# FLIGHT MANUAL

| | |
|---|---|
| **Airplane Type** | **SHARK 600** |
| **Model / Version:** | **UK** |
| **Serial Number:** | |
| **Registration:** | |
| **Document Number:** | Shark600_MA_218 Rev.C |
| **Date of Issue:** | |
| **Approval Number and Date:** | |
| **Manufacturer:** | **© The Light Aircraft Company LTD**<br>Little Snoring Airfield, Little Snoring,<br>Fakenham, Norfolk, NR21 0JL<br>+44 (0)1328 878809, sales@g-tlac.com |

This airplane must be operated according to the information and limitations presented in this Flight Manual.
This manual must be available to the Pilot at any time during flight.
**Differences training in accordance with TLAC Shark 600 Training Manual MUST be undertaken before flight.**

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# 0 Foreword

## 0.1 Record of Revisions

| Rev. | Number of the document - bulletin | It concerns pages No. | Date of issue | Signature |
|---|---|---|---|---|
| IR | - | New document | 18.7.2023 | |
| A | - | 0-1, 0-2, 5-7 Correction of kts speeds | 18.9.2023 | |
| B | - | All sections | 23.2.2024 | |
| C | - | Sections 0,1,2,4,7,9 | 25.3.2024 | |

**NOTE**

It is the responsibility of the owner to keep this manual up to date. Check www.shark.aero for the latest updates.

## 0.2 Table of Contents



This manual of SHARK600 model UK combines chapters of manuals SHARK600_MA_075 and SHARK600_MA_218.
It is valid for the UK model of the SHARK 600UK, which has a maximum takeoff weight (MTOW) of 600kg and is equipped with V3 stall strips on the wings.

* Amendments form part of the flight manual if the relevant system is installed.

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# 1 General

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## 1.1 Introduction

This flight manual is provided with your airplane to allow you to obtain as much knowledge as possible for safe operation. Additionally, this section contains definitions or explanations of symbols, abbreviations, and terminology used in this manual. It also includes supplementary information which can be helpful to the pilot.

Read this manual before your first flight and make sure you understand all the information presented here. This manual does not replace a Flight Instructor!

## 1.2 Certification Basis

The following standards were used for approval and testing:

| | |
|---|---|
| CAP 482 | British Civil Airworthiness Requirements, Section S Issue 8, Microlight and Small Light Aeroplanes |
| UL 2 | Requirements of LAA – Light Aircraft Association of Czech Republic. |
| LTF UL | Ultralight aircraft requirements applicable in Germany. |
| ASTM | Standard Requirements for Light Sport Aircraft (LSA) valid in US and used as a background for European light airplane standards. |

## 1.3 Warnings, Cautions and Notes

The following definitions applied to Warnings, Cautions and Notes are used in this manual:

**<u>WARNING</u>**

**NON-OBSERVATION OF THE CORRESPONDING PROCEDURE CAN IMMEDIATELY LEAD TO A SIGNIFICANT REDUCTION OF FLIGHT SAFETY.**

**<u>CAUTION</u>**

**Non-observation of the corresponding procedure can lead to equipment damage and reduction of flight safety in a short or longer time interval.**

**NOTE**

Information not directly related to the safety of the flight.

## 1.4 Three View Drawing

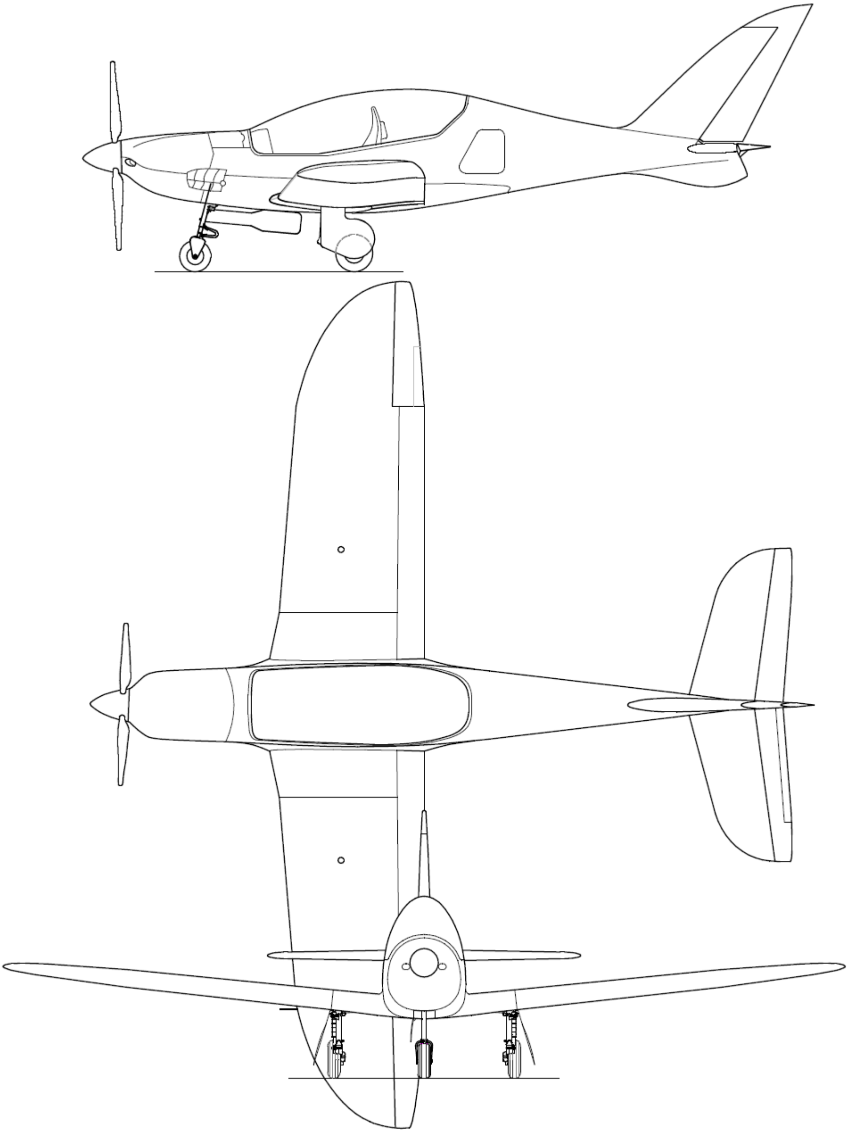

*Figure 1-1 Three View Drawing*

# 1.5 Dimensions

### Overall Dimensions

Wing Span: ............................................7.9 m

Length:..................................................6.85 m

Height: ...............................................2.5 m

### Wings

Airfoil:..................................................JS20 – JS80

Wing Area:............................................9.5 m$^2$

Mean Aerodynamic Chord (MAC):.........1.237 m

Aspect Ratio: ........................................6.671

Dihedral:...............................................6°

Sweep of Leading Edge: ........................3.53° / 13.8° / 38°

### Aileron

Area:....................................................0.281 m$^2$ each aileron

### Flaps

Area:....................................................0.922 m$^2$ each flap

### Horizontal Stabilizer

Area:....................................................2.154 m$^2$

Elevator Area:.......................................0.662 m$^2$

Angle of Incidence:................................-1.5°

### Vertical Stabilizer

Area: ....................................................1.062 m$^2$

Rudder Area: .......................................0.335 m$^2$

### Landing Gear

Track: ..................................................1.694 m

Wheel Base:..........................................1.48 m

## 1.6 Engine

Rotax 912 ULS Engine, 4 Cylinder, 4-Stroke, Horizontally Opposed, Liquid Cooled Cylinder Heads, Air Cooled Cylinders.

Propeller is driven via an integrated Reduction Gear.

Reduction Ratio:...................................2.43 : 1

Displacement;.......................................1.352 liters

Output Power:.......................................73.5 kW/100hp@5800 rpm

## 1.7 Propeller

Two-bladed Variable Pitch Propeller, manufactured by Woodcomp:

- In-flight electrically adjustable (Woodcomp SR 3000 2WN)
- In-flight hydraulically adjustable (Woodcomp KW20W)

## 1.8 Fuel

Approved fuel grades are:

- MOGAS EN 228 Super/Super plus (minimum 95 octane).
- MOGAS ASTM D4814.
- AVGAS 100LL (ASTM D910) *see restrictions in 2.12.

Total Capacity:

- 100 liters ( 26,4 US gallons) or optional 150 liters ( 39.6 US gallons), in both configurations 1 liter (0.26 gal) is unusable.

## 1.9 Lubricant and Oil

Lubrication system is “forced feed type” with an external reservoir.

Type:

- for MOGAS: API SL
- for AVGAS / 100L: API SL

Oil capacity:

- 3 liter maximum ( 0.79 gal)
- 2 liter minimum ( 0.53 gal)

## 1.10 Cooling

The Cooling System consists of a combination of forced air and a pressurized closed liquid system.

Type:

- Conventional cooling liquid mixed with water 50% + 50%

*For example: BASF Glysantin Antikorrosion 50% / water 50%*

Capacity:

- Minimum:  2.4 Litres ( 0.63 gal)
- Maximum: 2.5 Litres ( 0.66 gal)

## 1.11 Weights

See section: 2.6

## 1.12 Wing Loading

| | Maximum take-off weight 600 kg |
|---|---|
| Wing Loading | 63.2 kg/m² |
| Power Loading | 6.0 kg/hp |

## 1.13 Parachute Recovery system

Magnum 601 manufactured by STRATOS 07.

**WARNING**

**THE PARACHUTE RECOVERY SYSTEM INSTALLATION HAS BEEN APPROVED BY CAA ON THE BASIS THAT, AS FAR AS IS PRACTICABLE TO DEMONSTRATE, IT WILL CREATE NO HAZARD TO THE AEROPLANE, ITS OCCUPANT(S) OR GROUND PERSONNEL WHILST THE SYSTEM IS NOT DEPLOYED; AND THAT WHEN PROPERLY MAINTAINED, THE RISK OF MALFUNCTION, DETERIORATION OR INADVERTENT DEPLOYMENT IS MINIMISED. THE CAA HAS NOT APPROVED THE SYSTEM ITSELF OR CONSIDERED THE CIRCUMSTANCES, IF ANY, IN WHICH IT MIGHT BE DEPLOYED. THE EFFECTIVENESS OF THE SYSTEM FOR THE SAFE RECOVERY OF THE AEROPLANE HAS NOT BEEN DEMONSTRATED.**

## 1.14 List of Abbreviations

| Abbreviation | Definition |
|---|---|
| CAS | Calibrated airspeed; Indicated speed corrected for installation and instrument errors. CAS is equal to TAS at standard atmospheric conditions at MSL |
| Center of Gravity | Point of equilibrium for the airplane mass (weight) |
| CG | Centre of Gravity |
| CG Arm | Distance from the reference datum to the CG, it is determined by dividing the total moment (sum of the individual moments) by the total mass (weight) |
| CG Limits | The CG range which an airplane with a given mass must be operated within |
| Demonstrated crosswind component | The max. speed of the crosswind component at which the maneuverability of the airplane during take-off and landing has been demonstrated during test flights |
| EW | Empty Mass (Weight) of the airplane including unusable fuel, all operating fluids and maximum oil amount. Movable ballast is not included in Empty Weight |
| GS | Ground Speed. Speed of the airplane relative to the ground |
| hp | Horsepower |

| Abbreviation | Definition |
|---|---|
| IAS | Indicated airspeed as shown on the airspeed indicator |
| ISA | International Standard Atmosphere |
| KCAS | Calibrated airspeed on knots |
| KIAS | Indicated airspeed in knots |
| KTAS | True airspeed in knots |
| Lever Arm | The horizontal distance from the reference datum to the center of gravity (of a component) |
| MAC | Mean Aerodynamic Chord |
| MAP | Manifold (intake) Pressure |
| MCP | Maximum permissible continuous engine output power during flight |
| MLW | Maximum mass (weight) permissible for landing |
| Moment | The mass (weight) of a component multiplied by its lever arm |
| MPG | Miles (nautical) per US gallon |
| MSL | Mean Sea Level |
| MTOW | Maximum Take-off Mass (Weight), the maximum mass (weight) permissible for take-off |
| OAT | Outside Air Temperature |
| RD | Reference datum (RD)/ Reference plane. An imaginary vertical plane from which all horizontal distances for the center of gravity calculations are measured. It is the plane |

| Abbreviation | Definition |
|---|---|
| | through the leading edge of the wing root rib, perpendicular to the longitudinal axis of the airplane. |
| rpm | Revolutions per minute |
| Station | A defined point along the longitudinal axis which is generally presented as a specific distance from the reference datum |
| Take-off Power | Maximum engine power for take-off |
| TAS | True airspeed. Speed of the airplane relative to air. TAS is CAS corrected for altitude and temperature error |
| TFUEL | Temperature (Fuel) (at a specific critical point under the engine cowling) |
| TMOT | Temperature (Motor) (at a specific critical point under the engine cowling) |
| Unusable Fuel | The amount of fuel remaining in the tank which cannot be used |
| Usable Fuel | The amount of fuel available for the flight plan calculation |
| Useful Load | The difference between take-off mass (weight) and empty mass (weight) |
| VA*, $V_A$ | Maneuvering speed. Maximum speed at which the airplane is not overstressed at full deflection of control surfaces |
| VFE, $V_{FE}$ | Maximum speed with flaps extended |

| Abbreviation | Definition |
|---|---|
| VLE, $V_{LE}$ | Maximum speed with the gear extended |
| VLO, $V_{LO}$ | Maximum speed of gear extending or retracting |
| VNE, $V_{NE}$ | Speed which must never be exceeded in any operation |
| VNO, $V_{NO}$ | Maximum structural cruising speed which should only be exceeded in calm air, and then only with caution |
| VS0, $V_{S0}$ | The power-off stall speed with the airplane in landing configuration |
| VS1, $V_{S1}$ | The power-off stall speed with the airplane in its current configuration |
| VX, $V_x$ | Best angle-of-climb speed |
| VY, $V_y$ | Best rate-of-climb speed |

* - Indexes of characteristic speeds may, in cases of very small type (e.g., on placards), be written in the font size of the base type.

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## 2 Limitations

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## 2.1 Airspeeds

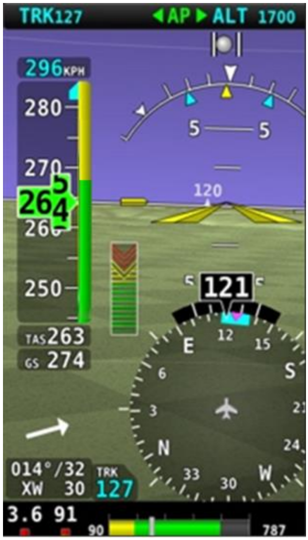
| Speed | | | KIAS kts | |
|---|---|---|---|---|
| $V_{FE}$ | Maximum flap extended speed | | **76** | |
| $V_{LO}$ | Maximum landing gear operating speed | | **70** | |
| $V_A$ | Maneuvering speed | | **100** | |
| $V_{RA}$ | Rough Air Speed | | **145** | |
| | | | **KIAS kts** | **At altit.** ft |
| $V_{NE}$ | Never exceed speed | | **177** | 0-3000 |
| | ***Above 3000 ft. allowed*** | | **169** | 6500 |
| | ***max. 185 KTAS*** | | **161** | 10000 |

**NOTE**

Refer to section 4.5.7 for more details of VNE limitation with altitude

## 2.2 Airspeed Indicator Markings

| |
|---|
| *NEVER EXCEED SPEED: 177 KIAS* <br> *Radial line |
| CAUTION RANGE: 145 – 177 KIAS |
| *DESIGN MANOEUVRING SPEED: 100 KIAS* <br> *Radial line |
| NORMAL OPERATION RANGE: 51 – 145 KIAS |
| FLAPS OPERATING RANGE: 44 – 76 KIAS |



*Dynon SkyView*

*Garmin G3X Touch*

## 2.3 Engine

The Shark 600 is powered by a 100hp, 4-cylinder Rotax engine. The type designation is Rotax 912 ULS and the most important details are in the table below.

For more information see the Rotax 912 Operator's Manual which is supplied with the engine and available online.

| | | |
|---|---|---|
| Max. take-off power | 73.5<br>100 | kW<br>HP |
| Max. engine speed (5 min) | 5800 | RPM |
| Max. continuous power | 69<br>92 | kW<br>HP |
| Max. engine speed (continuous) | 5500 | RPM |
| Operation range of outside temperature | - 25 | °C |
| | + 50 | °C |

**WARNING**

**FLYING THIS AIRCRAFT MUST ALWAYS BE DONE WITH POSSIBILITY OF A SAFE LANDING DUE TO LOSS OF ENGINE POWER.**

## 2.4 Engine Instrument Markings

Shark 600 is in standard equipped with a Dynon SkyView or GARMIN G3X Touch electronic flight display which displays flight instruments and engine instruments. Other EFIS/EMS systems or conventional engine instruments are optional.

| Engine Limits | | 912 ULS |
|---|---|---|
| **TACH** | - Max Engine Speed | 5800 RPM |
| **EGT** | - Exhaust Gas Temperature | 880 °C |
| **CHT** | - Cylinder Head Temperature | 135 °C |
| **OIL** | - Oil Temperature | 130 °C |
| | - Oil Pressure, max, cold start only | 7 bar<br>100 PSI |
| | - Oil Pressure, minimum below 3500 rpm | 0.8 bar<br>12 PSI |
| | - Oil Pressure, normal operation | 2.0 – 5.0 bar<br>30 – 72 PSI |
| | - Fuel Pressure: min-max | 0.15 – 0.4 bar<br>2.2 – 5.8 PSI |
| **ERT** | - Engine Room Temperature * | **70 °C** |
| **TFUEL** | - Fuel Temperature * | **70 °C** |

**CAUTION**

*** Read chapter 4.4 -Touch and Go's- carefully. It explains the importance of monitoring ERT (TMOT) and TFUEL.**

## 2.5 Weight Limits

| | |
|---|---|
| Typical Empty Weight, fully equipped version | 350 kg |
| Maximum Empty Weight | 374 kg |
| Max Take Off Weight, *(including parachute rescue system)* | 600 kg |
| | |
| Minimum Weight of Crew *(one pilot, front seat)* | 55 kg |
| Maximum Weight One Pilot *(front seat, empty rear seat)* | 110 kg |
| Maximum Weight in Rear Seat | 110 kg |
| Maximum Weight of 2 Occupants | 200 kg |
| Maximum Weight Baggage Area<br>When flying Solo from Front Seat<br>When flying with Occupant in Rear Seat, baggage weight depends on the weight in Rear Seat | <br>25 kg<br>0-25 kg** |

** refer to Section 6 for maximum baggage weight.

## WARNING

**DO NOT EXCEED THESE WEIGHT LIMITS. PAY ATTENTION TO FUEL QUANTITY, ESPECIALLY WHEN 2 PERSONS ARE ON BOARD.**

## 2.6 Centre of Gravity Limits

| | |
|---|---|
| Front centre of gravity limit | 17.5 % MAC |
| Rear centre of gravity limit | 31.5 % MAC |

CG limits are valid for extended landing gear.

*Note: Retraction of landing gear moves the CG 0,5-1% backwards.*

*See Section 6 for CG calculations.*

## 2.7 Approved Flight Manoeuvres

The Shark600 is not designed/ tested for Aerobatic operations and therefore only manoeuvres intended for normal operations are approved. These manoeuvres are:

- Manoeuvres for normal flying
- Lazy eights
- Chandelles
- Normal (practice) stalls
- Turns with a maximum bank angle of 60°

**WARNING**

**ALL MANOEUVRES MUST BE PERFORMED WITH A POSITIVE LOAD FACTOR BECAUSE THE FUEL AND LUBRICATION SYSTEMS ARE DESIGNED FOR POSITIVE LOAD FACTORS. ALL MANOEUVRES MUST BE PERFORMED IN A MANEUVER ENVELOPE WITH MAXIMUM POSITIVE + 4G AND NEGATIVE -2G LOAD FACTOR.**

**WARNING**

**AEROBATICS MANOEUVRES AND SPINS ARE PROHIBITED.**

## 2.8 Manoeuvring Load Factor

| | | |
|---|---|---|
| Flaps up 0° | Maximum positive load factor | **+ 4 G** |
| | Maximum negative load factor | **- 2 G** |
| | | |
| Flaps down I, II, III | Maximum positive load factor | **+ 2 G** |
| | Maximum negative load factor | **0 G** |

## 2.9 Flight Crew

Minimum Flight Crew is one Pilot.

