt landing in large open field (long and wide) against the wind

3.6.5.4. Loss of Flap Control

■ **Caution:** the CTLS-LSA can be landed irrespective of flap position. However, with negative flaps, the stall speed is higher and the resulting landing distance longer. When in doubt, an alternate airfield with a longer runway should be chosen. Recommended approach speed with Flaps -6° is 68 kt (125 km/h). With Flaps 0° the recommended approach speed increases to 65 kt (121 km/h).

Try to reset the flap controller:

- Master switch — Batt and Gen off
- Master switch — after 3 seconds Batt and Gen on
- Check flap controller — works again: end of procedure.
- Landing — Land in frozen flap position. Select longer runway, if required. Select approach speed to match flap position.

4. NORMAL PROCEDURES

4.1. Introduction

4.1.1. General Information

This Chapter contains the recommended procedures to be followed in normal operation. The information is provided in checklist style. This way the key information is better visible. The Flight Training Supplement may enhance on some topics with additional guidance.

You shall familiarize yourself with these detailed procedures before starting flight operations.

- **Note:** Unless otherwise identified, all speeds are indicated airspeeds (IAS).
- **Note:** Unless otherwise identified, all provided speeds refer to an aircraft with the actual flight mass being equal to the maximum permitted mass of 600 kg (1320 lbs).

4.1.2. Airspeeds for Normal Operating Procedures

Take-off speed

	Mass 400 kg (882 lb)	***Mass 500 kg (1100 lb)***	***Mass 600 kg (1320 lb)***
Flaps 0°	50 kt (93 km/h) IAS	56 kt (104 km/h) IAS	62 kt (114 km/h) IAS
flaps 15°	45 kt (83 km/h) IAS	50 kt (93 km/h) IAS	55 kt (102 km/h) IAS

Best Rate of Climb

	Mass 400 kg (882 lb)	***Mass 500 kg (1100 lb)***	***Mass 600 kg (1320 lb)***
Flaps -6°	58 kt (107 km/h) IAS	65 kt (120 km/h) IAS	71 kt (131 km/h) IAS
Flaps 0°	56 kt (103 km/h) IAS	62 kt (116 km/h) IAS	69 kt (127 km/h) IAS
Flaps 15°	50 kt (91 km/h) IAS	56 kt (102 km/h) IAS	61 kt (112 km/h) IAS

Best Climb Angle

	Mass 400 kg (882 lb)	*Mass 500 kg (1100 lb)*	*Mass 600 kg (1320 lb)*
Flaps -6°	46 kt (85 km/h) IAS	51 kt (95 km/h) IAS	56 kt (104 km/h) IAS
Flaps 0°	45 kt (82 km/h) IAS	50 kt (92 km/h) IAS	55 kt (101 km/h) IAS
Flaps 15°	42 kt (76 km/h) IAS	47 kt (86 km/h) IAS	51 kt (94 km/h) IAS

Approach Speed

	Mass 400 kg (882 lb)	*Mass 500 kg (1100 lb)*	*Mass 600 kg (1320 lb)*
Flaps 15°	45 kt (83 km/h) IAS	50 kt (93 km/h) IAS	55 kt (102 km/h) IAS
Flaps 30°	42 kt (78 km/h) IAS	48 kt (88 km/h) IAS	52 kt (96 km/h) IAS

Maximum demonstrated crosswind (no limitation)

Flaps 0° 16 kt (30 km/h)

Flaps 30° 11 kt (20 km/h)

4.2. Procedures

4.2.1. Preflight Inspection

▲Warning: Inadvertent start-up of the engine is dangerous! Always ensure that the ignition and master (Batt and Gen) switch are off and the fuel shut off vale is closed.

▲Warning: If leakage of operating liquids is discovered, the engine may not be started until the cause of the leakage has been established. This is particularly important in the case of oil and fuel leaks as both constitute a fire risk.

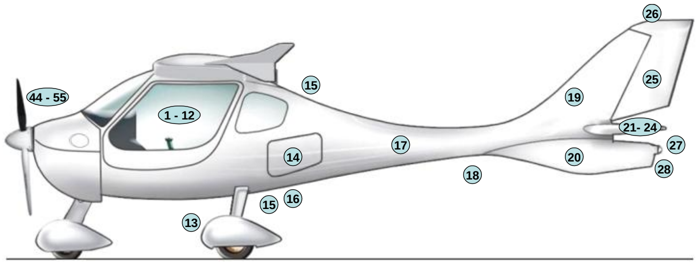
▲Warning: The passenger seat is not intended for the transport of objects or bags. However, should objects (e.g. bags) be placed on the passenger seat, they must be secured so that they cannot shift even if the aircraft experiences strong vertical gusts and accelerations.

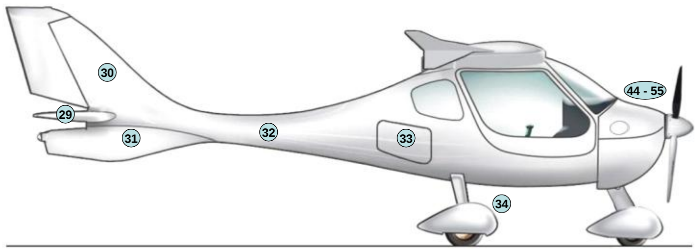
▲Warning: When flying alone, the passenger seat safety harness should be pulled tight and locked. No loose objects should be on the passenger side as they are not accessible to the pilot during flight.

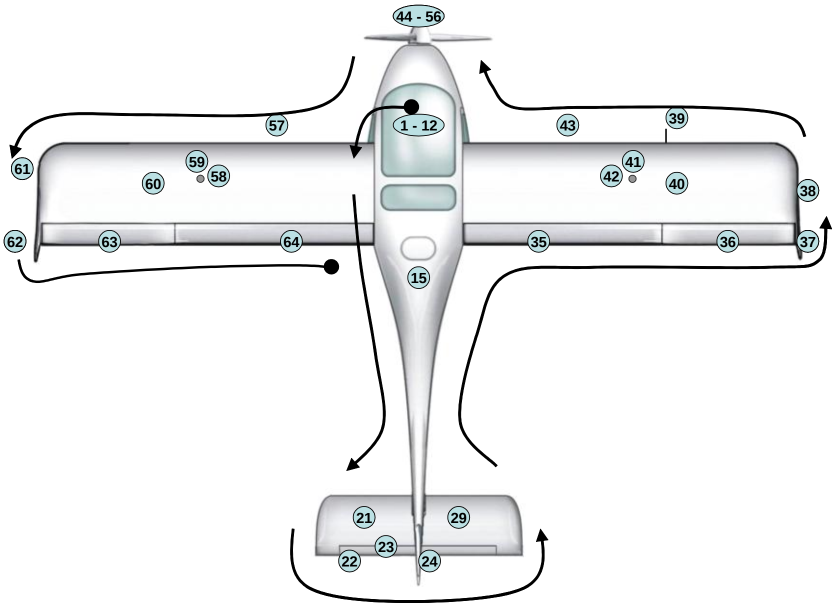
▲Warning: Should cracks appear in the finish, the cause should be investigated immediately. Cracks in composite structures are often indication of damage to the underlying structure. A qualified technician often has the means to check the structure without first having to remove the finish.

Even if the CTLS-LSA was operated within the last 24 hours, it is essential to inspect the aircraft thoroughly before the first flight of the day. The engine cowling must be removed.

Use the following illustrations to underline the preflight inspection steps.







4.2.1.1. Cabin

1.	Aircraft documents	on board
2.	Control surfaces	free and correct
3.	Main pins	inserted, caps in place and secured
4.	Ignition	off, key removed
5.	Electrical equipment	off
6.	Avionics switch	off
7.	Master switch	Batt on
8.	Wing flaps	extended
9.	Master switch	Batt off
10.	Fuel shutoff valve	open
11.	Doors	function checked
12.	Windows	check

4.2.1.2.B. Left side of aircraft

13. Main landing gear, tire, landing gear fairing	check
14. Baggage compartment	locked
15. Antennas	undamaged
16. Static pressure source	check clear

▲Warning: The aircraft is equipped with this one static port. For operational safety it is important to verify that the hole within the port is unobstructed. The hole can be found at the rear side of the step in the static port.

17. Fuselage	no damage
18. Rear tie-down	remove
19. Vertical stabilizer	check
20. Lower Fin	check
21. Stabilator	check
22. Anti servo tab	check
23. Elastic flap hinge	check
24. Trim tab link	check
25. Rudder	check cables, bolts
26. Rudder ACL	check
27. Tow release	check
28. Tail navigation light	check

4.2.1.3. Right side of aircraft

29. Stabilator	check
30. Vertical stabilizer	check
31. Fin	check
32. Fuselage	check
33. Baggage compartment	locked
34. Main landing gear & tire	check

4.2.1.4. Right wing

35. Wing flap	check
36. Aileron	check
37. Winglet, wing tip	check, vent clear
38. Navigation light	check
39. Pitot probe	check
40. Tie-down	remove
41. Fuel quantity	check
42. Filler cap	shut
43. Wing leading edge	check

4.2.1.5. Aircraft - Nose

44. Engine cowling	remove
45. Exhaust system	check
46. Nose gear	check
47. Air inlet	check
48. Fluid lines	check
49. Electrical wiring	check
50. Fuel	drain; no contamination
51. Landing light	check
52. Propeller	check
53. Spinner	check
54. Battery	check
55. Oil quantity	check
56. Coolant quantity	check

4.2.1.6. Left wing

57. Wing leading edge	check
58. Fuel quantity	check
59. Filler cap	shut
60. Tie-down	remove
61. Navigation light	check
62. Winglet, wing tip	check, vent clear
63. Aileron	check
64. Wing flap	check

4.2.2. Passenger Briefing

When flying with a passenger, introduce the passenger to the following features and procedures, for the safety of both occupants. Always consider that you as pilot might be not able to react as consequence to an emergency.

- Explain proper use of safety harness.
- Explain how to close, lock, unlock and open the door.
- Explain emergency procedures.
- Explain fast evacuation procedure.
- Explain presence and operation of fire extinguishing spray.
- Explain operation of the ELT in an emergency.

4.2.3. Engine Starting

▲**Warning:** When starting the engine, the pilot's attention is directed to inside the cockpit. The parking brake should thus be applied to prevent the aircraft from moving. Should the aircraft, despite parking brake, start to taxi after the engine has been started, the engine must be cut immediately by turning off the ignition. The aircraft has a tendency to move with the engine in idle when on concrete or if a tail wind prevails.

▲**Warning:** Oil pressure must begin to show at the latest 10 seconds after the engine has started to turn. If this is not the case, the engine must be cut immediately. Engine rpm may only be increased once oil pressure exceeds 2 bar (28 psi).

- Preflight inspection complete
- Parking brake set
- Carburetor heat off
- Circuit breakers all in
- Avionics off
- Master switch Batt on
- ACL on
- Fuel shutoff valve on (up)
- Ignition key in

▪	Choke	as required for cold engine start. When choke is set, hold throttle in idle. Throttle set disables the effect of the choke
▪	Throttle	idle. When no choke, slight throttle might be needed. Not more than 10% to avoid shocks to the propeller gearbox.
▪	Propeller area	clear
▪	Ignition key	turn to start then release (maximum 10 s)
▪	Choke	adjust, then off (forward)
▪	Oil pressure	check
▪	Generator	switch on
▪	Avionics	switch on
▪	Throttle	2000 rpm
▪	Wing flaps	retract
▪	Warm up	typically 2 min at 2000 rpm to reach minimum oil temperature 50°C (122 F). In cold weather up to five minutes

4.2.4. Taxi Check

▲**Warning:** Make sure that the taxi area is clear before you start the taxi checks. Always consider malfunctions.

▲**Warning:** Test rudder steering only when the aircraft is moving to avoid damages to the control system.

▪	Brakes	check brake function and proper release. Shut down engine when not braking properly.
▪	Steering	check proper control both directions Stop aircraft and shut down engine when not working properly.
▪	Flight instruments	check ASI shows 0 at standstill.

4.2.5. Taxiing

▪	Speed control	Control speed with throttle and brakes. Brake acts symmetric on both main wheels.
▪	Steering	Steering is only possible with rudder input. Brakes have no steering input.

- Sharp turns — No brakes in sharp turns such as 180° turns on the runway. The outside wheel must be able to turn.

4.2.6. Before Takeoff Check

▪ Parking brake	set
▪ Safety harnesses	fastened; lap tight, shoulders snug
▪ Doors	shut and locked
▪ Control surfaces	free and correct
▪ Altimeter	set to field elevation or QNH
▪ Transponder	on, standby
▪ Choke	shut
▪ Carburetor heat	off
▪ Throttle	4000 rpm
▪ Engine gauges	check
▪ Ignition, left	max. drop 300 rpm
▪ Ignition, both	check
▪ Ignition, right	max. drop 300 rpm. max. diff. to left 120 rpm
▪ Ignition, both	check
▪ Oil temperature	min. 50°C (122 F)
▪ Alternator control lamp	off
▪ Throttle	idle
▪ Flaps	set for takeoff
▪ Pitch trim	set (neutral for takeoff)
▪ Radios	set
▪ ELT	armed
▪ Passenger briefing	complete
▪ Approach & departure	clear
▪ Wind	checked OK for selected runway
▪ Runway	length OK under all given conditions
▪ Parking brake	release

4.2.7. Line Up

▪ Approach sector	check clear
▪ Doors and windows	check closed
▪ Passenger	check secured
▪ Transponder	on ALT
▪ Runway heading	check and compare

4.2.8. Takeoff

4.2.8.1. Normal Takeoff

▪ Wing flaps	0° (long runway) or 15° (short runway)	
▪ Choke	shut	
▪ Carburetor heat	off	
▪ Throttle	full	
▪ Take-off rpm	4800 – 5000 rpm	
▪ Elevator	Apply light back pressure to unload the nose wheel	
▪ Rudder	keep aircraft aligned with runway	
▪ Rotation	46 kt (85 km/h)	
▪ Accelerate to	Flaps 0°: 62 kt (114 km/h)	
	Flaps 15°: 55 kt (102 km/h)	
▪ Best rate-of climb	when obstacles are cleared	
	Flaps -6°	71 kt (131 km/h)
	Flaps -6°	69 kt (127 km/h)
	Flaps 15°	61 kt (112 km/h)

4.2.8.2. Short Field Takeoff

General comments on normal takeoff apply. Conduct short field takeoff as follows:

▪ Wing flaps	15°
▪ Parking brake	set
▪ Choke	shut
▪ Carburetor heat	off
▪ Throttle	full
▪ Engine speed	min. 4800 … 5000 rpm

▪ Parking brake	release	
▪ Rotation	41 kt (75 km/h)	
▪ Acceleration	51 kt (94 km/h)	
▪ Best angle-of-climb	until obstacles are cleared	
	Flaps -6°	56 kt (104 km/h)
	Flaps 0°	55 kt (101 km/h)
	Flaps 15°	51 kt (94 km/h)
▪ Best rate-of climb	when obstacles are cleared	
	Flaps -6°	71 kt (131 km/h)
	Flaps 0°	69 kt (127 km/h)
	Flaps 15°	61 kt (112 km/h)

4.2.8.3. Climb

▲**Warning:** When retracting the flaps during climb, especially when retracting to -6°, the aircraft loses climb performance, then accelerates before climb rate increases again. **This effect may be uncommon to a pilot transiting to the CTLS-LSA**. Be aware of this, and retract flaps only when reaching safe altitude, clear of obstacles and at adequate speed.

▲**Warning:** When retracting the flaps in horizontal flight, the aircraft can sink slightly.

▲**Warning:** The flaps should never be retracted by another step near the ground.

▲**Warning:** Reduce power to maximum 5500 rpm after 5 min.

- Flaps — retract to 0° and subsequently -6° in steps, as required.
- Airspeed @ Flaps -6° and 600 kg (1320 lb) for
- …best rate-of-climb — V_Y = 71 kt (131 km/h)
- …best angle-of-climb — V_X = 56 kt (104 km/h)

- Engine speed — max. 5500 rpm latest 5 min after application of full power

4.2.9. Cruise

▲**Warning:** A correct indication on the fuel sight gages in the wing ribs is only possible when the aircraft is leveled.

▲**Warning:** There is a tendency to fly the CTLS-LSA with a small sideslip angle. Flight performance is only marginally affected but it can lead to the tanks emptying at different rates. In this case, it is recommended to raise the wing with the fuller tank in a gentle temporarily slip. This can be achieved with the help of the rudder trim, if installed. The aircraft should be returned to level flight after a few minutes and the fuel indication checked. The amount in the tanks should now be more even.

▲**Warning:** The tanks in the CTLS have return flow flapper valves on the fuel tank anti-sloshing rib (refer to *Chapter 7 Systems Description*). They prevent fuel from quickly flowing into the outer tank area during side slipping where it could not be fed into the engine. The return flow valve reduces but does not completely prevent return flow. An exact indication of fuel quantity is thus only possible at the wing root when, after a sideslip, the aircraft has returned to normal flight attitude (and the amount of fuel inside and outside the anti-sloshing rib has evened out).

- Flaps: -6°
- Throttle: as required
  … 4300 rpm for most economic cruise
  … 4800 rpm for most efficient cruise
  … 5500 rpm for maximum horizontal cruise speed V_H
- Engine parameters: in the green
- Fuel consumption: monitor continuously. Check for symmetric consumption. In case of asymmetric consumption, slightly lift wing with more fuel.
- Carburetor heat: off, unless risk of carburetor icing. Apply only limited time.

4.2.10. Turns

- Controls — coordinated, rudder and aileron
- Bank — as required, max 60° permitted

  For speeds below 56 kt (106 km/h) max. 30° recommended

4.2.11. Stalls

- Stall warning — slight nodding, approx. 5 kt (8 km/h) before stall speed
- Controls — only use rudder for directional control (keep the ball centered).

  Release elevator back pressure
- Power — add not before 1.2 * Vs
- Wing drop — max. 20° from level flight,

  max. 30° from 30° bank turn
- Altitude loss — max. 165 ft (50 m)

4.2.12. Descent / Approach

- Carburetor heat — as required
- Power — reduce as required
- Altimeter — set to QNH

4.2.13. Before Landing

- Safety harnesses — tight
- Wing flaps — 0°
- Airspeed — 62 kt (114 km/h) IAS
- Wing flaps — 15°
- Airspeed — 55 kt (102 km/h) IAS
- Landing light — on
- Carburetor heat — off

4.2.14. Landing

4.2.14.1. Normal Landing

▲**Warning:** Too high approach speeds with flap changes on a light and efficient aircraft like the CTLS-LSA shortly before touch-down lead very quickly to dynamic flight conditions. If in doubt: discontinue the approach and perform a go around.

▲**Warning:** Do not rely on the demonstrated wind speed data in the manual for crosswind landings. Local conditions causing dangerous leeward turbulence can lead to lower limits.

▲**Warning:** The aircraft can be landed at all flap settings. The maximum flap position (30°) should be used to land on very short runways under favorable wind condition (no crosswind component, very light wind and low gusts).

- Approach airspeed — 55 kt (102 km/h)
- Flaps in final — … 15° at long airfields, gusty conditions or cross wind

  …. 30° only on final for short runways and when conditions permit
- Airspeed on final — 52 kt (96 km/h) with Flaps 30°
- Flare — smoothly, nose not too high; Avoid ballooning
- After touchdown — stick smoothly back to relieve nose wheel

During a landing with crosswind, the upwind wing should be dipped by applying aileron against the wind and direction kept using the rudder. As the CTLS-LSA is a high-wing aircraft, there is no risk of the wing tips touching the ground.

After landing, all unnecessary electrical equipment, especially the landing light, should be switched off. As this equipment requires a lot of power and since the alternator does not produce much power during taxiing due to relatively low engine rpm, the battery would discharge considerably before the engine is finally shut down.

4.2.14.2. Short Field Landing

- Flaps — 30° already after base turn
- Speed — approach 48 kt (88 km/h) IAS
- Throttle — idle before touchdown at 5 ft (1,5 m) above ground
- Touchdown — positive landing and immediate braking.

4.2.14.3. Soft Field Landing

- Approach — same as normal landing
- Flaps — 30° in final
- Speed — approach 48 kt (88 km/h) IAS
- Descent — smooth descent rate, no steep descent
- Throttle — reduce smoothly just above ground
- Flare — hold aircraft just above ground and reduce speed to minimum speed
- Touchdown — smooth touchdown at minimum speed
- After touchdown — hold nose wheel high as long as possible.

  When nose wheel can no longer be held, apply very little power to finally lower nose wheel smooth.
- Brakes — typically not required on soft field, avoid braking to avoid pressure on nose wheel.

4.2.14.4. After Landing

- Throttle — idle
- Brakes — as required
- Landing light — off
- Wing flaps — retract
- Electric consumers — switch off not needed consumers. Generator provides significantly reduced power with engine running at idle

4.2.15. Balked Landing

▪ Throttle	full
▪ Carburetor heat	off
▪ Elevator	increase aircraft pitch to stop the descent as the engine power builds up; do not reduce the speed
▪ Rudder	maintain direction

▲**Warning:** After the application of full power the elevator forces can increase considerably. Be aware to push the elevator control forward in order to control the correct speed.

▪ Airspeed	52 kt (96 km/h). Control forces can go up, as aircraft is trimmed for landing
▪ Flaps	15°
▪ Rate of climb	confirm positive rate
▪ Trim	adjust as needed
▪ Climb	continue climb in the same manner as in a normal takeoff

4.2.16. Engine Shut down

▪ Parking brake	set
▪ Avionics	off
▪ Electrical equipment	off
▪ Generator	off
▪ Ignition	off
▪ Master switch	Batt off
▪ Ignition key	remove
▪ ELT	check off (check COM freq. 121,5 MHz)

5. PERFORMANCE

5.1. General Considerations

Performance data is based on an aircraft in good condition and correct settings. Even the smallest adjustments to the controls or the omission of a small piece of fairing can adversely affect aircraft performance. Sufficient reserve should be added to the data given in this handbook to cover all such possibilities.

▲**Warning:** All performance data are based on standard atmosphere at sea-level and the Neuform CR3-65-47-101.6 ground adjustable propeller. They are also based on the procedures described in this handbook. Higher runway elevations and higher temperatures can lead to considerable differences in the data.

5.1.1. Airspeed Calibration

Airspeed values in this POH are given as IAS (Indicated Airspeed). This includes errors due to the characteristic of the aircraft pitot-static system. IAS has been selected, as this is what the pilot actually sees on his instruments. There is no need for the pilot to convert values shown in this POH.

The error of the airspeed indication can be identified with the calibration chart on the next page. Applying this correction leads to CAS (calibrated airspeed).

5.1.2. Altitude Calibration

The static air pressure system of the aircraft has a certain error over the speed range. As consequence the indicated altitude slightly differs from real altitude. The effect is dependent from flight speed. The second chart on the next page shows the value that must be added to the indicated altitude, to obtain the real altitude.

