ULTRALIGHT CZECH REPUBLIC

StingSport

AIRCRAFT OPERATING INSTRUCTIONS

These Aircraft Operating Instructions must remain in the aircraft and be accessible to the pilot all times.

31 Dec-05

Dear StingSport Owner:

Congratulations on the purchase of your StingSport! You will find your new TL Ultralight aircraft very enjoyable, extremely economical, and easy to maintain. The StingSport is the ideal Light Sport Airplane. It is fast, economical, pleasing to the eye, and user friendly. We at TL Ultralight Sport Aircraft are certain that your StingSport will give you hours and hours of leisure flying and enjoyment. With these Aircraft Operating Instructions (AOI), we hope to help inform you about the design and operation of your aircraft.

These Aircraft Operating Instructions are to be used as a guide to assist the pilot to safely use the StingSport aircraft. They are not intended to be a final authority and although proofed extensively they are still not considered error free. Therefore, the pilot is the final authority for the safe operation of the aircraft. Should there be any questions or errors found in your reading this manual please contact us immediately and we will issue a clarification.

Thank you again for your business. We look forward to a continuing satisfied customer relationship. Feel free to contact us if you have any questions or comments regarding your StingSport.

Fly safe! Fly fun!

(sig)
Jiri Tlusty

TL Ultralight, sro
Letište, Budova 84
503 41 Hradec Králové
Czech Republic

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SECTION INDEX

NOTES, CAUTIONS, AND WARNINGS

Throughout this manual, small boxes are inserted reading **Note, Caution**, or **Warning.** These are items which require particularly close attention for special conditions or procedures.

NOTE

This text box emphasizes specific operating conditions, steps in a procedure, helpful hints or useful advice.

CAUTION

This text box represents danger to equipment or operation. By not observing the cautions, the result could be the destruction of equipment and possibly personal danger and injury.

WARNING

This text box represents a hazardous situation. Warnings are used to call attention to operating procedures or conditions which, if not strictly observed, may result in personal injury or death.

Every owner, pilot, operator, or user of the StingSport should become familiar with the entire text of these Aircraft Operating Instructions (AOI). The text consists of flight and maintenance information and is required to be on board the plane and available to the pilot during all flights. It also incorporates *only* some references from Rotax®, the engine manufacturer, Woodcomp®, the propeller supplier, and Galaxy®, the installed aircraft parachute system. Please refer to the latest edition of those manufacturer manuals for specific and complete detailed operation of each aircraft system.

Notice! The information contained in this document is for reference and information only.
The pilot is the final and only responsible party for the safe operation of this aircraft.

CAUTION

The StingSport is intended for sport and recreational purposes only. This aircraft meets the standard specification Design and Performance (D&P) established by the American Society for Testing and Materials (ASTM) Document F 2245-04, and it is therefore restricted by that guideline. The aircraft does not comply with any FAA Part 22, or 23 certification processes. Compliance with regulations placed upon the airplane category should be strictly adhered to by the operator

CAUTION

The items discussed in each amplified procedures are informational. None of these items or procedures are intended to replace properly qualified ground or in-flight instruction by an FAA certified flight instructor (CFI).

NOTE

This AOI manual is valid only if the airplane operator complies with any changes that may be issued at a later date. Any pages affected by a change should be removed and replaced with the effective pages immediately.

If this manual is found not to be current, revisions missing or pages removed, contact our USA Customer Service location for replacements.

TL Ultralight, sro Customer Service
10401 West Markham Street
Little Rock, AR 72205

Phone: 501.228.7777
Fax: 501.227.8888

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LIST OF CHANGES

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0	5/1/2005	None	Original Issue	
1	12/31/2005	All	Re-issue All Pages	

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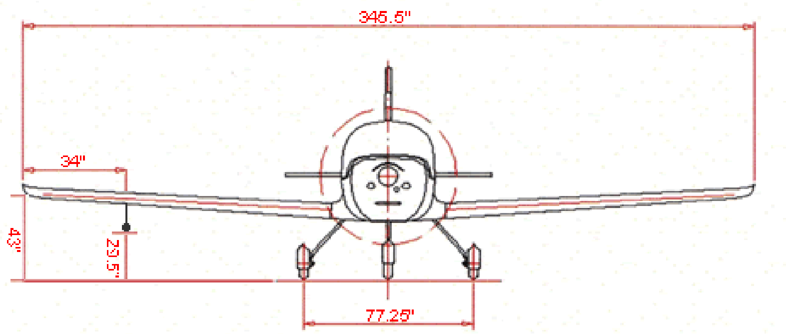
SECTION 1
GENERAL INFORMATION

TABLE OF CONTENTS PAGE

Notice! The information contained in this document is for reference and information only.
The pilot is the final and only responsible party for the safe operation of this aircraft.

THREE VIEW DRAWINGS



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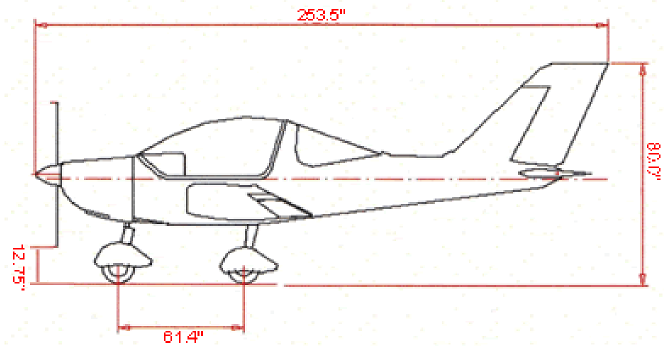

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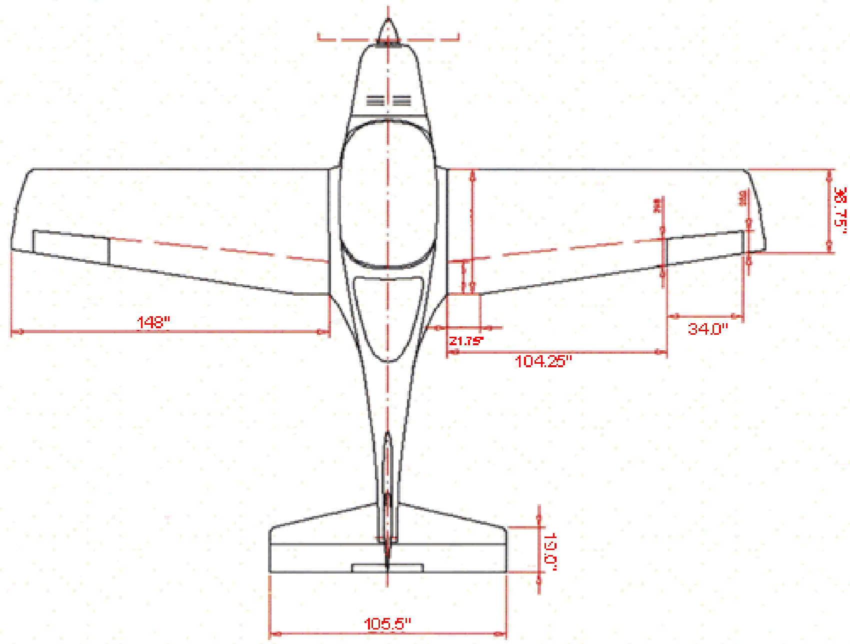

TOP VIEW

INTRODUCTION

This manual is written and organized to conform to the ASTM F2245-04, Design and Performance of a Light Sport Aircraft. A copy is issued with each aircraft and is required to remain in the aircraft and be available to the pilot at all times.

All pilots of this aircraft must read and understand the operation and limitations of this aircraft design. As such, many items are added as narrative information to assist them in clearly understanding what is required and in most cases help in achieving the necessary performance. The AOI does not intend to and cannot replace properly qualified ground or in-flight instruction by an FAA certified flight instructor. (CFI)

Maintenance and operation of major components, engine, emergency parachute system, propeller, avionics or other installed equipment is provided in the appropriate manufacturer manuals which are included with the aircraft. Any conflicts in this manual should be superseded by the appropriate manufacturer's manual.

The StingSport has a high cruising speed and may traverse very different weather conditions during a single flight. The aircraft is designed and intended only for operation in VFR/ VMC conditions. The operator is responsible for the safe flight of the aircraft and should be prepared to avoid any meteorological conditions which will endanger the occupants, the aircraft or both.

Section 1 provides general information and descriptive figures relevant to the aircraft and the engine. It also contains certain definitions of aeronautical terms, ASTM Design and Performance standards and commonly used abbreviations.

DESCRIPTIVE DATA

AIRCRAFT

The StingSport is a full three axis, low wing; two place side-by-side seating, tricycle landing gear aircraft with a steerable nose wheel. The primary aircraft structure is carbon fiber and fiberglass UV resistant reinforced laminate with an inner foam core creating a 'sandwich' layered construction between each ply.

Various options are available such as the Rotax 912ULS, tinted canopies, wing fuel tanks and other avionics or interior selections. Therefore your aircraft may vary from the descriptions in this manual. Please check with your local dealer if you have any specific questions not addressed here.

ENGINE

Number of Engines: 1
Engine Manufacturer: Rotax® G.m.b.H. Aircraft Engines
Engine Model Number: 912 UL, Standard Equipment
Engine Type: Normally-aspirated, liquid/air-cooled, dry sump, gear-reduced drive, dual carburetor-equipped, four-cylinder, four-stroke, electronic dual ignition, horizontally-opposed engine with 73.91 cu.in. displacement
Horsepower Rating and Engine Speed: 80 BHP at 5800 RPM

PROPELLER

Propeller Manufacturer: Woodcomp® Propellers, SRO
Propeller Model Number: SR 200
Number of Blades: 3
Propeller Diameter: 63 in.
Propeller Type: Fixed-pitch, ground-adjustable
Blade Pitch:

Lowest Possible Angle Setting: 16°
Best Climb Angle Setting: 17°
Maximum Cruise Setting: 21.5°
Highest possible Angle Setting: 26°

WARNING

Adjusting the propeller blades at a higher setting than 21.5°, in an attempt to obtain a higher cruise speed, will cause the engine RPM to "bog-down", fail to reach a sufficient ground RPM, and will not allow a safe takeoff.

Loading the engine with a high propeller pitch (high propeller 'angle of attack' or 'big angle') above 21.5° may also result in engine failure and WILL result in extremely long takeoff rolls and low climb rates.

High propeller pitch angles will result in high engine CHT temperatures during climb and will also result in engine vibration due to minor differences in the pitch of each blade.

GALAXY ROCKET PARACHUTE SYSTEM

The rocket deployed emergency parachute system is standard equipment. It is activated inside the cockpit by pulling a red “T” handle located on the overhead roll bar above and between the crew positions. The system is secured by an embroidered red tag attached to a brass safety pin. Refer to the Galaxy operational manual included with the aircraft for detailed information.

BASIC DIMENSIONS

Length .... 20 ft. 4 in.
Cabin width .... 44 in.
Wing Span .... 28 ft. 3 in.
Height .... 6 ft. 4 in.

Areas

Wing .... 121.4 ft^2
Flap .... 18.6 ft^2
Aspect ratio 7.26
Glide ratio 12:1

FUEL

Approved Fuel Grade:
  92 Unleaded Automobile Fuel, “Auto gas” (Yellow)
Approved Alternate Fuel Grade:
  100LL Aviation Fuel, “Avgas” (Blue)

CAUTION

100LL Avgas is only to be used as an **alternate fuel type** if 92 octane unleaded auto fuel is not available. Due to the high lead content, the use of 100LL Avgas is restricted to less than 30% of engine time. See the latest Rotax engine operational supplement for more detailed fuel specifications and information.

Total Fuel Capacity: 20.5 US Gallons

WARNING

During refueling, the main fuel tank can be filled with approximately 22.0 gallons of fuel. This will eliminate all fuel expansion area and will cause a fire hazard as the fuel expands, is forced out of the fuel vent line and spills on to the parking area.