Only two occupants are allowed on board of this aircraft.

## 2.10 Type of Operation

**WARNING**

**ONLY VFR FLIGHTS ARE PERMITTED**

**WARNING**

**FLYING IN CLOUDS AND FLIGHT IN ICING CONDITIONS ARE PROHIBITED.**

## 2.11 Fuel

### 2.11.1 Approved Fuel Types

| Fuel |
|---|
| MOGAS ASTM D4814 |
| MOGAS EN 228 Super/Super plus (min. RON 95) |
| AVGAS 100LL (ASTM D910) |

### 2.11.2 Fuel Tank Capacity

| Fuel Tank Type | Standard | Long Range |
|---|---|---|
| Capacity each tank | 50 liters | 75 liters |
| Total Fuel capacity | 100 liters | 150 liters |
| Unusable Fuel | 1 liter | |

## 2.12 Other Limitations

| | |
|---|---|
| Maximum demonstrated takeoff and/or landing cross wind component | 12 kts<br>6 m/s |
| Maximum demonstrated head wind component | 30 kts<br>15m/s |
| Maximum outside temperature | 50°C |
| Minimum outside temperature | -25°C |

**CAUTION**

**Heavy rain or excessive moisture can cause decrease of airplane performance. Increase take-off and landing speeds by 10 km/hour.**

## 2.13 Placards

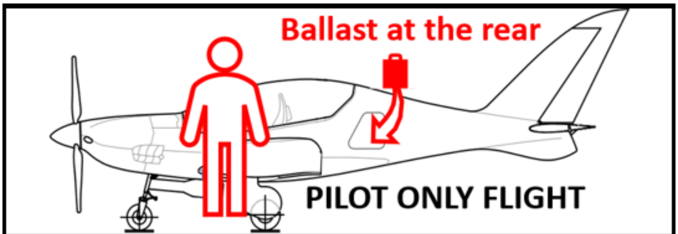
**Production Label**

Producer : SHARK.AERO s.r.o
Serial number :
Year :
Type / Model : SHARK 600

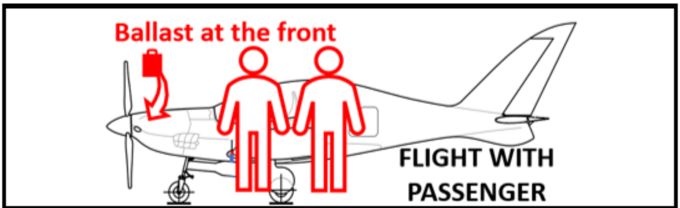
**Registration Label**

| | |
|---|---|
| **Registration:** | |
| **Producer:** | **SHARK.AERO s.r.o.** |
| **Type/Name :** | **SHARK 600UK** |
| **Production number/year:** | |
| **Empty weight:** | **kg** |
| **Max. take-off weight:** | **600 kg** |

**Front and rear seat / luggage weight limit label:**




| Front seat kgs | | Rear seat kgs | | Baggage kgs | | Fuel litres | |
|---|---|---|---|---|---|---|---|
| Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| 55 | 110 | 0 | 15 | 0 | 25 | 0 | 150** |




| Front seat kgs | | Rear seat kgs | | Baggage kgs | | Fuel litres | |
|---|---|---|---|---|---|---|---|
| Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| 55 | 90* | 95 | 110* | 0 | 0 | 0 | 25 |
| 55 | 100* | 95 | 100* | 0 | 0 | 0 | 100** |
| 55 | 105 | 25 | 95 | 0 | 0 | 0 | 100** |
| 55 | 110 | 25 | 85 | 0 | 5 | 0 | 100** |
| 55 | 110 | 25 | 75 | 0 | 10 | 0 | 100** |
| 55 | 110 | 25 | 70 | 0 | 15 | 0 | 100** |

* Sum of weights on front and rear seat is 200 kg maximally.
** Maximum amount of fuel is limited by MTOW = 600 kg.

**Basic information placards:**

**AEROBATICS MANOEUVRES AND INTENTIONAL SPINS ARE PROHIBITED**

**Occupant Warning: This aircraft has not been certificated to an International Requirement.**

**This microlight aircraft has been approved only for VFR day flights under no icing conditions.**

| OPERATION INFORMATION AND LIMITS – speeds kts KIAS | | | |
|---|---|---|---|
| Registration | | | |
| Empty Weight | | | kg |
| Max. Take-off Weight | | **600** | kg |
| Max. Payload | | | kg |
| Max. Baggage Weight | | **25** | kg |
| Min / Max. Pilot Weight | | **55 / 110** | kg |
| Max. Passenger Weight (Rear Seat) | | **110** | kg |
| Max. Pilot + Passenger Weight | | **200** | kg |
| Stall Speed, Landing Configuration | **VS0** | **40** | KIAS |
| Stall Speed, Clean Configuration | **VS** | **47** | KIAS |
| Maximum Flap Extended Speed | **VFE** | **76** | KIAS |
| Max. Gear Operating Speed | **VLO** | **70** | KIAS |
| Design Maneuvering Speed | **VA** | **100** | KIAS |
| Max. Extended Gear Speed | **VLE** | **124** | KIAS |
| Rough Air Speed | **VRA** | **145** | KIAS |
| Never Exceed Speed | **VNE** | **177** | KIAS |

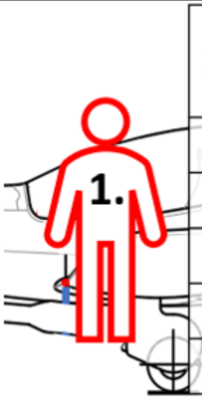
## ENGINE SPEED

| | |
|---|---|
| Max. take-off (max 5min) | **5 800** rpm |
| Max. continuous | **5 500** rpm |
| Idling | **1 400** rpm |

**This aircraft has not been flight tested for recovery from unintentional spins.**

| | |
|---|---|
| 50 **liters**<br>**Natural 95**<br>min. MON 85 RON 95 | 75 **liters**<br>**Natural 95**<br>min. MON 85 RON 95 |
| FUEL TANK VOLUME LIMIT<br>**Standard** | FUEL TANK VOLUME LIMIT<br>**Optional (Long Range)** |

**ALLOWED COMBINATIONS OF WEIGHT ON REAR SEAT AND BAGGAGE WEIGHT**




| 2. kg | Max. kg |
|---|---|
| 0 – 15 | 25 |
| 15 - 70 | 15 |
| 71 - 75 | 10 |
| 76 - 85 | 5 |
| 86 - 110 | 0 |

*Baggage Compartment*

**CG calculation**

SHARK600 S/N

Empty weight kg

Empty CG %

*Cockpit*

**tyre 3,0 Bar**
**44 PSI**

*On Landing Gear*

**NO STEP**

*On the Wing close to the Fuselage*

**NO PUSH**

*On Control Surfaces*


*Rescue Parachute Warning on motor cowling close to canopy-frame*


*Rescue Parachute Warning on fuselage adjacent to occupant entrance (UK only)*

*Parachute egress identification marking (UK only)*

| |
|---|
| **WARNING – EMERGENCY PARACHUTE**<br>**(Action to be taken)**<br>**Unapproved Equipment - see Pilot's Handbook** |

*Rescue Parachute Warning adjacent to the release control (UK only)*

| |
|---|
| **Autopilot operation is not permitted below 1000 ft AGL** |

*Autopilot limitation in the full view of the pilot (UK only)*

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## 3 Emergency Procedures

## 3.1 Introduction

This section provides checklists and procedures in the event of emergencies. Non-normal situations caused by airplane or engine malfunction are extremely rare if appropriate maintenance and pre-flight inspections are carried out correctly.

The guidelines, described in this section, should be applied to solve the problems. All air speed values in this chapter are presented in km/h - Indicated Airspeed. Each Pilot flying Shark 600 should be thoroughly familiar with this section of the flight manual.

**IMPORTANT NOTE**

Checklists with titles in **BOLD UPPERCASE UNDERLINED**, often referred to as **BOLDFACE CHECKLISTS** must be memorized and performed from memory when operating the aircraft.

## 3.2 ENGINE FAILURE DURING TAKE-OFF RUN

| | |
|---|---|
| Throttle | Idle |
| Rudder | Maintain directional control |
| Brakes | Apply as needed |
| When safely stopped | |
| MAG1 and MAG2 | Off |
| ATC | Radio call |
| Master Switch | Off |

## 3.3 ENGINE FAILURE DURING TAKE-OFF

| | |
|---|---|
| Airspeed: | 65 KIAS |
| Landing Site | Find most suitable field, make only small changes in heading and limit bank angle |
| BRS | Consider use if no suitable field available |
| Flaps | As needed |
| Landing Gear | Down |
| MAG1 and MAG2 | Off |
| Fuel selector | Closed |
| FUEL PUMP | Off |
| Master Switch | Off |
| Harness | Tighten |
| After touchdown | Brakes as required |

### WARNING

**IF NO SUITABLE LANDING AREA IS AVAILABLE ACTIVATE THE BRS IMMEDIATELY**

## 3.4 ENGINE FAILURE IN FLIGHT

Convert excess speed to height or a turn towards landing area

| | |
|---|---|
| Airspeed | 65 KIAS |
| Trim | As required |
| Landing area | Choose area for outlanding |
| Radio | Consider MAYDAY call but the priority is to fly the aircraft |

If sufficient altitude and time available:

Carry out the **ENGINE RE-START IN FLIGHT** drill

If no suitable field is available and the engine does not restart

Carry out the **BALLISTIC RECOVERY SYSTEM ACTIVATION** drill

If the engine does not restart and a suitable field is available

Carry out the **FORCED LANDING WITHOUT POWER** drill

## 3.5 CARBURETOR ICING

| | |
|---|---|
| Airspeed: | 70-80 KIAS |
| Throttle: | Try to find RPM with minimum power loss |

Leave the icing area (if possible - a 180° turn may be an option).

After 1-2 minutes slowly increase engine power to establish cruise speed.

When engine power is not recovered, use

**3.4 ENGINE FAILURE IN FLIGHT**

## 3.6 ENGINE RE-START IN FLIGHT

| | |
|---|---|
| Airspeed | 65 KIAS |
| Master switch | On |
| MAG1 and MAG2 | On |
| Fuel selector | Change to fuller tank |
| Choke | Closed |
| FUEL PUMP | On |
| Throttle | 1/3 forwards |
| ENG START | On |
| Starter | Start |

If the engine cannot be started due to insufficient battery power, increase the airspeed to 81-92 KIAS for propeller windmilling to support engine starting.

## CAUTION

**Loss of altitude needed for in-flight engine start is approximately 600 ft.**

## 3.7 ENGINE FIRE ON THE GROUND

| | |
|---|---|
| Fuel selector | OFF |
| Throttle | Max |
| FUEL PUMP | Off |
| MAG1 and MAG2 | Off |
| Master Switch | Off |
| Parking Brake | Set |
| Aircraft | Evacuate |

## 3.8 ENGINE FIRE IN FLIGHT

| | |
|---|---|
| Cabin Heat | Off |
| Fuel selector | Off |
| Throttle | Max |
| Airspeed | Increase, to attempt to extinguish the fire. **Do not exceed $V_{NE}$.** |

Proceed acc. to **3.4 ENGINE FAILURE IN FLIGHT**,
avoid Engine Restart.

## WARNING

**DO NOT ATTEMPT TO RESTART ENGINE**

## 3.9 COCKPIT / ELECTRICAL FIRE

| | |
|---|---|
| Cockpit vents and windows | Open, to remove smoke and fumes |
| Electric equipment | Switch off all electric equipment not needed for a safe landing |

Land as soon as possible at closest airfield, or make **3.12 PRECAUTIONARY LANDING**

## 3.10 GLIDING

| | | |
|---|---|---|
| Optimal gliding speed | | 78 KIAS |
| Glide Ratio | Flaps 0 | 1 : 11 |

## 3.11 FORCED LANDING WITHOUT POWER

| | |
|---|---|
| Airspeed: | 67 KIAS |
| Trim | As needed |
| Landing Field | Choose most suitable field |
| Throttle | Idle |
| Fuel selector | OFF |
| MAG1 and MAG2 | Off |
| Flightpath and flaps | Adjust to control glide angle of final approach |
| If a belly landing safer | Carry on **3.15. Belly Landing drill** |
| Once landing assured | |
| LANDING GEAR | Down |
| Master Switch | Off |
| Harness | Locked and tight |

## 3.12 PRECAUTIONARY LANDING

| | |
|---|---|
| Airspeed: | 67 KIAS |
| Flaps: | 0 |

Choose suitable landing site and check it at low pass by over-flying it upwind. Evaluate wind (direction and speed), surface, slope and obstacles.

Follow normal pattern and Approach and Landing Checklist.

| | |
|---|---|
| Flaps | As required |
| LANDING GEAR | Down |
| After Touchdown | |
| MAG1 and MAG2 | Off |
| Master Switch | Off |
| Fuel selector | Off |
| Brakes | As required |

## 3.13 Landing with a damaged landing gear

In case of damaged wheel or leg, non-extended leg, or unlocked leg, Belly Landing is recommended. If pilot decides to land with gears down, use normal approach and landing procedure, keep damaged leg above ground during the flare as long as possible using ailerons and elevator.

## 3.14 Landing with a flat tire

Use normal approach and landing procedure, keep the damaged tire above the ground during the flare as long as possible by using aileron and elevator.

## 3.15 Belly Landing

Use belly landing when field for landing is too soft and collapse of landing gear after touch-down is expected with risk of overturning the aircraft: water, mud, snow, sand. Belly landing is usually safer and less damage is inflicted on the aircraft. Grass or snow is preferred over asphalt and concrete. Damage in a controlled belly landing is often less than would be expected in a collapsed landing gear situation on a soft surface.

Retract FLAPS 0 and cut off engine by selecting MAG1 and MAG2 Off when safely established on final. Set the Fuel Selector to OFF and only if time allows and sufficient pilot capacity remaining adjust the 2 bladed propeller in horizontal position with the starter motor. The priority is to fly the aircraft and land with wings level.

## 3.16 Landing gear does not move up

| | |
|---|---|
| LAND GEAR | Switch/circuit breaker Off |
| Altitude: | Climb to safe altitude where you can continue flight without stress |
| LAND GEAR | Switch/circuit breaker On |
| Speed: | 70 KIAS |
| LANDING GEAR | Extend and visually confirm down, leave down for the rest of the flight |

**CAUTION**

**Do not operate aircraft again until the landing gear has been repaired and adjusted by an authorized person.**

**NOTE**

The electric system of landing gear has a safety switch installed. The switch is activated by air pressure from the static system. This system blocks retracting the gear below 65 KIAS, and activates warning sound and warning lights if one or more gear-legs is/are not down and locked below this speed.

## 3.17 Landing gear does not go down / Emergency landing gear release

If any malfunction occurs during the extending of the landing gear:

- **Switch Off** the LAND GEAR switch/circuit breaker
- Climb to safe altitude where you can continue flight without stress
- Reduce speed to 65 KIAS
- **Switch On** LAND GEAR switch/circuit breaker and extend the landing gear
- If landing gear is not down and locked, retract landing gear and then extend it again. Combination of positive and negative G loads can help to release the system if there is a mechanical failure
- If one of the landing gear legs is not fully extended and locked, use the following **Emergency Landing Gear Release** procedure;

| | |
|---|---|
| LAND GEAR switch/circuit breaker | Off |
| Speed | Reduce 65 KIAS |
| FLAPS | FLAPS I |
| Emergency Release Handle | Pull the corresponding red gear-emergency-handle |
| Gear position indicators | Cross check |

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## CAUTION

**Emergency Landing Gear Release Notes:**

- **If you have any doubts that the landing gear is not properly down and locked, check the gear visually via the gear position indicators in the inspection windows**
- **The gear position indicator red-black flag-arrows need to be aligned. This visual check is the primary indication and takes precedence over the LANDING GEAR indications on the instrument panel**
- **When the Emergency Landing Gear Release is used, it is not possible to retract the gear until the release mechanisms are re-assembled by an authorized technician**
- **In case of one landing gear leg staying locked in the up position, it is a safe procedure to retract the other gear legs as well and perform a belly landing**

## 3.18 Extreme Turbulence Encounter

| | |
|---|---|
| Airspeed | Reduce to $V_A$ 100 KIAS |
| Harness | Locked and tight |
| Loose Objects | Stow |

## 3.19 Engine Vibrations

| | |
|---|---|
| Power setting: | Find a power setting which gives minimal vibrations |
| Flight Adjustable Propeller: | Find propeller pitch setting with the least vibrations. |

If vibrations increase, land as soon as possible, consider an off-airport landing.

## 3.20 Oil Pressure Drop

Low oil pressure might be an indication of an imminent engine failure.

| | |
|---|---|
| Power | Reduce |

Convert excess speed to height or start diversion towards a suitable airfield

Land as soon as possible, consider an off-airport landing.

## 3.21 Inadvertent Icing Encounter

| | |
|---|---|
| Throttle: | Increase to higher-than-normal power setting. |
| Heading/Course: | Reverse or alter route to avoid icing. |
| Altitude: | Climb above moisture or descent to warmer air. |

## 3.22 Electrical Failures

In case of Electrical System failure, there are 3 indicators providing information about the system status.

**1. Charging Indicator**: Red LED on left top edge of instrument panel.
Providing primary information about electric regulator status.

| Condition | |
|---|---|
| ENG START switch On and engine not running | LED is flashing due to the generator not providing energy |
| Engine is running | LED is Off<br>Generator provides energy,<br>regulator provides volts and amps |
| Engine is running<br>LED is flashing | LED is flashing<br>Regulator does not provide energy.<br>Electrical equipment will use main and back up batteries. After about 30 minutes the battery is depleted. |
| In flight: Switch off all instruments not required for flight.<br>Make a precautionary landing at the closest airport for maintenance. | **LANDING GEAR** must be extended by the Emergency Landing Gear Release procedure.<br>**Flaps** are inoperative and a FLAPS 0 landing must be made.<br>**Radio** and **Transponder** are inoperative.<br>The engine will operate normally, Dynon operates normally using its backup battery, Oblo operates normally using its backup battery. |

| 2. Volt Meter | |
|---|---|
| Condition | |
| Engine not running | Voltmeter shows battery voltage.<br>Normal value is 12 to 13,5V.<br>Below 11V the battery is empty and engine start is not possible. |
| Engine Running | Voltage is provided by the regulator.<br>Normal level is 13.5 – 14,4V.<br>If regulator fails, charging indicator starts flashing, voltage drops below 10.5V, some instruments stop working. |

| 3. Ammeter | |
|---|---|
| Condition | |
| Engine running<br>Ammeter indicates negative or zero values | With negative values<br>-15 to 0 Amps, battery is being charged.<br>0 shows fully charged battery. |
| Engine running<br>Ammeter indicates positive values | Power is drained from battery. This indicates a regulator failure. |
| Engine not Running | Ammeter indicates a positive value, indicating that electrical equipment takes power from the battery. |

## 3.23 STALL RECOVERY

| | |
|---|---|
| Simultaneously | Side-stick centrally forward until buffet and all stall indications stop |
| | Max power |
| Once stall indications stop and at a safe speed | |
| | Roll wings level |
| | Select desired flight path (climb) |

### NOTE

Loss of altitude after stall in straight direction is 100 ft, in turn 150 ft.

## 3.24 SPIN RECOVERY

If an inadvertent spin is detected (uncommanded roll and aircraft stalled):

Immediately select IDLE power and centralise the rudder and side-stick.

If the spin continues and below 3000 ft AGL

| | |
|---|---|
| BRS Handle | PULL |

If above 3000 ft AGL

| | |
|---|---|
| Turn indicator | identify direction of turn |
| Rudder | apply full opposite rudder |
| Side-stick | continue to move centrally forward until the spin stops |
| When the spin stops | centralise controls and pull out of the dive to desired flight path (climb) . |

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## WARNING

**IF OUT OF CONTROL OR IN A SPIN SITUATION BELOW 3000 AO, DO NOT DELAY ACTIVATION OF THE BRS**

## WARNING

**THIS AIRCRAFT HAS NOT BEEN FLIGHT TESTED FOR RECOVERY FROM UNINTENTIONAL SPINS. THE PROCEDURE ABOVE IS FOR INFORMATION PURPOSES ONLY.**

## NOTE

Use of the Ballistic Recovery System is recommended:

- if it is not possible to continue safe flight because of structural failure caused by bird strike, collision, overloading, over-speed, icing

- if it is not possible to land safely because of flight in IMC conditions

- if pilot lost control of aircraft position because of spin, turbulence

- if pilot can´t find safe field for forced landing

- if landing on water is necessary

- if pilot lost capability to control aircraft – heart attack, seizure

Trying to land aircraft in all above-mentioned circumstances brings pilot and passenger to serious risk of life and can cause serious damage to the

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aircraft. Use of the Ballistic Recovery System is highly recommended, it can save life and reduce damage to the aircraft.