Chart – Airspeed Calibration:

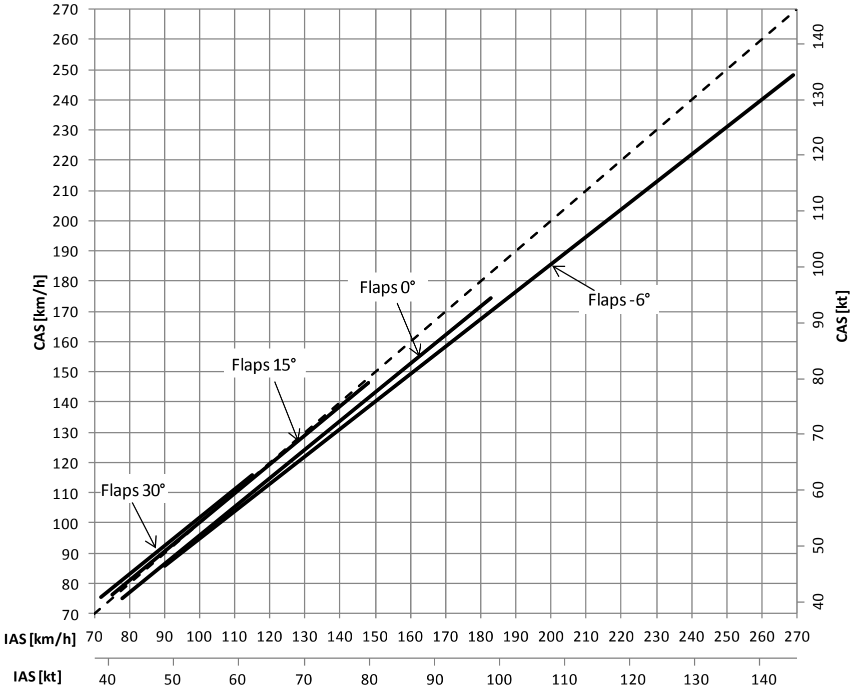
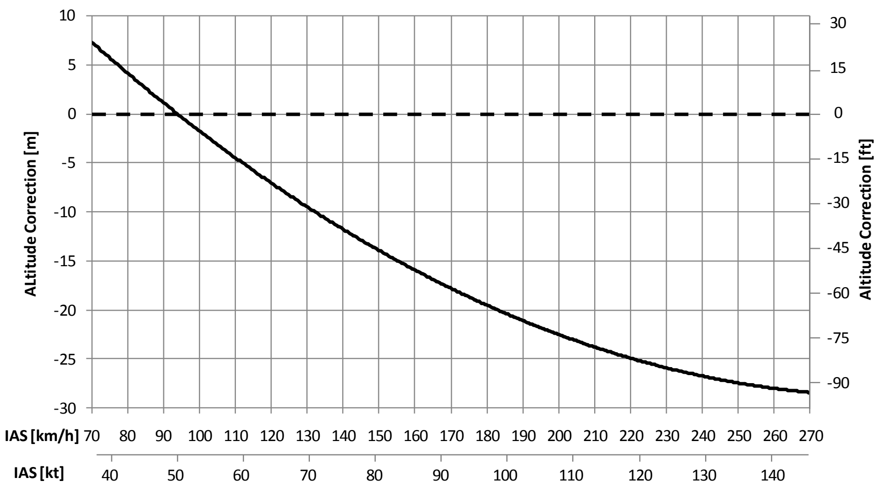


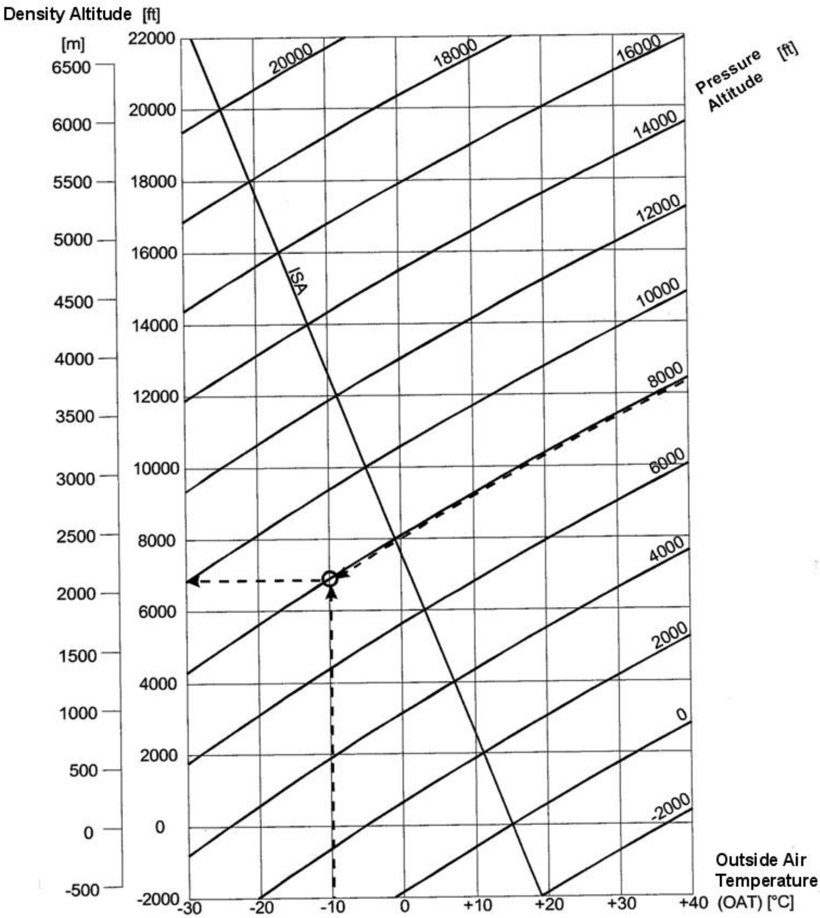
Chart – Altitude Calibration:



5.1.3. Pressure Altitude – Density Altitude

In order to determine exactly the aircraft performance available for a particular flight, the density altitude must be calculated. The CTLS-LSA is equipped with a carbureted engine, the performance of which varies according to ambient temperature and pressure. This is the reason that density altitude is so important. The aerodynamic characteristics of the aircraft are also dependent upon this parameter.

Density altitudes can easily be calculated using the following table. Using this density altitude as the input parameter, the performance which can truly be expected will be calculated in the following sections.



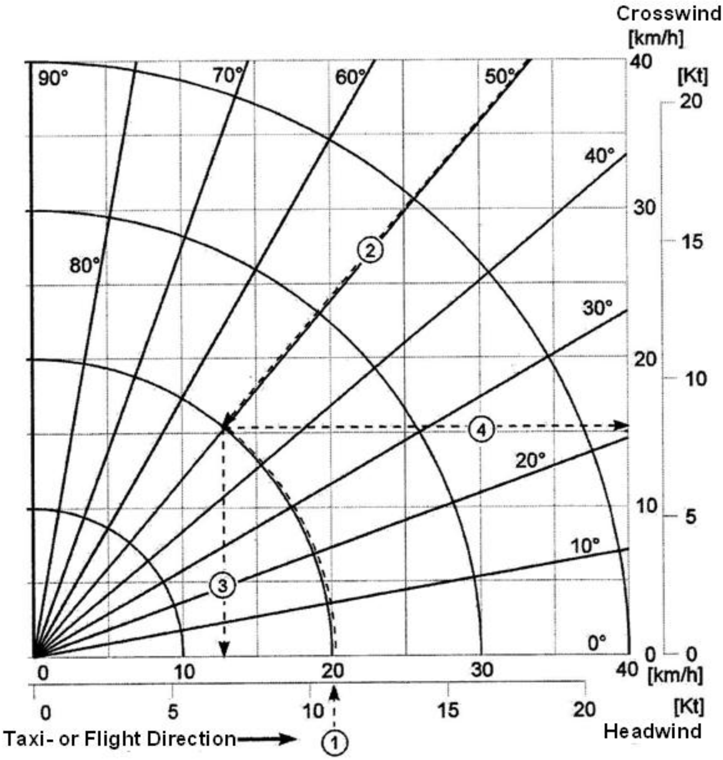
An example is given in this diagram. Outside air temperature is -10°C (14 F) and the altimeter shows a (pressure) altitude of 8000 ft (2440 m).

▲**Warning:** Pressure altitude can be obtained with the reference pressure of the altimeter set to standard atmosphere equals 1013.25 hPa (=29.92 in Hg) only.

The corresponding density altitude is 6800 ft (2100 m). Performance values are thus equivalent to those given in the next chapter for this value. If the pressure altitude of 8000 ft (2400 m) were used, the performance figures would be wrong. This difference can be very significant, particularly in the summer months when the density altitude is much higher than the pressure altitude due to the higher temperatures.

5.1.4. Influence of Wind Direction on Take-Off and Landing

To determine whether the aircraft can take-off safely, it is necessary to determine the prevailing crosswind component. On the one hand, this determines the appropriate take-off procedure while, on the other hand, it ensures that the demonstrated permissible crosswind component for take-off and landing is not exceeded. The following diagram is used to determine the crosswind component.

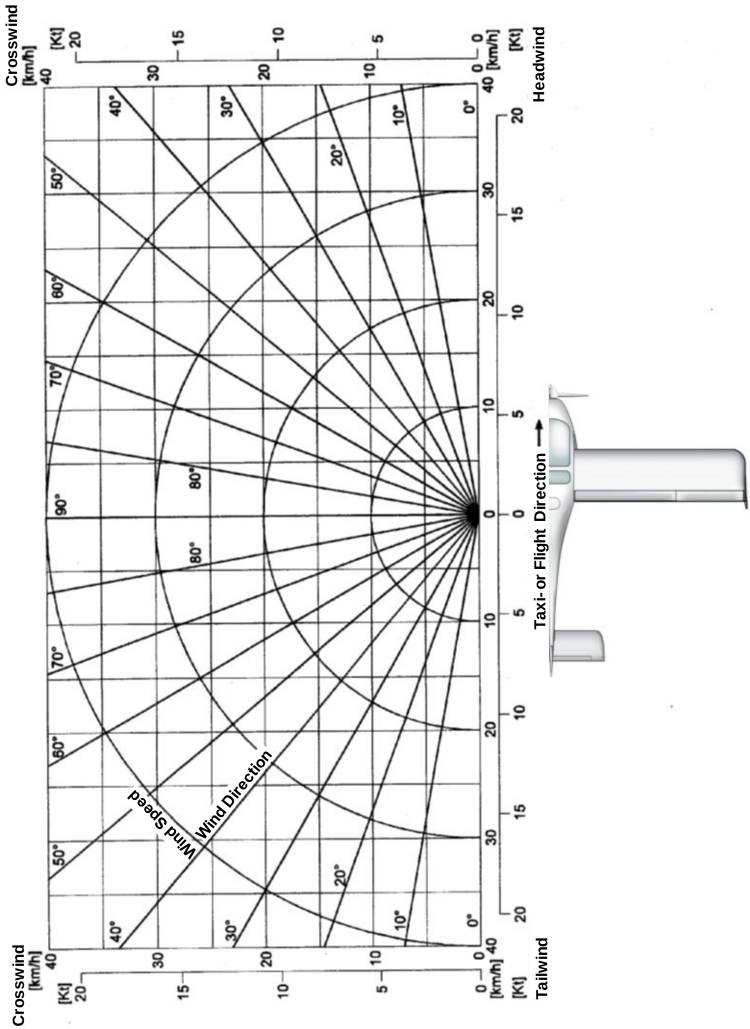


An example is shown in the diagram. Take-off direction is 120°. The wind direction is 070°, wind speed 11 kt. The wind angle is thus 120° - 70° = 50°. Wind speed is plotted along the circle segment (1) to the point where it intersects the wind angle (2). The corresponding value on the x-axis (3) results in a head wind component of 7.1 kt, the value on the y-axis (4) in a crosswind component of 8.4 kt.

Values for landing are determined in a similar manner.

5.1.5. Wind Influence on Cruise

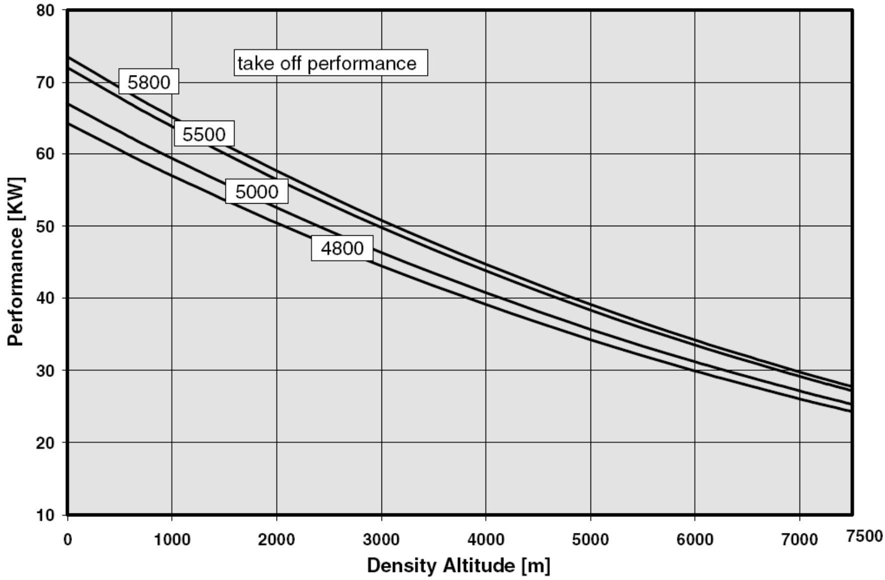
Wind also has a noticeable influence on the forward progress of the aircraft over ground in cruise. The relevant components can be easily calculated from the graph.



Calculation procedures are analogous to those used to determine take-off procedures, the only difference being the possible inclusion of a tailwind component.

5.1.6. Influence of Altitude on Engine Performance

Engine performance decreases with increasing (density) altitude. The following data may be used to determine available engine performance.



Curves are provided for full throttle setting. Selection of the correct curve (RPM) depends from the flight speed. Example: During initial climb after takeoff, full throttle engine speed is between 4800 and 5000 RPM. In level cruise flight, full throttle engine speed is 5500 RPM.

The relative power decrease at reduced throttle setting follows the same logic.

5.2. Performance Data

5.2.1. Take-Off Distance (an approved chapter of the POH)

Takeoff distances in the following charts have been analyzed for varying conditions and takeoff weights. Takeoff is possible with flaps in 15° (typical) and flaps in 0° (long field takeoff).

▲Warning: Important for the usage of these charts is the correct density altitude. Field elevation is not sufficient and leads to wrong results.

▲**Warning:** The values provided here are based on an aircraft in good conditions, flown by an experienced pilot. Always add a reserve to the data which takes into consideration the local and aircraft conditions and your level of piloting experience.

The takeoff roll distance defines the distance between the start of the takeoff roll and the point where the aircraft leaves the ground. Takeoff distance defines the distance between the start of the take-off roll and the point where the aircraft reaches 50 ft (15 m) altitude. The distances are given for concrete runway, without wind influence. Distances for short mown grass on a hard and dry level soil are comparable with the CTLS-LSA.

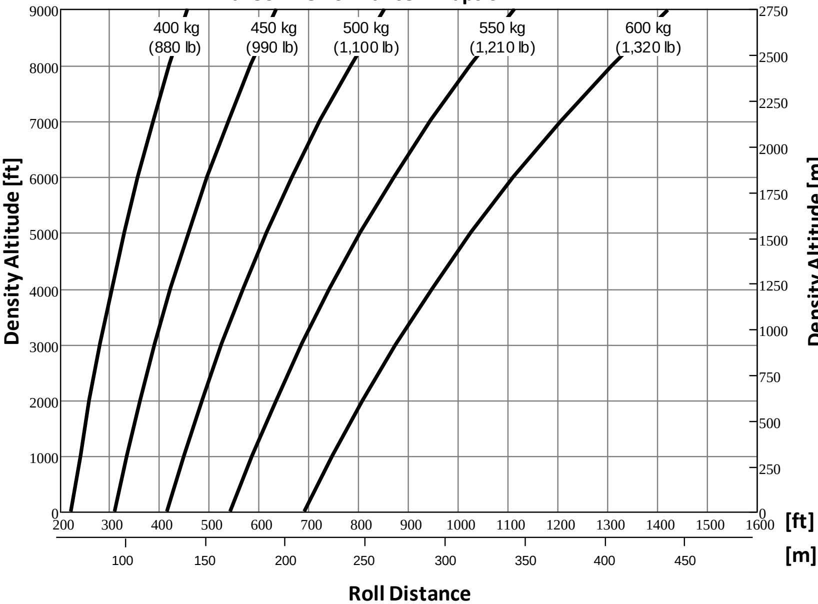
Take-off performance for conditions different to the ones named before can be estimated by using the following rules of thumb.

	Increase of take-off roll distance	***Increase of take-off distance***
high grass 8 in (20cm)	app. 20% (= x 1.2)	app. 17% (= x 1.17)
2% inclination of runway	app. 10% (= x 1.1)	app. 10% (= x 1.1)
4% inclination of runway	app. 14% (= x 1.14)	app. 12% (= x 1.12)
tail wind 5 kt	app. 20% (= x 1.2)	app. 25% (= x 1.25)
wet snow	app. 30% (= x 1.3)	n/a
soaked soil 1.2 in (3cm) deep	app. 16 % (= x 1.16)	n/a

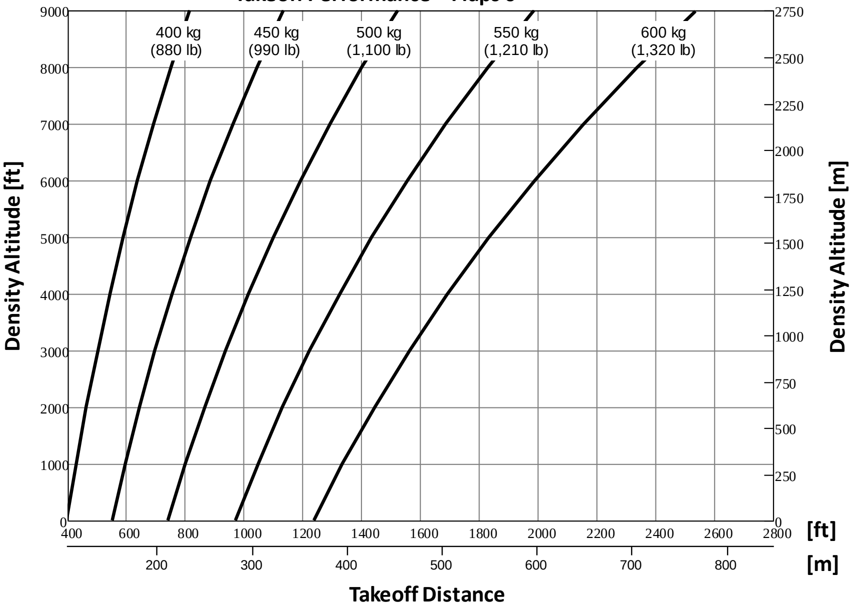
Each factor occurring at a time has to be considered individually.

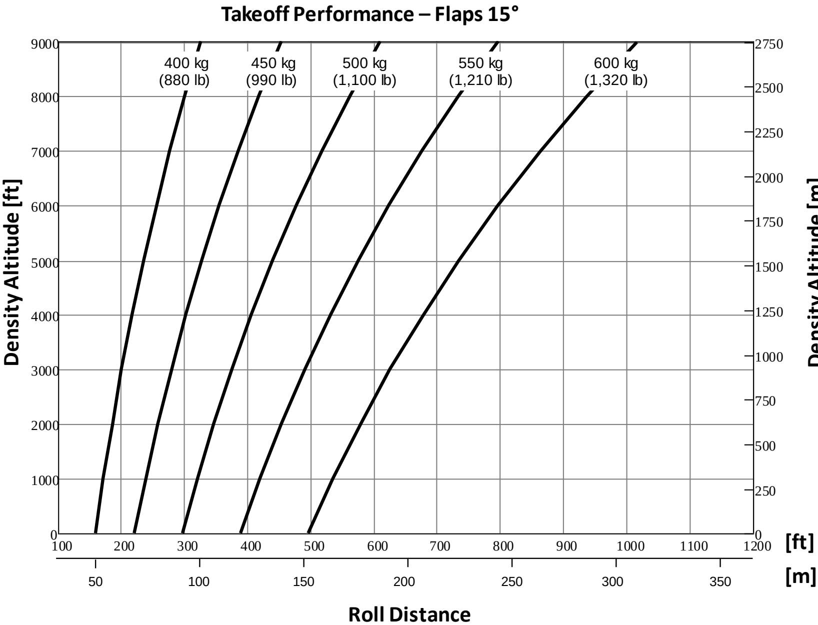
Example: Take-off with flaps 15° at 500 kg (1.100 lb) at 20°C (68 F) at 2000 ft (600 m) pressure altitude in high grass with a runway 2% inclination. Density altitude for this case is 3000 ft (900 m). Takeoff charts show a take-off roll distance of 380 ft (115 m) and a take-off distance of 690 ft (210 m). Consideration of the deviating factors delivers: Take-off roll = 380 ft x 1.2 x 1.1 = 500 ft (150 m) and take-off distance = 690 ft x 1.17 x 1.1 = 890 ft (270 m). Using the field elevation (200 ft) would have delivered values by 22% too low.