Total Unusable Fuel: Main tank: 1.5 Gallons
Wing tank (if installed): .3 Gallons

NOTE

Total unusable fuel is the minimum amount of fuel an aircraft may have in its gas tank before engine fuel starvation. Unusable fuel, as its name implies, cannot be consumed by the engine for power and thus cannot be relied upon for flight, but is included in the aircraft empty weight.

OIL

Oil Capacity: 3.7 Quarts
Oil Grades: Vary depending on the engine operation and may vary from one aircraft to another depending on the operator. Refer to Fig. 9.1 and 9.2
Oil Filter: Rotax part number 825 701, **no substitutions allowed.**

AIRPLANE WEIGHTS

Maximum Ramp Weight: 1320 Lbs
Standard Empty Weight: 780 Lbs
Maximum Useful Load: 540 Lbs
Maximum Takeoff or Landing Weight: 1320 Lbs
Baggage Weight: Total of 60 Lbs.

NOTE

Each baggage compartment can hold a maximum of 20 Lbs. An additional 20 Lbs may be loaded on the surface of deck aft of the seats if properly secured against an abrupt movement. A total of 40 lbs of baggage weight is used as a basis for most cg calculations.

WARNING

Do not allow baggage to block the exit area of the aircraft parachute system nor hinder free deployment of the four parachute riser cables. After securing baggage, assure that each shoulder harness is attached and operational.

MAXIMUM DEMONSTRATED CROSSWIND VELOCITY

Maximum Demonstrated Crosswind Velocity: 17 Knots

SYMBOLS, ABBREVIATIONS, AND TERMINOLOGY

GENERAL AIRSPEED TERMINOLOGY

Best Angle-of-Climb Speed (V_X): The speed which results in the greatest gain of altitude in a given horizontal distance.

Best Rate-of-Climb Speed (V_Y): The speed which results in the greatest gain in altitude in a given time.

Best Glide Speed (V_G): The speed that will result in maximum glide distance.

Design Cruise Speed (V_C): The optimal cruise speed.

Knots Calibrated Airspeed (KCAS): Indicated airspeed corrected for position and instrument error and expressed in knots. KCAS is equal to KTAS in standard conditions at sea level.

Knots Indicated Airspeed (KIAS): The speed shown on the airspeed indicator and is expressed in knots.

Knots True Airspeed (KTAS): KCAS corrected for non-standard temperature and pressure and is expressed in knots.

Maneuvering Speed (V_A): The maximum speed at which you may use abrupt full control travel.

Maximum Flap Extended Speed (V_{FE}): The highest speed permissible with wing flaps in a prescribed extended position.

Maximum Structural Cruising Speed (V_{NO}): The speed that should not be exceeded except in smooth air, and then only with caution.

Maximum Sustained Speed in Level Flight (V_H): The highest speed that can be attained in level flight at sea level under standard conditions while the engine is operating at its designed maximum continuous power setting.

Never Exceed Speed (V_{NE}): The speed limit that may never be exceeded under any conditions at any time.

Stalling Speed (V_S): The minimum steady flight speed at which the airplane is controllable without flaps.

Stalling Speed (V_{S0}): The minimum steady flight speed with power off and full flaps.

METEORLOGICAL TERMINOLOGY

Indicated Altitude: The altitude displayed on the altimeter.

Mean Sea Level (MSL): The average level of the ocean's surface – the level halfway between mean high and low tides, used as a standard reference for expressing altitude.

Outside Air Temperature (OAT): The free air static temperature, expressed in either degrees Celsius or degrees Fahrenheit.

Pressure Altitude: The altitude displayed on the altimeter when the altimeter's barometric scale has been set to 29.92 inches of mercury (1013 mb) (on a standard day).

Standard Temperature: 15°C at sea level pressure altitude. (Decreases approximately

2°C for each 1000 feet increase of altitude.)

True Altitude: The true height above mean sea level (MSL). True altitude is indicated altitude corrected for nonstandard atmospheric pressure.

AIRPLANE PERFORMANCE AND WEIGHT TERMINOLOGY

Arm: The horizontal distance expressed in inches from the reference datum plane to the center of gravity (CG) of an item or location along the fuselage.

NOTE

Units of measurements and weights must be consistent for each set of calculations and in the same system of units, i.e., pounds and inches, or kilograms and centimeters.

Ballast: A specific amount of weight attached in a specific location, which can be temporarily or permanently installed in an aircraft, to help bring its Center of Gravity within the required limits. If temporary ballast must be used for certain operations, the exact amount and its location must be placarded on the instrument panel within clear view of the pilot. The use of Ballast increases Empty Weight and reduces Useful Load.

Basic Empty Weight: The standard empty weight plus the weight of any additionally installed or optional equipment.

Basic Empty Weight Center of Gravity. The c.g. of an aircraft in its basic empty weight condition, and is an essential part of the weight and balance record.

Brake Horsepower: The power developed by the engine expressed in horsepower and measured by an instrument resisting (brake) device.

Center of Gravity (CG): A point along an aircraft's longitudinal axis at which all the loads and forces are perfectly concentrated and balanced. It is computed by dividing the total moment by the total weight of the airplane. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.

(Total Moment / Total Weight = Center of Gravity)

Center of Gravity Arm is the arm obtained by adding the airplane's individual moments and dividing the sum by the total weight.

Center of Gravity Limits are the extreme forward and aft center of gravity locations (limits) within which the airplane must be operated at any given weight.

Center of Gravity Range: The horizontal distance, along an aircraft's longitudinal axis, within which an aircraft has been found to be fully maneuverable at all specified design speeds, weights and loading configurations.

Datum: A convenient vertical reference plane along the longitudinal axis of an aircraft from which all horizontal measurements are taken.

Demonstrated Crosswind Velocity: The velocity of the crosswind component at which adequate control of the airplane was actually demonstrated during takeoff and landing certification testing. The value is not considered to be a maximum limit.

Gallons Per Hour: The amount of fuel (in gallons) consumed in one hour.

Gear Box: The gears forward of the engine and aft of the propeller used to change (reduce) the propeller RPM by a factor of 2.43 of the engine RPM.

Installed Equipment: All optional accessories and equipment permanently installed on an airframe or engine at the time of weighing. These items must be included in the "Installed Equipment List" resulting in the Basic aircraft weight. Additions and deletions must be noted in the list each time they are made and new Weight and Balance calculations performed to determine the magnitude and effect of weight change. Ballast, if permanently installed, must also be listed.

Manifold Pressure: The atmospheric pressure measured in the engine's induction system and is expressed in inches of mercury (Hg).

Maximum and Minimum Weights: Due to balance, structural and aerodynamic considerations, maximum, or minimum, weights for certain locations on the aircraft are specified. For example, the pilot's minimum (100Lbs) and maximum (240Lbs) weight is be specified for some operations. The same is true for baggage, cargo, fuel, and any other disposable or variable loads.

Maximum Forward and Maximum Aft C.G. Locations: A specified forward most and rear most Center of Gravity location, along the aircraft longitudinal axis. These Center of Gravity location limits are expressed in inches from a convenient reference (forward tip of the propeller spinner) on the aircraft.

Maximum Gross Weight: The maximum total weight for which the aircraft's structure and performance have been approved for normal operations by its manufacturer. It is the maximum weight at which the aircraft can be safely operated.

Maximum Landing Weight is the maximum weight approved for the landing touchdown.

Maximum Ramp Weight is the maximum weight approved for ground maneuver. (It includes the weight of start, taxi and run-up fuel.)

Maximum Takeoff Weight: The maximum weight at which an airplane is approved for the start of its takeoff roll.

Moment: The product of the weight of an item multiplied by its arm.

(Weight x Arm = Moment)

Nautical Miles per Gallon: The distance (in nautical miles) which can be expected per gallon of fuel consumed at a specific engine power setting and/or flight configuration

Reference or Datum Plane: An imaginary vertical plane located on the forward tip of the propeller spinner from which all horizontal distances are measured for balance purposes.

Revolutions per Minute: Expressed as engine "speed", is the number of 360 degree turns that the engine crankshaft completes in each minute of time. (The propeller, driven by the gear box, completes one revolution each 2.43 engine revolutions.)

Standard Empty Weight: The weight of a standard airplane, including unusable fuel, full engine operating fluids, and full engine oil reservoir.

Station: A vertical location along the airplane fuselage horizontal axis given in terms of the distance from the reference datum plane.

Tare: The weight of chocks, blocks, stands, etc. used when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

Useful Load: The total amount of weight available for pilot, passengers, baggage, cargo and in-flight usable fuel. The difference between the maximum ramp weight and the basic empty weight. (Maximum Ramp Weight – Basic Empty Weight = Useful Load) The useful load will be reduced by the installation of additional equipment.

Usable Fuel: The amount of fuel available for engine use in flight.

Unusable Fuel: The quantity of fuel that cannot be safely used in flight.

Weight: Actual individual weight of each item such as airframe, crew, fuel, baggage, cargo, etc. in pounds or kilograms

ABBREVIATIONS

100LL – 100 Octane Low Lead Aviation Fuel (Avgas) (Rotax = 30% max AvGas)
A – Amps, Electrical Amperage
ADI – Solid state gyro **A**ttitude and **D**irectional **I**ndicator
AGL – Above ground level
AMP – Amps, Electrical Amperage
AOI – Aircraft Operating Instructions (In LSA terms AOI = POH)
AOA – Angle of Attack, relative angle of the wind to an airfoil
ASAP – As Soon As Possible
ASTM – ASTM International (Old -American Society of Testing and Materials)
ATC – Air Traffic Control (Center)
AUX – Auxiliary
Auto Gas – Automobile fuel, 92 Octane is min. auto gas rating for Rotax engines
Avgas – 100 Octane Low Lead Aviation Fuel (100LL) (Max 30% use in Rotax)

Big Angle – Large AOA of the Propeller blade in relation to the air stream
BHP – Brake Horse Power

CAS—Calibrated airspeed
CB – Circuit Breaker
CBS – Circuit Breaker Switch
CFIT – Controlled Flight Into Terrain
CK - Check, Checked
Code – Transponder Squawk
Comm, Com1 – VHF radio
CSP – Constant speed propeller, (not used in LSA)
CG – Center of Gravity
Cu-In, (Cu.In.), CI – Cubic Inch(s)

D&P – Design and Performance (ASTM) Standards
Datum – Location base for measurement(s)
DC – Direct Current
DOT – (US) Department of Transportation

EIS – Engine Information System
EFIS – Electronic Flight Information System
ETA – Estimated time of arrival
EWGG - Empty weight center of gravity

FAA – Federal Aviation Agency
FG - Fuel Gauge
FSDO – Flight Standards Service District Office (FAA)
FPM – Feet Per Minute
Ft – Foot (Feet)
Full – (Landing flap setting) Second (full) extended Flap Setting (30 degrees)

G, g, Gs – Acceleration due to gravity
GAL, Gal. – Gallon(s)
GPH – Gallons per hour
GPS – Global Positioning System
GRS – Galaxy Rescue System (rocket parachute system)

Half – (Takeoff flap setting) First extended Flap Setting (15 degrees)
HOBBS - Engine hourmeter
HP, Hp – Horse Power

IFR – Instrument Flight Rules
IMC – Instrument Meteorological Conditions
In – Inch(s)

K – Kilogram
Kt – Knot, nautical mile

LB(S) Lb(s) – Pound(s)
LL – Low Lead, as in 100LL
LSA – Light Sport Aircraft
LSP – Light Sport Plane

MAC – Mean Aerodynamic Chord
Max – Maximum
MC – Magnetic course
MIDO – Manufacturing Inspection District Office (FAA)
Min – Minimum
MoGas – Low octane (83) ‘motor gas’, ***not*** approved for Rotax engine operation
MPH – Miles per hour
MPG – Miles per gallon

NE – Never Exceed
NM – Nautical Mile(s)

MODE C – Altitude data transmitted to ATC by the XPDR

POH – Pilot Operating Handbook (Not used in LSA)
PIM – Pilot Information Manual (No longer used in LSA)
PSI – Pounds per Square Inch

RPM – Revolutions per Minute

Small Angle – Small AOA of a Propeller blade in relation to the air stream
Stage1 – (Takeoff flap setting - Half) First extended Flap Setting (15 degrees)
Stage2 – (Landing flap setting - Full) Second (full) extended Flap Setting (30 degrees)

T&B – Turn and bank indicator
Tach – Tachometer
TC – Turn Coordinator

V – Volt(s)
VDC – Volts Direct Current
VFR – Visual Flight Rules
VHF – Very High Frequency
VMC – Visual Meteorological Conditions
VSI – Vertical Speed Indicator
VVI – Vertical Velocity Indicator

WgWg – Wig Wag light flashing system

XPDR – Transponder

END

SECTION 2
OPERATING LIMITATIONS

Table of Contents **Page**

INTRODUCTION

Section 2 includes specific operating limitations and airspeed instrument markings. The limitations provided in this section should be adhered to for safe operation of the airplane.