A second handle for Ballistic Recovery System is located in front of the passenger seat. The two systems operate independently and separately.

Speed and altitude is needed for activation of the Ballistic Recovery System. However, even just partially deployed parachute can significantly reduce speed at impact. Referring to numerous years of experience, it is key to note that the MAGNUM rescue system may work even at very low altitudes and save human lives. In emergencies, it is recommended to activate the MAGNUM rescue system even at altitudes which are below limits; even this option offers a considerable chance of rescue.

Do not delay decision to use the BRS as it takes a finite time to deploy the system and carry out post deployment drills, ideally:

- With the aircraft under control deploy before 1000 ft AO
- With the aircraft out of control deploy before 3000 ft AO
- Convert excess speed to height
- Maintain an upward vector as long as possible
- Activate at apex of flight path before aircraft stalls

## WARNING

**DO NOT DELAY PULLING THE RED DEPLOYMENT HANDLE IF RISK OF IMPACT IS IMMINENT**

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## 3.25 BALLISTIC RECOVERY SYSTEM ACTIVATION

### ZOOM – TRIM – MAGS – MAYDAY – BOOM!

Convert excess speed to height

Trim to maintain an upward vector

| | |
|---|---|
| MAG1 and MAG2 | Off |
| Radio | Consider MAYDAY call |
| Red Deployment Handle | Pull fully to end of travel |

Once parachute is deployed and if time permits:

**Post BRS Activation Actions**

| | |
|---|---|
| ELT | Activated |
| Fuel Selector | OFF |
| LANDING GEAR | DOWN |
| MAYDAY | Transmitted |
| BAT MASTER | OFF |
| Canopy | Unlocked or jettisoned if ditching on water |

Before impact:

Brief passenger and adopt posture:

- Straps tight, buttocks well back in seat
- Legs forward with feet on the rudder pedals to ensure optimum thigh support
- Back pressed firmly against the seat back
- Head located hard back against the headrest
- Eyes closed

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**NOTE**

The Ballistic Recovery System is secured by a pin with a red flag labelled: REMOVE BEFORE FLIGHT. This pin must be removed before every flight. In case you forgot to do so remove the pin before use.

**CAUTION**

**Use of the Ballistic Recovery System will result in considerable airframe damage.**

## 3.26 Misplaced movable ballast – pilot solo flight

If a takeoff occurs with the movable ballast incorrectly positioned in front:

- continue to fly, expect degraded ability to trim at lower speeds and with flap extended
- use FLAPS I for approach and landing
- approach at 65 KIAS
- higher side-stick elevator forces will be required in the flare
- expect longer landing than usual

## 3.27 Misplaced movable ballast – flight with passenger

If the take-off with passenger occurs in with a misplaced movable ballast in the rear:

- continue flying, the aircraft can be significantly more sensitive to control inputs and will have a reduced stability margin
- use extra caution when making steering inputs
- do not release the side-stick
- do not perform stalls

**CAUTION**

**It is the pilot's responsibility to check the loading of the aeroplane before each flight, determine the position of the movable weight and check that the movable weight is in that position**.

**NOTE**

In the event of a misplaced movable ballast, consider a precautionary landing at a suitable airport and moving the ballast to the correct position.

## 3.28 High carbon monoxide (CO) level alarm

| | |
|---|---|
| Cockpit HEAT Control Knob | CLOSE |
| Cockpit VENT switch | OPEN (10 seconds) |
| Cockpit air vents (front and rear) | rotate fully open |
| Canopy air vents (front and rear) | fully open |

LAND AS SOON AS POSSIBLE:

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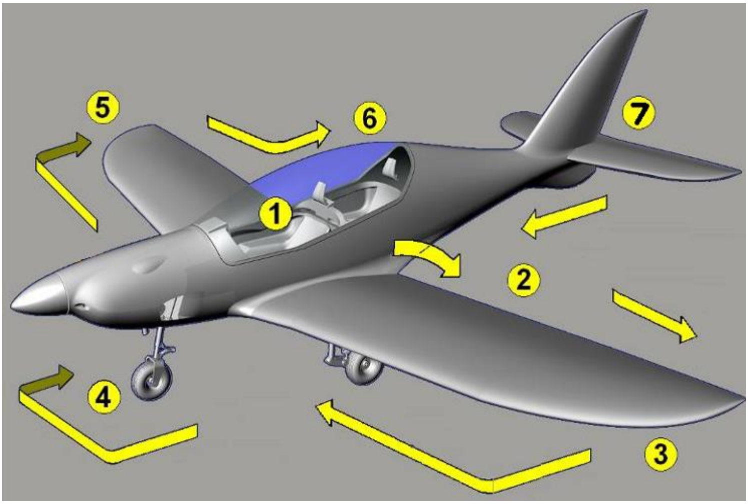
## 4 Normal Procedures

## 4.1 Pre-Flight Inspection




Numbers correspond with list below

## CAUTION

**Never lift open the canopy using the window aperture persex – structural damage is likely to occur. Only use the approved canopy opening support notch/handle to avoid damage.**

| 1 Cockpit | |
|---|---|
| MAG1, MAG2 | Off |
| Master | Off |
| Position of seats | Checked & adjusted |
| Safety belts | Inspected |
| Instruments and equipment | Inspected |
| Headsets | Connected |
| Side-stick | Inspected, freedom of movement |
| Rudder pedals | Inspected, and adjusted |
| Rudder control cable | Inspected |
| Floor | Inspected, no debris or loose articles |
| Engine and prop control | Inspected, freedom of movement |
| Parking brake | Set |
| Canopy | Check condition and cleanliness checked, sliding window function checked |

| 2 /3 Wing Left | |
|---|---|
| Flap: | Control rod inspected, bolts and nuts inspected, secured |
| | Stiffness of control tested |
| | Hinge bolts and nuts inspected, secured |
| | Surface inspected |
| Fuel tank ventilation: | Ventilation hole in the outbound flap hinge clear (blow inside to test throughput) |

| | |
|---|---|
| Aileron | Control pushrod, ball end, root hinge, nuts, anti-trim tab pushrod, ends, pins inspected, secured |
| | Teflon sealing tape inspected, freedom of movement up to limit stops |
| Wing tip | Shake - check gaps in pins |
| | Press down/lift, test shock absorber function |
| | Position light, camera fix point - inspect |
| Wing surface | Top, bottom, leading edge inspected |
| Pitot tube | Inspected |
| Inspection window | Aileron bell crank, pushrods, ball ends, bolts, nuts inspected |
| Fuel tank cap | Inspected, fuel quantity checked, cap secured |
| Window, wing root sealing tape, stickers, walkway | Inspected |
| Fuel drain | Fuel drained, checked for water |

## 4 Landing Gear Left/Right/Front Legs, Tires, Wells

| | |
|---|---|
| **Left/Right main leg:** | |
| Tire and wheel | Inspected, pressure (3,0 bar/ 44 psi) |
| Brake system | Disc and securing wire, calliper, bolts |
| Trailing arm | Hinges, bolts, nuts, wheel axle, wheel nut, secure and inspected |
| Shock absorber | Inspected |

| | |
|---|---|
| Main leg, attachment, locking strut | Inspected |
| Retracting cable and release lock | Inspected, function tested |
| Gas spring, steel spring, Bowden | Inspected |
| Sensors up/down, flag, window, LED | Inspected |
| Gear main doors | Carbon holding arm, bottom spring bracket, upper limit stop, free movement of leading edge, upper rear hinge inspected |
| Main gear small doors | Hinges, hooks, spring, microswitch inspected, LED function tested |
| Wing pins | Main spar 2 pins IN and secured, rear spar IN, nut secured |
| Fuel filter | Inspected |
| Fuel lines | Condition, connection inspected |
| Sensor fuel tank | Connectors and wiring inspected |
| **Nose landing gear** | |
| Tire and wheel | Inspected, pressure (2.3 bar/ 33 psi) |
| Fork, axle, nut, composite spring | Inspected, secured |
| Main leg, locking strut | Inspected |
| Servo plus hinge, emergency lock | Inspected |
| Bowden, flag, sensors | Inspected |
| Front doors strip | Hinge, sliding pushrod function inspected |
| Side doors | Inspect hinges, arm, spring function |

| | |
|---|---|
| Parachute Bowden cables, parking brake valve plus hoses, transponder antenna | Inspected |

## 4 Powerplant

Remove left gills, disconnect movable ballast connector, remove upper engine cowling, inspect

| | |
|---|---|
| Engine, propeller | Surface and general condition, check for leaking liquids |
| Engine mount | Checked for cracks, secured nuts, fixed ballast |
| Exhaust system | Clamps, cracks, EGT sensors inspected |
| Ignition system | Wiring, boxes, spark plugs plus connectors |
| Fuel system | Gascolator, hoses, pump, pressure sensor, fuel flow sensor inspected |
| Carburettors | Clamps, filters, bowls, drain hoses inspected |
| | Carburettor heating system – open valve if flight in conditions with risk of icing is expected |
| Cooling system | Hoses, radiator, overflow bottle, level checked |
| Oil system | Hoses, clamps, radiator, pressure sensor, thermostat, oil tank inspected |
| Propeller control system | hydraulic |
| | Governor and Bowden |

| | |
|---|---|
| Propeller control system electric | |
| | Wiring and contact plate and box |
| Throttle and choke Bowden cables | |
| Secured, free movement to limits | |
| Sensors | CHT, MAP, TMOT, TFUEL inspected |
| Battery, Starter | Battery box, fuse, wiring, external plug, wiring to starter inspected |
| Heating valve | Valve, servo, wiring, exhaust hose inspected |
| Brake fluid level | Collector bottle level checked - if installed here. Fill if needed. |
| Bottom engine cowling | Sealing to radiators, landing light, NACA flap, servo, plexiglass inspected. Winter plug - adjusted |
| Oil level check | Remove oil tank lid |
| Turn propeller until “burps” | |
| Check oil amount, refill if needed | |
| Re-fit oil tank lid | |
| Oil access panel door | OPEN if OAT is over 30°C and if there is a risk of vapor lock during taxi |
| Movable ballast | Check position and locate to proper position according to intended flight configuration, locking pin secured |

## 5 Wing

As Wing above (2/3)

## 6/7 Fuselage and tail section

| | |
|---|---|
| Fuselage plus tail | Surface, static ports on sides inspected |
| Stabilizer | Shake on tip – check no gaps condition, rear pin nut and safety needle inspected |
| Pushrods, trim connector | |
| Bolts, nuts, secured | |
| Elevator Right & Left | Freedom of movement up to limits |
| Trim Tab | Inspected |
| Strobe lights, sealing tapes, camera fixpoints | |
| Inspected | |
| VHF, ELT antenna | Inspected |
| Baggage compartment | Check correct loading, rear bulkhead, check brake liquid in collector cup -if installed here. Fill if needed. |
| ELT | ARMED |

## 8 Movable Ballast

| | |
|---|---|
| Position | Stowed and secured in baggage for flight with 1 occupant.<br>Stowed and secured in engine cowling for flight with 2 occupants. |

## 4.2 Flight Procedures

### 4.2.1 Boarding

**General**

| | |
|---|---|
| Headsets | Installed |
| Documents | Check mandatory documents for aircraftand pilot on board |
| Essential equipment | Pens and kneepad with checklists on board |
| Tablet, mobile | Installed |
| USB key in Dynon slot | Installed |
| Movable ballast | Inserted in correct position and secured |
| Seats | Adjusted (consider raising to highest position for ease of subsequent adjustment) |

**When passenger is seated**

| | |
|---|---|
| Passenger seat | Adjusted |
| Harness | Secured and tight |
| Controls | Free (through full range, stick, throttle, pedals) |
| BRS briefing: | Completed (Safety pin removal, stowing, insertion) |
| If installed: | |
| Master | On |
| MAG1, MAG2 | On |
| EFIS (rear seat) | On |

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| | |
|---|---|
| Ventilation & window | Adjusted |
| Armrests | Secured |

**When Pilot is seated**

| | |
|---|---|
| Seat height | Adjust |
| Pedals | Set |
| Harness | Secured and tight |
| Pilot equipment | Tablet, mobile, kneepad, maps, cap, glasses |
| Headset | Connected, ANR ON |
| Canopy | Closed and locked or latched on strut |
| Windows | Set |
| Mirror | Set |

### 4.2.2 Before engine start

| | |
|---|---|
| PARK BRAKE | ON |
| Fuel tank selector | As required (LEFT if tanks are full) |
| EFIS | On (Use Skyview Button 1, press for 2s) |

### 4.2.3 Engine start

| | |
|---|---|
| Master Switch | On |
| Propeller | High RPM (Hydraulic propeller only) |
| ENGINE COOLING | OPEN |
| ENG START | On |
| FUEL PUMP | On |
| STRB LIGHTS | On |

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| | |
|---|---|
| MAG1, MAG2 | On |
| Throttle | Cold engine: Idle |
| | Warm engine: approx 2cm forward |
| Choke | Cold engine - On |
| | Warm engine - Off |
| Propeller area | Check and call “CLEAR” |
| Red ENGINE START | Actuate (10 sec max-then cool for 2 min) |
| After engine starts | Maximum 2500 rpm, set 2000 |
| Oil pressure | Checked (rising within 10s) |
| Choke | Off |

## CAUTION

**Warm up engine at 2000 rpm for 2 minutes, continue at 2500 rpm until oil reaches 50 °C.**

## WARNING

**LITHIUM BATTERY FITTED - NO JUMP STARTING PERMITTED**

**LITHIUM BATTERY MUST BE DISPOSED OF IF DEEP DISCHARGED (BELOW 8V) DUE TO DENDRITIC DAMAGE**

## 4.2.4 After engine start

| | |
|---|---|
| EFIS | On |
| RADIO | On |
| FLAPS | On - Flaps 0 green LED flashing, acknowledge by pressing “FLAPS 0” |
| TRIM | On |
| LAND GEAR | On, Audio Warning noted, self test complete, no flashing lights |
| PROP | On (Electric prop only) |
| AP | On |
| POS LIGHT | On |
| LAND LIGHT | On |
| Other circuit breakers | As required |
| **On EFIS:** | |
| QNH | Set |
| TRIM indicator | Neutral |
| MESSAGES | Checked |
| Backup instruments | Set |

## 4.2.5 Taxi

| | |
|---|---|
| Brakes | Checked |
| Nosewheel steering | Checked |

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## CAUTION

**Excessive TFUEL and TMOT can cause engine overheat. When TMOT is above 70°C in the engine compartment cool down the engine to avoid vapor lock.**

### NOTE

Engine warm up may be performed during taxi.

The recommended maximum taxi speed is 6 KTS (slow runing speed). Do not use too much brake in snowy conditions, melting ice can freeze on brake discs.

| **4.2.6** | **Engine function** | |
|---|---|---|
| | PARK BRAKE | Set |
| | Engine temperatures | Checked |
| | Throttle | Set 4500 rpm |
| | Engine indications | Checked |
| | Propeller | Test |
| | Throttle | Set 4000 rpm |
| | MAG1 | Off/On (max drop 350 rpm) |
| | MAG2 | Off/On (max drop 350 rpm, max difference from MAG1) |
| | Throttle | Idle, check smooth running |
| | Throttle | Set 2000 rpm |

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## CAUTION

**Maximize cooling during engine functional test. Consider pointing the aircraft into the wind. Minimize duration of the test and high power settings.**

### 4.2.7 Before departure

The form below may be used as an easy way to perform both the engine function test and the before departure items. The first three rows include flight preparation items.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type: **SHARK 600 UK** | Registration | | Callsign | | Production Number | Date | |
| Crew : | | | | | Purpose of flight : | | |
| Weather TWR: | wind: | | visibility/clouds | | | °C | hPa/inHg |
| Check before departure | Fuel L | R | fuel pump | selector | charging | cooling flap | brakes |
| | | | | | | | |
| Landing gear | rpm max | magnetos | flaps | trim | radio | transponder | prop |
| | | | | | | | |
| Free controls | canopy | +baggage lock | movable ballast | | | | |

Fuel tank selector LEFT or RIGHT (LEFT if full tanks)

| | |
|---|---|
| Propeller | High RPM |
| Choke | Off |
| ENGINE COOLING | OPEN |
| FLAPS | Set for take off |
| MOVABLE BALLAST | Position verified |
| BAT CHARGE | Not illuminated |
| Trim | Set for take off |
| Engine indications | Checked |
| MESSAGES | Checked |
| FUEL PUMP | On |
| Circuit Breakers | As required |
| PITOT HEAT | As required |
| Backup instruments | Checked |
| MAG1, MAG2 | On |
| Harness | Secure and tight |
| Flight controls | Full and free movement |
| Canopy | Closed, latched, light out |
| Baggage compartment | EFIS indication CLOSED |
| Windows | Closed |
| BRS Pin | Removed front and rear, cross checked |

### 4.2.8 Take-off

| | |
|---|---|
| Brakes | Released |
| Throttle | Max |
| Engine parameters | Checked |

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| | |
|---|---|
| Airspeed indication | Checked |
| *At safe height and with positive rate of climb* | |
| FLAPS | FLAPS 0 |
| LANDING GEAR | Up |
| Propeller rpm | Set (Max 5500 rpm, normal 5000) |
| Throttle | Set MAP (Max 27, normal 26 inHg) |
| Engine indications | Monitor |

**NOTE**

Keep direction by the use of rudder pedals, light pressure right pedal needed. Apply back pressure to the sidestick aiming to lift the nosewheel as soon as possible. As the nosewheel lifts at 25-30 KIAS it should be held approximately 10 cm above the ground until the aircraft flies off at approx. 50 KIAS.
Accelerate the aircraft and retract the gear at 65-70 KIAS. Raise the flap prior to exceeding 76 KIAS. Climb at best angle of climb speed of 73 KIAS until all obstacles are cleared and then climb at the best rate of climb speed 81 KIAS.
The landing gear system is connected to pitot-static / electronic system. This prevents unintentional retraction of the gear on the ground or in the air below 55 KIAS. Gear down selection will work at any speed.

If any of the 3 legs of landing gear are not down and locked below 65 KIAS, the pressure switch will activate a warning sound and light.

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Properly retracted legs are indicated by red LED lights on the control panel. Properly closed small landing gear doors are indicated by green lights in viewing windows.

A visual inspection of the landing gear being down and locked can be done through small inspection windows. These are positioned on top of each wing and in the mid console in front of the pilot and correct indication will have 3 visual indicator arrow pairs aligned.

### 4.2.9 Climb

| | |
|---|---|
| Propeller | 5500 rpm maximum |
| Airspeed | 70 to 100 KIAS |
| | *$V_X$ – 73 KIAS – max. angle* |
| | *$V_Y$ – 81KIAS – max. climb* |
| Engine Indications | Monitor, if needed reduce power to avoid overheating |

### 4.2.10 Cruise

| | |
|---|---|
| FUEL PUMP | Off |
| Propeller | 4000 – 5500 rpm |
| Throttle | Set MAP (from 22 inHg to full) |
| Engine Indications | Monitor, adjust power and ENGINE COOLING to keep temperatures within limits |
| MESSAGES | Checked |
| Fuel tank selector | Set |

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The following values are recommended for optimized cruise:

| SHARK 600 - Rotax 912 ULS | Engine speed (1/min) | MAP (inHg) | Fuel flow (l/h) |
|---|---|---|---|
| **Take-off power (5 min Max)** | 5800 | 28,4 | |
| **Max. continuous power** | **5500** | **27** | **25,5** |
| **75 %** | 5000 | 26 | 20,0 |
| **55 %** | 4600 | 22 | 15,0 |
| **Long range Cruise** | 4000 | 23 | 12,0 |

**WARNING**

**SWITCH BETWEEN LEFT AND RIGHT TANK ON REGULAR BASIS TO PREVENT FUEL STARVATION.**

**AVOID PROLONGED OPERATION WITH IDLE POWER DURING FLIGHT AS THE ENGINE MAY BECOME OVERCOOLED AND LOSE POWER**

### 4.2.11 Descent

| | |
|---|---|
| Harness | Secured and tight |
| Fuel tank selector | LEFT or RIGHT |
| Engine Indications | Monitor |
| ENGINE COOLING | As required |

## 4.2.12 Approach and landing

| | |
|---|---|
| FUEL PUMP | On |
| LANDING GEAR | Down (3 green lights on)<br>3 visual indicator arrows aligned |
| Brakes | Checked |
| PARK BRAKE | OFF |
| FLAPS | Flaps set |
| Propeller | Max |

**NOTE**

Approach and landing are conventional. Pilots can choose to fly power-on or power-off approaches as appropriate.