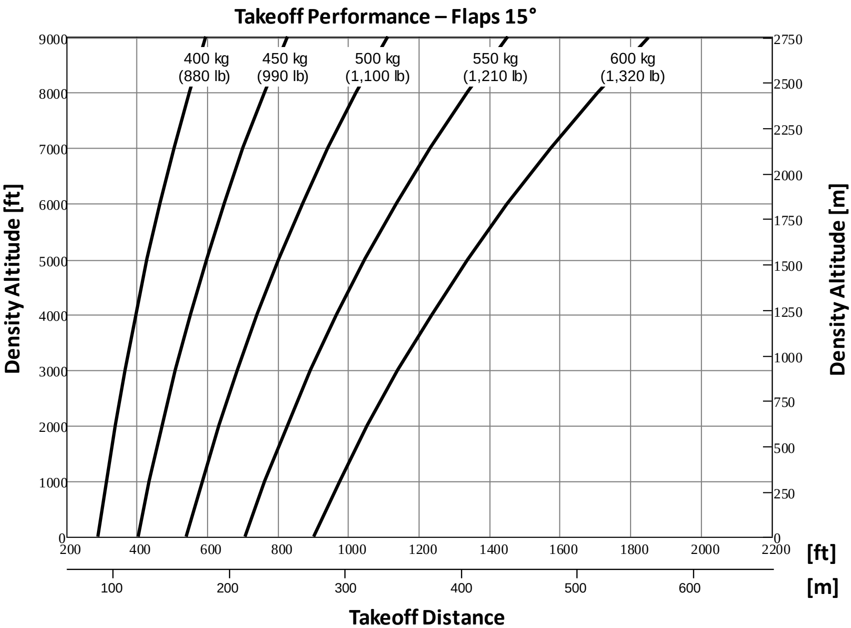
Takeoff Performance – Flaps 0°



Takeoff Performance – Flaps 0°




Takeoff Performance – Flaps 15°
400 kg (880 lb)
450 kg (990 lb)
500 kg (1,100 lb)
550 kg (1,210 lb)
600 kg (1,320 lb)
Density Altitude [ft]
Density Altitude [m]
[ft]
[m]
Roll Distance

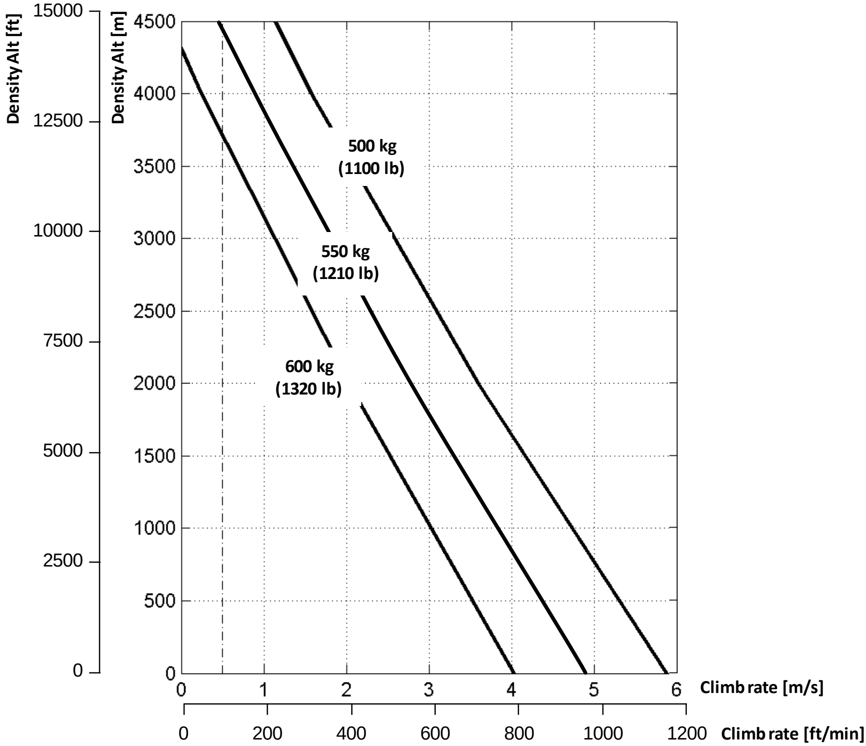

Takeoff Performance – Flaps 15°
400 kg (880 lb)
450 kg (990 lb)
500 kg (1,100 lb)
550 kg (1,210 lb)
600 kg (1,320 lb)
Density Altitude [ft]
Density Altitude [m]
[ft]
[m]
Takeoff Distance

5.2.2. Climb Performance (an approved chapter of the POH)

Climb performances have been tested at various altitudes with various flap settings. The values are shown in the following tables.

▲**Warning:**	Important for the usage of these charts is the correct density altitude. Pressure altitude is not sufficient and leads to wrong results.
▲**Warning:**	The values provided here are based on an aircraft in good conditions. Reserves must be considered as suitable.

5.2.2.1. Climb Performance at Flaps -6°

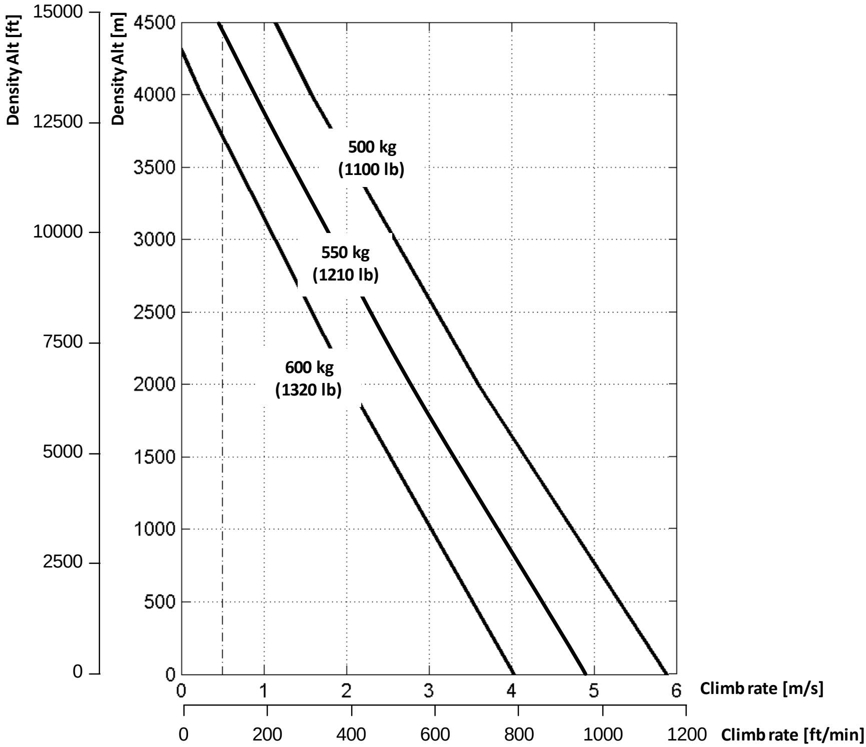


Speeds at MTOM, Flaps -6°; 0 ft (0 m) Density Altitude:

… best Rate of Climb: 4,03 m/s; V_Y = 71 kt (131 km/h) IAS

… best Angle of Climb: 7,3° (1:7,8); V_X = 56 kt (104 km/h) IAS

5.2.2.2. Climb Performance at Flaps 0°

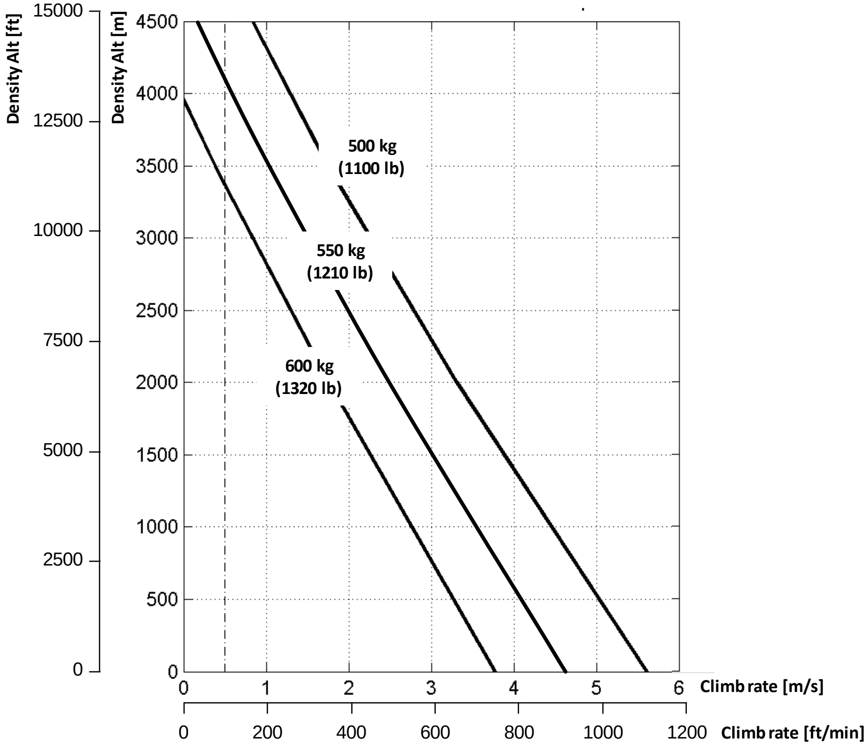


Speeds at MTOM, Flaps 0°; 0 ft (0 m) Density Altitude:

… best Rate of Climb: 4,12 m/s; V_Y = 69 kt (127 km/h) IAS

… best Angle of Climb: 7,8° (1:7,4); V_X = 55 kt (101 km/h) IAS

5.2.2.3. Climb Performance at Flaps 15°



Speeds at MTOM, Flaps 15°; 0 ft (0 m) Density Altitude:

… best Rate of Climb: 3,88 m/s; V_Y = 61 kt (112 km/h) IAS

… best Angle of Climb: 7,8° (1:7,4); V_X = 51 kt (94 km/h) IAS

5.2.3. Landing Distance

Landing distances in the following charts have been analyzed for varying conditions and landing weights. Landing is possible with different flap settings. Full flaps shall only be used with no or moderate cross winds and low turbulence.

▲Warning: Important for the usage of these charts is the correct density altitude. Field elevation is not sufficient and leads to wrong results.

▲Warning: The values provided here are based on an aircraft in good conditions, flown by an experienced pilot. Always add a reserve to the data which takes into consideration the local and aircraft conditions and your level of piloting experience.

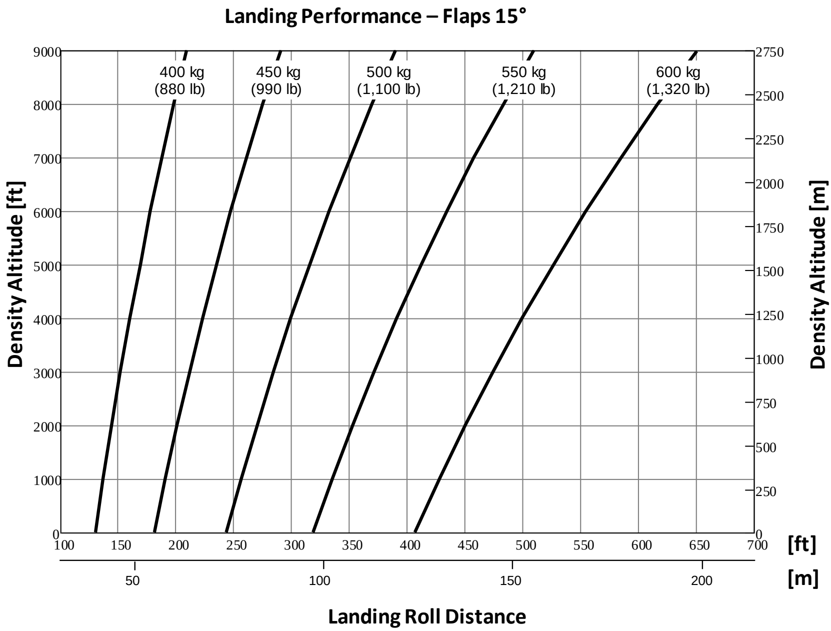
The landing distance is determined for a landing over an obstacle of 50 ft (15 m) height up to a full stop of the aircraft. The landing roll distance defines the distance between touchdown and the point where the aircraft comes to full stop. The distances are given for concrete runway, without wind influence. Distances for short mown grass on a hard and dry level soil are comparable with the CTLS-LSA.

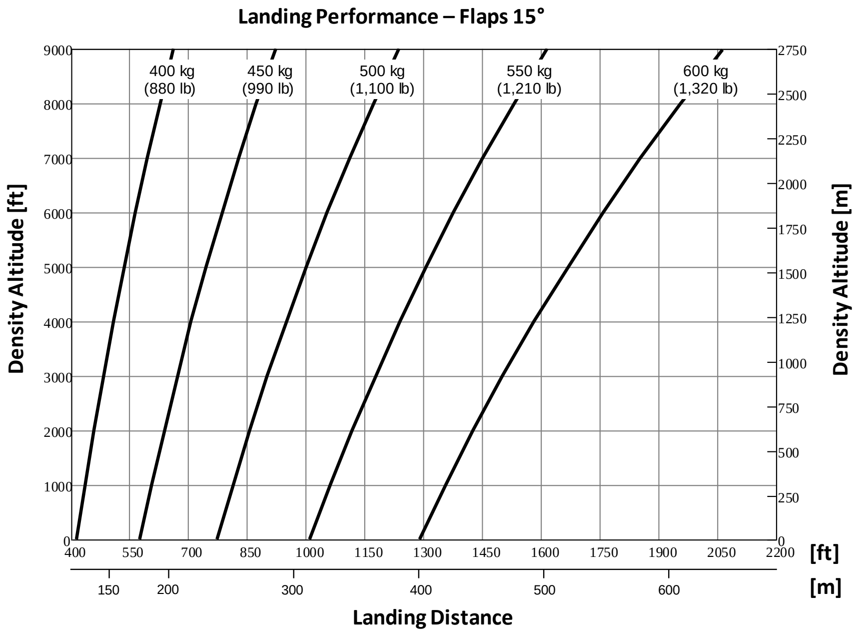
Landing performance for conditions different to the ones named before can be estimated by using the following rules of thumb.

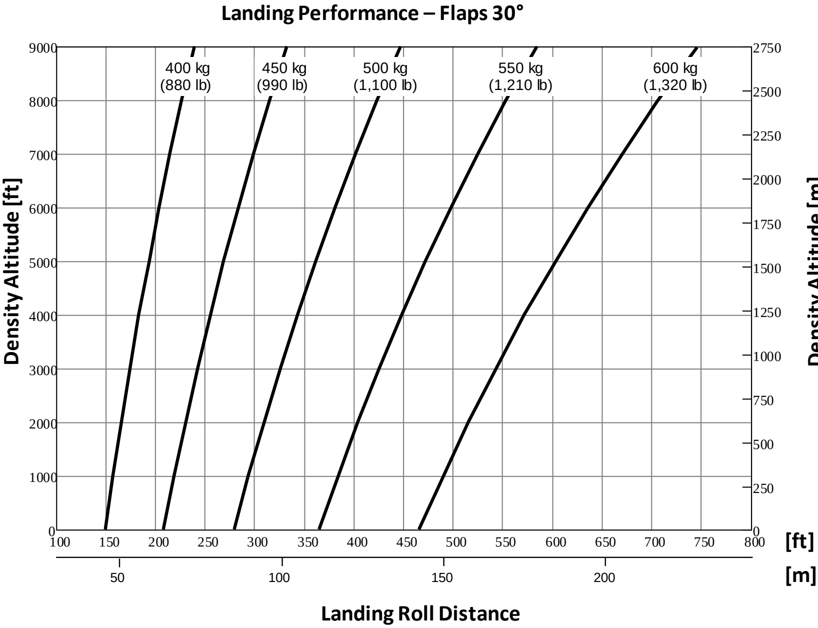
	Increase of landing roll distance	***Increase of landing distance***
2% inclination of runway	app. +/-10% (= x 1.1)	app. +/-10% (= x 1.1)
4% inclination of runway	app. +/-14% (= x 1.14)	app. +/-12% (= x 1.12)
tail wind 5 kt	app. 20% (= x 1.2)	app. 25% (= x 1.25)

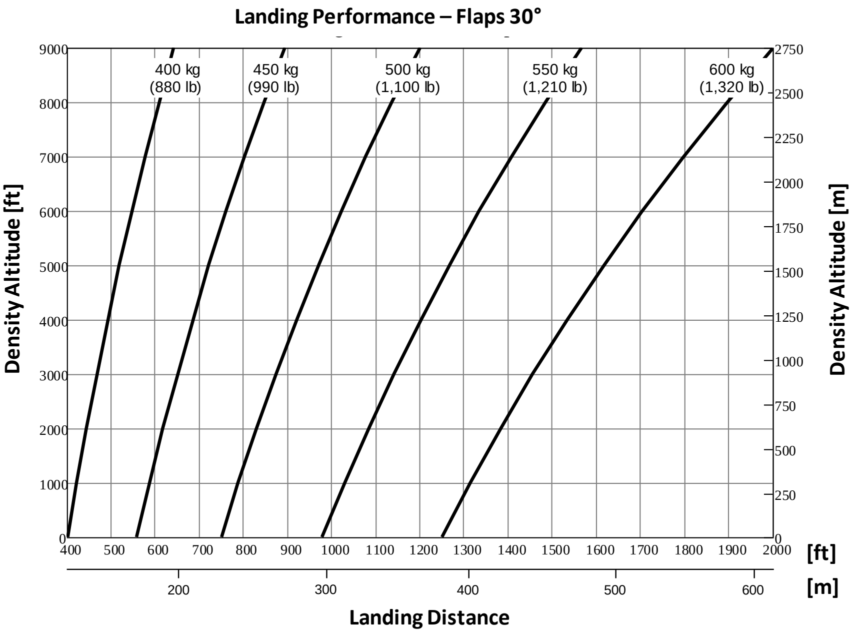
Each factor occurring at a time has to be considered individually.

Example: Landing with flaps 15° at 500 kg (1.100 lb) at 20°C (68 F) at 2000 ft (600 m) pressure altitude on a runway 2% inclination downwards. Density altitude for this case is 3000 ft (900 m). Landing charts show a landing distance of 900 ft (275 m) and a landing roll distance of 285 ft (87 m). Consideration of the deviating factor delivers: Landing roll = 285 ft x 1.1 = 314 ft (95 m) and landing distance = 900 ft x 1.1 = 990 ft (300 m), 10% higher than the value from the chart.


Landing Performance – Flaps 15°
400 kg
(880 lb)
450 kg
(990 lb)
500 kg
(1,100 lb)
550 kg
(1,210 lb)
600 kg
(1,320 lb)
Density Altitude [ft]
Density Altitude [m]
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
100
150
200
250
300
350
400
450
500
550
600
650
700
[ft]
50
100
150
200
[m]
Landing Roll Distance


Landing Performance – Flaps 15°
400 kg
(880 lb)
450 kg
(990 lb)
500 kg
(1,100 lb)
550 kg
(1,210 lb)
600 kg
(1,320 lb)
Density Altitude [ft]
Density Altitude [m]
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
400
550
700
850
1000
1150
1300
1450
1600
1750
1900
2050
2200
[ft]
150
200
300
400
500
600
[m]
Landing Distance

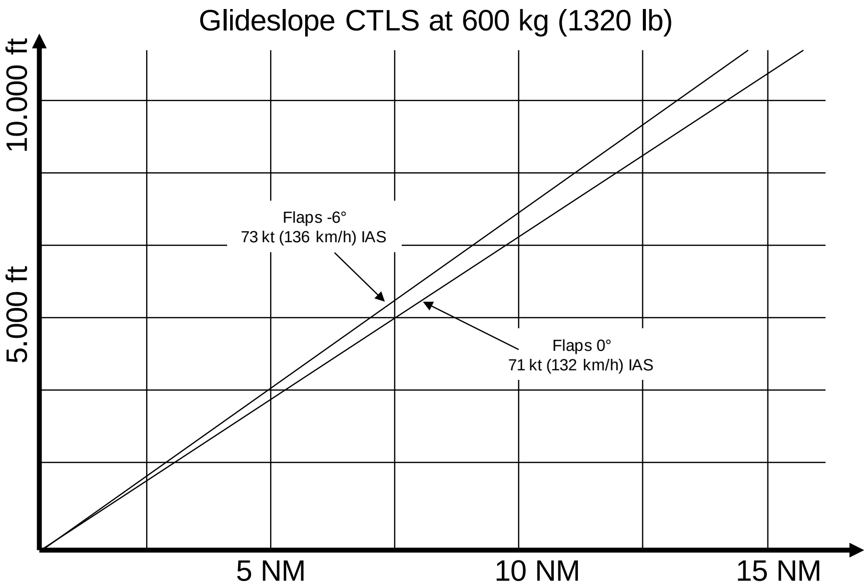

Landing Performance – Flaps 30°
400 kg (880 lb)
450 kg (990 lb)
500 kg (1,100 lb)
550 kg (1,210 lb)
600 kg (1,320 lb)
Density Altitude [ft]
Density Altitude [m]
Landing Roll Distance
[ft]
[m]


Landing Performance – Flaps 30°
400 kg (880 lb)
450 kg (990 lb)
500 kg (1,100 lb)
550 kg (1,210 lb)
600 kg (1,320 lb)
Density Altitude [ft]
Density Altitude [m]
Landing Distance
[ft]
[m]

5.2.4. Gliding Characteristics

The following chart shows the distances the aircraft can glide, dependent upon altitude, assuming smooth air, no wind and no vertical air currents.

▲**Warning:** Thermal activity can stretch or shorten these distances. Turbulence always leads to a reduction in gliding distance. One should never expect favorable conditions when estimating a possible gliding distance!



Glide angle of the CTLS-LSA can be assumed in practice to be 8.5 to 1 with flaps 0°, and 7.9 to 1 with flaps -6°. With flaps further extended this ratio gets worse. One effect of moderately set flaps is to reduce the minimum sink, but the speed at which the minimum sink is observed reduces faster. This results in a reduced possible gliding distance. Speeds for best glide at flight mass can be assumed as follows:

	Mass 400 kg (880 lb)	***Mass 500 kg (1100 lb)***	***Mass 600 kg (1320 lb)***
Flaps -6°	60 kt (111 km/h) IAS	67 kt (124 km/h) IAS	73 kt (136 km/h) IAS
Flaps 0°	58 kt (107 km/h) IAS	65 kt (120 km/h) IAS	71 kt (132 km/h) IAS

5.2.5. Cruise Speeds, RPM Settings and Fuel Consumptions

The following chart provides performance values for the CTLS-LSA aircraft equipped with Neuform CR3-65-47-101.6 ground adjustable propeller. All values refer to an aircraft in good condition. Validity of the values requires that all parameters match for the individual aircraft.

As true airspeed is of relevance for flight planning, the subsequent table provides all values for indicated airspeed, calibrated airspeed and true airspeed. Power setting is indicated in percentage of maximum continuous power, not maximum takeoff power.

9000 ft (2750 m)			***IAS***		***CAS***		***TAS***		***RPM***
Power Setting	***Fuel Flow***		***kt***	***km/h***	***kt***	***km/h***	***kt***	***km/h***	
	l/h	***US.gal/h***							
50%	15.0	3.96	73	136	69	127	81	150	3850
65%	18.3	4.83	89	164	83	153	97	181	4250
75%	21.2	5.60	96	179	90	166	106	196	4500
6000 ft (1840 m)			***IAS***		***CAS***		***TAS***		***RPM***
Power Setting	***Fuel Flow***		***kt***	***km/h***	***kt***	***km/h***	***kt***	***km/h***	
	l/h	***US.gal/h***							
50%	15,0	3.96	82	151	76	141	85	158	4050
65%	18,3	4.83	93	173	87	161	97	180	4450
75%	21,2	5.60	101	187	94	174	105	195	4700
3000 ft (930 m)			***IAS***		***CAS***		***TAS***		***RPM***
Power Setting	***Fuel Flow***		***kt***	***km/h***	***kt***	***km/h***	***kt***	***km/h***	
	l/h	***US.gal/h***							
50%	15,0	3.96	87	161	81	150	86	159	4200
65%	18,3	4.83	98	182	91	169	97	179	4600
75%	21,2	5.60	106	196	98	182	104	193	4900

6. MASS AND BALANCE; EQUIPMENT LIST

6.1. Datum Plane and Weighing

Datum plane is the wing leading edge, when the aircraft is leveled.