CAUTION

This airplane is restricted to VFR/VMC day weather conditions unless it has been equipped with the VFR/VMC night minimum equipment list in accordance with 14 CFR 91.205c.

AIRSPEED LIMITATIONS

V	SPEED	KIAS	KCAS	REMARKS
V_{NE}	Never Exceed Speed	**164**	**162**	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	**118**	**117**	Do not exceed this speed except in smooth air, and even then only do so with caution.
V_A	Maneuvering Speed	**118**	**117**	Do not make full or abrupt control movements above this speed.
V_{FE}	Maximum Flap Extended Speed: Half (Takeoff) Flaps: Full (Landing) Flaps:	**75** **65**	**74** **64**	Do not exceed these speeds with the given flap settings. Damage to the flap mechanism may occur due to excessive air loads.
V_S	Stall Speed (No Flaps)	**44**	**43**	Do not attempt to fly slower than this speed at full gross weight when operating without flaps.
V_{S0}	Stall Speed (Full Flaps)	**39**	**38**	Do not attempt to fly slower than this speed when operating with full (Landing) flaps.
V_H	Maximum Sustained Speed in Level Flight	**122**	**120**	Maximum speed with maximum continuous rated engine power in horizontal flight at sea level in standard conditions at full gross weight.

Speeds shown are for full gross weight at sea level, standard conditions.

Fig. 2.1

CAUTION

Maximum speed for aircraft parachute deployment at gross weight: 122.5 Kts.

AIRSPEED INDICATOR MARKINGS

MARKING	KIAS	KCAS	SIGNIFICANCE
White Arc	**39 - 75**	**38-74**	**Full-Flap Operating Range.** Lower limit is maximum weight V_{S0} in landing configuration. Upper limit is maximum speed permissible with flaps extended to stage one (Takeoff) setting.
Green Arc	**44 - 118**	**43-117**	**Normal Operating Range.** Lower limit is maximum weight V_S at most forward C.G. with flaps retracted. Upper limit is maximum structural cruising speed.
Yellow Arc	**118 - 164**	**117-162**	**Caution Range.** Operations must be conducted with caution and only in smooth air.
Red Line	**164**	**162**	**Never Exceed Speed.** Maximum speed for all operations.

Fig. 2.2

WARNING

Flap speed limits do not contain additional load factors for higher than specified speeds. Adhere to the following maximum limits to prevent damage at the flap attachment hinges.

Flaps Half, 15 degrees = **75 KIAS** Maximum
Flaps Full, 30 degrees = **65 KIAS** Maximum

WARNING

Side slips with Full flaps are not approved. High sink rates may develop and the disturbed airflow may impose negative loads on the inboard portion of the flap panels.

MAXIMUM DEMONSTRATED CROSSWIND VELOCITY

17 Knots (Flight operations should be halted in gusts or crosswinds in excess of 25Kts.)

SERVICE CEILING

Standard conditions, standard day: 18,000 Ft
LSA altitude limit: 10,000 Ft.

ENGINE LIMITATIONS

See the latest engine manufacturer's manual supplied with the aircraft for more detailed Rotax engine data.

Engine Manufacturer: Rotax® G.m.b.H. Aircraft Engines
Engine Model Number: 912 UL
Maximum Power: 80 BHP

Engine Operating Limits:

Maximum Engine RPM speed: 5800 RPM (5 Minutes Maximum)
Maximum Continuous Engine RPM speed: 5500 RPM (No time limit)
Maximum Cylinder Head Temperature: 239°F (with .9 bar radiator cap)
Maximum Cylinder Head Temperature: 248°F (with 1.2 bar radiator cap)
Maximum Exhaust Gas Temperature: 1616°F

Oil Temperature,	Minimum: 120°F
	Maximum: 250°F
	Normal: 190 – 230°F
Oil Pressure,	Minimum: 20 psi
	Maximum: 102 psi
	Normal: 29 – 73 psi
Fuel Pressure,	Minimum: 2.2 psi
	Maximum: 5.8 psi

CAUTION

Exceeding the maximum fuel pressure may override the float valves of the carburetors and cause erratic engine operation. The fuel pressure of the additional electrical aux pump must not exceed 4.4psi. Therefore, takeoff with the electric aux pump ON is not recommended.

Fuel Grade: ***92 Octane Unleaded Auto Gas***; *100LL Avgas (alternate grade)*

CAUTION

100LL Avgas is to be used **only as an alternate fuel** type if 92 octane auto fuel is not available. **The use of 100LL Avgas is restricted to less than 30% of engine operation time by the engine manufacturer.** If 92 Octane Unleaded is not available during travel, adding 100LL Avgas to partial tanks of 92 Unleaded is acceptable.

CAUTION

The aircraft manufacturer does not recommend the use of additives such as TCP for leaded fuel (Avgas) operations. Following use of Avgas during travel, run the engine to warm the oil. Then, change the oil to reduce the effect of lead on engine life.

Oil specifications: Oil type is dependant on engine operation conditions. Rotax Service Instructions, SI-18-1997 R5, dated September 2004 are shown in detail in Section 9: Fig. 9.1 and 9.2. Confirm that these are the latest Rotax engine oil recommendations prior to selection. The use of a semi-synthetic motor-cycle oil with gear additives is recommended.

PROPELLER LIMITATIONS

Propeller Manufacturer: ***Woodcomp® Propellers sro***
Propeller Blade Angle, Lowest possible angle (pitch) setting: 16°
Best climb angle (pitch) setting: 18°
Maximum cruise angle (pitch) setting: 21.5°
Maximum possible angle (pitch) setting: 26°

WARNING

Adjusting the propeller blades at a higher setting than 21.5°, in an attempt to obtain a higher cruise speed, will cause the engine RPM to "bog-down", fail to reach a sufficient ground RPM, and will not allow a safe takeoff. Loading the engine with a high propeller pitch (high propeller 'angle of attack' or 'big angle') above 21.5° may also result in engine failure and WILL result in extremely long takeoff rolls and low climb rates.

OPERATIONAL WEIGHT LIMITS

Standard Empty Weight: 780 Lbs
Maximum Ramp Weight: 1320 Lbs
Maximum Takeoff Weight: 1320 Lbs
Maximum Landing Weight: 1320 Lbs
Maximum Pilot or Copilot seat load: 240 Lbs.
Minimum Single Pilot or Copilot operation load: 100 Lbs.
Maximum Weight in Baggage Compartments: 20 Lbs each
Maximum Weight on aft Baggage Shelf: 20 Lbs. total
Maximum Weight at Baggage Station location: 60 Lbs total.

CENTER OF GRAVITY LIMITS

Center of Gravity Range:

Forward: 22 % MAC; or 80.2" Aft of Data Plane (Forward tip of prop spinner)
Aft: 34 % MAC; or 86.7" Aft of Data Plane (Forward tip of prop spinner)

MANEUVER LIMITS

This airplane is certified as a Light Sport Aircraft and is not approved for aerobatic flight, including spins. **All aerobatic maneuvers, including spins, are prohibited.** An aerobatic maneuver, as defined by 14 CFR 91.303, is an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight.

FLIGHT LOAD FACTOR LIMITS

Flight Load Factors:

Flaps Up: +4g, - 2g
Flaps Down: +4g, - 2g

FLIGHT LIMITATIONS:

The StingSport is intended for VFR/VMC flight conditions only. **Do not operate this aircraft in IMC conditions!** Operation under IMC conditions is considered an emergency and is strictly prohibited.

CAUTION

Additional flight attitude limitations are specified by the engine manufacturer to assure appropriate flow of fuel, coolant, and lubrication. See the Rotax manuals included as a CD with the aircraft documents.

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SECTION 3
EMERGENCY PROCEDURES

Table of Contents Page

INTRODUCTION

Section 3 provides checklists and amplified information in the event of an emergency. Abbreviated checklists for use in the aircraft are included in Section 10. Proper preflight inspections and maintenance practices can help eliminate emergencies caused by airplane or engine malfunctions. Emergencies caused by poor weather conditions can be minimized or reduced by proper flight planning and using good judgment when unexpected weather is encountered.

Should an emergency arise, the basic guidelines described in this section should be considered and applied as necessary to correct the problem. Due to the fact that emergencies can occur at any altitude or any moment, procedures to follow may have to be suitably altered by the pilot in command in order to best cope with the real time situation.

NOTE

All *StingSport* airplanes have a parachute recovery system installed. This system may be deployed at any time by the crew. IF time permits it should generally be employed after all other efforts to recover the aircraft have been exhausted. If deployment of the system is necessary, consider deployment at the end of the checklist applicable to the situation.

WARNING

Be advised that a completely stopped or wind-milling propeller will increase drag on the airplane more than a propeller with the engine running at idle. This will result in a higher sink rate and a shortened glide distance. When engine-out procedures are simulated, aircraft glide performance will not completely reflect true engine-out conditions.

CAUTION

The items discussed in each amplified procedures are informational. None of these items or procedures are intended to replace properly qualified ground or in-flight instruction by an FAA certified flight instructor (CFI).

PARACHUTE RECOVERY SYSTEM

WARNING

The aircraft parachute system should be considered as the primary method of choice of recovery when the aircraft has departed controlled flight (out of control).

The StingSport comes standard with a parachute recovery system manufactured by the Galaxy® High Technology Corporation. It is imperative that the owner/operator of this airplane read and understand the recovery system operating manual provided by Galaxy®. In most emergency scenarios, the use of the recovery system is not necessary. The parachute system will increase the chance of occupant survival at the cost of substantially damaging the airframe. If the system is used, certain steps should at least be attempted prior to activation:

1. **Slow the Aircraft, If Possible**
2. **Ignition — OFF**
3. **Harnesses — TIGHTEN**
4. **GRS Activation Handle — PULL FIRMLY (25 POUNDS)**
5. **Radio — SET TO 121.5. TRANSMIT “MAYDAY, MAYDAY, MAYDAY!” with AIRCRAFT ID and CURRENT POSITION**
6. **Transponder — SET TO 7700**
7. **Glidepath — CONTROL IF POSSIBLE**
8. **Impact Position — PULL LIMBS CLOSE TO BODY and COVER FACE**

Turn off the ignition to stop the spinning propeller. If the aircraft has departed controlled flight and the prop is stopped there is less risk of damaging or hindering the parachute deployment.

Tighten the seat belts and shoulder harnesses before activating the system. As much as 5.5 Gs may be experienced during the chute inflation process, depending on the flight parameters.

Firmly pull the activation handle out 18 inches with about 25 pounds of force. The system should complete inflation in 1.5 – 3.5 seconds.

WARNING

Maximum speed for aircraft parachute deployment at gross weight: 122.5 Kts.

If time permits, make the proper emergency transmissions on the VHF radio and transponder. The airplane should descend at approximately 1260 FPM depending on weight, pressure altitude, temperature, and any deployment damage.

In some situations, the aircraft may be controllable to an extent after the recovery system has been deployed. If in a nose-low attitude and sufficient airflow over the control surfaces exists, limited control in flight may be accomplished. If this is possible, make every effort to guide the airplane toward an isolated landing zone, but do not attempt a “drop-in” landing into a confined or congested area.