For a power-on approach, bring throttle to idle at approx 30ft. Maintain a speed of 50 – 55 KIAS until the flare. When flaring at a height of 1-2 ft, bring the aircraft into a nosewheel-high attitude. This might require significant nose-up inputs. Touch down on the main wheels first. If runway length permits, consider aerodynamic braking with the nosewheel held off the ground. Lower the nosewheel onto the runway smoothly.

## 4.2.13 Go around (balked landing)

| | |
|---|---|
| Power | Max |
| Airspeed | minimum 55 KIAS |
| FLAPS | FLAPS 1 |

After achieving a positive rate of climb:

| | |
|---|---|
| FLAPS | FLAPS 0 |

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| | |
|---|---|
| LANDING GEAR | Up |
| Airspeed | 75 to 100 KIAS |
| Propeller | maximum 5500 rpm |
| Engine Indications | Monitor |
| ENGINE COOLING | As required |

**CAUTION**

**The go around procedure poses a significant risk of flap overspeed if power and attitude are not managed accurately. The Shark 600 has a high power to weight ratio; applying full power without raising the nose to the climbing attitude is likely to rapidly and significantly overspeed the flaps with an associated risk of severe damage and loss of control occurring.**

### 4.2.14 After landing

**After touchdown**

| | |
|---|---|
| Throttle | Idle |
| Brakes | As required |

**Clear of runway**

| | |
|---|---|
| BRS | Safety pin inserted, front and rear, cross checked (as appropriate) |
| ENGINE COOLING | OPEN |
| FLAPS | FLAPS 0 |
| FUEL PUMP | Off |

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| | |
|---|---|
| PITOT HEAT | Off |

**Engine shut down**

| | |
|---|---|
| PARK BRAKE | ON |
| Power | Cool down the engine at 2000 rpm (if necessary) |
| ELT | Checked |
| ENGINE COOLING | CLOSE |
| HEAT | CLOSE |
| VENT | CLOSE |
| All Circuit Breakers | Off (usually from right to left, except for STRB LIGHTS) |
| MAG1, MAG2 | Off |
| Master switch | Off |
| STRB LIGHTS | Off |

### 4.2.15 Aircraft securing post flight

| | |
|---|---|
| BRS safety pins | In |
| EFIS rear circuit breaker | Off |
| Master switch | Off |

Check the airplane overall condition

Pickets, tie down, and control locks and covers as required

### 4.2.16 Short field take-off and landing procedures

For **Short Field Take-off** use flaps II, further follow normal procedures for take-off.

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For **Short Field Landing** use flaps III. Use approach speed 50 KIAS, expect higher descent rate, adjust power to compensate.

## 4.3 Fuel system and its use

The fuel system consists of a wing fuel tank in each wing, both connected by a fuel valve. It is necessary to check fuel level regularly and switch between tanks if require.

There is a fuel return line from the engine to the left fuel tank which maintains correct fuel pressure, and as well helping bleed off any vapors that could cause vapor lock, resulting in a possible loss of power.

An electric fuel pump is installed behind the fuel tank selector.

### 4.3.1 Normal use of fuel system:

1. Use left fuel tank when both tanks are full.
2. Switch to right tank after about 30min of flight time.
3. Switch between tanks as needed in order to keep tanks balanced.
4. The fuel system returns fuel back into left fuel tank – no matter whether the fuel tank selector is set to left or right. When operating with fuel amounts close to the required minimum, consider using the left tank.

## 4.4 Cooling flap - adjustable engine cooling inlet operation

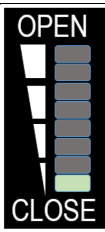
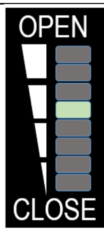
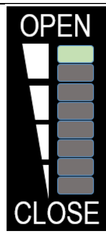
**NOTE**

Adjust the position of winter plug based on outside temperature during pre-flight check according to Aircraft Maintenance Manual.

Do NOT overextend the turn-range of the cooling flap control knob. The flap LED indicator has servo delay to the pre-selected position, always observe and follow LED indicator.


Turn knob to the left to CLOSE. Turn knob to the right to OPEN. Knob range is approximately 270°.

**Engine start** - Adjust the cooling flap control knob (left side panel below dashboard) according outside air temperature:

| OAT | OAT < 10˚C | OAT < 20˚C | OAT > 20˚C |
|---|---|---|---|
| Cooling flap | CLOSED | HALF OPEN | FULLY OPEN |
| LED Indicator |   |   |   |

**Taxing** - Adjust the position with regard to engine temperatures. For OAT over 25°C keep cooling flap FULL OPEN on the ground.

**Take-off and climb** - open the cooling flap by 1-2 LED-step/s for each 10°C of OAT, keep fully open for over 30°C.

**Cruise** - adjust cooling flap to keep TMOT between 90-100°C

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**Approach** - adjust/close cooling flap to avoid over-cooling the engine.

**Landing** - close flap fully for landing.

**Ground and Taxing** - warm engine up if necessary

## 4.5 Risk of vapor lock

Problems with engine re-start can occur during hot days. This is caused by overheated fuel in the engine compartment. Fuel starts boiling at 70-80°C. Due to formation of bubbles an irregular fuel supply occurs, and power loss including engine failure can occur during take-off. This effect is called vapor lock.

To reduce risk of vapor lock, the T connection of the return line is placed on the highest position of fuel hoses. Two temperature sensors are installed inside engine compartment, one close to the fuel line, so the pilot has information about these temperatures.

Temperatures over 60°C indicate yellow so attention is needed, temperatures over 70°C generate a **red indication, which causes the risk of vapor lock.** Recommendation is to turn airplane in the wind and run engine at idle to reduce temperature or shut it down to let it cool down. In hot environmental conditions, keep the oil inspection door on the upper motor cowling open in flight, to reduce this problem.

There is no risk of vapor lock during flight. After take-off the engine compartment cools down to a temperature of about 20°C above the outside air temperature. Rotax recommends using AVGAS fuel in case of vapor lock issues.

## 4.6 Performance considerations

Because the Shark 600 performance is higher than most ultralights, more awareness required. Please read the following items.

### 4.6.1 Turbulence

Shark 600 economy cruise speed is 130 KIAS. Normal cruise ranges between 135 and 145 KIAS at 75% power and fuel consumption 20 l/h.

Maximum speed with maximum continuous power is 150 – 160 KIAS depending on the systems installed – e.g. landing gear doors, airbox, injection, exhaust, weight, temperature and altitude. For longer trips 135 KIAS is an advisable economy cruise speed which can be used for planning and is even acceptable in light turbulence.

Speed up to 146 KIAS is comfortable for passengers when flying in light turbulence.

**CAUTION**

**Reduce speed to 100 – 125 KIAS when flying in moderate to heavy turbulence.**

## 4.6.2 Manoeuvring speed ($V_A$)

Manoeuvring speed, $V_A$, is the speed where the pilot can use single, full deflections of the control surfaces. $V_A$ is 100 KIAS. At this speed a full “nose up” deflection of the elevators would cause the plane to stall at 4G, therefore limiting the stress on the airframe. Beware that normal cruising speed is significantly higher, so it is necessary to use smaller and smooth movements of controls to avoid overstressing the aircraft.

## 4.6.3 Speed reduction

The extremely sleek design of the Shark 600 may present a challenge to pilots converting from lower performance “draggy” ultralights or flying club aircraft. The Shark 600 will slow from cruise speeds to just above circuit speeds as follows:

- Idle power: around 1 nautical mile
- 15 inHg: In excess of 2 nautical miles

The Shark 600 will not slow down perceptibly whilst descending.

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**NOTE**

The Shark 600 has been carefully designed to comply with the slow speed regimes of the ultralight category as well as to be capable of very high speed cruise and excellent maneuverability. The wing shape/profile and sleek design mean that there is a wide range of pitch attitudes which will be selected in every flight. The Shark 600 has excellent forward visibility which means that selecting accurate pitch attitudes in combination with accurate power settings provides very precise control of aircraft performance. Much more than in lower performance aircraft types the following “equation” is important and valuable:

**POWER + ATTITUDE = PERFORMANCE**

### 4.6.4 Propeller & engine RPM

The Shark 600 easily increases its speed during maneuvering. Careful power management is required to avoid engine RPM overrun. This is especially important for fixed pitch propellers but as well for electric adjustable propeller due to their slow angle movement. It takes about 12 seconds to change the blade angle from minimum to maximum. Therefore, even at constant speed mode it is recommended to reduce RPM during maneuvering and work smoothly with the throttle.

Hydraulically controlled propellers do have the advantage to change blade angle very fast, therefore the risk of engine overrun is minimal.

### 4.6.5 Flaps

In the traffic pattern, extend the landing gear at 70 KIAS, reduce speed further to 65 KIAS to extend FLAPS I.

One potential error is attempting to deploy flaps at too high a speed. To counter this, the flap control system is equipped with a pressure switch which prevents flaps extending above 75 KIAS. If the flaps are in an extended position and the speed increases above 70 KIAS a blinking LED on the flap panel will provide overspeed warning.

The flaps will not extend at a speed over 75 KIAS.

It is important to check if flaps are in the desired setting after the flap deployment command! Check LIMITATION-OPERATION-INDICATION

The design structural limit of the flaps is 76 KIAS. Higher speeds can cause structural overload.

**CAUTION**

**The go around procedure poses a significant risk of flap overspeed if power and attitude are not managed accurately. The Shark 600 has a high power to weight ratio; applying full power without raising the nose to the climbing attitude is likely to rapidly and significantly overspeed the flaps with an associated risk of severe damage and loss of control occurring.**

### 4.6.6 Landing gear operation

A pressure switch in landing gear system prevents retraction below 55 KIAS. It is recommended to keep airplane in a shallow climb after take-off and wait until speed passes 65 KIAS.

It is recommended to visually check, if retracting procedure starts (lights flash), or if landing gear is fully retracted 3 red lights illuminate continuously). Test flight with opened landing gears with installed doors was made up to 124 KIAS, without any damage.

### 4.6.7 Flutter versus altitude

Fast airplanes are more susceptible to flutter. Problems may occur during higher speeds at high altitudes because critical flutter speed decreases with altitude.

$V_{NE}$ is limited for this reason according to following table to keep TAS speed constant for altitudes above 3000 ft.

IAS $V_{NE}$ versus altitude:

| Altitude | ft | 0 | 3000 | 6500 | 10000 | 13000 |
|---|---|---|---|---|---|---|
| *KIAS* | kts | 177 | 177 | 169 | 161 | 153 |
| ***KTAS*** | **kts** | **177** | **186** | **186** | **186** | **186** |

For high altitude flights, keep maximum allowed IAS in this table, or check TAS displayed on modern EFIS devices.

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# 5 Performance

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## 5.1 Introduction

The performance calculations are valid for a:

- Standard airplane
- Maximum take-off weight 600 kg
- Normal flying technique
- ISA conditions (sea level, 15°C, 1013 hPa, 29.9 inHg)

**<u>CAUTION</u>**

**Variations in Pilot Technique, Weather Conditions and Airplane Handling (e.g. propeller pitch) can cause significant differences in Flight Performance**

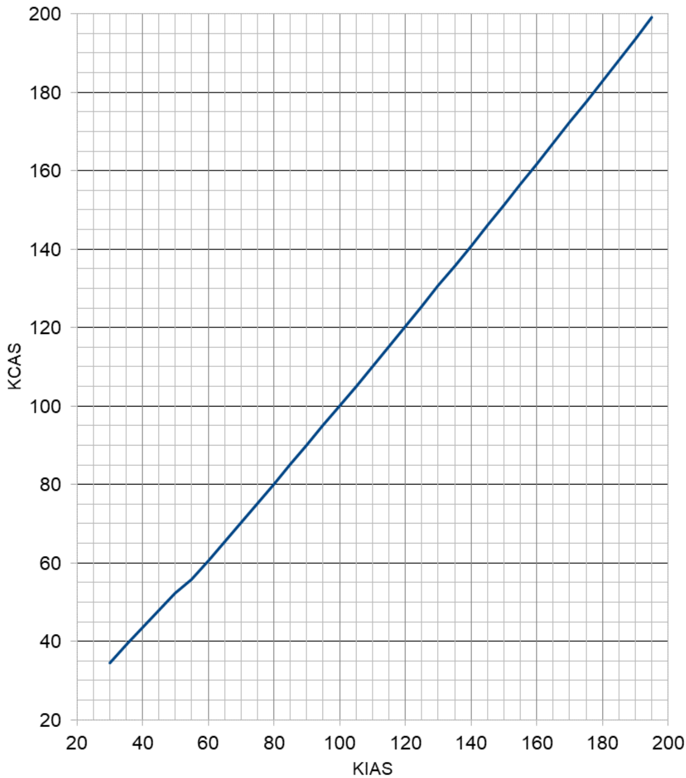
## 5.2 Airspeed Indicator System Calibration

Primary airspeed indicator – EFIS **knots**

| | Cruise FLAPS 0 | Take-off FLAPS I | Landing FLAPS III |
|---|---|---|---|
| KIAS | KCAS | | |
| 30 | | | 35 |
| 35 | | 37 | 39 |
| 40 | | 42 | 43 |
| 45 | | 47 | 48 |
| 50 | 51 | 52 | 52 |
| 55 | 56 | 56 | 57 |
| 60 | 61 | 61 | 61 |
| 65 | 65 | 66 | 66 |
| 70 | 70 | 71 | 70 |
| 75 | 75 | 76 | 75 |
| 80 | 80 | | |
| 85 | 85 | | |
| 90 | 90 | | |
| 95 | 95 | | |
| 100 | 100 | | |
| 105 | 105 | | |
| 110 | 110 | | |
| 115 | 115 | | |
| 120 | 120 | | |
| 125 | 125 | | |
| 130 | 131 | | |
| 135 | 136 | | |
| 140 | 141 | | |
| 145 | 146 | | |
| 150 | 151 | | |
| 155 | 157 | | |
| 160 | 162 | | |
| 165 | 167 | | |
| 170 | 172 | | |
| 175 | 178 | | |
| 180 | 183 | | |
| 185 | 188 | | |
| 190 | 194 | | |
| 195 | 199 | | |
| 200 | 204 | | |
| 205 | 210 | | |
| 210 | 215 | | |

**NOTE**

Changing from cruise to take-off or landing configuration does not affect the margin of error of airspeed indicator.



| | KIAS | KCAS* | |
|---|---|---|---|
| $V_{S0}$ | **40** | 42 | Stall speed in landing configuration |
| $V_{S1}$ | **47** | 48 | Stall speed in clean configuration |
| $V_{FO\text{-}III}$ | **54** | 55 | Maximum speed for flap extending III |
| $V_{FO\text{-}II}$ | **59** | 61 | Maximum speed for flap extending II |
| $V_{FO\text{-}I}$ | **65** | 65 | Maximum speed for flap extending I |
| $V_{LO}$ | 70 | **70** | Maximum gear operating speed |
| $V_{FE}$ | **76** | 76 | Maximum flap extended speed |
| $V_A$ | 100 | **100** | Design Maneuvering speed |
| $V_{LE}$ | **124** | 125 | Max. extended gear speed |
| $V_B$ | 145 | **146** | Design cruise speed- max gust intensity loading |
| $V_{RA}$ | **145** | 146 | Maximum turbulence penetration speed |
| $V_H$ | **160** | 162 | Maximum speed in level flight at maximum continuous power - Woodcomp propellers |
| $V_{NE}$ | 177 | **180** | Never exceed speed |

*KCAS speeds at H=0, ISA

## 5.3 Stall Speed

| Config. | FLAPS Deflection | Indicated | Stall speed | | | |
|---|---|---|---|---|---|---|
| | | | | | KIAS | KCAS |
| Clean * | 0° | 0 | | | 47 | 48 |
| Take-Off * | 20° | I | | | 41 | 43 |
| Short T-O* | 30° | II | | | 40 | 43 |
| Landing** | 38° | III | | | 40 | 42 |

* Stall speeds applicable for Max. Take-Off Weight, Idle

** Stall speeds applicable for Max. Take-Off Weight, engine OFF

## 5.4 Take-off Distance, MTOW 600kg

| **FLAPS position I (20°)** | Take-off run | Total take-off distance to 50 ft |
|---|---|---|
| Grass surface | 200 m | 405 m |
| Paved surface (concrete / asphalt) | 190 m | 395 m |

| **FLAPS position II (30°)** | Take-off run | Total take-off distance to 50 ft |
|---|---|---|
| Grass surface | 180 m | 330 m |
| Paved surface (concrete / asphalt) | 170 m | 320 m |

| **FLAPS position 0 (0°)** | Take-off run | Total take-off distance to 50 ft |
|---|---|---|
| Grass surface | 270 m | 480 m |
| Paved surface (concrete / asphalt) | 250 m | 440 m |

## 5.5 Landing Distance, MLW 600kg

Speed at 50ft

- 60 KIAS for FLAPS I, II, III
- 65 KIAS for FLAPS 0

Propeller fine pitch, idle power, landing gear down

| **FLAPS position III (38°)** | Landing ground roll | Total landing distance from 50 ft |
|---|---|---|
| Grass surface | 200 m | 350 m |
| Paved surface (concrete / asphalt) | 180 m | 330 m |

| **FLAPS position II (30°)** | Landing ground roll | Total landing distance from 50 ft |
|---|---|---|
| Grass surface | 240 m | 380 m |
| Paved surface (concrete / asphalt) | 220 m | 360 m |

| **FLAPS position I (20°)** | Landing ground roll | Total landing distance from 50 ft |
|---|---|---|
| Grass surface | 265 m | 430 m |
| Paved surface (concrete / asphalt) | 245 m | 410 m |

| **FLAPS 0 ( 0°)** | Landing ground roll | Total landing distance from 50 ft |
|---|---|---|
| Grass surface | 350 m | 560 m |
| Paved surface (concrete / asphalt) | 320 m | 530 m |

## 5.6 Best Rate of Climb, Vy

FLAPS 0, Clean configuration, 600kg, Max. continuous power

| Altitude | Woodcomp SR 3000 2WN KW20W | $V_y$ Best rate of climb IAS | $V_x$ Best angle of climb IAS |
|---|---|---|---|
| 2000 ft | 1230 ft/min | 81 KIAS | 73 KIAS |
| 5000 ft | 940 ft/min | 81 KIAS | 67 KIAS |
| 9000 ft | 595 ft/min | 78 KIAS | 70 KIAS |

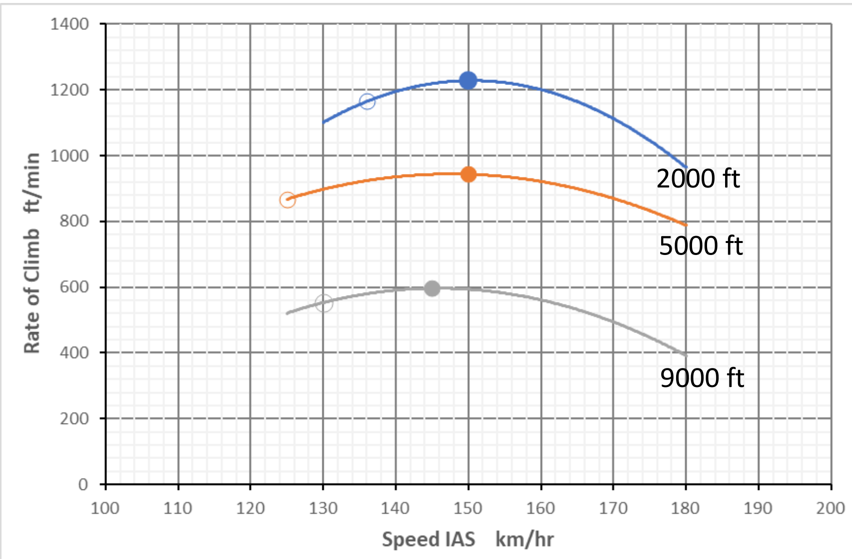



*Figure 5-1*

## 5.7 Cruise, Endurance, Range

Conditions: MSL, ISA Units: **km, km/h, liters**

| Rating | | Long Range Cruise | Economic Cruise | Fast Cruise | Max. Cruise |
|---|---|---|---|---|---|
| Power | | | 55% | 75% | Max. continuous |
| | RPM | 4000 | 4300 | 5000 | 5500 |
| MAP | in.Hg | 23 | 24 | 26 | 27 |
| Fuel Flow | l/h | 12,0 | 15,0 | 20,0 | 25,5 |
| IAS | km/h | 235 | 251 | 280 | 297 |
| TAS | km/h | 236 | 252 | 282 | 300 |
| Fuel /100km | liters | 5,1 | 6,0 | 7,1 | 8,5 |
| Standard fuel tanks 100l | | | | | |
| Endurance* | hours | **7,4** | **5,9** | **4,4** | **3,5** |
| Range* | km | **1748** | **1493** | **1253** | **1046** |
| Optional fuel tanks 150l | | | | | |
| Endurance* | hours | **11,6** | **9,3** | **6,9** | **5,4** |
| Range* | km | **2731** | **2333** | **1958** | **1635** |

* plus VFR reserve 30 min

Conditions: MSL, ISA    Units: **NM, knots, US gallons**

| Rating | | Long Range Cruise | Economic Cruise | Fast Cruise | Max. Cruise |
|---|---|---|---|---|---|
| Power | | | 55% | 75% | Max. continuous |
| | RPM | 4000 | 4300 | 5000 | 5500 |
| MAP | in.Hg | 23 | 24 | 26 | 27 |
| Fuel Flow | gal/h | 3,2 | 4,0 | 5,3 | 6,7 |
| KIAS | kts | 127 | 135 | 151 | 160 |
| KTAS | kts | 127 | 136 | 152 | 162 |
| MPG | NM/gal | 40,2 | 34,3 | 28,8 | 24,1 |
| Standard fuel tanks 26,4 US gal | | | | | |
| Endurance* | hours | **7,4** | **5,9** | **4,4** | **3,5** |
| Range* | NM | **943** | **806** | **676** | **565** |
| Optional fuel tanks 39,6 US gal | | | | | |
| Endurance* | hours | **11,6** | **9,3** | **6,9** | **5,4** |
| Range* | NM | **1474** | **1259** | **1057** | **882** |

* plus VFR reserve 30 min

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## 6 Weight and Balance

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## 6.1 Introduction

It is essential to operate the Shark 600 within the weight and balance envelope. This will give you a safety, good performance and predictable flight characteristics.