To weigh the aircraft, three scales must be set on a level floor. The aircraft is leveled by shimming either the nose wheel or both of the main wheels. It is in the correct position for weighing when the tunnel (where the throttle quadrant is located) in the cockpit is in the horizontal. The aircraft must also be level span-wise. This can be determined by placing a level on the cabin roof in the vicinity of the roof window, above the wing spar.

Using a plumb bob, the middle of the wheel axles is projected on to the floor and marked. The same procedure is used to mark the reference datum. A plumb bob is dropped from the wing leading edge on the outer side of the root rib. The transition to the fuselage is faired in the root rib area which can lead to an incorrect measurement. The distance between the wheels must be measured during each weighing. These values must be used in the tabulation. If the original Flight Design weighing form is used as a spread sheet, the distances must be recorded with a positive algebraic sign. If the calculations are done manually, one must be careful to use the proper algebraic signs.

It is easy to make mistakes when weighing, particularly if the scales experience a side-load (e.g. due to landing gear deflection). It is therefore very important that the weighing process remains free from distortion. Distortion can be avoided if at least one of the main wheels (better both) is placed on a pair of metal plates with grease in between. The two plates slide easily on each other which reduces the tension due to side-loads virtually to zero.

The weighing data for the aircraft as delivered from the factory can be found in this Pilot's Operating Handbook and on the detailed mass and balance sheet in the aircraft documentation. It is the responsibility of the owner/operator of the aircraft to ensure:

- that the aircraft is weighed after any relevant changes (change in equipment; repair work).
- that all mass and balance reports are maintained with the aircraft documentation
- that the mass and balance data are entered to the subsequent overview table in this POH.

6.2. Mass and Balance Report

The mass and balance report provides information of the aircraft at the time of weighing. The mass and balance report provides the empty aircraft mass, the empty aircraft center of gravity and the limitation for cabin payload. The last value is a result from the aircraft component mass and from the maximum mass of non-lifting parts (all mass that is suspended between the wings), as it is used in structural compliance.

A mass and balance report is only valid in connection with the equipment list that was valid at the time of aircraft weighing. Any changes to the aircraft equipment must be appropriately registered, and the effect to the empty aircraft mass and balance and to the permissible cabin payload must be considered, either by calculation or by re-weighing.

There is a wide variety of options available for the aircraft. Uncontrolled addition of optional equipment can lead to an increase in aircraft empty mass which exceeds that set down in the certification regulations. It is the responsibility of the owner to ensure that national regulations and aircraft limitations are followed.

The following table provides a summary of the mass and balance data of this specific aircraft. Every new mass and balance status must be entered here. Add more sheets when required. The detailed mass and balance report must be kept with the aircraft documentation.

CTLS-LSA
Mass and Balance Overview

Airplane Serial No.: | **Registration:** | **Page:**

Date	*Description*	*Changes to Mass Situation*					*Current Empty Weight*			*Approval*
		Addition (+)	*Subtract (-)*	*Mass*	*Moment Arm*	*Moment*	*Mass*	*Moment Arm*	*Moment*	
	Upon Delivery	/	/	/	/	/				

6.3. Flight Mass and Center of Gravity

The flight mass and the connected center of gravity in flight must be determined prior to each flight. The following table and charts provide you with all necessary information to perform this part of your flight preparation.

▲**Warning:** You always have to expect that you burn all your fuel during one flight. Therefore, in all cases both conditions have to be verified to be within allowed limits: With tanks filled as on takeoff, and with tanks completely empty. In no case you may neither get out of the allowed cg range nor exceed MTOM as certified in your relevant country.

▲**Warning:** Data used as example in the following charts have nothing to do with your real aircraft. The only purpose of these data is to illustrate the process of determining the required values for the flight planning. In any case you must make sure that you take the correct data as valid for your individual aircraft.

The table below provides you with the calculation scheme for the aircraft center of gravity for your flight. You have the possibility to calculate the moments analytically, or to read them from the following diagrams. Both methods will lead to the same result. Always make sure that you calculate the results for your takeoff configuration, and for the configuration with empty fuel tanks. In both cases the center of gravity must be within the defined limits.

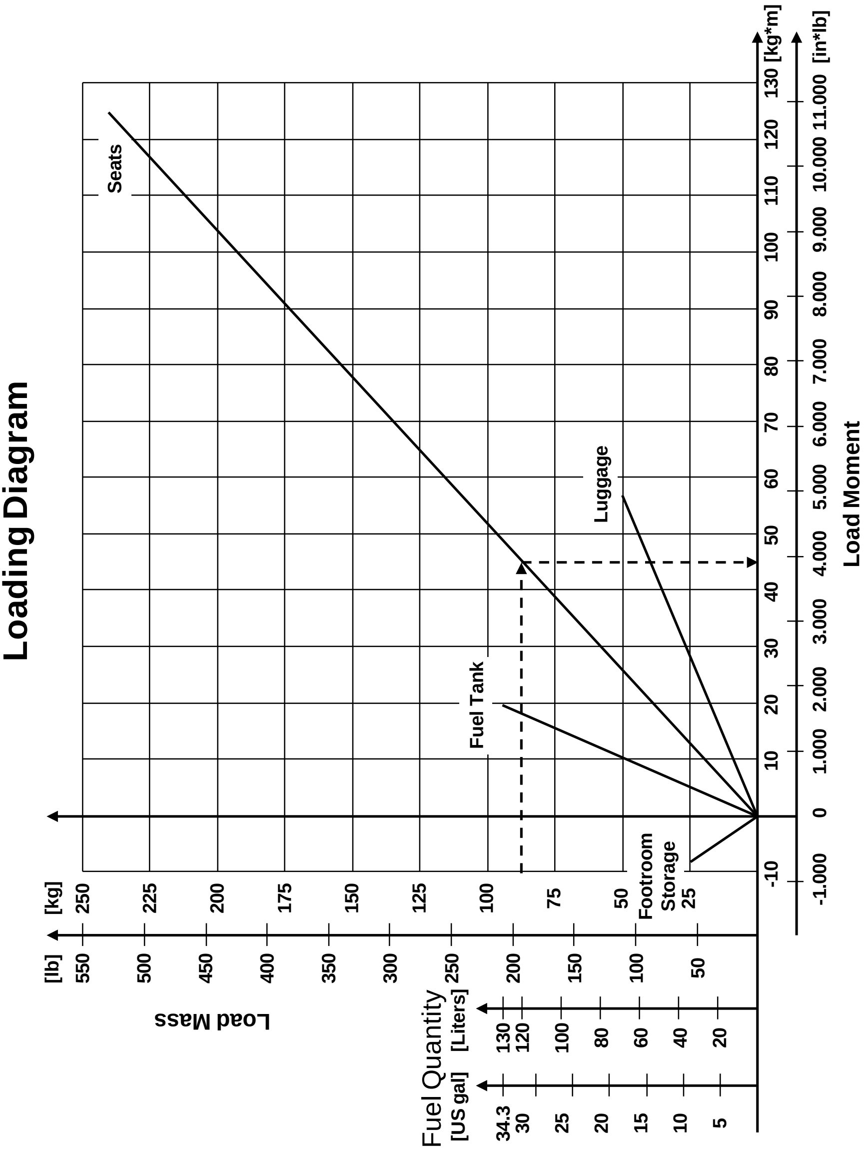
The following chart "*Loading Diagram*" provides you with a graphical method to determine the mass moments of the individual positions. To obtain the value, select the correct weight (or volume) on the vertical axis. Go horizontally to the intersection with the correct loading graph. Go vertically down to the horizontal axis to obtain the mass moment value. Enter this mass moment value to the correct line in the analysis table above.

The next chart "*Permissible Moment Range*" allows you to verify if your aircraft is within the allowable moment range. The allowable range is shaded in this chart. Six center of gravity positions are marked as lines.

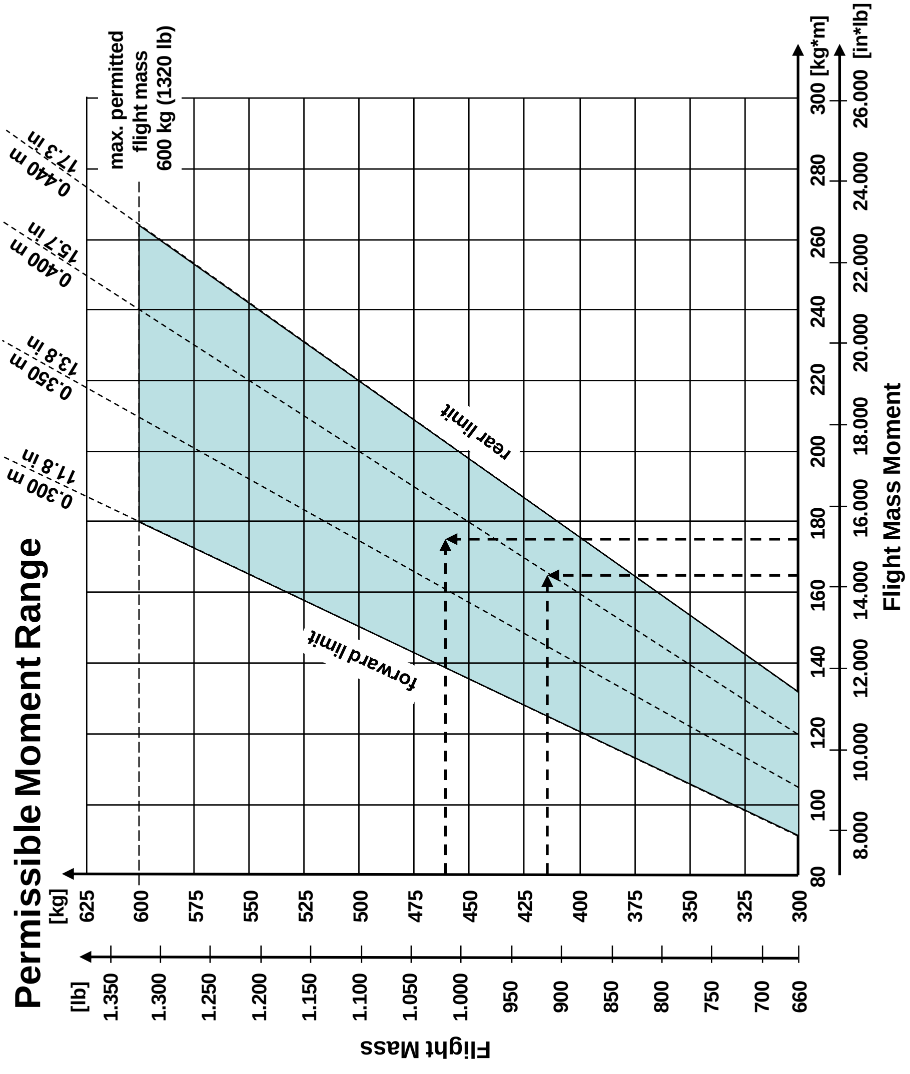
The third chart "*Permissible CG Range*" allows you to verify if your aircraft is within the allowable cg range. The allowable range is shaded in this chart. Forward and aft cg limit, as well as maximum permissible flight mass are marked as lines. This allows you to determine the actual center of gravity position you have achieved.

		CTLS example		Your CTLS	
		Mass [kg] *[lb]*	**Mass Moment [kg*m]** *[in*lb]*	**Mass [kg]** *[lb]*	**Mass Moment [kg*m]** *[in*lb]*
1.	Empty mass & mass moment (from most recent, valid Weight and Balance Report)	318 *701*	107,1 9.318		
2.	Combined pilot and passenger mass on front seats Lever arm: 0,52 m (*20,5 in*)	85 *190*	44,2 *3.895*		
3.	Mass loaded to luggage compartment behind the cabin Lever arm: 1,140 m (*45 in*)	12 *25*	13,7 *1.125*		
4.	Mass loaded to luggage compartments in foot area in front of the seats Lever arm: -0,335 m (*-13,2 in*)	0 *0*	0 *0*		
5.	**Total mass & total mass moment with empty fuel tanks (total of 1. – 4.)**	**415** ***916***	**165** ***14.338***		
6.	**Center of gravity with empty fuel tanks (Mass Moment of 7. divided by Mass of 7.)**	**0,398 m** *15,6 in*		_________**m** _________*in*	
7.	Usable fuel as verified to be filled on the aircraft[1] Lever arm: 0,21 m (*8,3 in*)	43 *95*	9,0 *789*		
8.	**Total mass & total mass moment including fuel (5. plus 7.)**	**458** ***1.011***	**174** ***15.127***		
9.	**Center of gravity including fuel (Mass Moment of 8. divided by Mass of 8.)**	**0,380 m** *15,0 in*		_________**m** _________*in*	
10.	The results in lines 5. and 8. must be all within the certified limits as defined for this aircraft in Chapter 2.4. Mass moments can be checked in the mass moment chart below. The results in lines 6. and 9. must be both within the limits as defined for this aircraft in Chapter 2.4				

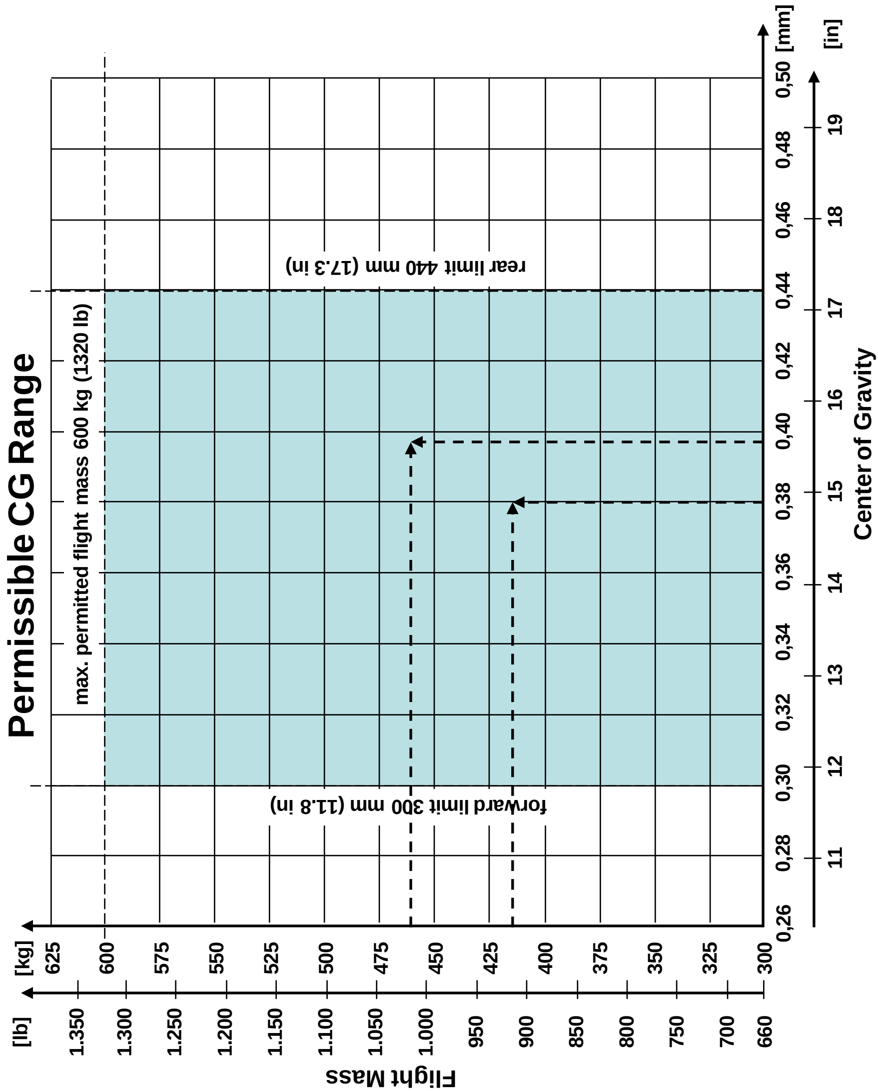
[1] One Liter of fuel weighs 0.725 kg – one U.S. gallon of fuel weighs 6.05 lb



The example shown in this diagram represents the determination of the mass moment value as by the example shown in the analysis table. The pilot mass of 85 kg (190 lb) is selected at the vertical axis. Intersection with the line „Seats“ leads to a mass moment of 44,2 kg*m (3895 in*lb).



The example shown in this diagram represents the verification of the mass and mass moment values achieved as by the example shown in the analysis table. The aircraft with no fuel is represented by the values 415 kg (916 lb) and 165 kg*m (14.338 in*lb). The aircraft takeoff fuel is represented by the values 458 kg (1.011 lb) and 174 kg*m (15.127 in*lb). Both values are within the allowed range. The two center of gravity positions can be determined as 0,380 m (15,0 in) and 0,398 m (15,6 in)



The example shown in this diagram represents the verification of the mass and cg position values achieved as by the example shown in the analysis table. The aircraft with no fuel is represented by the values 415 kg (916 lb) and 380 mm (15,0 in). The aircraft takeoff fuel is represented by the values 458 kg (1.011 lb) and 0,398 m (15.6 in). Both values are within the allowed range.

6.4. Equipment List

Each aircraft is delivered with an equipment list that shows the installed equipment. An example of this equipment list is shown as follows.

Equipment List for LSA Aircraft

FLIGHT DESIGN

Type	CT	Prod. Number	*XX-XX-XX*
Model	CTLS	Date	*xx.Xxx.xx*

Item	*Type*	*Manufacturer*	*Location*	*Weight*	*Installed*
1. Minimum Equipment					
Airspeed indicator	16-211-161	U.M.A., INC	-6,0 in	0,44 lb	X
Altimeter	5-410-20	U.M.A., INC	-6,2 in	0,48 lb	X
Compass	MCPN-2L	Falcon Gauge	3,1 in	0,77 lb	X
Rescue System	BRS-6 1350 HS	BRS	53,9 in	32,82 lb	X
Battery	SBS 8	Hawker	-24,0 in	1,78 lb	X
Propeller 3 blade fixed pitch	CR3-65-47-101,6"	Neuform	-49,6 in	13,59 lb	X
2. Additional Equipment					
EFIS	EFIS-D100	Dynon Avionics INC.	-7,1 in	5,84 lb	X
EMS	EMS-D120	Dynon Avionics INC.	-8,7 in	6,94 lb	X
Engine Hour Counter	85094	Hobbs	-3,9 in	0,20 lb	X
3. Additional Equipment Avionic					
Radio	SL 40	Garmin	-9,1 in	5,86 lb	X
Transponder	GTX330	Garmin	-8,9 in	6,39 lb	X
GPS	GPSMAP496	Garmin	-4,4 in	3,30 lb	X
ELT	AK-450	AMERI-King Co	57,1 in	4,41 lb	X
Intercom	PM 3000A	PS Engineering	-5,8 in	1,87 lb	X
4. Optional Equipment					
Oil and Water Thermostat	-	Flight Design	-33,3 in	3,68 lb	X
Towing Hook	E 22	Tost			
Towing Mirror System	-	Flight Design			
Autopilot 1 Axis	CT Pilot 1-Axis	Trutrak			
Autopilot 2 / 3 Axis	CT Pilot 2/3- Axis	Trutrak	15,4 in	8,00 lb	X
Strobe / Position Light	EPL / AOL / ERB	Thiesen	104,7 in	1,41 lb	X
Landing Light	-	Flight Design	-43,3 in	0,59 lb	X
Landing Light LED	ELL	Thiesen			
Tundra Wheels					
Sport Seat Leather and cushion	-	Flight Design	27,0 in	6,39 lb	X
Sun Visors		Flight Design	3,5 in	1,39 lb	X
Fire Extinguisher			27,6 in	1,10 lb	X
Main Wheel Fairings	-	Flight Design	24,6 in	3,57 lb	X
Nose Wheel Fairing	-	Flight Design	-33,9 in	2,29 lb	X
5. Misc. Equipment					
	Total Weight All Equipment		8,7 in	161,64 lb	

Signature *City* *Date*

The valid equipment list must be kept as part of the aircraft documentation. Every time when there is a update to the installed equipment, a new equipment list must be compiled and added to the aircraft documentation. The owner of the aircraft is responsible for ensuring that the equipment list is current and has a corresponding mass and balance report.

All equipment that is approved for installation in the CTLS-LSA is shown in the equipment list below. Additional equipment may be permitted on the basis of Supplements to this POH. Be aware that the equipment listed below cannot be installed in any arbitrary combination. When changing the installed equipment, this may only be done in accordance with manufacturer instructions.

Description	***Type / part No.***	***Manufacturer***
Analog airspeed indicator	6 FMS 4	Winter
Analog three pointer altimeter	4 FGH 10	Winter
Slip indicator, 58 mm	Gr 1	Winter
Vertical speed indicator, 58 mm	5 STVM 5	Winter
COM radio	SL40	Garmin
Transponder mode C	GTX 327	Garmin
Transponder mode S	GTX 328	Garmin
Transponder mode S	GTX330	Garmin
Altitude encoder	A-30	ACK Technologies
Analog tachometer	19-519-211	UMA
Analog cyl. head temperature gauge °C	N12116V150C010	UMA
Analog cyl. head temperature gauge F	N12116V300F020	UMA
Analog voltmeter	N141100917V060	UMA
Analog oil temperature gauge °C	N12113V150C020	UMA
Analog oil temperature gauge F	N12113V300F0A0	UMA
Analog oil pressure gauge bar	N04113V010B010	UMA
Analog oil pressure gauge PSI	N04113V130P070	UMA
Hobbs hour meter	85094	Honeywell
Magnetic compass	C-2300-L4-B	Airpath
Intercom	PM 3000	PS Engineering
406 MHz ELT unit	ME 406	Artex
406 MHz ELT unit	AF 406 Compact	Kannad
Lead-gel battery, 7 Ah	SBS 8	Hawker
Lead-gel battery, 15 Ah	SBS 15	Hawker
GPS Receiver	AERA 500	Garmin
GPS Receiver with XM capability	AERA 510	Garmin
GPS Receiver	GPSMAP 695	Garmin
GPS Receiver with XM capability	GPSMAP 696	Garmin

7. DESCRIPTION OF AIRPLANE AND SYSTEMS

7.1. General

This section provides the general descriptions of the aircraft airframe and systems.

This section does not provide any maintenance information, and may not be used as maintenance input. The purpose is to provide an understanding for the way the systems are installed and operate. When maintenance information is needed, this is fully provided by the Aircraft Maintenance Manual.

7.2. Airframe

The airframe is made of high-quality composite materials which permit production of an optimized and smooth shape with excellent aerodynamic characteristics at an efficient structural weight.

All outside surfaces are weather protected with high performance 2-component PUR paint, that is typically used by the car industry. Interior surfaces are protected with a high quality and robust 2-component interior paint system.