As the airplane nears the ground, assume impact position to decrease the risk of injury. Limbs should be pulled in close to the body, and the face should be covered for protection from possible flying debris. If the descent rate is approximately 1260 FPM (approx. 14 MPH), the airplane should strike the ground with the same force as if it had been dropped from a height of about six feet.

WARNING

This manual does not account for all aspects involved in deploying the parachute recovery system. It is the responsibility of the aircraft operator to fully understand this system by consulting the latest Galaxy® High Technology Corporation operating manual provided with the aircraft.

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF ROLL (ABORT)

1. **Throttle — IDLE**
2. **Brakes — APPLY**
3. **Wing Flaps — RETRACT**

Only the most time-critical items are on the checklist. These items are to be carried out quickly, in order to stop as soon as possible. The key item to note when an engine failure occurs is to respond early in the takeoff process during the ground roll in order to stop on the remaining runway. Closing the throttle and applying the brakes will minimize the ground roll. Retracting the wing flaps will decrease the amount of lift being produced so that the aircraft will be less likely to become airborne and place more weight on the wheels for braking.

ENGINE FAILURE (LANDING) IMMEDIATELY AFTER TAKEOFF

1. **Airspeed — 70 KIAS**
2. **Wing Flaps — HALF**
3. **Fuel Valve — OFF**
4. **Main Switch — OFF**

WARNING

The aircraft is capable of very high takeoff climb deck angles or AOA at low speeds. Loss of engine power will result in loss of airspeed very quickly due to the high nose attitude. Be prepared to immediately push the nose down to change (lower) the AOA and establish V_G.

If an engine failure occurs immediately after liftoff, promptly lower the nose to prevent a stall, and establish a V_G of 70 KIAS to maximize the glide distance. The sooner V_G is established, the further the airplane will be able to glide. In most cases it is more dangerous to turn back to the runway rather than continuing straight ahead. Turning back will result in a substantial loss of lift and altitude or a possible low altitude spin.

Therefore, identify a landing zone located in front of the airplane. Lower the flaps to Half to increase lift at slower speeds. Close the fuel valve to cut off fuel to the engine, and turn off the Main switch to minimize electrical problems during an off airport landing. Do not attempt to restart the engine as that may detract from basic flight operations.

ENGINE FAILURE DURING FLIGHT

Engine Restart:

1. **Airspeed — 70 KIAS**
2. **Fuel Valve — ON**
3. **Aux. Fuel Pump — ON**
4. **Ignition Switches — ON**
5. **Starter — ENGAGE**

If restart fails, execute a forced landing.

If an engine failure occurs while in flight, immediately establish V_G, and glide toward a chosen landing zone. Do this without delay to allow for a minimal loss in altitude, which results in a longer glide distance. When inbound to the landing zone, try to identify the problem.

Only if prudent and time permits, attempt an engine restart. The pilot's first and major responsibility is to fly the aircraft. Ensure the fuel valve is open so the engine can receive fuel from the main tank. In case the engine-driven fuel pump has malfunctioned, turn on the auxiliary fuel pump. Ensure that both ignition switches are on, and then engage the starter button. If the engine still will not start, complete the forced landing procedures detailed below.

WARNING

Be advised that a completely stopped or wind-milling propeller will increase drag on the airplane more than a propeller with the engine running at idle. This will result in a higher sink rate and a shortened glide distance. When

engine-out procedures are simulated, aircraft glide performance will not completely reflect true engine-out conditions.

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. **Airspeed — 70 KIAS**
2. **Landing Zone — DETERMINE and FLY TOWARDS**

Engine Shutdown:

3. **Aux. Fuel Pump — OFF**
4. **Fuel Valve — OFF**
5. **Radio — SET TO 121.5; TRANSMIT “MAYDAY, MAYDAY, MAYDAY!” and AIRCRAFT ID with CURRENT POSITION**
6. **Transponder — SET TO 7700**
7. **Landing Zone — CIRCLE OVER (if necessary)**

BEFORE LANDING

8. **All Switches — OFF**
9. **Harnesses — TIGHTEN**
10. **Flaps — FULL (on final)**
11. **Touchdown — PREFERABLY INTO WIND, NOSE HIGH**
12. **Brakes — APPLY AS REQUIRED**

Always be aware of the surrounding terrain so that you may easily decide on a suitable landing zone, if an engine failure occurs in flight. If such a failure does occur, immediately lower the nose (if slow), to establish V_G and turn towards the selected landing zone. Should time permit, attempt an engine restart.

If the engine still will not start, secure the engine. Turn off both ignition switches, close the fuel valve and turn off the auxiliary fuel pump if it is on.

NOTE

If engine failure occurs at a high cruise speed, maintain the current attitude and altitude until slowing to $V_{G.}$ Do NOT attempt a “zoom” maneuver to gain altitude.

Leave the main and instrument switches on for as long as possible. Tune the VHF radio to 121.5 MHz. This is the VHF emergency frequency and is monitored by air traffic control (ATC) and other aircraft. Transmit, “Mayday, Mayday, Mayday,” followed by the airplane’s ID number, current position, and altitude. Squawk 7700 on the transponder.

While performing the engine restart/shutdown checklist, maintain 70 KIAS and keep in mind where the landing zone is located. Circle over the landing zone if needed until sufficient altitude has been lost to setup for a landing. Do not dive toward the landing zone if at too high an altitude in order to attempt a safe landing. Doing so will result in a high energy, high speed approach that is not likely to allow the aircraft to touch down within the intended area.

To set up for landing, turn off all switches, and tighten the shoulder harnesses. If possible, land into the wind to ensure adequate airspeed at the slowest possible ground speed. Always use Full flaps for landings. Do **NOT** attempt to stall the aircraft just above the ground.

Touch down with the main gear first, and try not to allow the nose to touch the surface. Allowing the nose to touch too hard could cause it to dig into the ground, possibly flipping the airplane. Apply the brakes as necessary to stop the airplane in the available distance. Be mindful of the landing zone surface. If it is soft, the landing gear may plow into it. If the surface is wet or grassy, the airplane may be difficult to control, and the wheels may hydroplane if hard braking is attempted.

PRECAUTIONARY LANDING WITH ENGINE POWER

1. **Airspeed — 70 KIAS**
2. **Flaps — HALF**
3. **Harnesses — TIGHTEN**
4. **Selected Field — EXECUTE LOW PASS (only if practical)**

5. **Electrical Equipment — OFF (EXCEPT IGNITION!)**
6. **Flaps — FULL (on final)**
7. **Airspeed — 60 KIAS**
8. **Touchdown — PREFERRABLY INTO WIND, NOSE HIGH**
9. **Canopy — UNLATCH**

WARNING

The canopy may fully open and depart the airframe, if it is unlatched in flight. If the canopy is unlatched, it may be necessary to physically hold it down to prevent it from separating from the airframe.

10. **Brakes — APPLY AS REQUIRED**

On rare occasions, an engine may have only a partial loss of power; the engine can still produce a small amount of thrust. Even though it may be possible to obtain a higher speed than V_G, do not fly the airplane faster. This procedure will provide the maximum glide distance.

If the engine can produce sufficient thrust, make a low pass over the designated landing zone. That way, the surface and any obstructions can be noted before a final approach is established. When setting up for landing, turn off all electrical equipment.

WARNING

Leave the ignition switches ON while landing.

Set full flaps when on final and fly at 60 KIAS. Touch down nose high to reduce the risk of burrowing the nose wheel, and apply the brakes only as necessary to stop in the remaining distance.

DITCHING – WATER FORCED LANDING

WARNING

The aircraft parachute system should be considered as the primary method of choice for landing with an engine failure over water. Attempting to fly the aircraft onto the water is very dangerous and may result in complete airframe destruction during water impact.

1. **Airspeed — 60 KIAS**
2. **Flaps — FULL**
3. **Radio — SET TO 121.5; TRANSMIT "MAYDAY, MAYDAY, MAYDAY!" and AIRCRAFT ID with CURRENT POSITION**
4. **Transponder — SET TO 7700**
5. **Baggage — SECURE**
6. **Harnesses — TIGHTEN**
7. **Power — ESTABLISH MINIMUM DESCENT RATE AT MINIMUM SPEED**
8. **Approach — INTO WIND with high winds PARALLEL TO SWELLS with light winds**
9. **Canopy — UNLATCH**

WARNING

The canopy may fully open and depart the airframe, if it is unlatched in flight. If the canopy is unlatched, it may be necessary to physically hold it down to prevent it from separating from the airframe.

10. **Touchdown — NOSE HIGH WITH MINIMUM DESCENT RATE, AVOID STALLING THE AIRCRAFT ON WATER!**
11. **Airplane — EVACUATE**

In the event that a forced landing needs to be executed over water, follow the normal restart/shutdown procedures. Add Full flaps and establish a steady descent rate at an airspeed of 60 KIAS. This is done to allow for a slow airspeed with a slow descent rate to touch the water surface.

If winds are high and white-cap waves are present, try to land in the direction of the swells and as much into the wind as possible. If winds are calm, try to land parallel to the swells and as much into the wind as possible. Unlatch the canopy when nearing touchdown. This will help you to exit the airplane as quickly as possible before possibly submerging.

Do **NOT** attempt to flare over smooth, calm water because height above the water's surface is optically very difficult to judge. Rather, touchdown level with as slow a descent rate as possible without entering a stall. As soon as the airplane stops, evacuate the airplane.

CAUTION

For flight over-water with distances greater than gliding distance, all occupants should wear an approved inflatable life vest. A US Coast Guard approved model that does NOT inflate automatically should be used since an unintended inflation would hinder aircraft evacuation.

FIRES

ENGINE FIRE DURING START

1. **Starter — CONTINUE CRANKING**

If engine starts:

2. **Power — 2000 RPM for a few seconds**
3. **Fuel Valve — OFF**
4. **Engine — SHUTDOWN and INSPECT FOR DAMAGE**

If engine fails to start:

5. **Throttle — FULL OPEN**

6. **Starter — CONTINUE CRANKING**
7. **Ignition Switches — OFF**
8. **Fuel Valve — OFF**
9. **Main Switch — OFF**
10. **Fire Extinguisher — OBTAIN**
11. **Airplane — EVACUATE**
12. **Fire Extinguisher — USE AS REQUIRED**
13. **Airplane — INSPECT FOR DAMAGE**

If a fire occurs while starting the engine, continue to crank the engine to attempt to draw the fire back into the combustion chamber. If the engine starts, let it run for a few seconds, shut it down, and then evacuate the airplane. Use the radio to call for fire assistance if available.

If the engine does not start, continue to crank the engine. Turn off all switches except the Main Switch, to keep power to the starter, until ready to evacuate. Open the throttle completely, and close the fuel valve. Be prepared to reduce the throttle if the engine starts.

Obtain the fire extinguisher between the seats and evacuate the airplane. Use the fire extinguisher only as a method to gain a clear path for evacuation. Allow the fire assistance personnel to extinguish any blaze and inspect for damage.

ENGINE FIRE IN FLIGHT

WARNING

During an in-flight fire do not deploy the aircraft parachute system at high altitude. If the decision is made to use the parachute system and conditions permit, attempt to fly (DIVE) the aircraft to a lower altitude to minimize the time for the fire to spread within the cockpit.

1. **Fuel Valve — OFF**
2. **Throttle — FULL OPEN**
3. **Aux. Fuel Pump — OFF**
4. **Ignition Switches — OFF**
5. **Cabin Heat — OFF**
6. **Air Vents — AS REQUIRED**

NOTE

The side air vents may be aimed forward and/or aft to assist in cabin ventilation. In an emergency they also may be removed and discarded. Also, a controlled side-slip may assist in clearing the cockpit of smoke and fumes.

WARNING

Do not allow a low speed side-slip to cause the aircraft to stall and spin.

7. **Radio — SET TO 121.5. TRANSMIT "MAYDAY, MAYDAY, MAYDAY!" with AIRCRAFT ID and CURRENT POSITION**
8. **All Non-Essential Switches — OFF**
9. **Airspeed — 60 KIAS**
10. **FLAPS - FULL**
11. **Execute a Forced Landing**

In the event of an in-flight engine fire, an engine restart should not be attempted. This could aggravate the emergency even further by providing more fuel for the fire. Adjust the aircraft pitch attitude to obtain 60 KIAS and setup for a forced landing. Close the fuel valve, open the throttle, and turn off the auxiliary fuel pump, if it is on.