It is pilot's responsibility to ensure that weight and balance limitations are within limits before every flight. This chapter will explain the pilot the procedures of weighing the aircraft as well an awareness of the correct CG during Flight Operations.

## 6.2 Movable ballast weight

Shark 600 uses a movable ballast weight.

It is a 6 kg non-structural weight that is added to the aircraft and used to adjust the location of the CG to keep handling characteristics within limits.

The movable ballast is not counted into the Basic Empty Weight, but it must be always present on board during the flight operations, placed and secured in front or rear slot.

Actual position of movable ballast is indicated by:

- an LED on instrument panel
- a red flag visible under front position lid or in baggage compartment
- physical presence of the ballast block in the slot

## CAUTION

**It is the pilot's responsibility to check visually that the movable ballast is located in the correct position.**

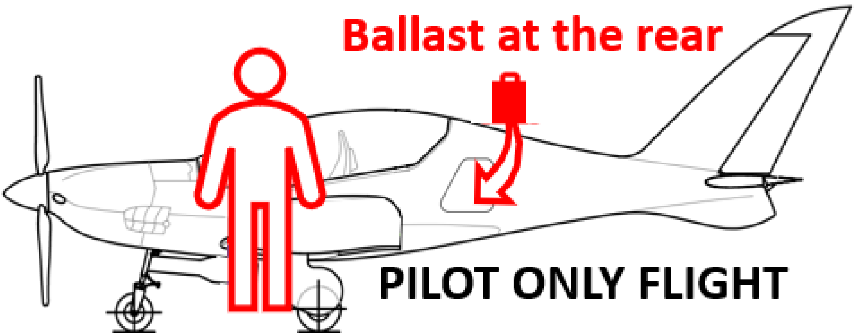
## WARNING

**INCORRECT POSITION OF MOVABLE BALLAST CAN LEAD TO CG OUT OF THE APPROVED RANGE AND CAUSE REDUCED STABILITY OR CONTROLABILITY OF THE ARICRAFT.**

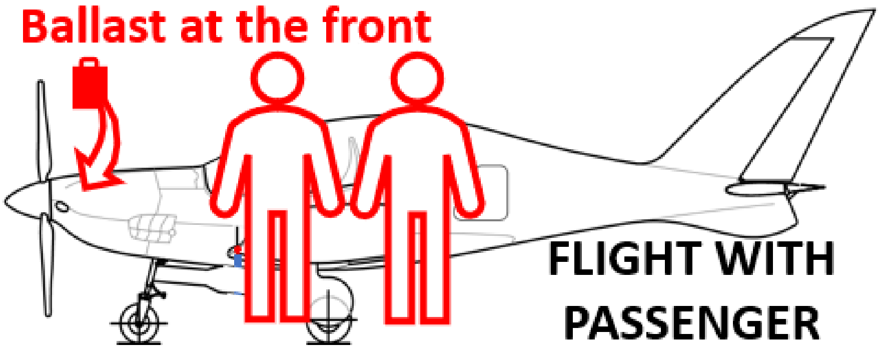
Following principles are used to set proper movable ballast location:

**There are two positions where the movable weights can be placed;**

- **PILOT ONLY FLIGHT (1 Occupant operations) - if only the pilot is on board, no passenger or heavier load is in the rear seat (less than 15 kg) – Movable ballast is placed in the rear position** - in the pocket located in the baggage compartment rear bulkhead, accessible through the baggage door.




- **FLIGHT WITH PASSENGER in the rear seat (2 Occupant operations), or any load heavier than 25 kg placed on the rear seat** - **movable ballast is placed in the front position** - in the pocket on engine cowling, accessible through the lid.




Red flag visible when the lid is closed indicates that the movable ballast is located in the front position.

## CAUTION

**The movable ballast must be secured by the pin in both front and rear positions.**

## 6.3 Aircraft weight and balance data

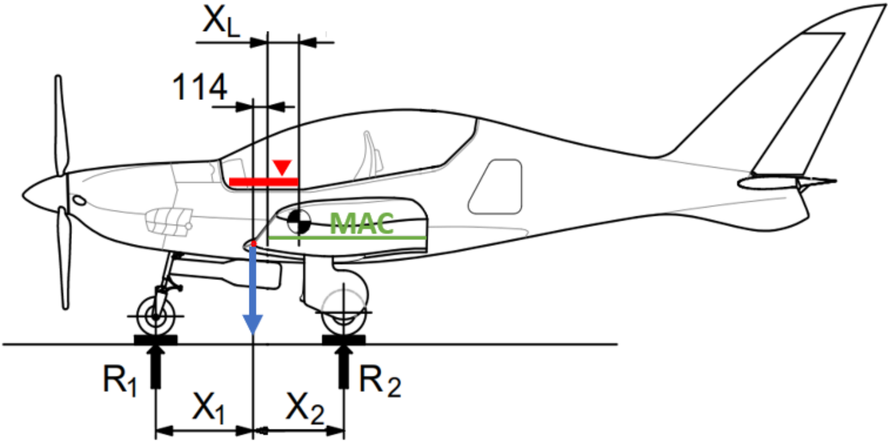
The empty weight of each plane is calculated and recorded in this weighing record, which is integral part of this airplane documentation:

| SHARK600 | S/N | | | |
|---|---|---|---|---|
| Date | Empty weight** EW [kg] | Center of gravity | | Recorded by |
| | | $X_L$, [mm] | $X_T$ [%] | |
| * | | | | |
| | | | | |
| | | | | |
| | | | | |

* Actual weight information shall be entered here before the first flight. Other lines shall be used when any change is made on the airplane configuration.

** Empty weight EXCLUDING the movable ballast

## 6.4 Weighing procedure




The airplane is weighed standing on main wheels – all tyres must have the correct size and pressure. All operating fluids must be filled to the normal volume with only useable fuel remaining. Movable ballast must be removed during this weighing procedure.

Place a levelling tool on the front part of the canopy frame.

Add thin sheets of plywood between front tyre and scale to level the airplane horizontally, to zero degrees on levelling tool on the canopy frame.

The reference plane (datum) is defined on the leading edge of the wing, where wing and fuselage connect.

Lower a plumb-line from this point and mark the floor to obtain the reference line.

The following values have to be measured:

| | | | |
|---|---|---|---|
| Front Wheel reaction | $\mathbf{R_1}$ = | | kg |
| Main Left Wheel reaction | $\mathbf{R_{2L}}$ = | | kg |
| Main Right Wheel reaction | $\mathbf{R_{2R}}$ = | | kg |
| Distance between Front Landing Gear and ref. line | $\mathbf{X_1}$ = | | mm |
| Distance between Main Landing Gear and ref. line | $\mathbf{X_2}$ = | | mm |

To find the Airplane Empty Weight ($M_L$);

$\mathbf{M_L = R_{2L} + R_{2R} + R_1}$

To find the Centre of Gravity (CG) **position to MAC**:

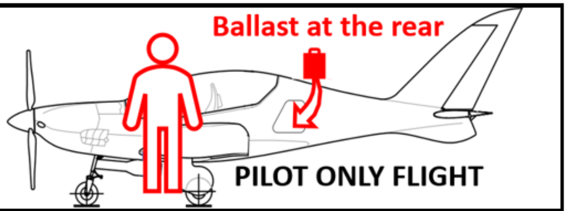
$$\mathbf{X_L} = \frac{(R_{2L} + R_{2R}) * X_2 - R_1 * X_1}{M_L} - 114 = \qquad \textbf{[ mm ]}$$

Centre of gravity position XT **to MAC in %:**

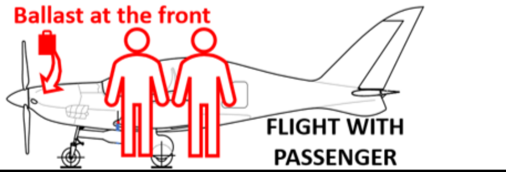
$$\mathbf{X_{L\%}} = \frac{X_L * 100\,\%}{b_{MAC}} = \frac{\quad * 100\,\%}{1237} = \qquad \textbf{[\%MAC]}$$

## 6.5 Limit useful load combinations

Following table can be used as a simple load plan check. Useful load within the ranges of single table line secures that the resultant CG is within the limits approved for safe operation. Pilot is responsible for ensuring, that the MTOW of 600 kg is not exceeded.




| Front seat kgs | | Rear seat kgs | | Baggage kgs | | Fuel litres | |
|---|---|---|---|---|---|---|---|
| Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| 55 | 110 | 0 | 15 | 0 | 25 | 0 | 150** |




| Front seat kgs | | Rear seat kgs | | Baggage kgs | | Fuel litres | |
|---|---|---|---|---|---|---|---|
| Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| 55 | 90* | 95 | 110* | 0 | 0 | 0 | 25 |
| 55 | 100* | 95 | 100* | 0 | 0 | 0 | 100** |
| 55 | 105 | 25 | 95 | 0 | 0 | 0 | 100** |
| 55 | 110 | 25 | 85 | 0 | 5 | 0 | 100** |
| 55 | 110 | 25 | 75 | 0 | 10 | 0 | 100** |
| 55 | 110 | 25 | 70 | 0 | 15 | 0 | 100** |

* Sum of weights on front and rear seat is 200 kg maximally.
** Maximum amount of fuel is limited by MTOW = 600 kg.

*__Use only one row__ on placard to read allowed combination of usefull load limits.*

***Example 1:***
*Pilot - 95 kg,*
*Passenger - 84 kg*
*– select table FLIGHT WITH PASSENGER-*
*The ballast must be placed in the front.*
*A maximum of 5 kg of luggage may be placed in the luggage compartment.*

***Example 2:***
*Pilot - 100 kg*
*Baggage – 15 kg*
*Passenger maximum weight is then limited to 70 kg*

## 6.6 Center of gravity determination

It is the pilot's responsibility to load the aircraft correctly within the weight and balance limitations.

### 6.6.1 Weight & balance application

The QR code shown below or in the cockpit will direct you to the application at https://app.shark.aero

**CG calculation**

**SHARK600 S/N**

**Empty weight kg**

**Empty CG %**

1. Select proper certification basis of your aircraft
2. Fill manually the Empty weight and Empty CG fields (without movable ballast)
3. Use sliders to fill intended aircraft loading
4. Note any CAUTION messages that pop-up if not-allowed combinations of loads are used
5. Ensure that the weight and CG is inside the envelope from take-off weight up to zero fuel weight
6. Keep in mind, that the app is only a supporting tool, and it is still the pilot's responsibility to check the CG by primary Weight & Balance charts

**NOTE**

**FLIGHT WITH PASSENGER:** In specific weight combinations where the center of gravity is calculated using the application, it is permissible to load the baggage compartment with more than the 15kg limit mentioned on the placard.

### 6.6.2 Weight & balance charts

On the next pages you will find two charts to determine the aircraft center of gravity and different weights during flight (take-off weight up to zero fuel weight).

Procedure in steps:

1. Choose the correct chart

for a **PILOT ONLY FLIGHT** (1 OCCUPANT) - with maximum of 15 kg of baggage in the rear seat and a normal loading in the baggage compartment.

or;

for a **FLIGHT WITH PASSENGER** (2 OCCUPANTS) - use this table when you have more than 25 kg in/on the rear seat.

2. Draw vertical "weight-lines"

for weights loaded in each respective compartment;
Front Seat, Rear Seat, Baggage Compartment and Fuel
(beware that the front seat compartment starts at 55kg; the minimum pilot weight)

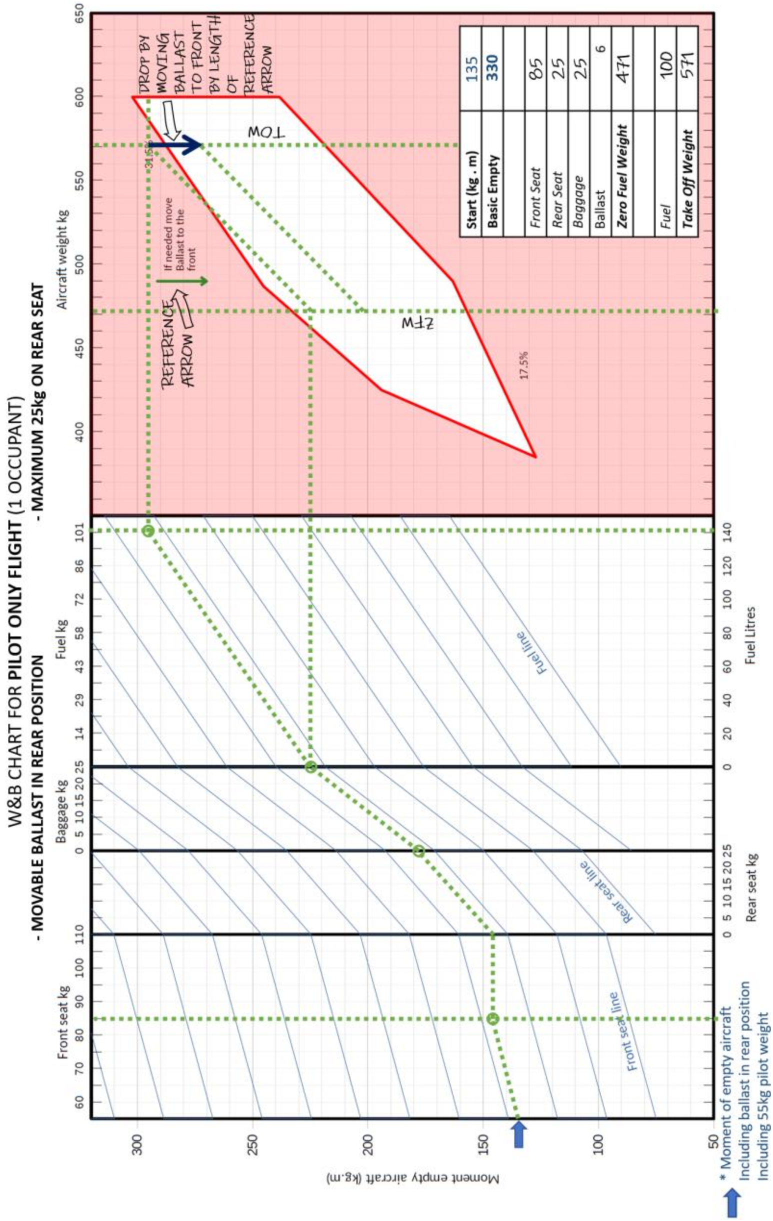
Fill in weights into the side table, calculate and draw zero-fuel-weight and take-off-weight lines (it must be always less than or equal to 600kg).

3. Start your next line at "Moment Empty Aircraft" at the left side of the table. Check that the Moment Empty Aircraft is correct for the airplane you are going to fly

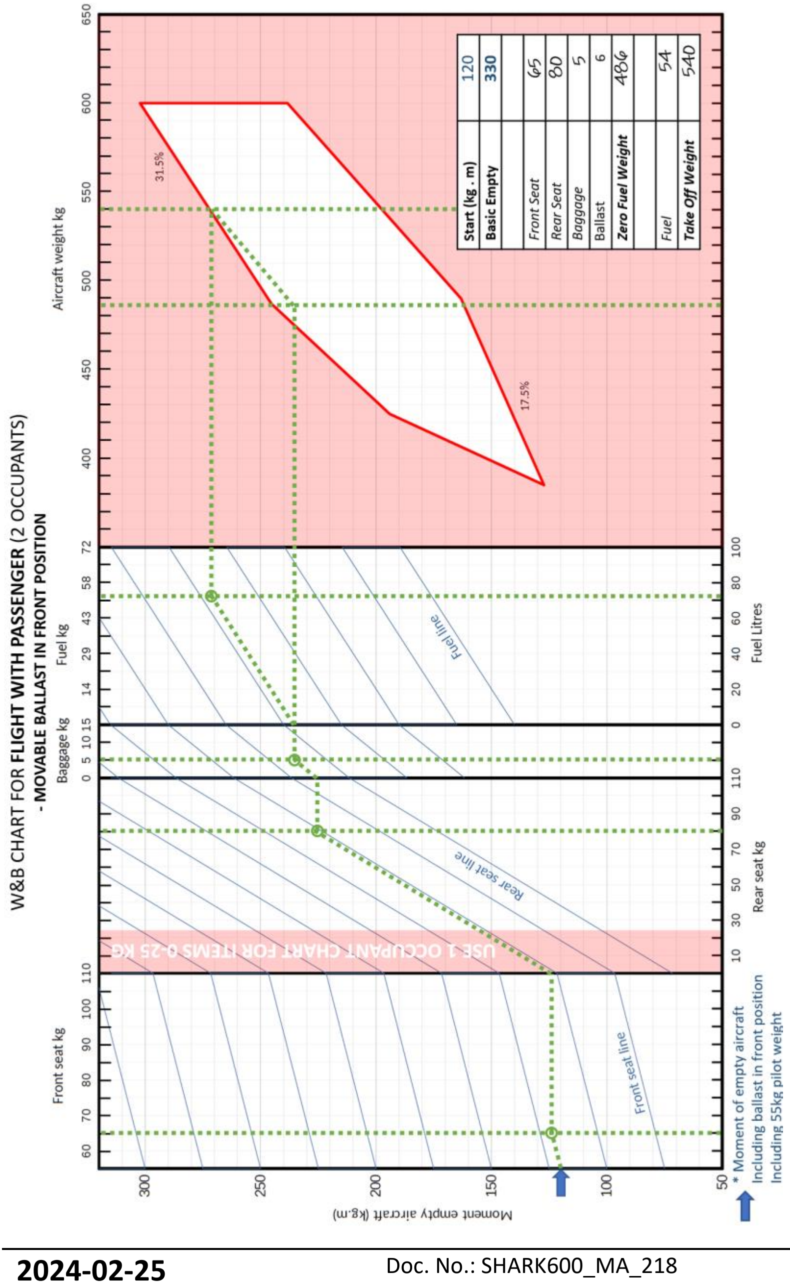
4. Follow slope of the Blue Lines until you intercept the vertical weight-line you draw earlier in that compartment. From this point you continue horizontally to the right until you meet the next compartment. If there is no weight in the next compartment, proceed horizontally to the next compartment
5. When you reach the fuel compartment; first proceed horizontally until you intercept the vertical zero-fuel-weight line. This intersection gives you the CG position at the aircraft's zero-fuel-weight
6. Then again enter the Fuel-compartment and follow the blue lines until you intercept the vertical fuel weight-line. Then continue horizontally to intercept with the vertical take-off-weight line. This interception gives you the CG position at the take-off weight of the aircraft
7. Note; when flying solo, the take-off-CG could be too far rearward (too far to the top in the table) for baggage 25kg and rear seat load above 15kg. Only then it is allowed to move the ballast weight from the rear to the front position. Then the Take- off CG point moves down by the length of the green "reference" arrow
8. Check if both ZFW CG and TOW CG are within limits given by CG envelope highlighted on CG charts

| | |
|---|---|
| Front center of gravity limit | 17.5 % MAC |
| Rear center of gravity limit | 31.5 % MAC |