The airframe consists of three major components. These are the fuselage (including vertical tail and cowlings), the wings (two pieces, connected by two main bolts in the fuselage area) and the horizontal tail. Even if assembly and disassembly of the aircraft is not complex, this may be only be done by qualified personnel.

Due to the complex nature of composite materials and the necessary knowledge in the lay-up of a specific structure, repair work on the composite airframe may only be undertaken by a qualified facility. Should the aircraft structure be damaged, detailed information must be requested from the manufacturer.

7.3. Flight Controls

7.3.1. Dual controls

The aircraft has dual controls, thus allowing operation from both seats. The dual controls cannot be separated.

Even when the aircraft can be fully operated from both seats, the pilot in command is defined on the left hand seat. The arrangement of the instruments and operating devices is primarily optimized for this seat. Thanks to the dual controls, the aircraft is well equipped for training and instruction. In this case, the instructor sits on the right hand seat.

7.3.2. Rudder and Nose Wheel Steering

The rudder is activated via control cables which are housed in a plastic sleeve in the tunnel and along the tail boom.

The left and right foot pedals are coupled through the tunnel. The turnbuckle units to tension the cables and the connection to the nose wheel steering are in the front section of the tunnel.

A spring loaded centering device is located in the tunnel. This device helps to center the rudder pedals in flight, and holds the pedals in neutral position. A minimum force is required to move the pedals from their center position.

The nose wheel steering is coupled fix to the rudder pedals, using two pushrods. This allows direct and precise steering when taxiing the aircraft. Nose wheel adjustment is not affected by the rudder trim.

7.3.3. Stabilator

The CTLS-LSA has a drag-optimized Stabilator (all-moving) with an anti servo tab. It is attached to a fuselage-mounted Stabilator pivot. An individually matched counter-weight, attached to the Stabilator pivot inside the fuselage, ensures full mass-balance.

The anti servo tab on the trailing edge of the horizontal tail covers 75% of the Stabilator span. It is aerodynamically optimally attached to the fin with an elastic composite membrane. It is activated through a mechanical coupling when the stabilizer is deflected. In this way the anti servo tab deflects in the same direction and further as the Stabilator, thus improving Stabilator effectiveness and ensuring a proper control force feeling.

The Stabilator is activated with a special push-pull cable that runs through the tunnel and along the fuselage floor. This push-pull cable aligns itself to the fuselage and is maintenance-free.

7.3.3.1. *Stabilator Trim*

Stabilator trim is adjusted with the trim wheel in the center console, next to the throttle. The trim indicator is located directly next to the trim wheel. The aircraft becomes nose heavy when the wheel is rotated forward and tail heavy when it is turned backward.

The trim wheel activates a threaded spindle at the Stabilator pivot bearing via a Bowden cable. This spindle is self-locking and adjusts the zero position of the anti servo tab. Since the anti servo tab has a large span, the required deflection is not very big.

Fig. 7-1

- **Note:** By the nature of the anti servo tab mechanism, the maximum available authority of the elevator depends from the trim setting. This has no noticeable effect in cruise flight, but might show effect at low speed, especially during flare.

7.3.4. Ailerons

The ailerons are activated via push rods which run from the control stick through the tunnel to the mixer in the baggage compartment behind the main frame. In the mixer, at the upper end of the main bulkhead, the aileron input is coupled with the flap setting. When flaps are extended, the ailerons follow the flaps to a certain amount.

Fig. 7-2 shows the aileron control system (yellow) in the fuselage, with mixer and with connection to the wings.

The aileron controls have return springs which ensure a harmonic control feel also at slow speeds. These springs are installed between rear side of the main bulkhead and aileron control system.

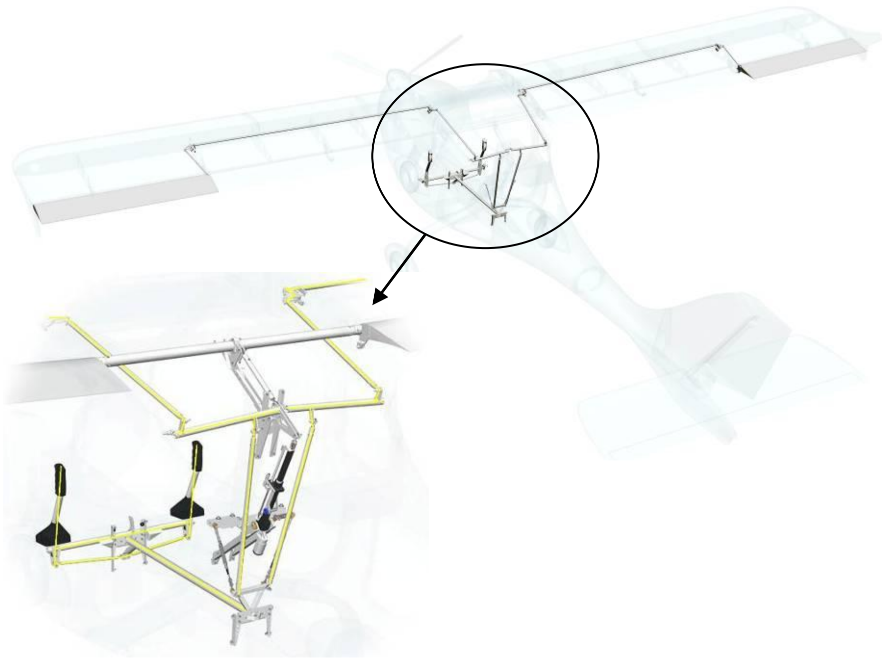


Fig. 7-2

7.3.4.1. *Aileron Trim*

Aileron trim is activated by a trim wheel in the middle of the tunnel between the pilot and co-pilot. By turning the trim wheel to the right, the aircraft will bank to the right - by turning it to the left, the aircraft will bank to the left. The aileron trim system takes influence to the return springs in the aileron control system by changing the pretension of one of the springs. Due to trim kinematics, it is usual that trimming in one direction requires a bit more control force than in the other direction.

7.3.5. Flaps

The flaps are driven by a geared and self-locking electric motor and are activated from the flap control unit in the lower section of the instrument panel. The desired flap setting is selected with a lever switch. The position indicator will flash as long as the flaps are moving to the desired setting. Once the desired setting has been reached, the position will be permanently shown in the display. The flaps may be set at any of the following positions:

- -6° – flaps negative for fast cruise flight
- 0° – flaps retracted for moderate cruise and takeoff long runways
- 15° – flaps extended first position for takeoff on short runways) or Regular Landing
- 30° – flaps extended full position for short field landing

Fig. 7-3 shows the flap drive installed to the fuselage.

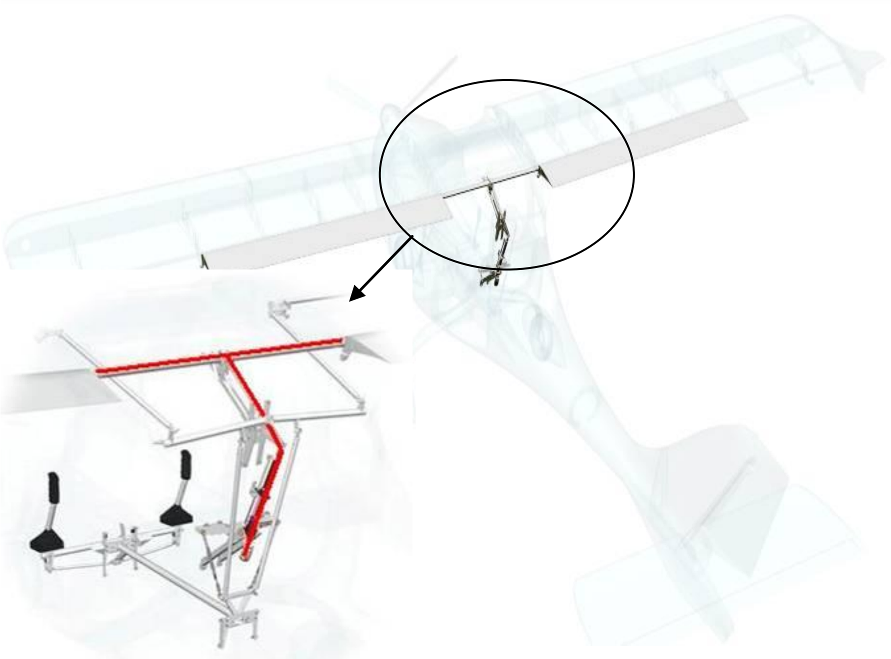


Fig. 7-3

The flap motor moves a rocker that is installed behind the main bulkhead. This rocker moves a pushrod that is placed under the rear cabin roof. Another rocker connects to torsion tubes that drive the flaps. This way the flaps are physically interconnected, left side to right side. This ensures that flaps always move symmetrically.

▲**Warning:** An individual maximum airspeed is defined for each wing flap setting. The pilot must observe these to ensure that the aircraft and the flight controls are not over-stressed.

The flap control system has an internal load-limiting device which prevents the extension of the flaps at too high airspeeds without causing sustainable damage to the structure. Should the indicator blink constantly when extending the flaps, airspeed should be reduced. If the flaps then extend, the internal load-limiting device was in operation.

The flap control circuit breaker is located directly next to the flap controls. It will pop if the flap servo is continuously over-loaded. As it is a thermal circuit breaker, it can take some time before it can be pushed back in.

7.4. Instrument Console

The instrument console for the CTLS-LSA has four panel sections - upper left, upper center, upper right and lower. The flight instruments are located in the three upper panels.

This POH provides description for the standard instrument console and the standard instrumentation. Information about standard avionic equipment is provided in section 7.13. Information about optional equipment, its operation and enhanced consoles is provided in the appropriate supplements to this POH. The relevant supplements are provided with an aircraft when the option is installed to an aircraft.

Graphic representations of panels and equipment are exemplary. Depending on the individual aircraft situation, the detail arrangement of equipment and labeling or the look of individual systems may vary, without changing the functional and operational sense.

7.4.1. Upper Panel Area

The upper panel area holds the main flight and engine monitoring instruments and the avionic equipment. Fig. 7-4 shows the typical arrangement.

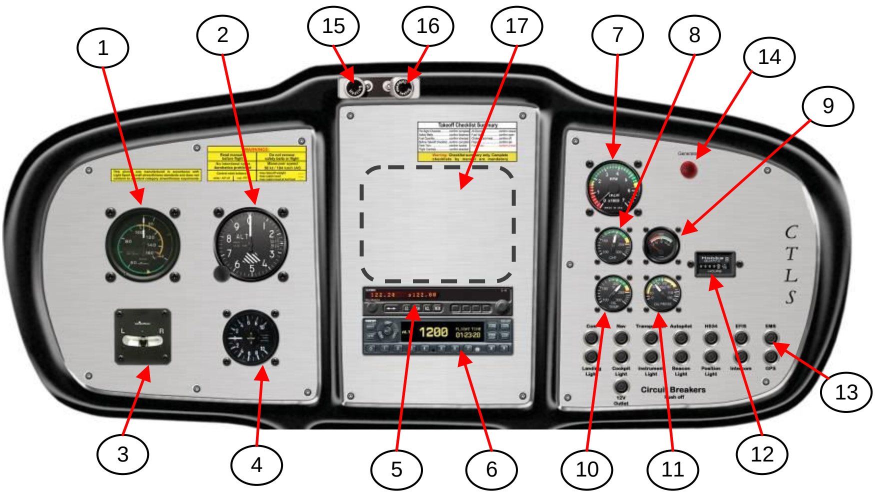


Fig. 7-4
Upper panel with analog instrumentation and basic ATC equipment – example view.

Pos.	Manufacturer	Type	Description
1	Winter	6 FMS 4	Analog airspeed indicator 3.25 in, km/h or kt
2	Winter	4 FGH 10	Analog three pointer altimeter, 80 mm
3	Winter	Gr 1	Slip indicator, 58 mm
4	Winter	5 STVM 5	Vertical speed indicator, 58 mm
5	Garmin	SL40	COM radio
6	Garmin	GTX 327; GTX 328; or GTX330	Transponder mode C; Transponder mode S (low power); Transponder mode S (high power)
n/a	ACK Technologies	A-30	Altitude encoder; installed inside console
7	UMA	19-519-211	Analog tachometer 2.25 in
8	UMA	N12116V150C010 or N12116V300F020	Analog cylinder head temperature gauge 32 mm; units °C … units F
9	UMA	N141100917V060	Analog voltmeter 32 mm
10	UMA	N12113V150C020 or N12113V300F0A0	Analog oil temperature gauge 32 mm, units °C … units F
11	UMA	N04113V010B010 or N04113V130P070	Analog oil pressure gauge 32 mm, units bar … units PSI
12	Honeywell	85094	Hobbs hour meter
13	n/a	n/a	Circuit breaker area
14	n/a	n/a	Warning lights engine & generator
15	n/a	n/a	Cabin heat control (round)
16	n/a	n/a	Carburetor heat control (rectangular)
17	n/a	n/a	Location for radio stack enhancements and GPS installation
n/a[1]	Airpath	C-2300-L4-B	Magnetic compass with deviation table with lighting

7.4.1.1. Circuit Breakers

All circuit breakers – except the master breakers and the circuit breaker for the flap controller (all located in the lower center panel) are located in the lower part of the upper right panel. Breakers are installed depending from the actual installed aircraft equipment. The breaker panel layout always foresees full breaker positions. Fig. 7-5 shows the order of the circuit breakers.

[1] Installed to the tube in the upper cockpit area above instrument console; not shown in Fig. 7-4.

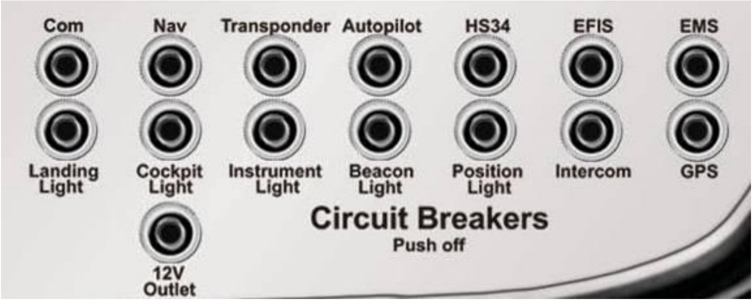


Fig. 7-5

Circuit breaker panel – example view

When a circuit breaker pops, the knob shows out of the panel and the white ring gets visible. Top reset the breaker, push the knob in. A breaker can be manually disengaged also by pushing the knob. This allows to selectively switch off one electric circuit.

7.4.2. Lower Panel Area

The equipment in the lower panel is installed as shown in Fig. 7-6. The positions identified in the figure are as follows:

Pos.	*Manufacturer*	*Type*	*Description*
1	n/a	n/a	Ignition key switch, operates starter and ignition circuits
2	n/a	n/a	Fuel valve; move up to open, move down to close. Closed when lever in red area.
3	n/a	n/a	12V power connector
4	n/a	n/a	Avionic master switch; allows disconnect of Avionic equipment
5	n/a	n/a	Individual switches for (left to right): beacon light, position light, intercom, cockpit light, landing light (switches active when respective equipment installed)
6	PS Engineering	PM 3000	Intercom
7	n/a	n/a	Two-way switch to select between XM music (when XM GPS installed, XM music gets audible over the Intercom) and Aux music input. To fast mute music, switch to the channel that has no active input
8	n/a	n/a	Aux music input (MP3 player or similar)
9	Flight Design	n/a	Flap position selector display. Flashes when selected position not yet reached; shows flap position permanent when position is reached

Pos.	***Manufacturer***	***Type***	***Description***
10	n/a	n/a	Circuit breaker for the flap controller
11	Artex Kannad	ME 406 AF 406 Compact	ELT 406 MHz ELT 406 MHz. In both cases remote control installed to lower panel; ELT unit installed to luggage compartment.
12	Flight Design	n/a	Flap selector switch. Switch to desired flap position.
13	n/a	n/a	Generator master breaker/switch combination. Push to engage , pull to disengage.
14	n/a	n/a	Bat master breaker/switch combination. Pull to disengage, push to engage. When pulled, power is disconnected from aircraft equipment; does not stop a running engine.
15	n/a	n/a	Brightness of instrument lights. Rotate clockwise to make brighter, counter-clockwise to reduce brightness. Active only when instrument lights installed
16	n/a	n/a	Backup headset connectors. Can be used by pilot in case of intercom failure

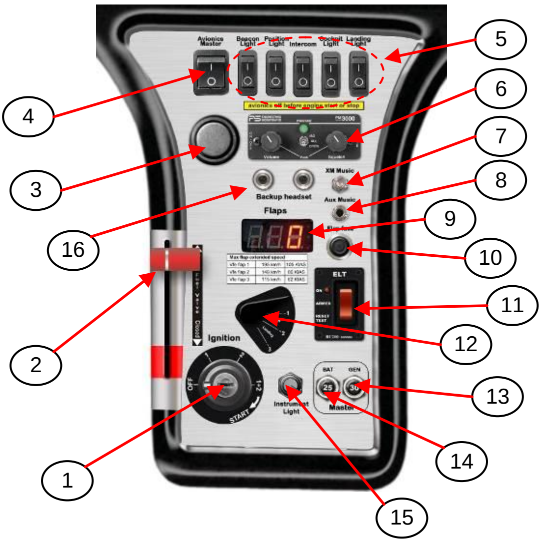


Fig. 7-6
Lower center panel – example view

7.4.3. Throttle Quadrant

The throttle quadrant is located in the center pedestal, just behind the lower instrument panel. It can be easily operated from both seats, although it is primarily designed to be operated from the left seat, by the pilot-in-command.

The positions identified in the Fig. 7-7 are as follows:

Pos.	***Description***
1	Pitch trim control wheel. Move forward to trim nose heavy; backward to trim tail heavy.
2	Pitch trim indication. Indicator moves forward when trimmed nose heavy, backward when trimmed tail heavy.
3	Choke lever. Pull to engage choke, push to disengage. Choke has no effect when throttle is above idle.
4	Throttle lever (blue handle). Pull to idle, push to increase. Throttle lever has a non-adjustable friction brake.
5	Brake lever. Acts simultaneously on both main wheels. Pull to brake, let go to release brake.
6	Parking brake valve. Move to rear position (as on the figure) to set. Brake lever can be held in pulled position when closing the valve, or close valve first and then pull brake lever. Move forward to release.

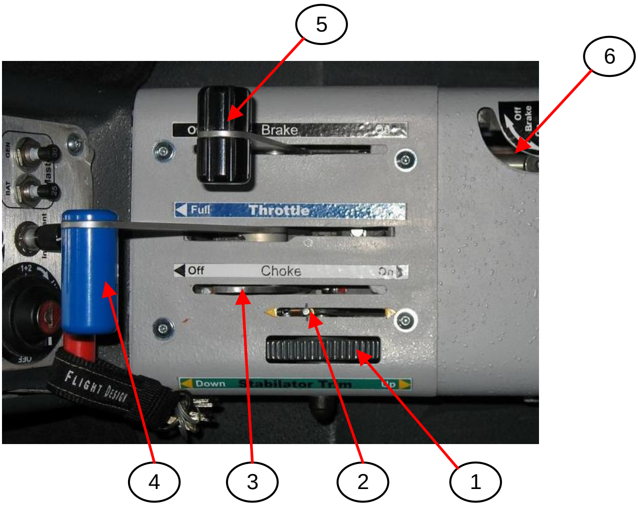


Fig. 7-7
Throttle quadrant – example view

7.5. Landing Gear

The CTLS-LSA is equipped with a tricycle landing gear.

7.5.1. Main Landing Gear

The main landing gear of the CTLS-LSA consists of two individual gear struts, two main wheels with brakes, wheel fairings and gear leg fairings.

The main gear struts are made of composite materials. The gear struts form a cantilever spring with excellent damping characteristic. The struts are mounted in a load bearing attachment in the fuselage. This attachment is located in the fuselage main bulkhead area and allows perfect load introduction to the fuselage structure. The struts are fixed with two bolts at the upper ends. A clamp cushioned with a thin layer of rubber at the fuselage pass-through supports the gear leg.

The interface between main gear strut and fuselage is covered with a composite fairing to ensure good aerodynamic efficiency.

At the lower end of each landing gear strut there is a stub axle to which the main wheels and the brakes are attached. The main wheels have removable fairings.

The main wheel assemblies are covered with composite wheel fairings to ensure good aerodynamic efficiency.

7.5.2. Nose Landing Gear

The nose landing gear is attached to the lower section of the big engine mount with bearings, to allow steering. The nose gear strut is designed as telescope with integral urethane spring elements. The excellent damping characteristic of the spring elements ensures smooth touch-down with very low tendency for porpoising.

The nose landing gear is steered via control rods which are attached directly to the pedals.

The nose gear has an aerodynamically optimized composite fairing.

The CTLS-LSA aircraft is equipped with an interface for a hand operated tow bar. There are two protruding pins attached to the nose gear leg. The tow bar is attached to these pins. The tow bar attachment size fits to one of the most common tow bars, that also fits most Cessna aircraft models.

Fig. 7-8

7.5.3. Brake System

The main wheels of the CTLS-LSA have hydraulic disc brakes. They are operated with the brake lever that is located in the throttle quadrant. Braking is only possible symmetric on both wheels. As the aircraft has a steerable nose wheel, this ensures easy handling.

The brake lines are reinforced with fiber cloth and connections are crimped tightly on to the lines, thus ensuring high line rigidity and stability at a low installed weight. This results in a very good brake efficiency.

The brakes can be locked in parking position by blocking the backflow line. The locking lever is in the middle console in the cockpit, directly behind the brake lever. It is possible to set the locking lever to the parking position, and then apply brake force to the brake lever. This makes one-hand operation of the parking brake easy.

▲Warning: When parking the aircraft for a longer time, always apply chocks in addition to the parking brake. Variations in temperature can be a sufficient reason to lose brake pressure and therefore the brake force.

7.6. Seats and Safety Harnesses

The cabin is equipped with two adjustable seats. Each seat consists of a composite seat shell, Polyurethane foam upholstery and a seat cover. The seat is attached to the fuselage to seat rails by a bracket at the forward end of the seat, and with a strap to the main bulkhead at the rear side of the seat.

To adjust the seat in length, pull on the cable between the front attachment brackets of the seat. This will disengage two pins, one in each bracket. The seat can be moved along the seat rail. Release the cable to re-engage the locking pins. Make sure that the seat locks to the same position at both brackets.

To adjust the inclination of the seat, tighten or release the strap behind the seat.

▲Warning: Always make sure that there is clearance between the lower seat shape and the rear cabin floor section. Consider that there is a minimal, but existing elasticity in the rear strap that will allow the seat to settle when you sit in it. Contact between seat and fuselage in flight can lead to seat damage.

▲Warning: Make sure that the buckle of the rear seat strap is always engaged in the correct direction. When engaged wrong, the seat will slide down under load. This will be noticed immediately when entering the seat, so you will notice it. But it can lead to damages of the seat.