Turn OFF both ignition switches, but leave the main switch on in order to make distress calls. Turn off cabin heat, if on, in order to prevent smoke and fumes from entering the cockpit. Also, open the three canopy air vents to allow fresh air to enter the cockpit.

Transmit the "MAYDAY" distress call on 121.5 MHz and squawk 7700 on the transponder to alert ATC of the emergency. Proceed with the forced landing that has been established.

ELECTRICAL FIRE IN FLIGHT

1. **Main Switch — OFF**
2. **All Switches Except Ignition Switches — OFF**
3. **Cabin Heat — OFF**

4. **Air Vents — AS REQUIRED**
5. **Fire Extinguisher — USE (if practical)**
6. **Execute an immediate forced landing if fire continues**
7. **Land ASAP**

If fire appears out and electrical power is necessary for extended flight:

8. **Main Switch — OFF**
9. **All Switches Except Ignition Switches — OFF**
10. **Circuit Breakers — CHECK for faulty circuit (do not reset)**
11. **Main Switch — ON**
12. **Instrument Switch — ON**
13. **Avionic/Electrical Switches — ON, ONE AT A TIME to locate fault**
14. **Land ASAP**

An electrical fire can be identified by the pungent odor of burning insulation. Turn off the main switch and all other electrical equipment. Be sure to leave the ignition switches on. On occasion, the fire can be stopped by turning off the power to the electrical equipment.

WARNING

Leave both ignition switches ON

Close off cabin heat and open the air vents for adequate cockpit ventilation. If the fire does not appear to be out and the location of the fire can be determined, use the fire extinguisher to control the fire. When it appears the fire is out and electrical equipment is needed to complete the flight, ensure that all electrical switches are still off, and check the circuit breakers. A "popped" circuit breaker is key to identifying the faulty system, but do not reset any breaker that has "popped" (Either a CB or SCB) because this could restart the electrical fire.

If you must attempt to troubleshoot the problem, first turn off all electrical equipment and all switches. Next, turn on the main switch and instrument switch. Then proceed to turn on each electrical system one by one. This will help to identify the faulty system if the electrical fire restarts. If the fire does restart, turn off the last switch that was turned on. Be prepared for an emergency landing, and land as soon as possible.

WARNING

If you choose to troubleshoot any problem when airborne, remember that the main priority in any airborne situation is to fly the airplane. Do not focus all attention on fixing the problem, which is *post-flight* maintenance.

CABIN FIRE

1. **Main Switch — OFF**
2. **Cabin Heat — OFF**
3. **Air Vents — AS REQUIRED**
4. **Fire Extinguisher — USE AS REQUIRED**
5. **Execute a forced landing if fire continues**
6. **Land ASAP**

The most important thing to remember in a cabin fire is to **fly the airplane** and do not allow the situation to cause panic and distraction from the primary activity of aircraft control. Turn off the main switch to cut electrical power to the systems in case faulty electrical systems were the cause of the fire. Close off the cabin heat in case the fire came from the engine compartment. Open the air vents as required to allow for ventilation, but be cautious not to feed the flames with fresh air. Use the fire extinguisher located between the seats to fight the fire, and land as soon as possible.

NOTE

The first use of cabin heat of the winter season may produce some cockpit smoke or fumes from oil or hydraulic fluid that has dripped on exterior surface of the hot air supply hose.

LANDING GEAR FAILURE

A hard landing can result in damage to the landing gear, axles, tires, or the gear sockets. Landing gear failure may be suspected if, during a hard landing, a shock comparable to that of a blown tire is experienced. This does not necessarily mean a tire has blown, but possibly the landing gear may have fractured. The outboard surface of the landing gear strut may actually wrinkle and the gear will appear to 'bow out'. However, this may not be apparent from ground observers on an inspection "fly-by."

In the event that a main landing gear strut or wheel has been damaged, consider using a smooth sod runway, if available. Touchdown on the undamaged gear first. This can be accomplished by using aileron to bank into the good gear and using opposite rudder to keep the nose aligned down the runway. After the undamaged gear has touched down, keep the weight off of the damaged gear for as long as possible while still maintaining positive directional control of the airplane.

If the nose wheel has been damaged, touchdown on the main landing gear first without using any brakes, and initially do not allow the nose wheel to touch the surface. Do not lose elevator authority at low speed, as the nose will then drop hard to the ground. Keep full back pressure on the elevator control for as long as possible, and allow the nose wheel to gently settle to the surface.

SPIRAL DIVE RECOVERY

If a spiral is encountered at night or with an inadvertent cloud penetration (IMC/IFR conditions), proceed as follows:

WARNING

A spiral dive at night or in instrument meteorological conditions (IMC) is a serious, life threatening emergency. Consider the use of the GRS aircraft parachute system as the primary recovery technique.
See Parachute Recovery System deployment.

IF the aircraft parachute system is not deployed:

1. **Throttle to IDLE.**
2. **Level the wings using coordinated aileron and rudder until the wings of the Attitude Indicator (ADI) or turn coordinator are level. Remember there is no pitch data available from the turn coordinator.**

NOTE

If the angle of bank exceeds 30^o; the ADI will display a red arrow indicating the left or right direction to push the stick which will level the wings.

3. **Apply elevator back pressure steadily until 70 KIAS is established on the airspeed indicator and the altimeter shows neither a climb nor a descent.**

WARNING

When recovering from a nose-low attitude, do not over-stress the airframe by pulling back too abruptly on the flight stick.

4. **Trim the aircraft to maintain 70 KIAS.**
5. **Upon re-entering VFR/VMC conditions, resume normal cruise operation.**

Close the throttle to prevent any further increase in airspeed produced by the engine. Because it presents less data to a confused pilot, consider the turn coordinator as the primary reference for bank even though an attitude indicator is installed on the airplane. Although no pitch information is displayed, the solid state gyro of the turn coordinator is not gimbaled and should not tumble at steep aircraft pitch attitudes or bank angles. Establish aircraft control then use the ADI as the primary aircraft attitude reference.

Level the airplane wings using the turn coordinator and the ADI as references. Then bring the ADI into your cross check as the primary instrument. If airspeed is increasing, (diving), then steadily pull back on the stick until the airspeed reaches 70 KIAS. Hold this airspeed until the altimeter shows neither a climb nor a descent. Straight and level flight has now been regained. Then, lower the nose to maintain 70 KIAS.

Continue to monitor the ADI, Airspeed, turn coordinator, altimeter, and the VSI descent rate. Establish a descent at 70 KIAS until positive, visual outside references can be maintained.

WARNING

Consider the use of the GRS parachute system as the primary recovery procedure for loss of aircraft control.

Controlled flight into terrain (CFIT) is a common occurrence following inadvertent IMC conditions. Cross reference the

descent rate of the VSI with the altimeter to ensure that the airplane is not too low above AGL before reaching an altitude in which positive, visual outside references can be maintained.

SPIN RECOVERY

WARNING

Intentional spins in this airplane are prohibited.

Should an inadvertent spin occur in this airplane, the following recovery procedure should be used:

1. **Throttle — IDLE**
2. **Ailerons — NEUTRALIZE**
3. **Rudder — APPLY FULL (in opposite direction of rotation)**
4. **Elevator — FORWARD (to break stall)**

When rotation stops:

5. **Rudder — NEUTRALIZE**
6. **Elevator — RECOVER SMOOTHLY FROM NOSE-LOW ATTITUDE**

WARNING

When recovering from the nose-low attitude, do not over-stress the airframe by pulling back too abruptly on the flight stick.

Close the throttle to prevent an unnecessary increase in airspeed. During a spin, one wing is in a stalled condition resulting in ineffective aileron inputs to control the rotation. Neutralize the ailerons, and apply full rudder in the opposite direction of rotation. Because an airfoil can stall at any airspeed and in any relation to the horizon, push forward on the stick to break the stall.

When the rotation stops, neutralize the rudder. Firmly, but cautiously pull back on the stick in order to minimize loss in altitude. Be sure not to pull back on the stick too quickly because this could result in a secondary stall/spin or it could overstress the airplane.

WARNING

Intentional spins in this airplane are prohibited.

ROUGH ENGINE OPERATION OR LOSS OF POWER

CARBURETOR ICING

Although the aircraft engine has a full time carburetor heating system, an unexplained drop in manifold pressure and eventual engine roughness may result from the formation of carburetor ice. Use both the throttle and the choke to maintain engine RPM.

SPARK PLUG FOULING

A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits resulting from operation with 100LL. This may be verified by momentarily turning each ignition switch OFF and then back ON, one at a time. An obvious power loss in single ignition operation is evidence of spark plug or ignition module trouble. If the problem persists, proceed to the nearest airport for repairs using both ignition switches unless extreme roughness dictates the use of a single ignition.

IGNITION MODULE MALFUNCTION

A sudden engine roughness or misfiring is usually evidence of ignition problems. By turning off an ignition switch and then turning it back on, the malfunctioning module may be determined. Select different power settings to determine if continued operation on both ignitions is practicable. If not, switch off the bad module and proceed to the nearest airport for repairs.

LOW OIL PRESSURE OR LOSS OF OIL PRESSURE

If a loss of oil pressure is accompanied by a rise in oil temperature, there is good reason to suspect an engine failure may occur. Reduce engine power and select a suitable field for a forced landing. Use only the minimum power required to reach the desired landing zone.

LOW ENGINE COOLANT OR LOSS OF ENGINE COOLANT

A rise in cylinder head temperatures accompanied by a rise in oil temperature could result if there is a loss of engine coolant. This is also a situation when there is good reason to suspect an engine failure may occur. Reduce engine power and select a suitable field for a forced landing. Use only the minimum power required to reach the desired touchdown spot. See the latest Rotax publications on engine operation without coolant for further details.

NOTE

If an excessive engine limit is indicated in any of the EIS data fields, verify the other data indications before acting on and individual EIS alert. An erratic or intermittent temperature rise could be the result of a faulty sensor, and in this case, an emergency condition may not exist. However, this circumstance may not hold true in all situations, and appropriate precautions should always be taken.

NOTE

Abbreviated emergency checklists for use in the airplane are available in appendix A.

EXCEEDING MAXIUM AIRSPEED (V_{NE})

If the aircraft exceeds Vne, reduce power and speed immediately. Do not attempt abrupt control movement or unusual attitudes. Continue flight using minimum safe speed and control pressures to land as soon as possible. After landing have the aircraft airworthiness confirmed by a qualified mechanic to return it to service.

FLUTTER

Flutter is a serious structural vibration and/or oscillation of the control surfaces, usually caused by excessive airspeed. It may also be caused by abrupt control deflection at speeds near or above Vne. When it occurs, the ailerons, elevator, rudder or possibly the entire aircraft will start to shake very violently. Flutter can destroy the aircraft in seconds if ignored. **Should flutter occur, reduce power immediately** and slow the aircraft to minimum safe speed. Avoid large control deflections and attitude changes. Land as soon as possible and have the aircraft structure and controls inspected by a qualified mechanic prior to return to service.

WARNING

Flutter may cause immediate structural damage, control failure and/or the inability to control the aircraft.

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SECTION 4
NORMAL PROCEDURES

TABLE OF CONTENTS PAGE

INTRODUCTION

Section 4 provides checklists and amplified procedures for conducting normal operations.