## Example chart: **PILOT ONLY FLIGHT** (1 OCCUPANT)



## Example chart: **FLIGHT WITH PASSENGER** (2 OCCUPANTS)

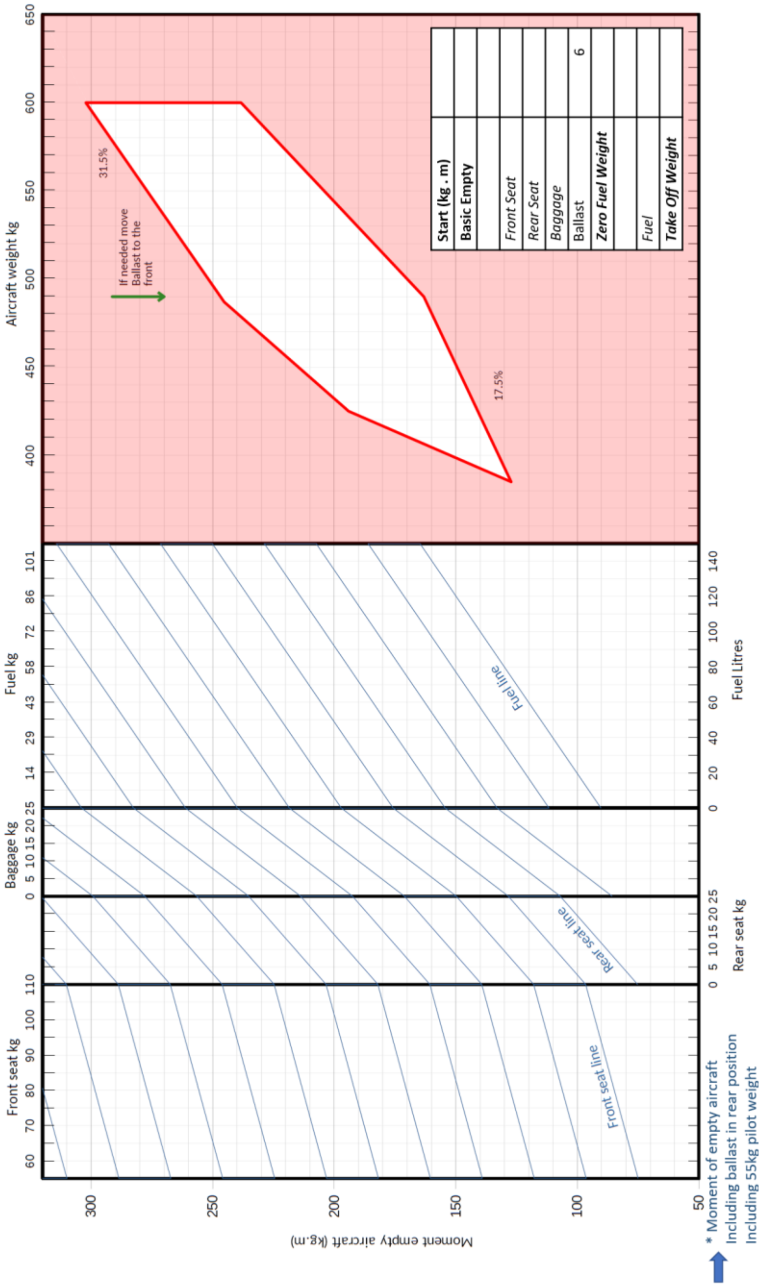


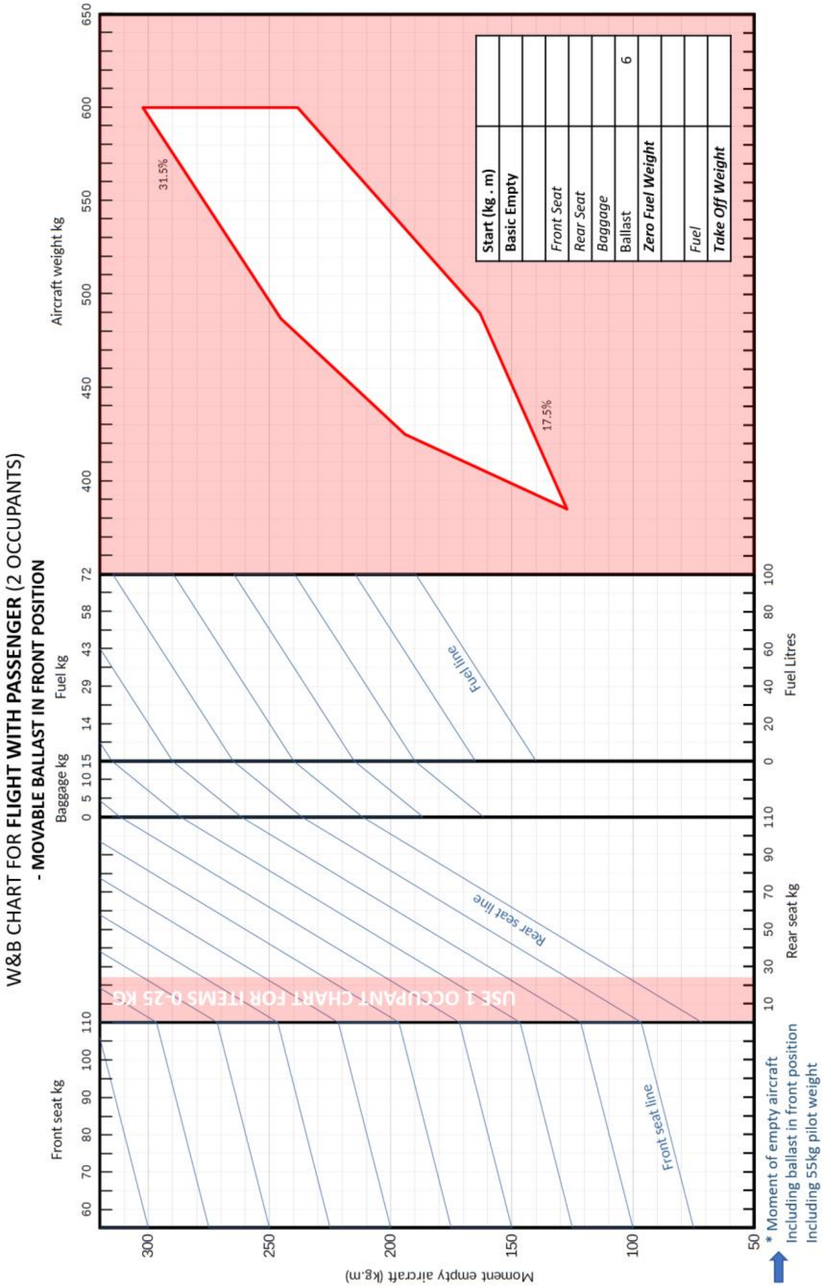
## 6.7 Weight & balance charts

Use charts on following sheet to determine CG position before the flight.

**INTENTIONALY EMPTY SPACE**

W&B CHART FOR **PILOT ONLY FLIGHT** (1 OCCUPANT)
**- MAXIMUM 25kg ON REAR SEAT**
**- MOVABLE BALLAST IN REAR POSITION**




W&B CHART FOR FLIGHT WITH PASSENGER (2 OCCUPANTS)
- MOVABLE BALLAST IN FRONT POSITION
Aircraft weight kg
400 450 500 550 600 650
31.5%
17.5%
Start (kg . m)
Basic Empty
Front Seat
Rear Seat
Baggage
Ballast
6
Zero Fuel Weight
Fuel
Take Off Weight
Fuel kg
14 29 43 58 72
Fuel line
Fuel Litres
0 20 40 60 80 100
Baggage kg
0 5 10 15
Rear seat line
USE 1 OCCUPANT CHART FOR ITEMS 0-25 KG
Rear seat kg
10 30 50 70 90 110
Front seat kg
60 70 80 90 100 110
Front seat line
Moment empty aircraft (kg.m)
300 250 200 150 100 50
* Moment of empty aircraft
Including ballast in front position
Including 55kg pilot weight

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# 7 Airplane Description

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## 7.1 Introduction

Shark 600 is a composite high-performance low-wing airplane with tandem seats and retractable tricycle type landing gear, designed according to European UL and US Light Sport Airplane criteria.


The airplane is powered by 100HP Rotax 912ULS with a variable-pitch propeller and 100 litres integral fuel tanks in the wings with an option for 150 litres integral tanks.

### Equipment

Shark 600 is designed as two-seat tandem cockpit aircraft with upholstered adjustable seats, full dual control (with side sticks on the right) and throttle and propeller levers on the left panels.

Integrated in the side-sticks are buttons for: elevator trim tab, radio and autopilot.

## Front instrument panel

Front EFIS/EMS is a standard display for Pilot, with integrated flight data, engine data, and map/GPS = navigation data.  The pilot station is as well equipped with control panels for landing gears, flaps, transceiver, movable ballast, optionally electric propeller, ELT, autopilot, CO detector and backup flight instruments.

## Rear instrument panel

Rear instrument panel is an integral part of canopy frame. Optionally, it can contain EFIS/EMS display, transceiver, flaps and landing gear control panels.


## Canopy

The single-piece canopy opens towards starboard (to the right hand side) and is supported by gas struts for easy opening and closing.

**Baggage compartment**

A baggage compartment is located behind the rear seat, accessible from the rear pilot seat or through a lockable baggage door on the left side of the plane.

## 7.2 Airframe

### Carbon composite airframe

The airframe is primarily made of carbon-epoxy composite with small amount of glass and aramid fibres, with PVC foam and aramid honeycomb core in sandwich panels. Composite wing with carbon main spar and an auxiliary spar carrying ailerons hinges and flaps have a 60% of trailing edge employed as Fowler flap . Wings and stabilizer are dismountable.

### Fuselage

The self-supporting monocoque fuselage with integral fin is made as one piece with integral interior, armrests, and floors. Interior shell has aramid-carbon layer for better passive safety and it is integrated into the middle part of the fuselage with added ribs. It creates integral ergonomic cabin structure for two crew members sitting in tandem configuration. The luggage space is located behind the rear seat, accessible from inside, or from left side of the fuselage. Part of central fuselage creates a 1,73m long center-wing, used for main undercarriage retraction.

The fuselage airframe includes firewall with four engine mounting stations, Ballistic Recovery System and front landing gear mounting points, main landing gear and cockpit mounting points, 2+1 hinges of horizontal stabilizer, 2 rudder mounts at the hear, together with a bottom fin, optionally with integrated structure for a glider towing mechanism.

### Canopy

A one-piece cockpit canopy consists of a carbon fibre frame with a Plexiglas windscreen. The canopy is supported by gas strut and hinged on the right side (starboard) by two hinges. The canopy is locked from inside by a single point lock system, accessible by both pilots.

### Engine cowling

The cngine cowling is fixed to the fuselage by cam-locs. The lower cowling has large NACA air intake, with adjustable flap, for cooling the water and oil radiators. An adjustable flap is used during low speeds and taxiing. The top cowling has a small air intakes for direct cylinder cooling on both sides of the spinner. Air from engine compartment is exhausted through gills placed on the sides. Top cowling has a door for the oil check, which can also serve as an air exhaust hole on hot environments by leaving it open in flight.

A slot for movable ballast is positioned on the top cowling.

### Wing

The Shark 600 has a composite wing with trapezoidal root, and elliptically shaped tip. Wing planform and airfoil is optimized for fast cross-country flights.

The wing structure consists of a carbon-fibre/epoxy monocoque, with a PVC foam sandwich. The Carbon-fibre main spar is placed at 25% of the chord and the rear spar carries the flap levers and aileron hinges. 60% of the trailing edge is equipped by very efficient single-slotted flaps.

There is an integral fuel tank in each wing (optionally 50 or 75 litres) positioned between the main and rear spar. Fuel gauges, fuel lines (feed and return line) are installed in the structure. Drain valves are positioned on the lowest point. Fuel tank ventilation lines are integrated in the most outbound flap hinges.

The wing is optionally equipped by integral position lights at the leading edge of wing tips. The wings can be dismounted for transport or storage by removing two main pins and one rear wing pin, dismounting flaps drive, ailerons control, fuel hoses and electrical connectors.

**Ailerons**

The 40% differential ailerons with carbon monocoque structure are hinged on three carbon hinges attached to the top wing shell. A push-pull tubes and bellcrank are used for control.

Aerodynamic forces are relieved by automatic trim tabs.

**Flaps**

Fowler flaps with monocoque sandwich design are hinged on three lever-hinges and driven by root-rib lever. The flap system is driven by an electric motor and 4 positions are pre-programmed:

- **FLAPS 0** **0°** flaps up
- **FLAPS I** **20°** take-off
- **FLAPS II** **30°** short take off/ landing
- **FLAPS III** **38°** landing

### Horizontal stabilizer

The stabilizer has carbon monocoque sandwich design with continual rear spar and auxiliary front spar. Hinges for the elevator are attached on the top shell. The stabilizer is attached to fuselage by two hinges on the rear fin frame and by one on the rear fuselage bracket.

### Elevator

The split monocoque elevator is attached to the stabilizer by 3 hinges. The left part is equipped with an electric trim-tab controlled by a three position centrally-sprung switch on the side-stick.

### Rudder

The carbon monocoque rudder is hinged by two hinges and controlled through steel wires by a lever placed below the root rib.

### Airplane exterior surface painting;

White two-component acrylic polyurethane topcoat is used.

## 7.3 Landing gear

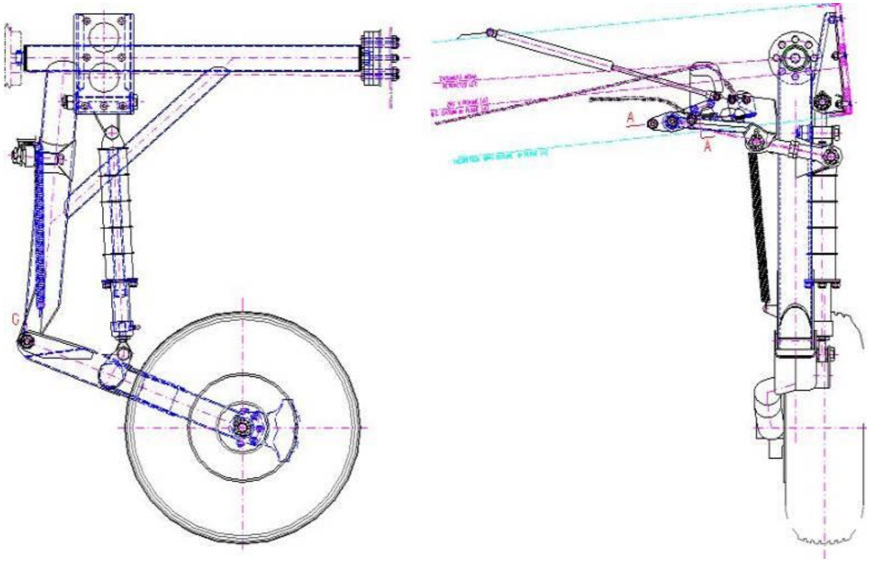
A retractable tricycle type landing gear is used, equipped by steerable 11x4" nose wheel and a 14x4" Beringer main wheel with hydraulic disc brakes.

The front undercarriage is retracted backwards into a wheel-well behind the firewall. The main landing gear is retracted into the center-wing.

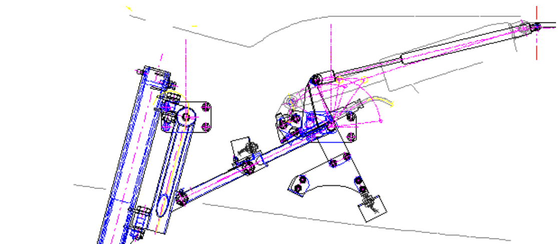
### Main landing gear

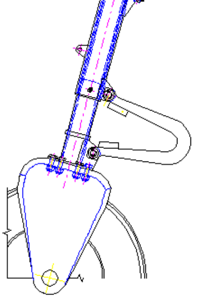
The legs of main landing gear are composed of steel tubes and sheets welded together. The main steel parts are hardened. The legs are hinged on two brackets with ball bearings between center-wing spars. The legs are retracted to fuselage bays.

The main undercarriage hinge joints are equipped with bronze bearings with grease-caps. Shock absorbers are attached to the root ribs. The trailing arm is twisted towards the main leg on retraction, resulting in reduced center-wing span.



**Front landing gear**





Parts of front undercarriage are composed of steel tubes and sheets welded together. The front wheel fork is made of carbon. The front gear leg has bronze bearings with grease-caps. It is connected to rudder-pedals for directional control. The undercarriage is secured in the down position by lock-struts and held in locked position by two gas springs. The damping is controlled by a U shaped composite spring.

**Assembly**

The shock absorbers are assembled from five elastomer polyurethane blocks, which are hinged between lever and root rib of center-wing by gimbals.

The legs are secured in extended position by folding struts and each one held in locked position by gas strut and steel spring.


The main wheels are made by Beringer with Aero Classic (or Mitas, Sava) tires. Hydraulic disc brakes are controlled by toe-sections on the front rudder pedals.

## Landing gear retraction and extending

Main landing gear extension and retraction

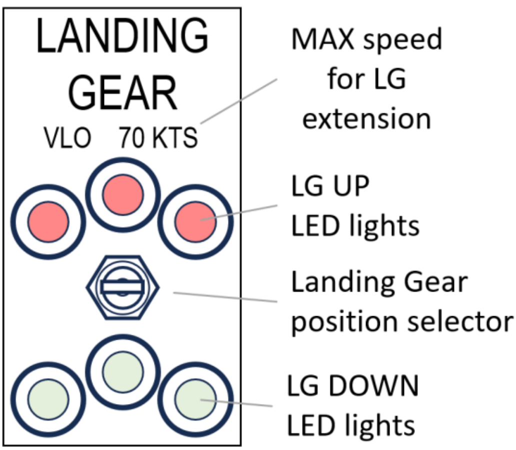
At retraction, a 2,5 mm steel cable routed through pulleys is pulled by a LINAK LA30 electromechanical strut mounted on the rear cockpit floor. Retraction takes approximately 15 seconds.

Gears are opened by weight and force from gas and steel springs, the electric strut controls the speed with extension taking approximately 10 seconds.

Locking

Landing gear legs are secured in the retracted position by self-locking electromechanical struts, in the down position by gas struts and springs. Strut movement is stopped by proximity inductive sensors when the required position is reached. In case of failure of these sensors, the strut actuation is stopped by its integrated end switches.

Landing gear control panel



Landing gear function and indication

When the landing gear module is activated, and all legs are at their fully extended end switches, the red and green LEDs on the control panel flash slowly four times (1Hz).

The landing gear electrical circuit is connected to the pitot-static circuit via a pressure sensor. The pressure sensor is adjusted to activate at speeds of 100 km/h (55 KIAS) or slower. When activated the control system prevents the retraction of the gear below 100 km/h (55 KIAS), thereby preventing the unintentional retraction of the landing gear whilst the aircraft is on the ground.