Seats are available with fabric cover and with leather cover. When leather covers are installed, the upholstery is done by cast-in-shape foam segments, providing improved comfort. When leather covers are installed, the seat is also equipped with inflatable cushions under the padding. The cushions are inflated simultaneously with a small hand pump that is located between seat and center tunnel of the fuselage. The cushions are adjusted by pushing the corresponding valve for the cushion at the end of the hand pump

7.7. Baggage Compartments

The aircraft offers three different locations where baggage can be stowed:

- The baggage compartment behind the main bulkhead (not accessible in flight)
- a hat or jacket rack at the main bulkhead, just behind the seats (accessible in flight)
- a storage box in the floor in front of the seats (accessible in flight).

▲**Warning:** Baggage must be carefully stored in all of the compartments. Even in apparently calm weather, turbulence can occur at any time. Baggage poses a great danger as it can slip in such a way as to adversely affect or even block the controls. Loose objects flying around in the cockpit can injure the pilot and/or passengers. Displaced baggage can also adversely affect the center of gravity of the aircraft, making it no longer controllable.

The baggage compartment in the fuselage behind the main bulkhead has a maximum payload of 25 kg (55 lb) on each side. Inside each of the compartments, tie-points are provided at the lower fuselage skin. Always use these tie-points to secure the baggage with adequate straps (not delivered with the aircraft).

The hat rack offers storage space for small and flat objects only. The size of the object may not exceed 250×250×85 mm (10×10×4 inches) nor weigh more than 2.5 kg (5 lb). This storage space may only be used if the baggage net is in place. The net can be removed to facilitate loading. It must be hung back on all three hooks when loading has been completed.

The storage compartment in the floor in front of the seats is for small, light objects only, as for example snacks, water bottle, light tools or the fuel dipstick. A hinged cover allows access to this compartment. The cover must be closed during flight.

▲**Warning:** The pilot is responsible for ensuring that any baggage has been properly stored before take-off.

7.8. Cabin

7.8.1. Glazing

All windows are made from contoured acrylic glass (known as Perspex® or Plexiglass®). The windows are glues to the composite structure, to allow a smooth aerodynamic shape.

The windows in both doors are equipped with sliding windows. The sliding windows can be opened to provide visibility in the extreme unlikely case when the windows get fogged.

The sliding windows are equipped with a small flap that can be opened. When open, the flap scoops fresh air into the cockpit.

7.8.2. Doors

The doors are built with composite material. They are hinged at the top and open like gull wing-doors. Gas springs are installed that hold the doors in the open position.

The doors are locked with three pins to the fuselage cut-out. The locking mechanism is operated with a lever at the lower rim of the window. When pushed forward, the door is locked. When pulled back, the door is opened.

7.8.3. Cabin Interior

The cabin interior is designed for comfort and functionality. The instrument console is designed to not obstruct the visibility of the pilot. The console surface is painted in a dark matte surface that avoids reflections in the windows. Cabin interior is painted with a robust 2k interior paint.

Two map pockets are installed below the instrument console. Only use these pockets for maps or similar equipment. The equipment cannot be locked here.

Fabric pockets are installed to both doors. A rubber band at the upper opening keeps these pockets closed. Use these pockets for light weight and soft items, as you might need them in flight.

A pen tray is installed to the center console, between throttle quadrant and aileron / rudder trim wheels.

7.8.4. Cabin Ventilation; Cabin Heat

Fresh air is provided to the cabin through the side sliding windows and small fresh air scoops that can be opened.

Heated air is provided to the cabin through specific warm air nozzles. The warm air is generated in a shroud that guides fresh air from the intake at the middle of the lower cowling around the exhaust muffler. A cabin heat valve allows to regulate the amount of warm air that is guided into the cabin. Within the cabin the warm air is distributed between two openings (one per side) at the side of the main tunnel, next to the pilot and copilot feet, and to slots in the upper instrument console, right at the lower rim of the windscreen.

To improve the heating capability in severe winter operation it is recommended to cover the cabin openings in the root rib area with self-gluing clear plastic film. Only use clear plastic film, so that the daily inspections can be conducted as required.

7.8.5. Emergency Equipment

On the rear side of each right hand seat you find a pocket that holds a fire extinguishing spray. It is the duty of the owner/operator to ensure that the limited life of this spray is considered, and the spray renewed on time.

Every CTLS-LSA aircraft is equipped with a Carbon Monoxide (CO) Detector. The detector is installed with adhesive tape to the left forward root rib area inside the cabin.

These CO detectors have a limited lifetime when taken from the protective bag for installation. The date of installation and opening must be marked clearly visible on the detector. The owner/operator is responsible to replace it when due. There are several comparable CO detectors available on the market. It is the duty of the owner/operator to ensure, that the selected is suitable for the use on the aircraft.

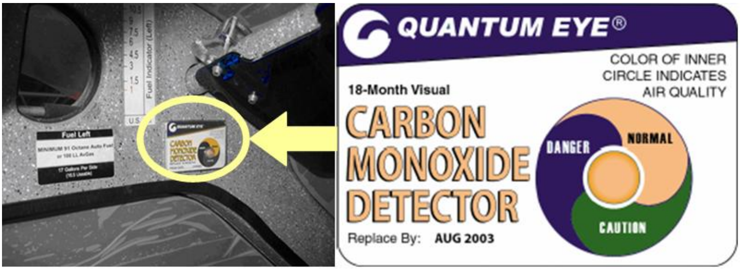


Fig. 7-9

7.9. Power Plant

The following sections provide information on all components of the powerplant. More detailed information on the engine can be obtained in the applicable engine manuals, provided by the engine manufacturer for the type certified engine. In case of conflict, the engine manufacturer manuals prevail, unless it is for an aircraft specific installation detail.

7.9.1. Engine

The engine of the CTLS-LSA is a standard ROTAX® 912 ULS or S engine. It is a horizontally opposed, four cylinder, four stroke engine with central camshaft pushrod driven overhead valves, liquid-cooled cylinder heads and a dry sump, pump-fed lubrication system. The propeller is attached to the engine by an integrated gearbox (2.43 : 1 reduction) with a mechanical vibration damper. It is also equipped with a constant pressure carburetor. The engine has an electric starter and a capacitive discharge (CDI) dual electronic ignition.

The engine is equipped with a friction clutch and thermostats for the oil and water-cooling systems.

Air is fed into the engine from a NACA inlet at the left side of the lower cowling, through a cylindrical air filter installed in the filter box at the firewall and through an aluminum air box which fills both carburetors with adequate air amount.

When the carburetor heat is on, air flow into the aluminum air box changes from fresh air to heated air. The heated air comes from the same exhaust shroud as supplies the cabin heating system. Air for this shroud is supplied from an inlet in the front underside of the lower cowling. As the air flow for heated air is completely separate from the regular air intake, preheated air provides a fully redundant air supply up to the air box.

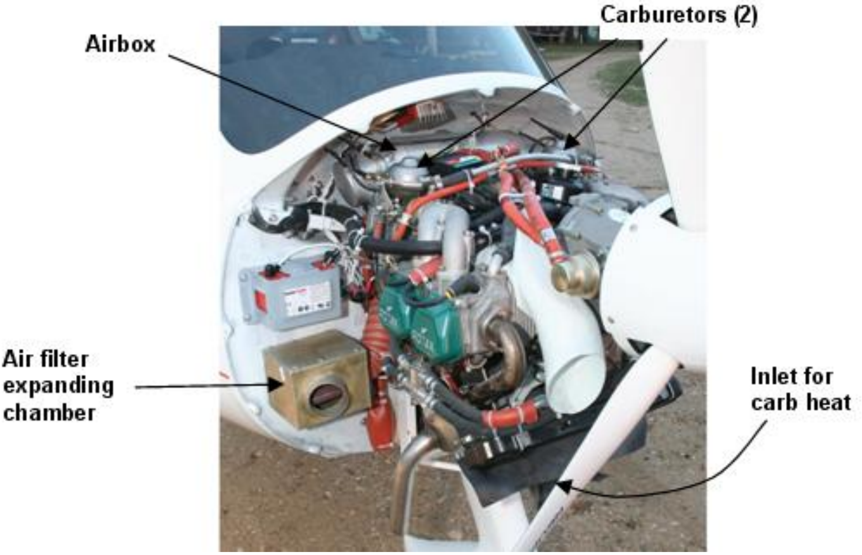


Fig. 7-10

7.9.2. Engine Controls

In flight the engine is operated with a single throttle lever. The throttle lever is located at the throttle quadrant on the center pedestal.

There is no mixture control.

Carburetor heat is operated by a knob on the top rim, of the instrument console. There are two knobs, the right one, rectangular shaped knob controls the carburetor heat. When pulled, carburetor heat is on. When pushed, carburetor heat is off. When on, the Carburetor heat system feeds the engine with preheated air from the heat shroud around the exhaust muffler. As side effect this will enrich the mixture, and reduce the available engine power. Even when carburetor heat is sufficient to remove a starting buildup of ice in the engine intake channels, it is recommended to activate carburetor heat from time to time in situations where carburetor icing can be possible, or when descending with reduced power. Make sure that carburetor heat is off when you need full power, for example during aborted landing.

A choke is available to enrich the engine for easier starting at cold weather. The choke lever is located directly next to the throttle. When pulled, choke is on. When pushed, choke is off. Be aware that the choke has effect only when the throttle is closed. As soon as you open the throttle, the choke has no more effect. To make a cold start you must keep throttle closed.

7.9.3. Engine Instruments

Engine instrumentation is provided by analog gauges installed to the upper right instrument panel. Refer to chapter 7.4.1.

Engine speed is displayed in engine RPM. Propeller speed is significantly lower due to the propeller gearbox that is part of the engine.

It must be noted that the coolant temperature is monitored by the cylinder head temperature of the most critical cylinder.

7.9.4. Propeller

The CTLS-LSA is equipped with a composite ground adjustable propeller. The following propeller is used on the CTLS-LSA:

Neuform	CR3-65-47-101.6, 3 blade composite propeller, adjustable

The ground adjustable propeller Neuform is factory-set to prevent over-revving the engine during take-off, climb and level flight. Full throttle static engine speed on the ground will be roughly 5000+/-50 rpm. This pre-setting makes the monitoring of the correct propeller speed in flight very simple for the pilot. 5000 rpm will remain mostly constant during takeoff and initial climb. 5500 rpm are reached during level flight with full throttle, corresponding to maximum continuous engine speed.

7.10. Fuel System

A fuel tank with a capacity of 65 l (17.2 US.gal) is integrated into each wing. The fuel tanks are each divided into two sections by an anti-sloshing rib. Fuel is filled into the outer section via a fuel filler opening on the upper side of each wing. To open the fuel filler cap, the lever in the cap must be raised and turned 90° anti-clockwise. The cap can then be removed. The cap is properly shut when the lever is pressed down into position.

▲Warning: The pilot must be certain during the preflight inspection that the fuel filler caps are properly shut. A missing cap leads to a massive loss of fuel in flight as the fuel is sucked out of the tank.

Fuel flows via a flapper valve into the inner section of the fuel tank inboard of the anti-sloshing rib. The flapper does not completely seal the inner tank. It does, however, greatly restrict the return flow of fuel into the outer chamber when one wing is low (sideslip). A sideslip can thus be undertaken even when low on fuel without risking immediate fuel starvation to the engine.

The tanks are vented via coupled tubes in the outer tank sections, the air coming from NACA inlets on the outer side of each of the upper winglets. The vent tube is led through the tank in a loop along the upper wing skin along the main spar. In this way, the risk of fuel escaping into the vent tubes should the aircraft be parked with a wing low is minimized. As the vent tubes left and right are coupled, equal pressure prevails in both tanks even when the winglets experience different flow conditions.

Each tank outlet has a coarse screen which can be removed via a maintenance plate in the root rib for visual inspection and cleaning.

Fuel is fed by gravity via two fuel lines in the A columns of the cockpit structure. They have a large volume so that even with virtually empty tanks, enough fuel is available in a sideslip to ensure engine power for landing. The two lines are connected to each other via a T-fitting. The fuel shutoff valve is located behind a second fuel filter and directly in front of the line through the fire wall.

The fuel flows from there into the gascolator which finally has a very fine filter. The gascolator is the lowest point in the fuel system and has a drain valve. The fuel system must be drained at this point before the first flight of the day and after filling up with fuel.

The engine driven fuel pump feeds fuel from the gascolator to the engine which then feeds the fuel to the carburetors. Excess fuel is pumped back to the gascolator.

The fuel system is presented schematically on the diagram (Fig. 7-11).

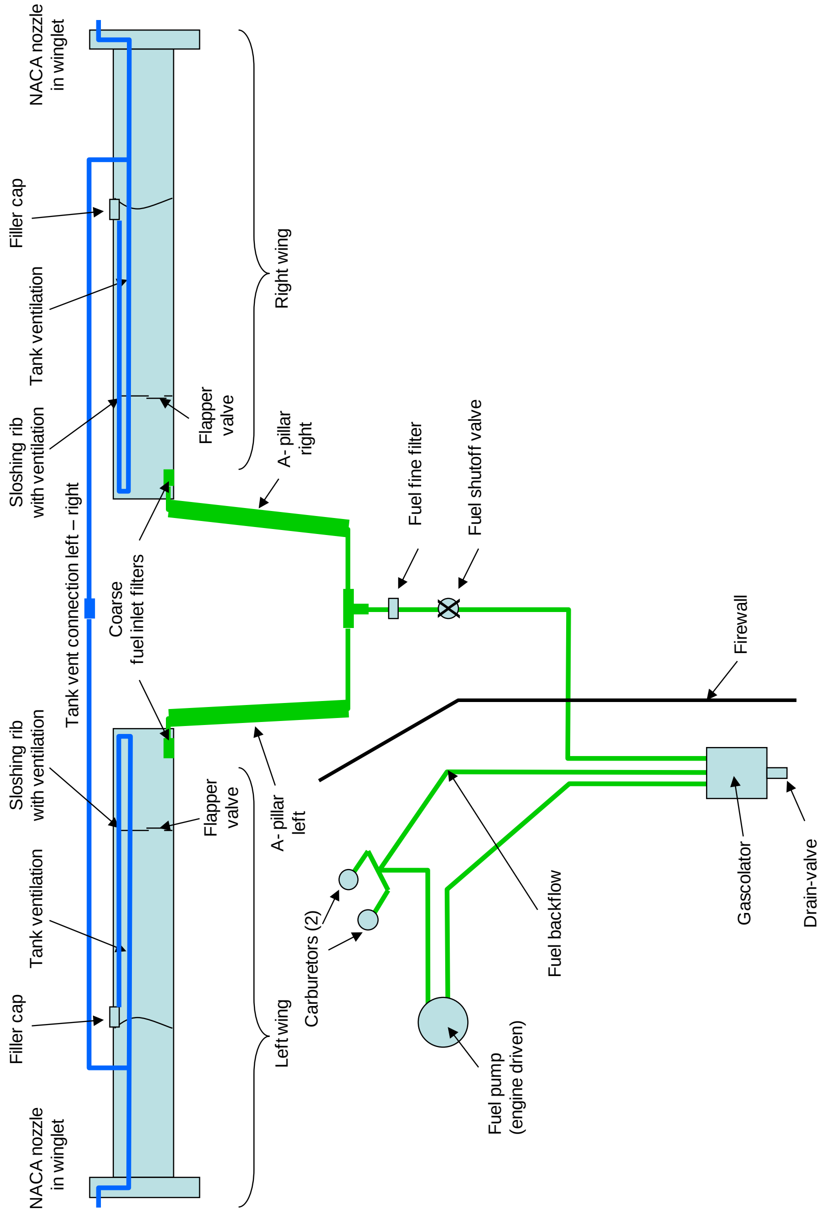


Fig. 7-11

Fuel level is shown in flight by two fuel quantity tubes installed to the wing root ribs and visible by the pilot in front of the wing main spar.

▲Warning: A correct indication on the fuel quantity tubes in the wing ribs is only possible when the wings are completely level.

▲Warning: The indication on the fuel quantity tubes in the wing root provides the only valid information on available fuel. Values provided by the EMS are calculated from fuel flow and not directly measured, and therefore only for convenience.

7.11. Electrical System

Even when not yet certified for night flight operation, the design of the electrical system is developed using the requirements provided by ASTM F2245 and applicable for LSA aircraft for night flight. Only high-quality wiring is used, the cross-sections and insulation meet applicable aviation requirements.

The electrical system is powered by a 12 V, 7 Ah lead-gel battery. A 15 Ah lead-gel battery is available as option. The battery is located at the engine side of the firewall. This battery has a high performance and needs specific charging procedure in case it gets fully discharged. If properly maintained it has a very long service life.

The battery is charged by the integrated generator of the Rotax engine. The AC generator, integrated to the rear crankcase of the engine, provides a maximum power of 250 Watt to an external rectifier-regulator. The rectifier-regulator is attached to the upper firewall on the engine side.

Power is distributed via a common power bus. The individual circuit breakers of the individual circuits are connected to the power bus. The breakers for the avionic equipment are connected to the power bus through the Avionic Master Switch. Power is then transferred to the electric loads using switches or dimmers where necessary.

All ground lines are connected to the battery via a ground bus. The avionics are grounded separately from the rest of the aircraft in order to avoid interference.

The master breaker function of the electric system is achieved by dual breaker-switches. The breakers are designed and qualified to be used as switches. This allows to reduce the amount of components in the system, and therefore reduces the possibility for system failures.

- **Note:** The warning light for “generator” will light when the “generator” breaker/switch is activated with engine off and the battery master breaker/switch off. This is due to the arrangement with the combined master breaker/switch function in the selected system layout. The warning light therefore also in this condition warns the pilot to check the breaker/switch position.

  Regardless of the warning light shining, equipment power is always off when the battery master breaker/switch is off.

The layout of the electrical system is shown with a simplified block diagram in the figure below. The block diagram (Fig. 7-12) illustrates the wiring layout and helps to explain the electric system function.

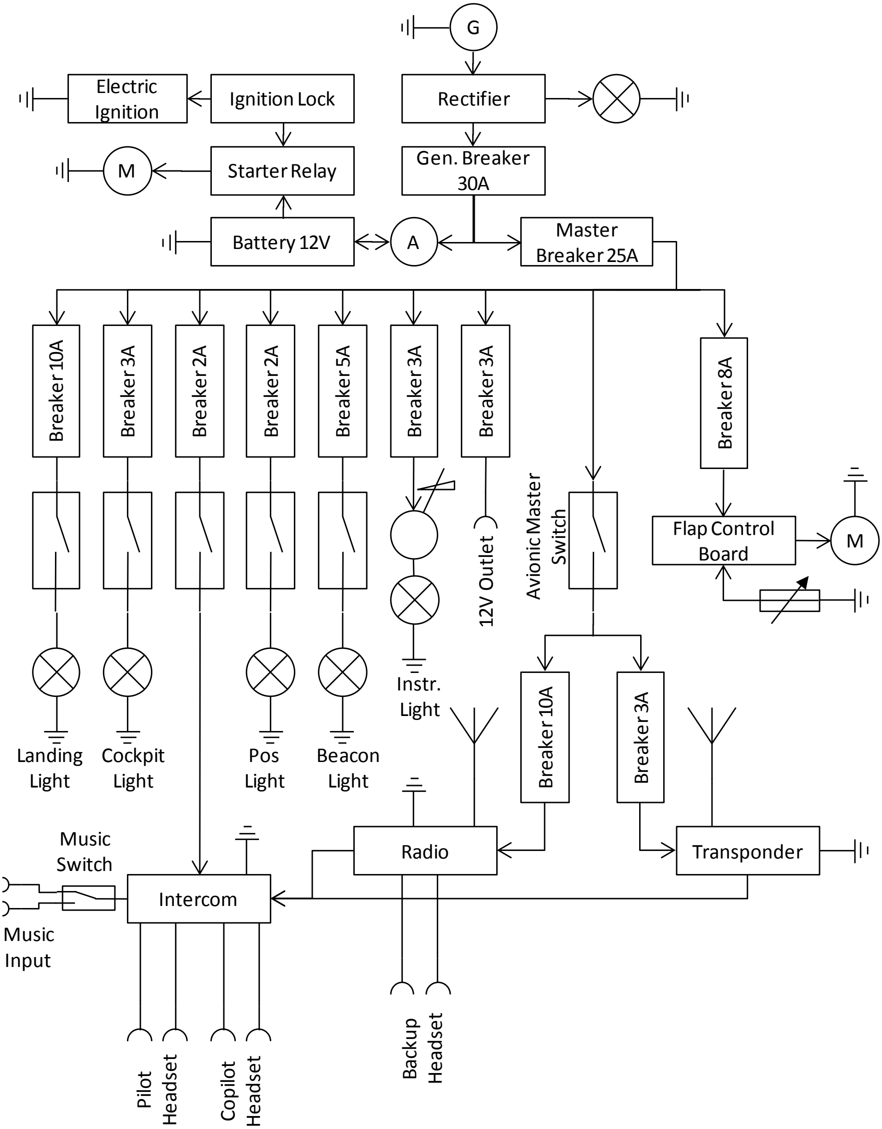


Fig. 7-12
Electrical System - Simplified Block Diagram

7.12. Pitot-Static System

The CTLS is equipped with a pitot-static system that supplies all relevant instruments.

The total pressure is measured with a probe at the leading edge of the outboard right hand wing. The probe is inserted from the front to a tube that is installed to the wing structure. PVC lines guide the total air pressure from here through the rear wing structure (behind the main spar wall, visible through the inspection hole at the lower wing in the area of the tie-down point) to the wing root rib area. A water trap is installed in the area of the wing inspection hole, right behind the probe location.

The pressure line is guided from the wing root rib area through the A-column to the instrument console area. The total pressure line is connected to the airspeed indicator.

The static pressure is measured at the lower fuselage center, just behind the main landing gear attachment area. The static port is equipped with a step that helps to calibrate the static port accuracy. The static pressure line is guided from the static port, through the fuselage center tunnel to the instrument console. T-connectors split the pressure signal to all affected instruments.

7.13. Avionics

This section provides the description and introduction to the operation of the basic avionic equipment that is installed to most delivered aircraft. Information about other optional avionic equipment, its operation and enhanced consoles is provided in the appropriate supplements to this POH. The relevant supplements are provided with an aircraft when the option is installed to an aircraft.

7.13.1. Radio Garmin SL40

The data provided in this section of the POH provides information on the aircraft specific installation and on the basic operation when used in the CTLS. Refer to the Garmin SL 40 Pilot's Guide (Garmin P/N 190-00488-00) in the latest revision applicable to the instrument S/N installed into your aircraft for complete system description and operational instructions of the unit as such.

7.13.1.1. Installation

The Garmin SL40 panel-mount COM radio is installed to the upper center panel on the instrument console.

The unit is protected by the “Com” circuit breaker in the breaker panel and switched by the “Master Avionic” switch in the lower center panel.

One PTT button per each control stick (red pushbutton) is installed and connected to the radio through the Intercom. The installation in the CTLS does not make use of the integrated intercom functionality.