AIRSPEEDS FOR NORMAL OPERATION

Takeoff: .... 45 KIAS
Climb:
- Normal: .... 75 KIAS
- Best Rate of Climb (V_Y): .... 60 KIAS
- Best Angle of Climb (V_X): .... 50 KIAS

Design Cruise Speed (V_C): .... 95-115 KIAS
Landing and Approach:
- Flaps Up: (Emergency only) .... 70 KIAS
- Flaps Half: (Normal for all approaches) .... 60 KIAS
- Flaps Full: (Normal for all landings) .... 55 KIAS

Balked Landing:
- Maximum Power, (Set Half Flaps): .... 65 KIAS

Maximum Horizontal Flight Speed (V_H): .... 120 KIAS
Maximum Structural Cruising Speed (V_{NO}): .... 118 KIAS
Maximum Demonstrated Crosswind Velocity: .... 17 Knots
Maximum (Never Exceed) Speed (V_{NE}): .... 164 Knots

PREFLIGHT INSPECTION

NOTE

All exterior preflight inspection items, including the cockpit section, can be conducted from outside the airplane.

COCKPIT

1. All Switches — OFF
2. Fuel Valve — OFF
3. Main Switch — ON
4. Fuel Gauge — CHECK QUANTITY
5. Main Switch — OFF
6. ELT Control Panel Indicator — CHECK STATUS
7. Flight Controls — PROPER OPERATION
8. Flaps — PROPER OPERATION, SET FULL
9. Trim — CENTERED
10. Required Documentation — ON BOARD

NOTE

See section 9 for required aircraft documentation.

11. Baggage — SECURED
12. Seats — SECURE
13. Proceed to Exterior Checklist

The entire preflight inspection of the cockpit can be accomplished while standing outside of the airplane. When inspecting the cockpit ensure that all of the required documents are on board the airplane or else it is not airworthy.

Momentarily turn on the strobe lights and check them for proper operation before turning them back off. Check the ELT control panel indicator located on the instrument panel to determine the ELT's status. Cross check this status with the actual ELT by removing the passenger seat back. Ensure the ON-ARMED-OFF switch is set to ARMED and agrees with the control panel indicator.

EXTERIOR CHECKLIST

NOSE AREA

1. Windshield — CLEAN
2. Cowling — SECURE, screws tight
3. Prop/Spinner — CHECK
4. Air Inlets — CLEAR
5. Oil — CHECK QUANTITY
6. Coolant – CHECK QUANTITY
7. Nose Strut Assembly — CHECK
8. Nose Tire — CHECK INFLATION and WEAR
9. Chock — REMOVE
10. Firewall Fuel Gascolator – CHECK for debris
11. Fuel and Oil Tank Vents — CLEAR
12. Traffic Alert Antennae — Secure
13. Transponder Antennae — Secure
14. Fuselage Fuel Sump — DRAIN, Check for water and contaminates

Make certain the canopy is clean from bugs or streaks that could impair vision. Review Section 9 for proper procedures for cleaning the canopy. The engine cowling should be securely fastened by screws that run along its seams. Ensure that all screws are present and tight. Clear all air inlets of debris or birds' nests that could hinder engine cooling

Inspect the propeller and spinner for cracks or chips. Even a small defect in the propeller can eventually lead to catastrophic failure of the blades. Check the ends of the blades for chips or delamination caused by gravel or debris.

Check the oil for sufficient capacity by referencing Section 9 of the AOI. The engine should only use a small amount of oil during normal operation. For longer flights, it may be advisable to add oil until it reaches its maximum limit on the dipstick to allow for some oil consumption in-flight.

CAUTION

The oil level can only be checked correctly by the dipstick within a few minutes of engine shutdown.

CAUTION

Contact with hot engine oil may cause scalds or severe burns. Take great care when dealing with hot engine oil or the oil level indicator dipstick.

CAUTION

Do not remove the coolant radiator cap when the engine is hot. The coolant will be dangerously hot and is under pressure. Relief of that pressure will cause the coolant to reach a boiling point, expand and spray out of the cap area. Severe burns may occur from hot coolant at normal engine operating temperatures.

Inspect the nose strut for freedom of vertical movement and damage from nose impact on misjudged landings. The strut compresses during taxi and landing operations and has an internal rubber 'snubber' to cushion extreme limit movement.

NOTE

Check the nose strut suspension system for evidence of nose wheel impact which can occur on high speed landings where initial runway contact is not on main landing gear.

CAUTION

Do not use the nose wheel pant to move the nose wheel left and right. The wheel pant is not designed to have large torsional loads placed on the front and aft in an attempt to point the nose wheel in either direction.

NOTE

Comply with proper environmental fuel disposal regulations; do not dump fuel onto the ground. When draining the fuel sump, always use a clean clear fuel sampler. Pour clean fuel back into the fuel tank.

The fuel sump located underneath the fuselage should be drained to ensure the correct fuel is onboard and no water or debris has accumulated inside the fuel tank. Water inside the fuel lines can come out of suspension by vibration or freeze thus interfering with fuel flow to the engine.

RIGHT WING

1. Main Fuel Tank — CHECK QUANTITY / CORRECT FUEL TYPE
2. Main Fuel Cap — SECURE
3. ELT – Check armed and secure
4. Gear Leg and Brake Line — CHECK
5. Wheel Pant and Bracket — SECURE
6. Brake Pads and Disk — CHECK FOR WEAR
7. Tire — CHECK INFLATION and WEAR
8. Chock — REMOVE
9. Wing Leading Edge — CHECK
10. Wing Aux Tank (if installed) – CHECK QUANTITIY / FUEL TYPE
11. Wing Aux Tank Cap — SECURE
12. Under wing Inspection Ports – SECURE / CHECK CONTINUITY

13. Pitot Tube — SECURE - CHECK PITOT / STATIC OPENINGS
14. Tie Down Strap — REMOVE
15. Wing Tip Cover and Enclosed Lights — CHECK
16. Aileron, Tab, and Hinges — CHECK
17. Flap and Hinges — CHECK

After checking the fuel quantity and that the correct fuel type (color) is on board, ensure the fuel cap is securely in place by inserting the cap back into the filler neck so that it lies flush with the rim and then press the small locking tab back into place. Be sure that the tab is aimed aft. Examine the landing gear leg for cracks or splits, and make sure the brake line is firmly fastened to the strut. The brake disk should not have any cracks or warps in it, and the brake pads should have ample pad material remaining.

The bolt and two screws that fasten the wheel pant bracket to the gear assembly should all be tight. Confirm that the grounding wire attached inboard to the right gear assembly is securely fastened. It should make sufficient contact with the ground and should be tightly woven without any fraying.

NOTE

If the grounding wire is worn, additional length of wire is available by simply extending it from inside the fuselage.

Inspect the wing's leading edge for flaws or dents. These can impede smooth airflow over the wing. Inspect the primary control connections to the ailerons which can be seen in the clear under-wing inspection ports. These connections assure aileron continuity and are vital for aircraft control. Ensure the pitot tube is secure and clear of obstructions as well as the small static holes that encircle the pitot tube. Inspect the clear wing tip light cover for cracks, and ensure the screws that attach it to the wing tip are all present and tight.

Gently move the aileron up and down to ensure freedom of motion, and examine the hinges for cracks. Examine the flap slot located underneath the wing to ensure no debris and proper clearance for the retracted flaps. Inspect the flap surface for cracks in the composite surface at the hinges caused by over-stress from air loads occurring above the extension airspeed limits, and that the flap mechanism has a slight amount of play.

AFT FUSELAGE

1. Right Entry Step — SECURE
2. Chute Window and Shroud Lines – FREE FROM INTERFERENCE
3. VHF Antenna — SECURE
4. Aft Tie Down — REMOVE
5. Right Horizontal Stabilizer — CHECK
6. Rudder and Tab — CHECK
7. Elevator, Trim Tab, and Hinges — CHECK
8. Tail Cone Control Bolts and Hinges — SECURE / FREE to MOVE
9. Tail Cone – FREE OF DEBRIS
10. Left Horizontal Stabilizer — CHECK
11. Aft Inspection Cover — SECURE
12. Aft Strobe and Position Light — CHECK
13. Left Entry Step — SECURE

Inspect the rudder and vertical stabilizer for cracks. Do not apply force in an attempt to move the rudder. The rudder is directly connected to the nose wheel so there will only be slight rudder travel. The horizontal stabilizer and trim tab should also be free of cracks and punctures. Inspect the mechanical linkages located underneath the horizontal stabilizer for security. Do not lift by the trim tab. The nuts and bolts should be snug and the linkages should be free from any obstructions. The marking paint on the nuts and screws should not be broken. Make sure the tail cone is firmly in place and its screws are present and tight. The aft inspection cover located on the pilot's side of the empennage should be securely in place with screws tightly fastened.

LEFT WING

1. Flap and Hinges — CHECK
2. Aileron and Hinges — CHECK
3. Wing Tip Cover and Enclosed Lights — CHECK
4. Tie Down Strap — REMOVE
5. Wing Leading Edge — CHECK
6. Under Wing Inspection Ports – SECURE / CHECK CONTINUITY
7. Wing Aux Tank (if installed) – CHECK QUANTITIY / FUEL TYPE
8. Wing Aux Tank Cap — SECURE
9. Gear Leg and Brake Line — CHECK
10. Wheel Pant and Bracket — SECURE
11. Brake Pads and Disk — CHECK FOR WEAR
12. Tire — CHECK INFLATION and WEAR
13. Chock — REMOVE

Examine the flap slot located underneath the wing to ensure proper clearance for retracted flaps. Inspect the flap surface for cracks, and it may have a slight amount of play at the hinges. Gently move the aileron up and down to ensure freedom of motion, and examine the hinge area for surface cracks. Inspect the clear wingtip light cover for cracks, and ensure the screws that attach it to the wing tip are all present and tight. Check the landing/taxi, strobe and position lights are operational.

Inspect the wing's leading edge for flaws or damage. These can impede smooth airflow over the wing. The bolt and two screws that fasten the wheel pant bracket to the gear assembly should all be tight. Examine the landing gear leg for cracks or splits, and make sure the brake line is firmly fastened to the strut. The brake disk should not have any cracks or warps in it, and the brake pads should have ample wear surface material available.

OPERATING CHECKLIST

Board the aircraft

CAUTION

Only one person at a time should board the airplane. Having more than one person on the designated wing area or step will cause the plane to tip aft, which might damage the tail section of the airplane. If this occurs, the aircraft should be grounded until an inspection of the aft control system can be completed.

ENGINE START

1. Canopy — CLOSED and LOCKED

NOTE

If the canopy is left open for an extended period, the plastic material of the canopy is susceptible to horizontal expansion at the frame due to unavoidable exposure to the sun and heat. This will effect how the canopy closes and locks into position.

CAUTION

If left open in bright sunlight, the excellent canopy optics are capable of focusing the sunlight off of the interior curved surface and causing burns in the cabin upholstery.

CAUTION

The canopy mechanism may be damaged by over extension if the canopy remains unattended, unlocked, open in the wind or during taxi operations.

2. Harnesses — ADJUST and FASTEN
3. Headsets — ON and ADJUST
4. All Switches — OFF
5. Fuel Valve — ON
6. Throttle — IDLE
7. Main Switch — ON
8. Aux Fuel Pump — MOMENTARILY ON
9. Aux Fuel Pump — OFF
10. Ignition Switches — ON
11. Check area visually and Call Out — “CLEAR PROP!”

CAUTION

Call out “CLEAR PROP!” through the canopy vent window. Also use a visual signal by rotating your hand vertically with an index finger up to indicate propeller movement. This step is intentionally some steps ahead of the starter engagement to allow time for the nearby personnel to clear the propeller movement area.

12. Brakes — HOLD
13. Choke — AS REQUIRED
14. Starter — ENGAGE
15. Throttle — 2000 RPM
16. Oil Pressure — CHECK
17. Choke — CLOSED as engine warms

18. Instrument Switch — ON
19. Strobe Lights — ON
20. Intercom — ON

CAUTION

When boarding the airplane, do so one at a time to prevent rocking the airplane backwards onto its tail.

Be sure to check that the safety harnesses, belts or headset wires are not outside the cockpit when closing the canopy.

Pull the canopy down into place and secure each of the three locking levers. This should be a 1-2-3 step process when closing. Start with the co-pilot's locking arm and move sequentially to the overhead lock and then to the pilot's locking arm. Establish a sequence for securing the canopy, and continue using it. Making your procedure common practice will help prevent takeoff with the canopy unlatched.