When “LG UP” is selected the landing gear will retract if the speed is greater than 100 km/h (55 KIAS). The red LEDs will flash slowly at 1Hz until the gear legs are up and locked in the retracted position. If the landing gear fails to reach the end switch within 25 seconds the red LEDs will flash rapidly at 3.3Hz.

At the end of the gear retraction cycle, and when all end switches have been reached, the RED LEDs will remain on (solid) for 10 seconds and then turn off. The landing gear control system module functionality can be checked in flight by selecting “LG UP”, the red LEDs will flash 3 times slowly at 1Hz and then turn off.

When “LG DOWN” is selected the landing gear will deploy at airspeeds up to $V_{LO}$, 130 km/h (70 KIAS). During gear extension the green LEDs will flash slowly at 1Hz until the gear is down and locked, when down and locked the green LEDs will remain lit. If the gear does not fully deploy and actuate the end switches after 25 seconds, the green LEDs will flash rapidly at 3.3Hz.

The aural warning “CHECK GEARS” activates when the speed is below 120 km/h (65 KIAS) and the landing gear is not extended.

Emergency landing gear extension

Three mechanical locks placed on locking struts are activated by three separate Bowden cables, connected to a T-handle accessible from the front pilot seat. Each leg has its own handle with the left and right leg handles each on the side wall of the cockpit just outboard of the knee position and the front leg handle position on the inner dividing wall below the instrument panel, just inboard of the right knee position.

If airspeed reduces to below 120 km/h (65 kts) and any of the undercarriage legs stay retracted or unlocked, an aural warning “CHECK GEARS” is given via the intercom system and a flashing LED is activated. When all three leg struts are down and locked, their status should be confirmed by visually inspecting their respective plat flags through the viewing windows on both top wing surfaces and in the forward foot well. The plate-flags, with yellow surfaces and black arrows are placed on each leg and locking strut and illuminated by LED lights.

With the gear in the the down and locked position, the arrows are tip-to-tip, indicating a safe and locked position of the landing gear. Visual inspection is always prioritized over the electrical signal and pilots should use it routinely after gear operation or if a malfunction in the electronic system is suspected.

Landing gear doors can be installed optionally on the gear legs. Doors on the main legs are composed of 2 parts. Larger doors are fixed to the main leg with 3 flexible joints. Smaller doors are fixed to the bigger ones with hinges. A steel spring pulls them into the correct position when closed. In addition, if doors are in the retracted position, they are locked with hooks and brackets to prevent them from being sucked out of the closed position at higher airspeeds. The proper closed position is indicated by a green LED visible in the gear inspection windows. When operating in mud, snow, or in wet and freezing conditions it is recommended to remove the doors and fly without them. If there are any doubts about the correct adjustment and function of the doors, operations shall cease, or the doors shall be removed, as malfunctions of the doors may pose a risk of causing malfunctions in the landing gear locking mechanism.

Extension, retraction and Indications of the landing gear

The Landing Gear is controlled by an electronic module placed behind the instrument panel on the BRS wall together with other electronic modules. Other components of the system are:

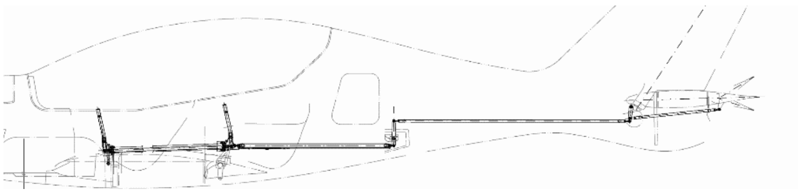
- relay switching voltage to the servo of the main landing gear
- control and display panel, on the instrument panel, associated with flaps control panel
- pressure sensor set to 120km/h (65 kts), providing signal to control unit
- warning horn
- contactless inductive position sensors, placed in the landing gear bays, providing information about landing gear status
- a second control and display panel can be optionally placed on the rear instrument panel

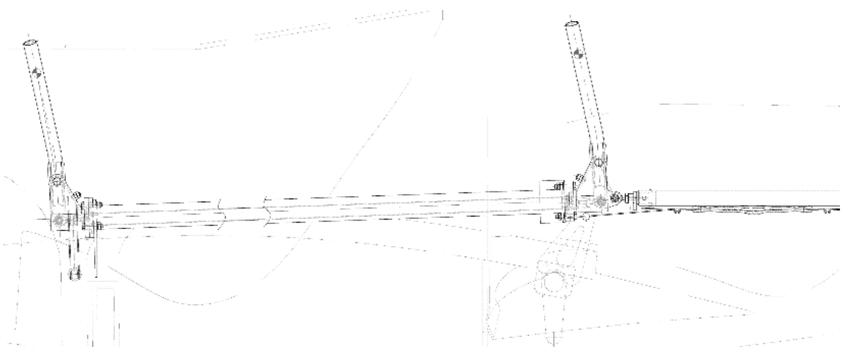
# 7.4 Flight control system

Both occupants have access to a side-stick positioned on their right armrest. Front rudder pedals are adjustable and equipped with toe-brakes. Flaps and landing gear are operated by switches on panel on pilot Instrument Panels, optionally on the rear panel. Trim switches, radio buttons and autopilot switches are located on the side-stick.

## Elevator Control

The elevator is controlled by two sidesticks, hinged in a control column through a system of push-pull rods and levers connected directly to the two-piece elevator. The pushrod in the baggage compartment is connected by cable and spring system to the flap control system. This improve trimming on low speeds with flaps and and it reduces the need for trimming when flaps are extended.

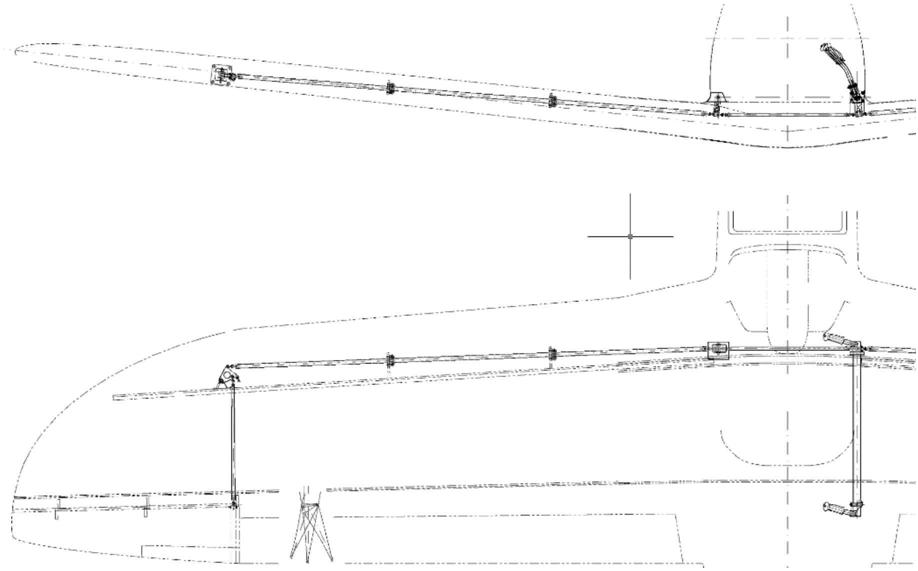




## Aileron control

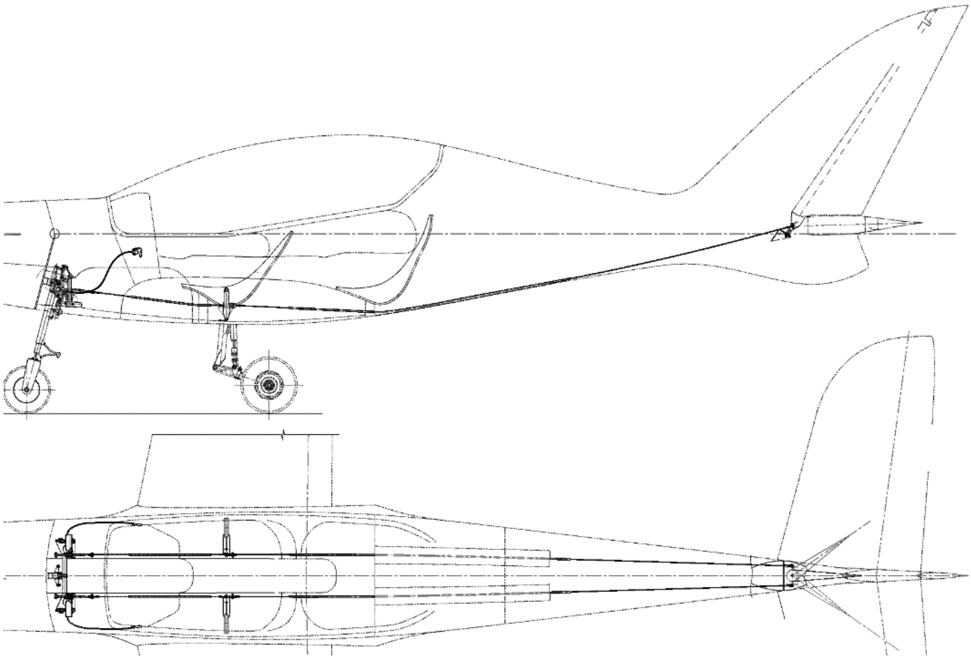
The ailerons are controlled by side movements of sidesticks hinged in control column, through system of rods and levers.

Automatic tabs attached on trailing edge of the ailerons deflect in opposite direction to the ailerons in order to reduce control force.



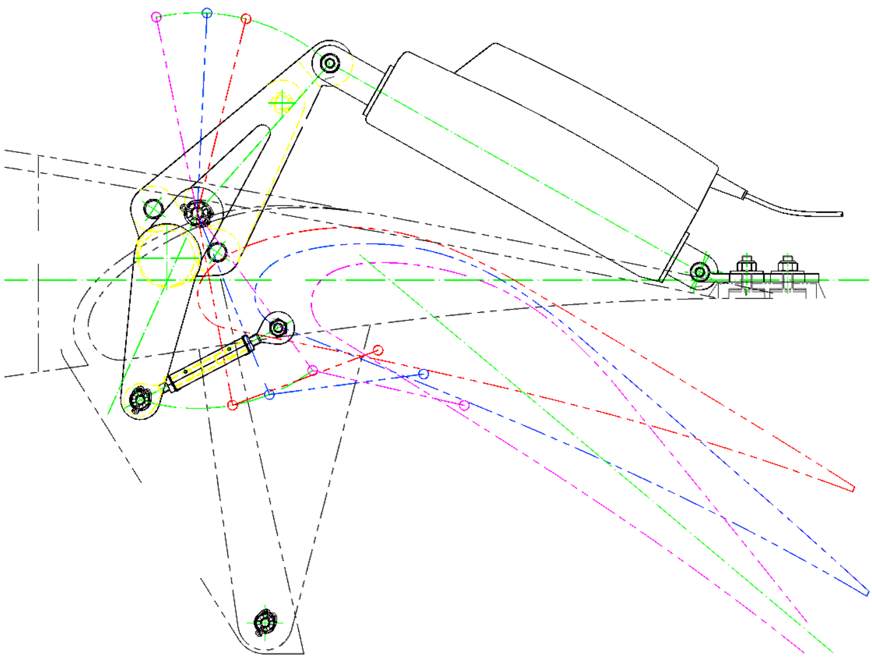
## Rudder control

The rudder is controlled by two steel cables, connected to the rudder lever and front pedals. They also turn the front wheel when extended, and thus steer the airplane on the ground. Rear pedals are connected to the same system. The system steering the front wheel is automatically disconnected when the landing gear is retracted. The system is closed-loop, turnbuckles are behind the pedals, adjusted to 300N force.

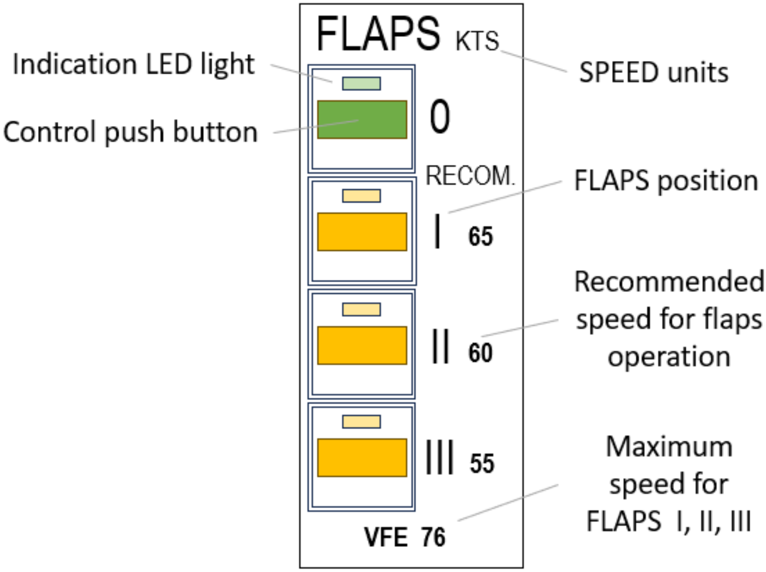


## Flaps

The flaps are controlled by a LINAK LA12 electric actuator placed under the left armrest of the rear seat. A short rod at the root rib controls the flaps through the torsion tube with the lever placed on the first flap hinge. The system is controlled by an Arduino electronic module which has a control and indication panel on the front instrument panel. As an option, an additional panel can be placed on the rear instrument panel.



Flaps control panel




Flaps system start up

When the Flaps Module is turned on, the FLAPS 0 LED button will flash rapidly at 5hz, and the LED of the last known flapsposition will illuminate. The FLAPS0 LED will continue to flash until it is pressed, the flaps will then retract to the FLAPS 0 position and the FLAPS 0 LED will illuminate.

Flaps functions and indication

When any of the FLAPS position control buttons are pressed, the corresponding LED will flash until the flaps reach the selected position. While in transit the LED corresponding to the current position of the flaps will remain illuminated. If front and rear control systems are installed, the latest command takes precedence.

The flaps deployment system is linked to the pitot-static system to prevent flaps deployment at speeds exceeding $V_{FE}$ 141 km/h (76 KIAS). At speeds higher than 130 km/h (70 KIAS), the pilot is notified by the flashing of the FLAPS 0 LED about the approaching the flaps limit $V_{FE}$.

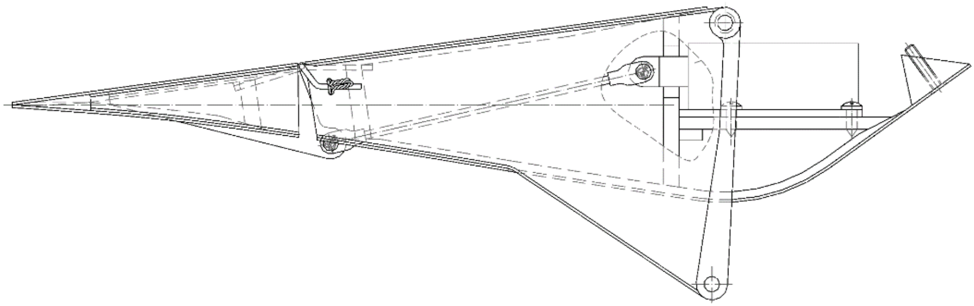
**Flaps emergency control**

If an error is detected during the flaps extension or retraction, the system switches to emergency mode. FLAPS 0 and I will illuminate. In this mode, the FLAPS 0 button is used for manual retraction, and the FLAPS I button for extension. The flaps only move while the respective button is pressed.

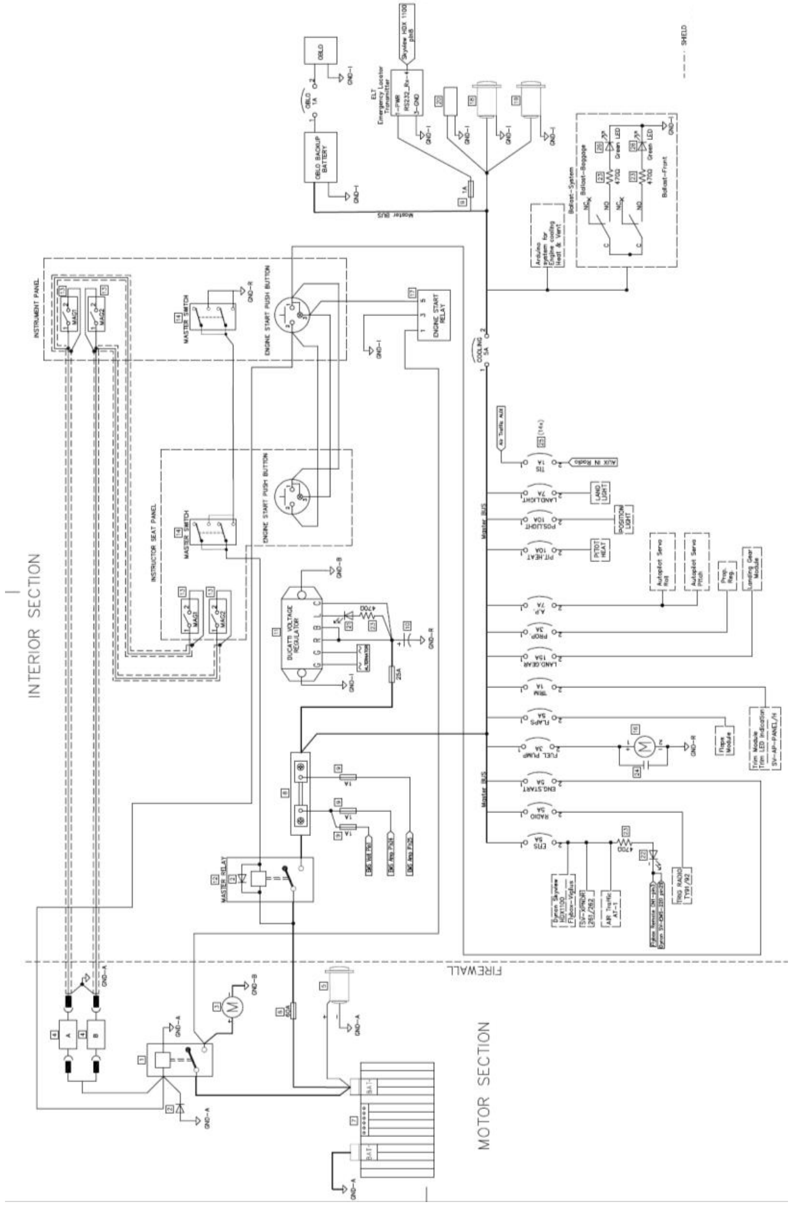
**Elevator trim tab control**

The Trim Tab of the Elevator is controlled by a Ray Allen servo.

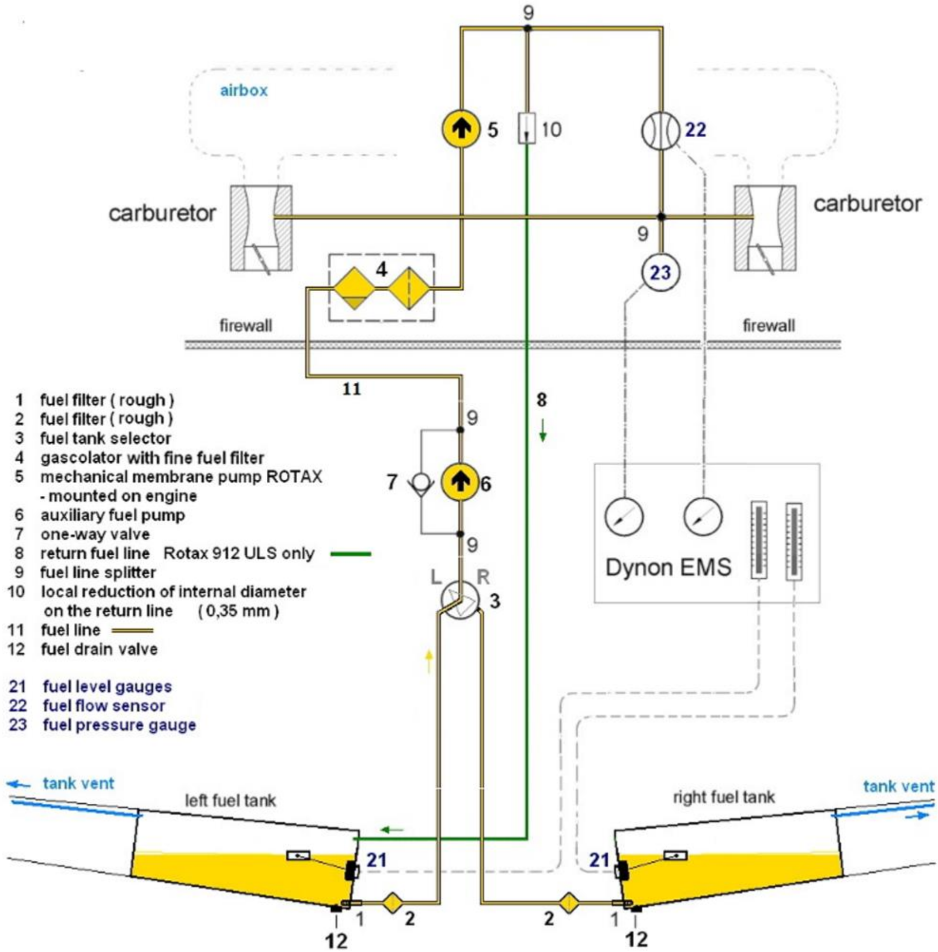
It is controlled by three position, centre-sprung switches on the Side-Sticks.