There is no loudspeaker installed to the aircraft. Communication is done solely through headsets, connected through the separate Intercom. Refer to the Intercom description for details on the headset interface.

7.13.1.2. General Description and Basic Operation

The Garmin SL 40 com provides aviation radio communication on 760 communication channels in the frequency range from 118 to 136.975 MHz. The unit offers monitoring of a standby frequency and offers storage of eight user-defined frequencies. A second memory stores / recalls the previous eight frequencies.

Operation is done from the front panel of the unit. A high intensity alphanumeric LED display provides information on the selected frequency and on the operational status. The radio display and controls are identified on Fig. 7-13.

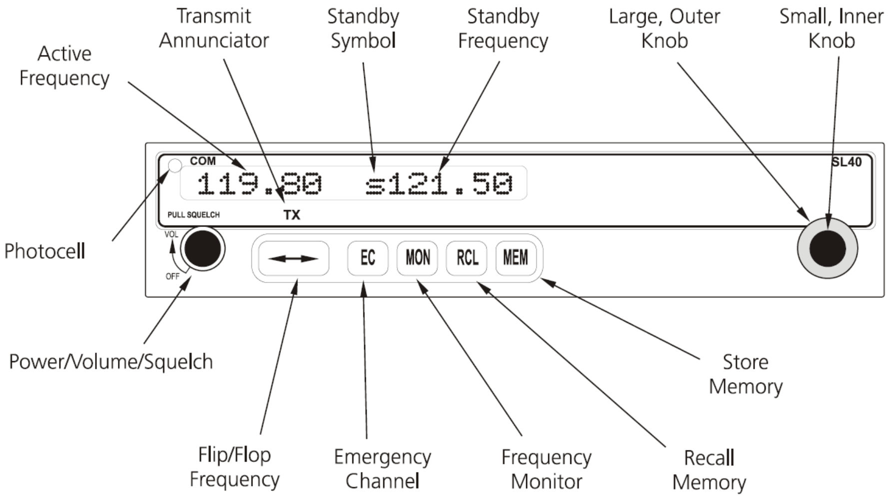


Fig. 7-13
Garmin SL 40 Radio Display and Controls

Brightness of the display is regulated to match the cabin light situation, detected by the photocell. The display shows on the left side the active frequency, and on the right side the standby frequency. The “s” in front of the standby frequency indicates that it is on standby. When the MON button is pushed this changes to “m” which indicates that the frequency is monitored. In this mode you can hear the communication on the second frequency, but you cannot transmit on that frequency. Pushing MON again switches back to standby mode.

The SL 40 is switched on by rotating the left knob clockwise past the detent. Further rotation increases volume. Pull the knob to disable automatic squelch. The background noise you will hear in this condition helps you to adjust volume correct.

Frequency is selected always on the standby frequency. Use the right large and small knob to select the desired frequency. When selected, the Flip(Flop button switches the standby frequency to the active frequency, and the previous active frequency becomes the standby frequency.

Press the EC button to load the emergency channel (121.500 MHz) as the standby frequency. The monitor function is automatically enabled.

Press the RCL button to retrieve stored frequencies. Press the MEM button to store displayed frequencies.

Refer to the GAMIN manual for further operating instructions.

7.13.1.3. Settings

The following settings are provided to the SL 40 when factory installed:

Headphone Level set to 0. This way the volume can be controlled by the volume knob.

Microphone Squelch 058.

Transmit Microphone set to Mic 1, as the different microphones are connected to the separate Intercom.

Intercom level has no effect due to the installation.

Sidetone level 0. This way side tone is slaved to the volume knob. This means that you can hear yourself speaking in your headset in the same volume as you have your radio adjusted.

Display brightness low value is set to 0, high value to 50. This way the automatic brightness control has the full brightness range available to react.

7.13.2. Transponder Garmin GTX 327, GTX 328 or GTX 330

The data provided in this section of the POH provides information on the aircraft specific installation and on the basic operation when used in the CTLS. Refer to the respective Garmin Pilot's Guide (Garmin Part Number for GTX 327: 190-00187-00; GTX 328: 190-00420-03; GTX 330: 190-00207-00) in the latest revision applicable to the instrument S/N installed into your aircraft for complete system description and operational instructions of the unit as such.

7.13.2.1. Installation

Either one of the available Garmin transponders is installed to the upper center panel on the instrument console.

The unit is protected by the "Transponder" circuit breaker in the breaker panel and switched by the "Master Avionic" switch in the lower center panel. Installation is done that Avionic master will always power the transponder to standby mode with the last selected code.

Installation does not support outside air temperature indication.

7.13.2.2. General Description and Basic Operation

The three offered Garmin transponders are comparable in their basic operation, therefore treated in this common chapter. The key difference between the transponders is as follows:

GTX 327: Capable of Mode A and Mode C operation with 200 W transmission power. No TIS functionality.

GTX 328: Capable of Mode A, C and S operation with 250 W transmission power. No TIS functionality. Offers display of altitude monitor, altitude trend and outside air temperature.

GTX 330: Capable of Mode A, C and S operation with 250 W transmission power. TIS functionality (service available only in selected countries due to required ground infrastructure). Offers display of altitude monitor and altitude trend.

All transponders offer timer functionality.

Operation of the transponders is done from the front panel of the unit. Fig. 7-14. Shows the front panel with display and operation knobs.

Fig. 7-14
Garmin GTX 328 Transponder Display and Controls
(GTX 327 and 330 are identical appearance)

Key functionality is provided with the use of the following controls.

Pushing of the OFF button powers the unit down.

Pushing either one of the ON, STBY or ALT button starts the transponder displaying the same code as selected when it was switched off.

STBY switches the transponder to standby mode, it does not answer to an interrogation in this mode.

ON selects mode A. The transponder replies to interrogations. When sending reply this is indicated in the display with a R symbol. For the Mode S units the transponder also submits the aircraft specific code.

ALT selects Mode A and Mode C. “ALT” is shown in the display in front of the active code. The transponder replies to interrogations and submits altitude information. For the Mode S units the transponder also submits the aircraft specific code

IDENT key activates the Special Position Identification Pulse for 18 seconds and makes the aircraft easier identifiable for the controller. “IDENT” will appear on the screen.

VFR changes the frequency to the pre-programmed standard VFR code. Pushing VFR again switches back to the previous code.

0 … 7 keys are used to enter a transponder code.

CLR cancels the previous keypress during code entry.

Refer to the GAMIN manual for further operating instructions.

7.13.2.3. Settings

All settings to the transponder should be checked and changed only by a qualified avionics workshop. Therefore settings are not documented in this POH.

7.13.3. GPS Garmin AERA 500 or 510

The data provided in this section of the POH provides information on the aircraft specific installation and on the basic operation when used in the CTLS. Refer to the Garmin AERA series Pilot's Guide (Garmin Part Number 190-01117-02) in the latest revision applicable to the instrument S/N installed into your aircraft for complete system description and operational instructions of the unit as such.

▲ **Warning:** Use of the maps and terrain information for pilotage navigation or obstacle avoidance is prohibited. These data are intended only to enhance situational awareness. Navigation is to be conducted using only current charts, data and authorized navigation facilities. It is the pilot's responsibility to provide terrain and obstacle clearance at all times.

▲ **Warning:** Database information loaded to the GPS unit has strictly limited validity durations. Validity may differ from database to database. It is in the sole responsibility of the pilot to ensure that current databases are loaded on the unit prior to commencing a flight and using the GPS unit. This may be connected with additional cost. Refer to the relevant Garmin manual and to the information of the provider of the individual database for validity and updating information.

7.13.3.1. Installation

The Garmin area portable GPS unit is installed to the upper center panel of the instrument console using the AirGizmos panel dock. The panel dock allows easy attachment and removal of the unit. This way the unit can be taken to the computer for updates or used in other situations as for example in your car.

The unit is protected by the "GPS" circuit breaker in the breaker panel and switched by the "Master Avionic" switch in the lower center panel.

The GPS antenna is installed to the upper instrument console dashboard, right behind the windscreen.

When installing the unit to the panel dock it must be connected to the wiring harness by standard connectors. When connected the unit receives power supply from the aircraft power system. Data lines provide GPS position information to other aircraft systems as required. GPS audio out is connected to the intercom.

7.13.3.2. *General Description and Basic Operation*

The Garmin AREA 500 / 510 GPS receiver provides navigation functionality with an easy to operate touch screen interface. The two models are identical, only the AREA 510 supports XM weather with all the related functionality.

Even if the unit is easy and intuitive to operate, it offers a large amount of possibilities. All options are described in very good detail in the relevant Garmin Pilot's Guide and shall not be copied here. The very basic operation is explained as follows.

The unit provides a touch screen. Tip on a symbol, and when it is selected it will turn blue,. See Fig. 7-15 for an example on the home screen.

Fig. 7-15
Garmin AERA 500 / 510 home screen (air navigation mode)

Basic navigation controls are as follows:

Home	Returns to the '**Home**' screen.
Back	Displays the previous page; Returns '**Home**' (touch and hold).
OK	Commits a value edited or selected.
Menu	Displays the context sensitive option menu.
Menu/D►	Displays the menu; Displays the **Direct-to** function (touch and hold).
Up	Scrolls up.
Down	Scrolls down.
Direct-to	Displays the **Direct-to** function.
Out	Zooms out.
In	Zooms in.

Keypad controls are as follows:

OK	Exits the keypad function and accepts the changes.
BKSP	Erases the current data.
Numeric	Displays the numeric only keypad.
Alpha	Displays the alpha and numeric keypads.
Cancel	Cancels a value that has been edited.

When you are on a page where more options are available as fit on one screen, you will see an up or down arrow on the right side. Use the key to scroll on the screen.

From the home screen you can reach the following options (when you are in the automotive mode, touch "Tools" "Aviation" "Yes" to come to the aviation mode):

Map	Displays the Navigation Map.
Terrain	Displays the Terrain Map.
HSI/Panel	Displays the Panel Mode.
Nearest	Displays the second-level Nearest Icons.
Numbers	Displays flight data.
Active FPL	Displays the Active Flight Plan.
WPT Info	Displays the Waypoint Information.
Direct To	Displays the 'Direct To' function.
Position	Displays the aircraft's Present Position.
Weather	Displays second-level Weather Icons (aera 510 & 560).
XM Radio	Displays XM Radio (aera 510 & 560).
Tools	Displays second-level Tools Icons.

After pushing the “Map” button you will directly reach the map display with a multitude of options. Of essential use are the following.

Fig. 7-16
Garmin AERA 500 / 510 map screen (air navigation mode)

To zoom in or out use the zoom buttons (see Fig. 7-16) The range is shown at the lower end of the map. When you touch anywhere in the map you will come to the map panning mode. You will be able to select items on the map and obtain detail information after pushing the map feature button that shows up at the lower end. When you touch and drag the map your viewing area will change.

You can change the appearance of the map and toggle the overlays (Weather (AREA 510), Topography, Terrain and Satellite Imagery) after pushing “Menu” “Show/Hide” from the map view.

The simplest form of GPS assisted navigation is the “Direct To” mode. This is available on the AREA units from most pages. Either select the “Direct To” button on the home page, or press and hold wherever you see the “Menu/Direct to” button (see Fig. 7-16, second lowest button on the right). This will bring you to the “Direct To” page (see Fig. 7-17).

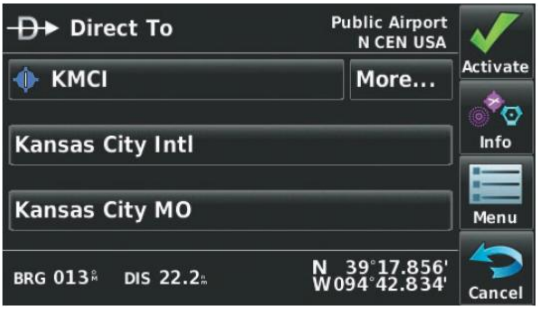


Fig. 7-17
Garmin AERA 500 / 510 direct to screen (air navigation mode)

Press “Menu” “Resume navigation” and select the desired search mode. Enter the desired identifier or name by the keypad. Touch OK. Touch “Activate” and the AERA establishes a point-to-point course line from your present position to the selected destination. Course guidance is now provided until a new navigation task is activated or the direct-to is cancelled.

Refer to the GAMIN manual for further operating instructions.

7.13.3.3. Removal / Attachment using AirGizmos Panel Dock

To remove the Garmin AERA 500 / 510 from the AirGizmos panel dock, first push the upper clamp to the upward direction and carefully pull out the GPS unit (see Fig. 7-18). Then disconnect the Power-Data cable and GPS/ XM antennas from the Garmin AERA 500 / 510 (see Fig. 7-19).

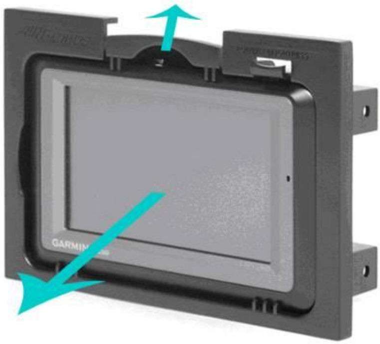


Fig. 7-18
Garmin GPS AERA AirGizmos panel dock

Fig. 7-19
Garmin GPS AERA Power/Data and XM Antenna cables

To attach the Garmin AERA 500 / 510 to AirGizmos panel dock perform the previous steps in reverse order. Make sure that the wiring slides properly into the AirGizmos to avoid wiring damage.

7.13.3.4. Settings

When factory installed, the Garmin AERA 500 / 510 setting for Interface Serial Data Format is set to “TIS In/NMEA & VHF Out”. With this setting the GPS can receive Mode S TIS traffic data from a Garmin GTX 330 transponder (when installed), submit frequency data to the Garmin SL40 or SL30 transceiver and control Autopilot track.

7.13.4. GPS Garmin 695 or 696

The data provided in this section of the POH provides information on the aircraft specific installation and on the basic operation when used in the CTLS. Refer to the Garmin GPSMAP695/696 Owner's Manual (Garmin Part Number 190-00919-00) in the latest revision applicable to the instrument S/N installed into your aircraft for complete system description and operational instructions of the unit as such.

▲ **Warning:** Use of the maps and terrain information for pilotage navigation or obstacle avoidance is prohibited. These data are intended only to enhance situational awareness. Navigation is to be conducted using only current charts, data and authorized navigation facilities. It is the pilot's responsibility to provide terrain and obstacle clearance at all times.

▲ **Warning:** Database information loaded to the GPS unit has strictly limited validity durations. Validity may differ from database to database. It is in the sole responsibility of the pilot to ensure that current databases are loaded on the unit prior to commencing a flight and using the GPS unit. This may be connected with additional cost. Refer to the relevant Garmin manual and to the information of the provider of the individual database for validity and updating information.

For operation instruction of the AirGizmos panel dock please refer to the AirGizmos manual.

7.13.4.1. Installation

The Garmin portable GPS unit is installed to the upper center panel of the instrument console using the AirGizmos panel dock. The panel dock allows easy attachment and removal of the unit. This way the unit can be taken to the computer for updates or used in other situations as for example in your car.

The unit is protected by the "GPS" circuit breaker in the breaker panel and switched by the "Master Avionic" switch in the lower center panel.

The GPS antenna is installed to the upper instrument console dashboard, right behind the windscreen.

When installing the unit to the panel dock it must be connected to the wiring harness by standard connectors. When connected the unit receives power supply from the aircraft power system. Data lines provide GPS position information to other aircraft systems as required. GPS audio out is connected to the intercom.

7.13.4.2. General Description and Basic Operation

The Garmin GPSMAP695/696 GPS receiver provides navigation functionality controlled by keys and a joystick. The two models are identical, only the 696 unit supports XM weather with all the related functionality.

Even if the unit is easy and intuitive to operate, it offers a large amount of possibilities. All options are described in very good detail in the relevant Garmin Pilot's Guide and shall not be copied here. The very basic operation is explained as follows.

Fig. 7-20 provides an overview of the unit.

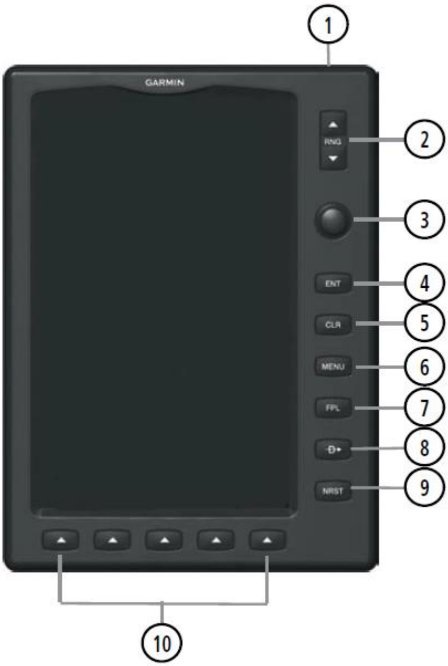
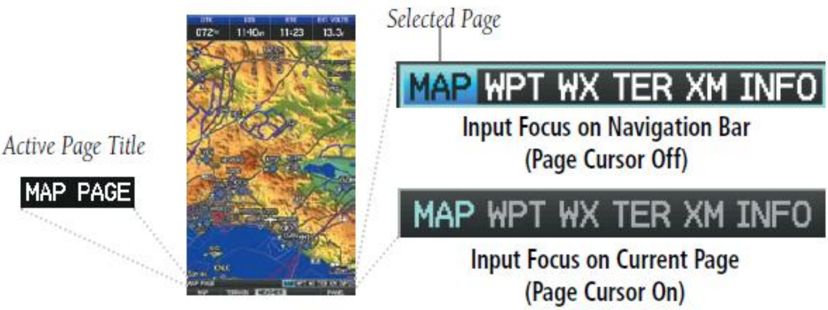


Fig. 7-20
Garmin GPSMAP 695/696 unit overview

Functionality of the control buttons is as follows:

1	Power Button	Press and hold to turn the unit on or off. With the unit on, press to adjust the backlight and volume
2	RNG Key	Press to increase or decrease the viewing range of the map.
3	FMS Joystick	Press the FMS Joystick to toggle input focus between user interaction with the current page and the page navigation bar. Turn the FMS Joystick clockwise to access a dropdown menu. Turn the FMS Joystick to change the selected value within the highlighted field. Move the FMS Joystick to highlight fields or move the map pointer when interacting with the page.
4	ENT Key	Press to confirm menu selection or data entry. Press to acknowledge messages. Press and hold to mark a waypoint.
5	CLR Key	Press to cancel an entry, revert to the previous value in a data entry field or remove menus. Press and hold to return to the default page.
6	MENU Key	Press once to view the Page Menu. Press twice to view the Main Menu. Press a third time to clear the Main Menu.
7	FPL Key	Press to display the Flight Plan Page. Press a second time to remove the Flight Plan Page.
8	Direct-To Key	Press to activate the Direct-To function, enter a destination waypoint and establish a direct course to the selected destination.
9	NRST Key	Press to display the Nearest Page for viewing the nearest airports, intersections, NDBs, VORs, waypoints, frequencies, and airspaces.
10	Softkeys	Press to select the softkey shown above the bezel key on the unit:

Selection of pages is done through the Navigation Bar, located at the lower right end of the display:



When the page curser is off, you can use the FMS joystick to select between the available pages. Pushing the joystick again flips back to the page cursor. This way you can always and easily select the map page for your navigation.

The simplest form of GPS assisted navigation is the “Direct To” mode. This is available on the 695/696 after pushing the “Direct To” key. You will come immediately to the page where you can enter the desired waypoint. Turn the FMS Joystick clockwise to begin entering a waypoint identifier (turning it counter-clockwise brings up the waypoint selection submenu - press the CLR Key to remove it), press the RECENT Softkey to display a list of recent waypoints, or move the FMS Joystick to select the facility name, or city field. Press the ENT Key. With ‘Activate’ highlighted, press the ENT Key. The GPS now establishes a point-to-point course line from your present position to the selected destination. Course guidance is now provided until a new navigation task is activated or the direct-to is cancelled.

Refer to the Garmin manual for further operating instructions.

7.13.4.3. Removal / Attachment using AirGizmos Panel Dock

To remove the Garmin GPSMAP 695 / 696 from the AirGizmos panel dock, first roll the latch to the down position (see Fig. 7-21). Then rock the top of the GPS from AirGizmos dock and carefully remove the unit (see Fig. 7-22). Disconnect the external GPS / XM antennas, Power/Data and Audio cables (see Fig 7-22).

Fig. 7-21

Garmin GPS 695 / 696 AirGizmos panel dock

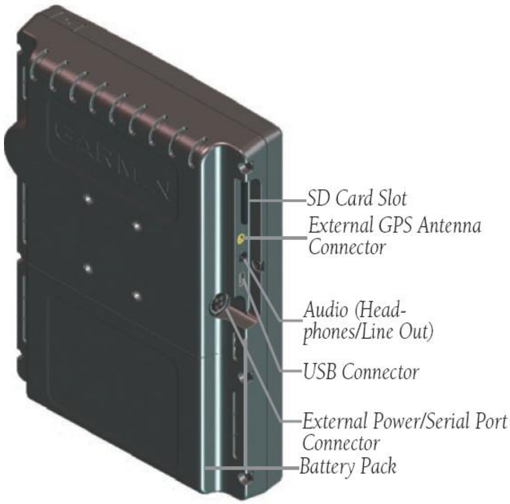


Fig. 7-22

Garmin GPS 695 / 696 interface connectors

To attach the Garmin GPS 695/696 to the AirGizmos panel dock perform the previous steps in reverse order. Make sure that the wiring slides properly into the AirGizmos to avoid wiring damage.

7.13.4.4. Settings

When factory installed, the GPS settings of the Garmin GPSMAP 695/696 Interface Serial Data Format are set to “TIS In/NMEA & VHF Out”. This way the GPS can receive Mode S TIS traffic data from a Garmin GTX 330 transponder (when installed), and send frequency data to Garmin SL40 or SL30 transceiver and control Autopilot track.

7.13.5. Intercom PS 3000

The data provided in this section of the POH provides information on the aircraft specific installation and on the basic operation when used in the CTLS. Refer to the PS Engineering PM3000 Pilot’s Guide (PS Engineering Part Number 200-193-0001) in the latest revision applicable to the instrument S/N installed into your aircraft for complete system description and operational instructions of the unit as such.

7.13.5.1. Installation

The PS Engineering PM3000 Stereo Intercom is installed to the lower center panel on the instrument console.

The unit is protected by the “Intercom” circuit breaker in the breaker panel and switched by a separate “Intercom” switch on the upper side of the lower center panel.

The unit is connected to all audio sources in the aircraft, such as the COM radio, the GPS (when installed), the NAV receiver (when installed), the EFIS / EMS (when installed) and it provides interface to the aux music input connector.