The throttle should be at IDLE before starting to prevent immediate engine run-up and airplane acceleration upon ignition. The "choke" is bypassed and will not be activated at high RPM throttle positions.

Open the fuel valve and momentarily turn on the auxiliary fuel pump to pump fuel into the engine. The fuel pump will initially make a loud and fast clicking sound. Within a few seconds it should quiet down to a muffled knocking sound. This is because the pump has pulled fuel from the tank and pressurized the fuel lines to the carburetors. When the auxiliary fuel pump makes the muffled knocking sound, verify fuel pressure on EIS (AUX2), and turn the auxiliary pump OFF.

Visually ensure that the prop area is clear before engine start. Turn on the ignition switches, and loudly call out, "Clear prop," to again warn the surrounding area that the engine is about to start. Make a last minute visual check of the engine area to assure that no personnel are nearby. Hold the brakes to prevent airplane movement during start up.

The choke will be necessary during cold starts. Pull out and hold the choke knob. Then press and hold the starter button. Do not hold the starter button on for longer than 10 seconds because this could overheat the starter. Be sure to allow for a cool down of two minutes if continuous, lengthy cranking is necessary, if engine does not start.

When the engine fires, ensure the oil pressure rises within 10 seconds. Use the choke as a 'Mini Throttle' to maintain acceptable RPM levels until the engine idles at 2000 RPM smoothly. Slowly close the choke, while at the same time slowly adjusting the throttle as required to keep the RPMs stable. If the engine begins to run rough, move both the choke and throttle back to their previous positions, wait a few seconds for the engine to warm up, and then try closing the choke again.

CAUTION

Always be observant of the oil pressure/temperature and cylinder head temperatures on the EIS data display during engine operation.

PRE-TAXI

1. Oil Pressure — CHECK
2. Transponder — STANDBY
3. VHF – ON
4. GPS — ON
5. Other Avionics — ON
6. Turn Coordinator — LEVEL
7. Altimeter — SET (note any field elevation variance)
8. GRS Safety Pin — REMOVED and STOWED
9. Warm-up — AS REQUIRED

NOTE

Rotax® advises that a two minute engine warm-up time is required before takeoff. This two minute warm-up **includes** taxi time.

Check the EIS to ensure at least 12 psi oil pressure. If no oil pressure indication exists, shut down the engine and troubleshoot the problem. Lack of oil pressure can cause serious engine damage. Turn on the strobe lights to warn the surrounding area of aircraft movement. Turn the transponder to standby and set the proper radar code for departure. Turn on the VHF radio and tune to the desired frequency. Also turn on the GPS and enter the desired information while the aircraft is NOT moving.

Ensure that the turn coordinator's solid state gyro is operating correctly by verifying the wings are level. Enter the proper barometric pressure in the Kollsman window of the altimeter to obtain the correct true altitude. If pressure is not known, enter the field elevation of the airport on the altimeter.

Carefully remove the safety pin from the GRS activation handle. Stow it in a place where it can be easily reached after landing for securing it back into place. The canopy locking lever on the pilot's side is a recommended storing location. Then you will be reminded to secure the chute when you reach for the canopy latch to exit the cockpit.

Allow a minimum of two minutes for the engine to warm up sufficiently prior to engine run-up in order to stabilize internal engine temperatures. This can include time during taxi operations. Allow oil temperature to read 110°F minimum before the engine ignition check.

TAXI

1. Area — CLEAR
2. Brakes — CHECK and APPLY AS NEEDED
3. Steering — CHECK
4. Compass — CHECK
5. ADI Track Display — CHECK
6. Turn Coordinator — CHECK (in turns)

Before releasing the brakes for taxi, ensure the area in front of and behind the airplane is clear of obstructions. If taxiing over loose gravel, pavement pebbles, or soft surfaces, use lowest engine RPM possible in order to minimize pulling debris into the propeller.

NOTE

As much as five minutes may elapse prior to correct digital track indications in the ADI or Pictorial Autopilot display windows.

When taxiing, use minimal braking to slow the aircraft. However, the aircraft gains speed even while idling. To prevent a fast taxi, smoothly apply the brakes to slow the airplane's speed to approximately that of a brisk walk, and then release them. Do not, at any time "ride" the brakes. Doing so (even if you don't think you are pushing on the brake pedals) will cause the brake pads to glaze and the brake caliper to chatter with each brake application.

Be sure to maintain hand control of the flight stick while taxiing. This will prevent the elevator from jolting up and down when taxiing over bumps or dips. Ensure the compass heading is swinging and in the proper direction. When in taxi turns, observe the turn coordinator. The display should indicate the direction of the turn and the ball should be free to move in the race.

ENGINE RUN-UP

1. Brakes — HOLD
2. Oil Temperature — 110°F min.
3. Oil Pressure — 29 – 73 PSI
4. Cylinder Head Temperature — 110º F min.
5. Throttle — 4000 RPM
6. Ignition Switches — 300 RPM DROP (max), 120 RPM DIFF (max)
7. Throttle — 2000 RPM
8. Fuel Pressure — CHECK

Hold the brakes before beginning the engine run-up. Ensure that both the oil temperature, oil pressure, and cylinder head temperatures are within their respective tolerances. The following process should be accomplished quickly yet fluidly to avoid overheating the engine or possibly pulling debris into the propeller.

NOTE

The brakes may not hold the aircraft during high power settings. Therefore do not taxi up to the restricted runway hold line prior to ignition check. Remain clear of the runway environment during the time that attention is diverted into the cockpit for engine observations.

Smoothly apply adequate throttle to stabilize at 4000 RPM. Turn off the first ignition switch and note the RPM on the EIS. Turn the first ignition back on, and allow the RPM to return to the higher setting. Immediately turn off the second ignition switch and note the RPM on the EIS. Then turn the second ignition switch back on. Smoothly throttle back down to 2000 RPM. The

RPM drop should not have exceeded 300 RPM on either ignition nor indicate more than a 120 RPM difference between the two.

WARNING

If you inadvertently switch off both ignitions at high RPM, do not turn the switches back on. Allow the engine to come to a stop and restart the engine.

In the event that there is no indication of an RPM drop during ignition checks, it may be caused by faulty grounding of one of the ignition modules. Whatever the cause, the aircraft should not be flown and the engine malfunction should be determined.

BEFORE TAKEOFF

1. Harnesses — SECURE
2. Loose Items — SECURE
3. Instruments — CHECK and SET
4. EIS Data — CHECK
5. VHF Radio — SET
6. Transponder — ON/ALT
7. Trim — AFT
8. Flaps — HALF
9. Controls — FREE and CORRECT MOVEMENT
10. Canopy — LOCKED (x3)
11. GRS Safety Pin — CHECK REMOVED
12. Aux Fuel Pump — AS REQUIRED

WARNING

Operation of both the engine driven and the auxiliary fuel pump for take-off and landing is not recommended. The combined pump output has been observed to overcome the carburetor float valve fuel cutoff, flooding the carburetor, preventing full power engine operation or cause engine failure.

Ensure that any loose items are secure before takeoff because these items may become a distraction or interference during acceleration if they are not stowed. Make a quick glance over the instrument panel to verify the correct readings: Compass-proper heading, Airspeed-0; ADI Horizon-level; Altimeter-field elevation; Turn coordinator-erect; VSI-steady. Also ensure that the readings displayed on the EIS are within their respective tolerance ranges.

Ensure that the correct squawk code is displayed and switch the transponder to ON/ALT. Move the trim control aft to aid in takeoff, and ensure the flaps are set at Half. Ensure the flight controls are free and correct by systematically moving the flight stick to all positions while verifying by observation that the flight surfaces outside of the airplane are responding correctly. Ensure the canopy is secured and locked in all three locations, and make certain the GRS safety pin has been removed and stowed on the pilot side canopy lever.

TAKEOFF

1. Flaps — CHECK (HALF)
2. Throttle — FULL
3. Rotate — 45 KIAS
4. Throttle — MONITOR (5800 RPM maximum)
5. Climb — 75 KIAS
6. Flaps — RETRACT SMOOTHLY AT 500 AGL

When aligned with the runway heading and cleared for takeoff, smoothly apply full throttle and make a quick observation of the EIS system to ensure the alert light has not illuminated. Abort the takeoff if the engine shows any sign of a malfunction or does not perform as expected. As the airspeed reaches 45 KIAS, apply a small amount of back pressure to the flight stick. (Do not attempt to “pull” the airplane off the ground by over-rotating.) The aircraft will rotate and depart the runway quickly.

Monitor the throttle at small angle propeller blade pitch settings to avoid over-speeding the engine (5800 RPM), establish a climb at 75 KIAS, and do not exceed the flap limits. When clear of obstructions or at least 500 Ft AGL, slowly retract the flaps.

CROSSWIND TAKEOFF

Set crosswind controls while on the runway. When taking off in a strong crosswind, it is still advisable to use Half flaps. Accelerate the airplane for takeoff as normal. The rudder is primarily for direction control; however, use the ailerons to assist in maintaining directional control by using full aileron deflection into the crosswind. As the aircraft accelerates, apply less and less aileron deflection. Accelerate to slightly above normal takeoff speed and rotate the aircraft off the ground smoothly. As soon as a stabilized climb has been accomplished, the aircraft should be turned into the wind and a “crab” established to ensure a runway heading climb-out flight path.

SOFT FIELD TAKEOFF

When taxiing over soft ground, keep constant back pressure on the flight stick to relieve stress on the nose strut. Set Half flaps before entering the runway. Maintain elevator back pressure, and when clear for takeoff, add enough power to just get the airplane moving. As the airplane steadily accelerates, smoothly add full power. As airspeed increases, raise the nose wheel off the ground, and when the airplane becomes airborne, level the nose to remain in ground effect until V_x is reached and accelerate to V_y. When V_y has been established, continue on a normal climb-out.

CLIMB

1. Throttle — SET TO 5500 RPM (or as required)
2. Climb — 75 KIAS
3. Trim — ADJUST AS NEEDED
4. EIS Data - CHECK
5. Aux Fuel Pump — OFF (if used)

When the flaps have been retracted, ease the throttle back to 5500 RPM when clear of obstacles and continue the climb out at 75 KIAS. Utilize the airplane’s elevator trim to assist in maintaining proper climb attitude. Make a quick observation of the EIS data. The EIS caution light will be illuminated to alert you if a preset limit has been exceeded.

NOTE

During operation in high ambient air temperatures or extended climb periods, the climb airspeed should be increased to allow ample cooling air to enter the engine which will prevent overheating and coolant loss.

CRUISE

1. Throttle — 5000 TO 5200 RPM
2. Trim — LEVEL FLIGHT
3. Fuel Status — MONITOR
4. EIS Data — CHECK

Upon reaching the desired cruise altitude and airspeed, throttle back to 5000-5200 RPM, (75% power). Trim the airplane for level flight and note the EIS data readings.

NOTE

Minimal fuel monitoring is required for the aux wing tanks if they are gravity feed. They will automatically feed as the main tank is depleted. The main tank will continue to indicate FULL for the time that the aux tanks are draining. If installed, the aux wing tank pumps may be used to transfer fuel any time the main fuel gauge is below half. This will insure that no fuel is pumped overboard.

Sea Level Power and Fuel Consumption for Rotax 912 UL Engine

Power Setting %	65	75	100
R.P.M.	4800	5000	5800
Horsepower	50.6	58.4	81.0
Torque (Ft * lbs)	55.3	61.2	72.3
Fuel Consumption (GpH)	4.2	5.1	6.3

Fig. 4.1

NOTE

Rotax® engine fuel mixtures will automatically lean during climb and enrich during decent. The above fuel rates are for sea level conditions. Use 75% power (5000-5200 RPM) as a cruise power setting. As an estimate, use 5 GpH as flight planning fuel flow. Typical cruise altitude fuel flow will be less than 5 GpH. Typical start to shutdown fuel flow will be 4.5 GpH or less. For detailed engine data refer to the CD included with the aircraft which contains the Rotax Operator Manual.