# 7.5 Electric system



# 7.6 Fuel system



The Air Vent of each fuel tank is incorporated in the most outbound flap hinge.

## CAUTION

**Clogging or obstructing the fuel vent could cause fuel supply problems and as well the wing surface to implode, caused by fuel pump creating a vacuum.**

## 7.7 Cockpit - interior and instruments


EFIS/EMS/GPS DYNON SKYVIEW HDX + OBLO


## 7.8 Cockpit arrangement

- Access to the seats through a right-side hinged canopy. Enter by stepping on the left wing
- Two composite height adjustable seats have adjustable headrests and a four-point harness each
- Dual controls with two sidesticks on the right side**,** dual rudder control pedals connected to the front wheel. Throttle, hydraulic prop and choke lever are positioned on left panel, engine cooling flap control panel in the front cockpit
- The main wheels are equipped with hydraulic brakes, controlled by the toe brakes placed on the front pedals and parking brake lever on the left side of the tunnel. The front pedals are adjustable, pin controlling levers are on both sides of the interior panel. A central brake lever for rear pilot is on the left panel below the throttle a prop lever is optional
- 2+2 Air vents are placed on the sides of instrument panel.
- Flaps and landing gear control panel, electric propeller control panel and radio panel are located on left side of the instrument panel. If the propeller is hydraulic, a controlling lever for both pilots is to the side of the throttle lever
- The right side of instrument panel is used for backup instruments, GPS
- The middle panel is used for EFIS (Dynon SKYVIEW or GARMIN G3X)

- Below the EFIS screen there are switch/circuit breakers. The autopilot panels and starter, magnetos and master switches are below the breakers
- The trim switch, radio button and autopilot on/off buttons are placed on top of the side-sticks
- A fuel selector valve is positioned in front of the left armrest behind the throttle
- The fuel quantity indicator is shown on the EFIS/EMS display
- The ventilation and heating control knobs are located in the front tip of the right armrest panel. Seat adjustment buttons are located behind the side-sticks
- Red handles for emergency release of landing gear are located in front of the front seat on the side panel and to the right side of the middle tunnel
- Windows allowing to check properly locked gear struts with the landing gear position indicators are situated on the root of wings and on center panel
- A baggage compartment is situated behind the rear seat is accessible from inside or from outside through a lockable door
- The Ballistic Recovery System has 2 independent **RED** activation handles installed on the middle panel between pilot legs.
- Small storage compartments are provided beneath each armrest

## Rear instrument panel


- The rear instrument panel is part of a canopy frame, optionally equipped with EFIS/EMS screen connected to the main device
- The Instructor configuration option gives the rear pilot the possibility to control flaps and landing gear from the rear position. Engine start, magnetos and master switches are located on the central panel. A single brake-lever activating both main wheels is located on the left panel
- A slave radio control panel can be installed optionally

## Cabin fire extinguisher (optional)

A portable fire extinguisher is installed on the side wall of central tunnel under the pilot's left leg. The extinguisher is readily accessible in case of fire. The extinguisher should be checked prior to each flight to ensure that its bottle pressure, as indicated by the gage on the bottle, is within the green arc and the operating lever lock pin is securely in place.

Next page »

To operate the fire extinguisher:

1. Loosen retaining clamp and remove extinguisher from bracket
2. Hold extinguisher upright, pull the operating lever lock pin, and press lever while directing the discharge at the base of the fire at the near edge. Progress toward the back of the fire by moving the nozzle rapidly with a side-to-side sweeping motion.

## CAUTION

**Care must be taken not to direct the initial discharge directly at the burning surface at close range because the high velocity stream may cause splashing and/or scattering of the burning material.**

## WARNING

**VENTILATE THE CABIN PROMPTLY AFTER SUCCESSFULLY EXTINGUISHING THE FIRE TO REDUCE THE GASES PRODUCED BY THERMAL DECOMPOSITION.**

# 7.9 Powerplant

**Engine**

Rotax 912 A3. 4 cylinder, 4 stroke engine, horizontally opposed, liquid cooled cylinder heads, air cooled cylinders.

Propeller is driven through an integrated reduction gear.

**Technical data**

Performances figures are valid for standard conditions (MSA/ISA).

| **Engine Model** | **912 ULS D.C.D.I.** |
|---|---|
| Engine power<br>Max. 5 min.: | 69.0 kW (95 hp) @5500 RPM<br>73.5 kW (100 hp) @5800 RPM |
| Torque | 128 Nm @ 5100 RPM |
| Maximum speed | 5800 RPM |
| Bore: | 84.0 mm |
| Stroke: | 61.0 mm |
| Cylinder capacity: | 1352.0 $cm^3$ |
| Compression ratio: | 10,5:1 |
| Ignition: | DUCATI double CDI |
| Ignition timing: | 4° to 1000 RPM / above 26° |
| Sparking plugs: | ROTAX part no. 297 940 |
| Generator output: | 250 W DC @ 5500 RPM |
| Voltage: | 13,5 V |


**Propeller**

Shark can be equipped by different propellers:

- Woodcomp SR 3000 2WN - 2 blade, in flight electrically adjustable
- Woodcomp KW20W - 2 blade, in flight hydraulically adjustable
- Neuform TXR2-V-70 - 2 blade, in flight electrically adjustable

## Woodcomp SR 3000 2W

SR 3000/2; An Electrically In Flight Adjustable propeller with two wood-composite blades, designed for Rotax 912 UL, Rotax 912 ULS and Rotax 914. Diameter is 1700 mm.

Blades angle is controlled by an electric servo mechanism and can be adjusted from minimum to maximum pitch within approximately 8 seconds.


## Constant speed unit

The unit sets and maintains the desired propeller speed. It Is mounted on the instrument panel.

## Woodcomp KW 20W

Propeller has identical blades and same performance as the electrically adjustable SR 3000 2W propeller described above.

Blades pitch is controlled by a hydraulic regulator using oil from engine lubrication system. Oil goes through a hollow shaft in the gearbox to the piston inside propeller hub. Regulator is controlled by a lever placed next to the throttle lever.

## Neuform TXR2-V-70


Neuform TXR2-V-70 is an electrically in-flight adjustable propeller with two composite blades. The blades are made of glass-fiber and are hollow. The root of the blade is made of duralumin. Outside part of blade leading edge is cast of plastic material with improved resistance to abrasion.

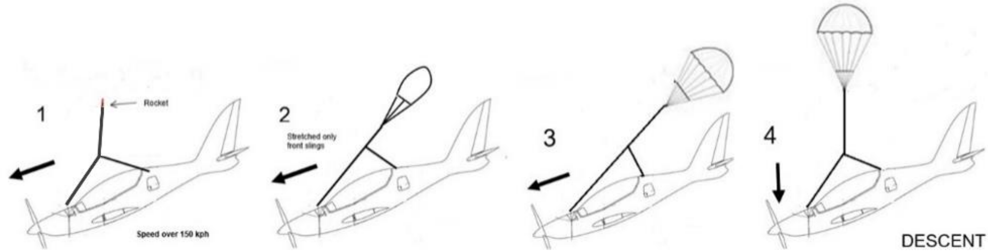
An electric servo located on the engine gearbox controls the pitch of the blades.

Mechanical stops and micro switches of maximum and minimum angle of attack are situated on the servo brackets.

A Flybox unit is used to set the required propeller RPM

## 7.10 Ballistic Recovery System

Shark 600 is equipped with **Stratos Magnum 601 LSA Ballistic Recovery System** with 2 independent release handles.




**Description of the rescue system Stratos Magnum 601 LSA**

The rocket engine is placed in the rocket case. After activation by pulling one of the release handles, this movement is mechanically transported by a Bowden cable to a percussive device. It activates two percussion caps which ignite the rocket box. After ignition, the rocket escapes under high pressure from the rocket box, towing the rope which releases the cap of the parachute container, and the parachute is pulled out of the container. Thereafter the bag of parachute is discarded, and parachute canopy is filled with air.

## CAUTION

**The minimum recommended altitude for system activation is 200 m (660 ft). However, there are known cases of successful application in less than 80 m. Successful activation also depends also depends on the horizontal and vertical component of velocity. System lifetime is 18 years, the revision and repackaging have to be performed every 6 years**

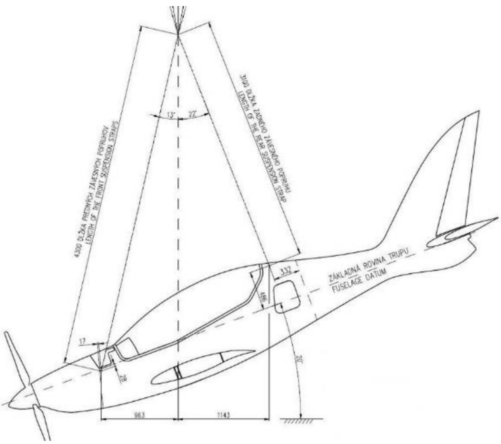
**The activation mechanism**

The activation mechanism is made of a Teflon coated steel cable and an outside sleeve (Bowden type). Each activation handle has double safety mechanism to prevent accidental launch and lock mechanism for storage and transport.

The mechanism is designed to have minimal activation forces under all circumstances. This minimal resistance remains throughout the life of the system.



## Rescue system installation




The rescue system is installed on all Sharks Aircraft between the firewall and the canopy/instrument panel.

Two rescue system belts are mounted to the top of the engine mounting and are folded inside of rescue system box. A third belt is guided under left cockpit-frame to the rear of the cabin. There it is mounted to the top of the baggage space frame. When the system is activated, the parachute compartment cover is broken in defined places and a strip of fuselage skin is ripped open under the left side of the cabin/canopy frame.

## 7.11 Towing system

Not Installed

## 7.12 Position lights (optional)

The airplane can be optionally equipped by position and strobe lights. Lights are made of streamlined transparent material with integrated LED lights.

Position lights (Red / Green / White LEDs) operate constantly. Lights are designed according to the regulations with defined angles and colors. The strobe lights flash continuously.

The left wing tip has a red position light combined with white strobe. The right wing tip has a green position light combined with white strobe. There also is a white strobe light on the top of vertical fin, the rudder has a “rearview” white position light plus white strobe in trailing edge.

The strobe flashes are synchronized, three flashes followed by a time break.

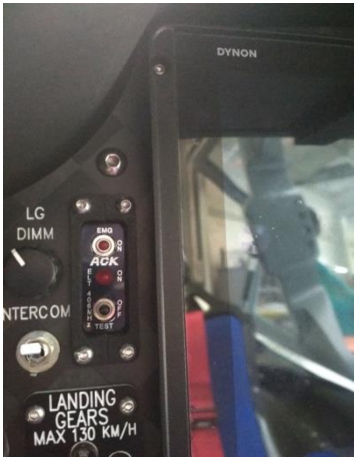
## 7.13 Landing light (optional)

Landing LEDs light can be optionally installed in NACA intake.

## 7.14 ELT (optional)

The ELT unit is installed on a bracket behind the rear baggage bulkhead. It’s accessible by removing the cover of rear baggage bulkhead. There is small window for an easy ELT check. An antenna is placed on the upper rear part of the baggage bulkhead and it is extended above the fuselage surface.

The ELT is controlled via a control panel on the instrument panel.


## 7.15 Autopilot (optional)

The Autopilot is dual-axis, controlling ailerons and elevator.

The Control System is integrated in all modern EFIS systems. Position of the two Servos is:

- behind baggage compartment
- fuselage, right side stub wing in front of spar channel

The system is activated via separate Autopilot (AP) switch/fuse on the forward instrument panel.

The autopilot can be controlled via the main EFIS screen or alternatively via the panel/s placed on the instrument panel.

Autopilot (de)activate buttons are located on both sidesticks.

For autopilot operation manual see Amendment 1.

## 7.16 First aid kit (optional)

The first aid kit  is located in the upper pocket inside the baggage compartment.

Access to the first aid kit is available both from the cockpit and through the door of the baggage compartment.

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## 8.1 Wing removal procedure

Wing removal is an option for storage in a limited space or for transport.

The step-by-step procedure to disconnect both wings can be found in the Shark Aircraft Maintenance Manual. (Chapter 3.2)

## 8.2 Stabilizer disassembly

The step-by-step procedure do disconnect the Stabilizer can be found in the Shark Aircraft Maintenance Manual. (Chapter 3.3)

## 8.3 Parking and mooring

### 8.3.1 General

Always secure the airplane during parking. It is always recommended to moor airplane due to the chance of unexpected adverse weather. During overnight parking add the following:

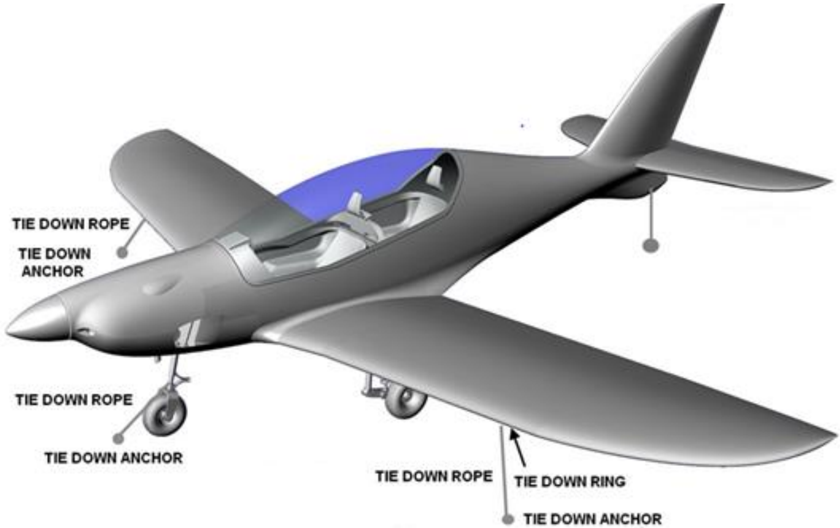
- pitot tube cover
- canopy covers
- wing covers, if available

### 8.3.2 Pitot tube cover

Use the Pitot tube cover for protection of the pitot static system, a cover with a red warning flag is supplied with each airplane.

### 8.3.3 Mooring

- Consoles for M8 eyebolts used for mooring are fitted on the wing spars close to the inspection rings. Other mooring points are the front leg and the hole in the bottom fin.




## 8.4 Hangaring, ground handling

Only move the airplane during hangaring, parking, etc. only when it is empty.

It is permitted to attach a steering rod to the front wheel axle.

The following list and sketch show the position of reinforced areas to prevent surface dimples caused by ground handling.

**Reinforced surfaces:**

- Fuselage-fin connection. Circle with radius 350 mm, where fuselage can be pushed down to lift the front wheel
- Leading edge of fin up to 500 mm height, 100 mm wide on each side
- Top part of the wing leading edge, 200 mm wide area
- Top part of the stabilizer leading edge, 150 mm wide area
- Area around fuel caps
- Stepping surface on left wing root - fuselage part
- Whole upper surface of the wing is reinforced, but maximum load is still limited
- Spinner
- Root part of propeller blades can be used for towing, don't push or pull on the tip!

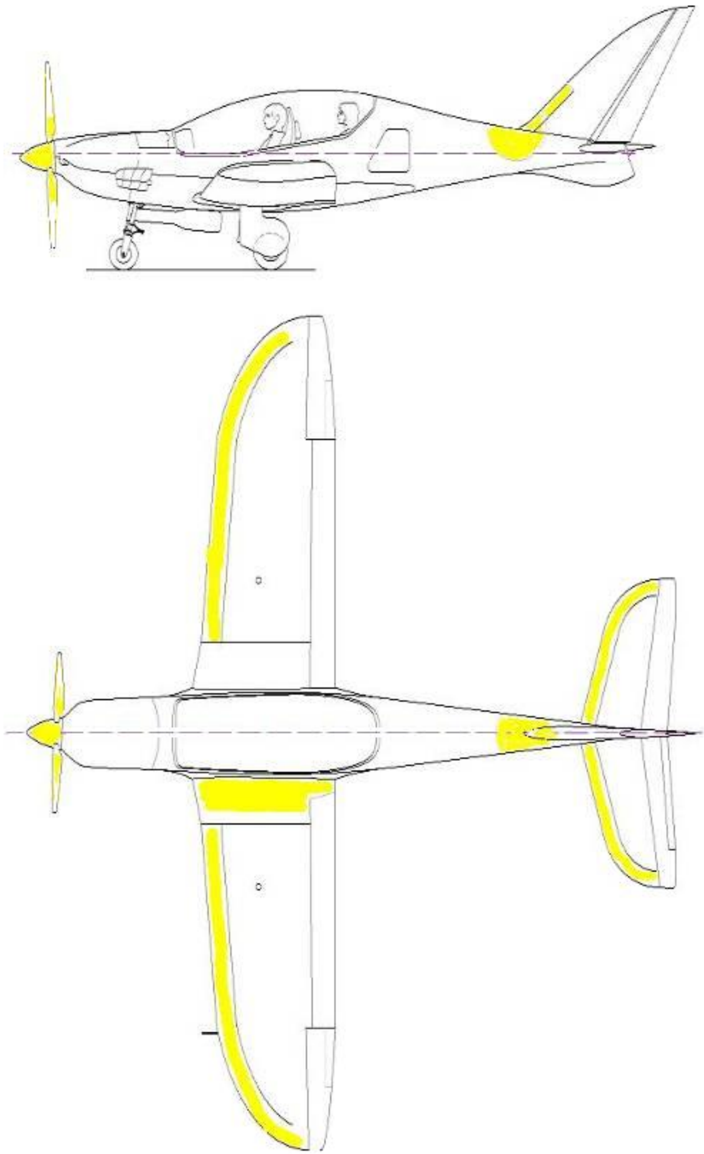
## CAUTION

**The Shark 600 composite surface is created by thin layer of carbon fabric, to keep the lowest possible weight. Under the carbon fibre layer is a layer of PVC foam with relatively low firmness and stiffness. Common hand pressure can result in surface damage and complicated repair. Gentle ground handling is therefore highly recommended.**

## CAUTION

**The airframe has integrated lifting points for landing gear maintenance - metal brackets with nuts are bolted on front wall of fuselage main spar.**

**If the plane is lifted by the wings, it is necessary to follow these basic rules: supported area should be below the wing spar, close to inspection window of the aileron bellcrank. The lower wing surface can easily be damaged!**



*Sketch of reinforced surfaces for ground handling*

## 8.5 Towing

Towing the airplane by car is not allowed.

## 8.6 Tyre pressures

| | | | |
|---|---|---|---|
| Nose Gear Tire | 11 x 4 | 3.0 bar | 44 psi |
| Main Gear Tires | 14 x 4 | 3.0 bar +/- 0,3 | 44 psi |

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# 9 Supplements

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## 9.1 Aircraft documentation

The SHARK 600 is provided with a set of documents in hardcopy format and/or on a USB key. The composition of the document set may vary depending on the type/model/variant of the SHARK 600 and the country of registration. The prescribed composition of the document set is outlined in the form SHARK.AERO_FT_116 Aircraft Documents Checklist.

## 9.2 Serial numbers of components

The list of installed components and their serial numbers is detailed in protocol S600_TP_056.

## 9.3 Manuals

List of 3rd party manuals corresponds to airplane equipment:

- Engine manual
- Propeller manual
- EFIS / EMS manual
- Rescue system manual
- ELT manual
- OBLO, backup EFIS manual
- VHF radio manual
- Transponder manual

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