The unit provides backup functionality in case of a power loss on the intercom by directly switching to the COM radio input in this case. An additional backup feature is provided by the auxiliary headphone jacks installed to the lower center panel of the instrument console. These jacks bypass the intercom and can be used as a second fallback in case of a communication failure that is suspected to be caused by the Intercom.

The PTT buttons on pilot and copilot control stick are connected in a way that the respective headset is used when one of the PTT buttons is pushed.

Normal headset plugs are installed to the center section of the hat rack area of the main bulkhead behind / between the pilot seats. The plugs nearest to the pilot seat are intended for the pilot headset, the ones nearest to the copilot for the copilot headset. Connectors provided can be of two types, classical coaxial jacks for regular headsets or Lemo Redel connectors to support specific ANR headsets. When both connectors are installed, either one can be used.

▲Warning: Do not connect the pilot headset to the connectors on the right side. The Push-to-talk buttons differentiate between pilot and copilot side. Wrong connection will result in transmission problems when using the radio.

7.13.5.2. General Description and Basic Operation

The Intercom controls are shown in Fig. 7-23.

Fig. 7-23

PS Engineering PM3000 Intercom Controls

The PM3000 volume control knob (left knob) adjusts the loudness of the intercom and music only. The volume control on the PM3000 does not affect the volume level of the aircraft radio. This allows the aircraft radio and intercom volume to be balanced independently. The volume control affects the music level for the pilot and copilot positions.

Squelch is adjusted from the right knob. With the engine running, set the squelch control knob by slowly rotating the squelch control knob clockwise until you no longer hear the background noise in the earphones. When the microphone is positioned properly near the lips, normal speech levels should open the channel. When you have stopped talking, there is a delay of about one half second before the channel closes.

The green LED in the center indicates green when the unit is turned on, and changes to red during transmit by either the pilot or copilot.

The center switch is a mode control that allows the pilot to tailor the intercom function to suit flight conditions:

ISO (Up) Position:	The pilot is isolated from the intercom and is connected only to the aircraft radios. Copilot and passengers will hear themselves and music but not the aircraft radio traffic.
ALL (Middle) Position:	All parties will hear the aircraft radio, intercom, and music. During any conversation, the music volume automatically mutes. The music volume increases gradually back to the original level after communications have been completed.
CREW (down) Position:	Same effect as ALL when installed to CTLS.

Regardless of configuration, the pilot will always hear the aircraft radio. If there is a power failure to the Intercom, or if the power switch is turned off, the copilot will not hear the aircraft radio.

Refer to the PS Engineering manual for further operating instructions.

7.13.6. ELT Artex ME406

The data provided in this section of the POH provides information on the aircraft specific installation and on the basic operation when used in the CTLS. Refer to the ME406 Series Emergency Locator Transmitter Operating Instructions (Artex Doc. No. 570-1600) in the latest revision applicable to the instrument S/N installed into your aircraft for complete system description and operational instructions of the unit as such.

7.13.6.1. Installation

The ELT unit is installed to a stiff mounting bracket on the center tunnel in the rear luggage compartment, behind the flap / aileron controls. This is the location with least risk of damage in case of an accident.

A remote control unit is installed to the lower center instrument panel. The Antenna of the ELT is installed outside the fuselage, to avoid shielding from the carbon fiber structure. When installed to the CTLS-LSA, the ELT is not connected with a GPS signal.

The unit is powered by internal batteries and does not depend upon aircraft power.

▲Warning: Absolutely obey the mandated exchange cycles for the ELT batteries to ensure that the unit is always available in the unlikely case you need it.

7.13.6.2. General Description and Basic Operation

The installed ELT unit is shown in Fig. 7-24.

The ELT is held in place with a Velcro strap and can therefore be easily removed for inspection and maintenance purposes.

Fig. 7-24

ELT Artex ME406 installed

The ELT can be controlled either from the controls on the unit as such and from the remote control installed to the lower instrument panel. See Fig. 7-25 for both controls.

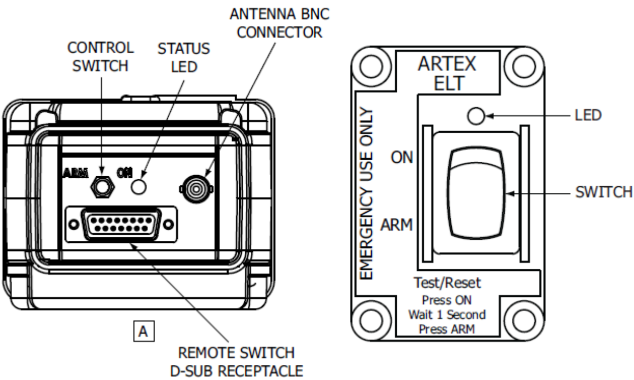


Fig. 7-25

ELT Artex ME406 Compact Controls

The unit is equipped with a switch that allows to select between ARM and ON. A status LED gives signal when the ELT is activated. There is no OFF position, the unit is always armed as long as the batteries are connected. The remote control provides the same functionality.

When the ELT is activated either manually or as consequence to a hard acceleration, the unit transmits a signal on 406 MHz and on 121.500 MHz in parallel. The transmitted signal includes the coded call sign of the aircraft. This way emergency rescue teams know exactly which aircraft did send the distress signal.

▲**Warning:** To ensure correct signal transmission you must ensure that the unit is correct programmed to your aircraft call sign.

Positively verify that the ELT is off after landing, or whenever suspecting a false activation of the ELT. This is done by switching the COM radio to the emergency frequency 121.500 MHz. When the ELT is on you will hear the alarm signal loud and clear.

▲**Warning:** Do not rely on the red LED when checking for a false activation, the LED might have failed.

To reset the ELT in case of a false alarm from the cockpit move the switch for approx. 1 second to the ON position and then back to ARM. To reset on the unit, set the switch at the unit for one second to the ON position and then back to ARM. Reset will not function if either of the two switches remains in the ON position.

Refer to the Artex manual for further operating instructions.

7.13.7. ELT Kannad AF 406 Compact

The data provided in this section of the POH provides information on the aircraft specific installation and on the basic operation when used in the CTLS. Refer to the Kannad 406 AF-Compact Operation Manual (Kannad DOC08038D Ref. 0145599D) in the latest revision applicable to the instrument S/N installed into your aircraft for complete system description and operational instructions of the unit as such.

7.13.7.1. Installation

The ELT unit is installed to a stiff mounting bracket on the center tunnel in the rear luggage compartment, behind the flap / aileron controls. This is the location with least risk of damage in case of an accident.

A remote control unit is installed to the lower center instrument panel. The Antenna of the ELT is installed outside the fuselage, to avoid shielding from the carbon fiber structure. When installed to the CTLS-LSA, the ELT is not connected with a GPS signal.

The unit is powered by internal batteries and does not depend upon aircraft power.

▲**Warning:** Absolutely obey the mandated exchange cycles for the ELT batteries to ensure that the unit is always available in the unlikely case you need it.

7.13.7.2. General Description and Basic Operation

The installed ELT unit is shown in Fig. 7-26.

Fig. 7-26

ELT Kannad AF 406 Compact installed

The ELT is held in place with a Velcro strap and can therefore be easily removed for inspection and maintenance purposes.

The ELT can be controlled either from the controls on the unit as such and from the remote control installed to the lower instrument panel. See Fig. 7-27 for both controls.

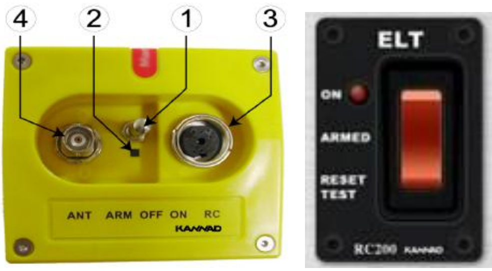


Fig. 7-27

ELT Kannad AF 406 Compact Controls

The three position switch (1) on the unit allows to select ON, OFF or ARM. The visual indicator shows red (2) when on. The connector (3) provides interface to the remote control. The BNC connector (4) provides interface to the antenna.

When switched to ARM at the unit, the remote control rocker switch allows to start the ELT by pushing ON (up), or to reset the ELT if it is on (down). The red LED provides a signal when the ELT is on.

Before flying the ELT must be switched to ARM at the unit.

▲**Warning:** When the ELT is in the OFF position it will not send an emergency signal in case of an accident, unless manually activated afterwards.

When the ELT is activated either manually or as consequence to a hard acceleration, the unit transmits a signal on 406 MHz and on 121.500 MHz in parallel. The transmitted signal includes the coded call sign of the aircraft. This way emergency rescue teams know exactly which aircraft did send the distress signal.

▲**Warning:** To ensure correct signal transmission you must ensure that the unit is correct programmed to your aircraft call sign.

Positively verify that the ELT is off after landing, or whenever suspecting a false activation of the ELT. This is done by switching the COM radio to the emergency frequency 121.500 MHz. When the ELT is on you will hear the alarm signal loud and clear.

▲**Warning:** Do not rely on the red LED when checking for a false activation, the LED might have failed.

Refer to the KANNAD manual for further operating instructions.

8. HANDLING AND SERVICING

8.1. Introduction

This chapter gives instructions of the aircraft ground handling and servicing practices.

8.2. Airplane Inspection Intervals

Engine inspection and maintenance must be done in line with the instructions provided by Rotax for the installed engine.

Inspection and maintenance of the installed certified ATC equipment (Radio, Transponder) must be done in line with the instructions provided by Garmin for the installed equipment.

Aircraft maintenance is defined completely within the Aircraft Maintenance Manual. The manual provides mandatory inspection cycles and inspection checklists.

It is the duty of the owner/operator to inform himself about possible manual updates, Service Bulletins, Airworthiness Instructions or other Instruction for Continued Airworthiness, issued by the individual equipment manufacturer (in the case of certified equipment) or by Flight Design. It is the duty of the owner/operator to verify, that the information is applicable to the individual piece of equipment installed to the aircraft, or to the aircraft S/N.

8.3. Airplane Alterations or Repairs

Airplane repair or alteration may only be carried out according to the Aircraft Maintenance Manual or according to approved Service Instructions, issued by the manufacturer or by the holder of a Supplemental Type Certificate, valid for the aircraft type, model and S/N.

8.4. Ground Handling / Road Transport

8.4.1. Ground Handling; Alignment

CTLS-LSA is a light weight aircraft that is easy to handle on ground. The nose wheel is steered. The aircraft can only be steered by a pilot in the cockpit. To change alignment when moving the aircraft on ground without person in the cockpit, push down the tail fuselage in front of the vertical tail. This will easily lift the nose wheel and allows to align the aircraft.

Only pull the aircraft carefully at the propeller in direct vicinity of the spinner, or push on the tail fuselage upper surface, in the area between vertical tail and wings. When the doors are open, you may push or pull at the door cut-out on the fuselage.

▲Warning: Do not attempt to press on the horizontal tail in an attempt to push the aircraft tail down. This will cause severe damage to the aircraft structure.

▲Warning: Do not attempt to push or pull on the horizontal tail in forward / backward direction. This will cause severe damage to the aircraft structure.

▲Warning: Do not attempt to push the aircraft backwards on the spinner. Pushing the spinner may damage the spinner. Running the engine with a damaged spinner can lead to spinner failure with risk of further damage and risk of hurting other persons.

■ Caution: Do not attempt to push the aircraft backwards on the cowling. This is a light weight aircraft with delicate secondary structure. Pushing the cowling may lead to damages.

8.4.2. Towing Instructions

The CTLS-LSA aircraft is equipped with an interface for Tow Bar connection. There are two protruded pins attached to the nose gear leg. The tow bar is attached to these pins. The tow bar attachment size fits to one of the most common tow bars, that also fits most Cessna aircraft models, see figure below.

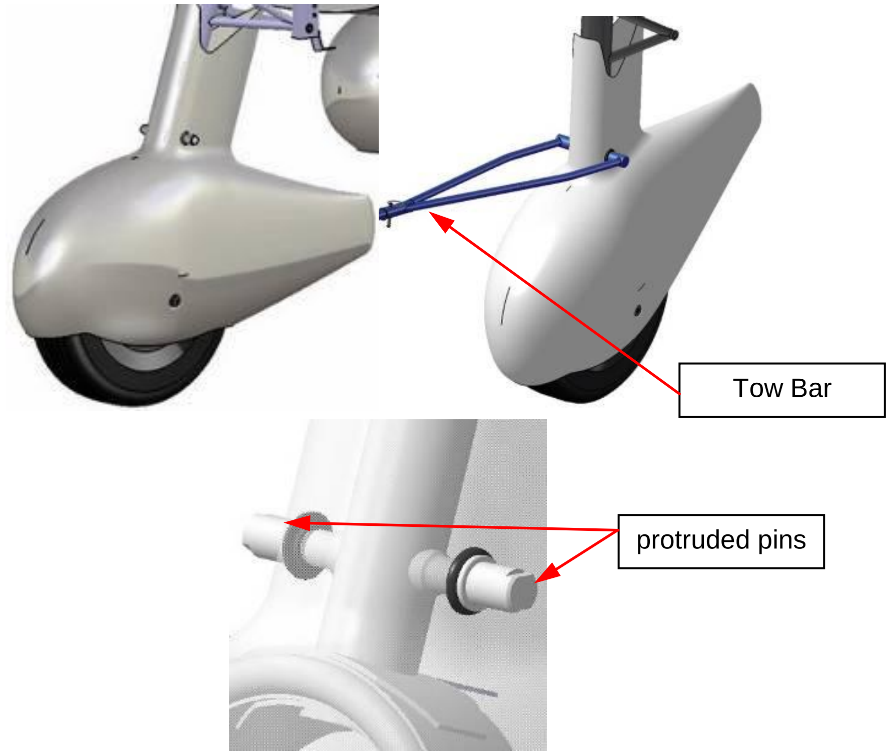


Fig. 8-1

When the tow bar is attached to the nose gear, the aircraft can be easily moved by hand. You should always pull or slow down with the tow bar. Avoid pulling on the propeller, to avoid damages to the propeller. To steer the aircraft while pulling, move the tow bar to the sides. The range of steering is limited by the stops of the rudder control system. Red lines on the lower cowling show the allowed range of steering. The red line on the nose gear leg fairing must always stay in between the two lines on the cowling, see figure below.

▲**Warning:** The tow bar has a long arm. When you steer with the tow bar you can bring high force to the nose gear steering mechanism. When you try steer more than is possible by the rudder control system stops, you can easily damage the rudder control system. Therefore, always stay within the are indicated by the red lines on the cowling.

Fig. 8-2

8.4.3. Parking

For short term parking the aircraft shall be placed with the nose in the wind. Retract flaps to -6° position. Set the parking brake. Check the aircraft does not roll when leaving the aircraft. When you intend to park the aircraft for a longer duration you must apply chocks in addition to the parking brake. For longer term parking it is highly recommended to tie down the aircraft, or to position it in a hangar.

8.4.3.1. Control Surface Gust Lock

Control surfaces can be blocked using the pilot side seat belt. To lock the controls, move the seat to the most forward position. Pull the stick back that it leans against the seat cushion. Close the seat belt around the control stick, so that the stick is fixed in the back position, pulled against the seat cushion. This will block elevator and aileron movement.

▲**Warning:** Always use the pilot seat safety belt to lock the control stick. Only this way it is made sure that the belt is removed from the stick when the pilot attempts to fly the aircraft. There have been accidents with other aircraft where the control stick was locked with the safety belt of the copilot seat, and the pilot did try to fly the aircraft!

Separate locking of the rudder is not required, as the nose wheel is steered and connected with the rudder control system, and sits firmly on the ground.

8.4.4. Tie-Down Instructions

For that moment, the aircraft does not provide built-in tie-down possibilities. To secure the aircraft, park it in a hangar when stronger or gusty winds are expected.

8.4.5. Jacking

Jacking is normally not required during normal aircraft operation.

There are methods for jacking, where the aircraft is supported by wooden blocks at the lower end of the main landing gear strut and by a padded stand under the forward fuselage, in the area of the firewall. This way of jacking requires removal of some fairings and is described in detail in the Aircraft Maintenance Manual.

8.4.6. Road Transport

Road transporting is only allowed to perform by qualified mechanics. Necessary procedures for assembly and disassembly are given in the CTLS-LSA Airplane Maintenance Manual.

8.5. Cleaning and Care

A modern aircraft made of composite materials must be cleaned with caution. Numerous cleaning agents have been developed especially for certain materials and can indeed cause damage to others. Using the wrong cleaning agent can damage the aircraft or parts of it. This damage may be visible or not directly detectable. Damage can take the form of simple flaws or can impair the structure. Therefore it is essential that you check the ingredients of a cleaning agent before use. If in doubt, contact your local Flight Design service station.

▲**Warning:** High-pressure washer equipment should never be used to clean the aircraft!

▲**Warning:** Use only alkali-free products to clean the composite structures of the aircraft.

8.5.1. Painted Surfaces

Many components of composite aircraft are sandwich constructions comprising a foam core and layers of glass fiber, carbon fiber or aramid fiber. The CTLS is made of a carbon or aramid sandwich and painted with a two-component polyurethane paint.

The Rohacell foam core used for the wings was chosen for its fuel durability. However, Rohacell is not resistant to alkaline liquids. For this reason, no alkaline cleaning agents such as Fantastic, Formula 409, Carbonex or Castrol Super Clean should be used. These alkaline cleaning agents can cause the Rohacell foam core to disintegrate if they penetrate to the core. A rippled surface is an indication of such disintegration. Components damaged in this way cannot be repaired and have to be replaced.

The wing spars of the airplane cannot be damaged in this way.

Products from the ComposiClean series which has been specially developed for aircraft made of composite materials are approved as cleaning agents.

8.5.2. Glazing

The windshield and windows of the CTLS-LSA are made of acrylic glass (known as Perspex® or Plexiglass®) which was formed at high temperatures. Although acrylic glass is very robust, it must be cleaned with care to ensure that it is not scratched. Never use abrasive cleaning agents or dirty cloths. Usually the windshield and windows can be cleaned using a lot of clean water. However, if dirt is stubborn, acrylic glass cleaning agents only should be used.

Only use special acrylic glass polish for the windshield and windows. Never polish in a circular movement, always in straight lines (up and down or from side to side). This prevents the occurrence of the disturbing halo effect caused by circular scratches. Light scratching can usually be polished out by your Flight Design service station.

Make sure that you never leave solvent-soaked cleaning cloths under the windshield or near the windows. Vapors can quickly lead to small stress cracks in the glass. A windshield or windows damaged in this way cannot be repaired and must be replaced.

8.5.3. Propeller

The same cleaning instructions apply as for the composite aircraft structure.

Damages or scratches on the propeller must be inspected by authorized personnel.

8.5.4. Engine

The ROTAX® operating handbook recommends the use of a standard degreaser. Please follow the instructions given in the operating handbook and make sure that the degreaser does not come in contact with the airframe.

▲Warning:	If a moisture-based cleaning agent is used on the engine, the electronics must be protected from getting damp. High-pressure cleaning devices should never be used to clean the engine.

8.5.5. Interior Surfaces

The interior should be cleaned using a vacuum cleaner. All loose items (pens, bags etc.) should be removed or properly stored and secured.

All instruments can be cleaned using a soft dry cloth, plastic surfaces should be wiped clean using a damp cloth without any cleaning agents.

The leather interior should be treated with leather sealer within 3 months since new, and then at intervals of 3 to 6 months. Clean the leather interior with an appropriate mild leather % cleaning agent and a soft cleaning brush for leather.

8.6. Lubricants and Operating Fluids

8.6.1. Refueling

Fuel – either of the following:	EN 228 Super or Super Plus min. RON 95 CAN/CSGB-3.5 Quality 3 min. AKI 91 US Gasoline Premium ASTM D4814 min. AKI 91 AVGAS 100LL ASTM D910 AVGAS UL91 ASTM D7547

Warning:	Not every oil type is suited to engine operation with AVGAS or MOGAS. Refer to the relevant version of the ROTAX® engine manual for detailed information on suitable oil types. The list of suitable engine oils is constantly adjusted according to availability. It is, therefore, recommended you consult the current list on the ROTAX® Service Bulletins website.

8.6.2. Oil Checking and Replenishing

Engine oil	in accordance with the latest update of the ROTAX® manual, including Rotax Service Instructions.
Lubricant, wing bolts	Heavy duty grease WGF 130 DIN 51502
Lubricant, bearings, rod ends	Heavy duty grease WGF 130 DIN 51502

Warning:	The plastic bearings on the flaps and the ailerons are maintenance-free and should not be greased.

8.6.3. Coolant Checking and Replenishing

Coolant	Glysantine / water mixture (50:50) in accordance with the instructions in the engine operating handbook.

Warning:	Anti-freeze from different manufacturers must not be mixed as they may react with each other and flocculate. If in doubt, the mixture should be completely drained off and replaced. Flight Design uses BASF Protect Plus, as recommended by ROTAX®. If the anti-freeze is changed, an aluminum-compatible anti-freeze recommended by ROTAX® should be used.
Warning:	We advise against the use of Evans coolant. The advantages offered by this fluid are negated by sustained operational problems (e.g. moisture absorption). Based on the results of testing under various climatic conditions, it has been demonstrated that Evans is not necessary for the safe operation of the airplane.

8.6.4. Brake Fluid

Brake fluid	Aeroshell Fluid 41 MIL-H-5606 Brake Fluid

9. SUPPLEMENTS

9.1. Introduction

Section 9 contains information concerning additional (optional) equipment of the aircraft as well as supplemental information that is not covered elsewhere.

Unless otherwise stated, the procedures given in the Supplements must be applied in addition to the procedures given in the main part of the Pilot's Operating Handbook.

All approved and available OEM supplements are listed in the List of Supplements in this Chapter, and marked for applicability to the individual aircraft serial number. In case of equipment changes this list might need to be altered. Supplements that are marked as applicable are valid part of the POH and must be considered.

The List of Supplement provides additional space to implement additional supplements that might not originate from the aircraft OEM, for example related to customer modifications on STC basis. Those supplements must be entered here by hand and marked applicable as well.

The Airplane Flight Manual contains exactly those Supplements which correspond to the installed equipment according to the Equipment Inventory of Section 6.5.

9.2. List of Supplements

Airplane S/N:	***Registration:***	***Date Filled:***

Supp. No.	***Title***	***Rev. No.***	***Rev. Date***	***Applicable***	
				YES	***NO***
S1	Continued Operational Safety Reporting on LSA Aircraft			☒	☐
S2	Flight Training Supplement			☒	☐
S3	Garmin SL 30 NAV/COM			☐	☐
S4	Garmin G3X Avionic Suite			☐	☐
S5	Garmin GTN series GPS/NAV/COM			☐	☐
S6	Dynon D100/D120(180) Glass Cockpit			☐	☐
S7	Dynon SkyView Suite			☐	☐
S8	Autopilot Installation			☐	☐
S9	Tow System			☐	☐
S10	Sensenich Composite Three-Blade Propeller			☐	☐
				☐	☐
				☐	☐
				☐	☐
				☐	☐
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