TURBULENCE IN FLIGHT

If turbulent air is encountered while in flight, slow the aircraft to below 118 KIAS, V_A (maneuver speed) in order to ensure that the airplane's structural integrity is not compromised. When slowed to below V_A, high G forces from turbulence or gusts will cause the airplane to stall before its structure is damaged.

BEFORE LANDING

Prior to entering traffic pattern:

1. Harnesses — SECURE
2. Airspeed — 75 KIAS
3. Fuel — CHECK QUANTITY
4. Secure Loose Items
5. Aux Fuel Pump – AS REQUIRED

Prior to entering the traffic pattern, ensure that the seat belts and shoulder harnesses are secure, and verify the strobes lights are on. Slow the airplane to 75 KIAS by reducing the throttle and maintaining altitude. Verify that there is still ample fuel remaining in the main tank.

LANDING

On downwind leg:

1. Throttle — SMOOTHLY TO IDLE
2. Airspeed — 75 KIAS
3. Flaps — HALF

When established on downwind, maintain proper side offset distance from the runway by visually placing it on the airplane's wingtip. Reduce the throttle to IDLE when the aircraft is abeam the desired touchdown point. Continue to maintain pattern altitude until reaching 60 KIAS. Add Half flaps and establish a steady descent at 60 KIAS. Use pitch to keep the airspeed stable. Observe the decent angle and make any required changes in pitch to maintain 60 KIAS in the decent.

On base leg:

4. Airspeed — 60 KIAS
5. Trim — ADJUST TO AFT

When turning onto the base leg, at idle power, trim the airplane to maintain a steady descent at 60 KIAS. Half way through the base turn, the aircraft should be half way between the pattern altitude and the field elevation.

On final approach:

6. Airspeed — 60 KIAS
7. Flaps — FULL
8. Trim — AFT AS REQUIRED
9. Throttle – IDLE (or as required)
10. Airspeed — 55 KIAS (on short final)
11. Touchdown — MAIN WHEELS FIRST, NOSE HIGH
12. Braking — MINIMUM

NOTE

All speeds noted above assume correct air speed indication and do not allow for cross-wind or gust correction.

Once established on final approach, maintain 60 KIAS and set full flaps when the landing is assured with no increase in power. Adjust the trim as required, but usually it will be in the full aft position. When on short final, maintain 55 KIAS. Decrease the decent rate as you enter the ground effect. Continue to raise the nose through ground effect as the airspeed decreases. Do not over rotate but touch down at the lowest possible airspeed. Touch down on the main wheels first. Continue to fly the elevator to keep the nose wheel off the runway as long as possible.

NOTE

If the AOA is not high enough (nose low), as the main wheels contact the runway, the nose wheel may drop to the runway due to the main wheels suddenly slowing the aircraft.

The nose wheel will then gently drop to the runway as the aircraft slows even more. Apply only as much braking as needed to stop in the remaining runway or the exit taxiway turn.

For more detailed information on landing pattern procedures, see Section 10.

WARNING

Heavy braking will cause exceptionally fast tire wear and may result in a tire failure.

CROSSWIND LANDING

If a strong crosswind exists during landing, it is practical to use the minimum flap setting required for available runway. Maintaining runway centerline on final approach can be accomplished by the crab method, the wing-low slip method, or a combination of the two. However, when executing the flare, the best method is the wing-low slip method. After touchdown, maintain directional control with the rudder and aileron, and as the aircraft decelerates, gradually apply full aileron deflection into the wind.

SOFT FIELD LANDING

The only difference between a normal landing and a soft field landing is keeping the nose wheel off the runway surface for as long as possible. To do this, float down the runway in ground effect rather than flaring to bleed off airspeed. This will decrease the sink rate to help prevent a hard landing. As the airspeed slows, flare just slightly enough to raise the nose wheel, but do not establish a high sink rate. Allow the airplane to settle to the runway. Do not allow the nose wheel to touch down on landing. This could result in the nose wheel digging into the soft runway and loss of airplane control. Continue the landing roll, and as the airplane decelerates, allow the nose wheel to gently settle to the ground. Use as little braking as necessary throughout the entire landing and taxi.

BALKED (GO-AROUND) LANDING

1. Throttle — FULL
2. Flaps — SET TO HALF
3. Airspeed — 50 KTS, V_X

4. Flaps — RETRACT WHEN CLEAR OF OBSTACLES
5. Airspeed — 60 KTS, V_Y

If a go-around is executed, full power should be applied, a climb at V_X should be established, and Half flaps should be used. Completely retract the flaps after any obstacles are cleared and maintain a climb at V_Y until reestablishing normal climb procedures.

NOTE

Establish full throttle prior to flap change. The aircraft will accelerate and climb until half flaps can be set and the drag from full flaps is eliminated. Do NOT use runway ahead to roll out while resetting the flaps. Establish full power to begin aircraft acceleration and the set Half flaps during the initial climb.

AFTER LANDING

1. Flaps — UP
2. Aux Fuel Pump — OFF (if used)
3. Transponder — STANDBY

After exiting the runway and the aircraft is at a slow taxi speed, retract the flaps and turn the transponder back to STANDBY.

SHUTDOWN

1. Throttle – IDLE
2. GPS – OFF
3. Transponder – OFF
4. Other Avionics — OFF
5. Strobes – OFF
6. Instrument Switch — OFF
7. Main Switch — OFF
8. Ignition Switches – OFF (one at a time)
9. Fuel Valve — CLOSED (horizontal)
10. GRS Safety Pin — INSERT
11. Canopy — OPEN

When ready to shut the engine down, turn off the GPS, the VHF radio, the transponder and any other avionics. Turn the strobe lights OFF, and then the instrument switch OFF. Finally, turn the main switch OFF. This process will prevent any unnecessary drain on the battery after the engine has stopped as well as avoid possible damage from "electrical spikes."

The process of shutting down the engine should be fluid and prompt. Confirm that the throttle is at IDLE, turn off the first ignition, and then the second in a 1-2-3 step process. Now that the engine has stopped turning, turn the fuel valve to CLOSED.

NOTE

A secondary check of the ignition system can be noted on alternate flights. This can be done by turning the 1 then 2 ignition switch off; alternating on the next shutdown with a 2 then 1 ignition switch off.

Before moving about the cockpit and stowing the headsets, reinsert the GRS safety pin into the activation handle. When opening the canopy, reverse your method of the closing sequence.

WARNING

It is imperative that the GRS safety pin be reinserted into its respective locking position before the crew and passenger disembark the airplane in order to prevent an accidental firing of the rocket system.

SECURING THE PLANE

1. Flaps — UP
2. Vents – CLOSED and TURNED DOWN
3. Canopy — CLOSED and LOCKED
4. Wheels — CHOCK
5. Tie Downs — SECURE
6. Pitot Cover — ON if required
7. Aircraft Cover — AS REQUIRED

Ensure the flaps are fully retracted before exiting the plane. Chock the wheels and tie down the wings as needed. If the plane is stored outside, be sure to cover the pitot tube to prevent any foreign objects from clogging the openings. If necessary, place the provided airplane cover over the canopy for added protection.

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Notice! The information contained in this document is for reference and information only.
The pilot is the final and only responsible party for the safe operation of this aircraft.

SECTION 5
PERFORMANCE

Table of Contents **Page**

INTRODUCTION

This section contains performance information pertinent to the intended use of the airplane. The information presented was based on sea level, standard conditions with the standard 912UL engine. Performance data with the optional 912ULS engine will increase approximately 8%. Operation at higher altitudes and temperatures will reduce all performance parameters.

TAKEOFF DISTANCES

Takeoff Roll: 490 Ft, Max power, Half flaps, paved runway
Takeoff Distance Over a 50ft Obstacle: 940 Ft, Max power, Half flaps, paved runway

RATE OF CLIMB

Rate of Climb: 810FPM at 60Kts, V_Y, Max power, Half flaps

CRUISE SPEED

Design Cruise Speed: 95-115 KIAS
Maximum Cruise Speed: 120 KIAS (V_H, max continuous power)

FUEL CONSUMPTION *(Sea Level)*

Maximum Power: 6.3 Gal/hr (Fuel flow at cruise altitude will be less)
Maximum Continuous Power: 5.6 Gal/hr (Fuel flow at cruise altitude will be less)
75% Continuous Power: 5.1 Gal/hr (Fuel flow at cruise altitude will be less)

NOTE

Rotax® engines are self-leaning. The above fuel rates are for sea level conditions. Use 75% power (5000-5200 RPM) as a recommended cruise power setting. As an estimate, use 5 GpH as flight planning fuel flow. Cruise altitude fuel flow will normally be less than 5 GpH. Typical start-to-shutdown fuel flow will be 4.5 GpH or less. For detailed engine data refer to the CD included with the aircraft which contains the Rotax Engine Operator Manual.

FLIGHT ENVELOPE

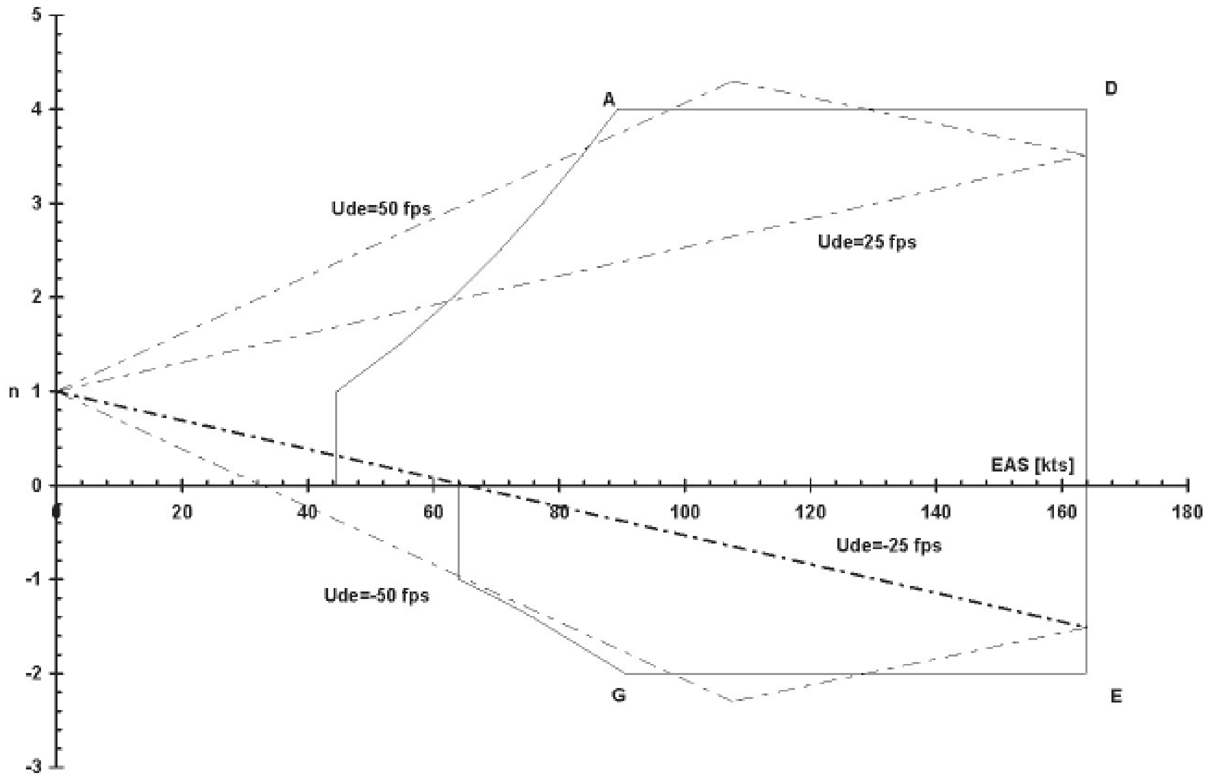

Fig. 5.1 is the StingSport Flight Envelope

MAXIMUM RANGE

Range: 460 NM (No Wind / No Reserve)
Range (with wing tanks installed): 780 NM (No Wind / No Reserve)

NOTE

Maximum range can not be obtained at high cruse power settings. For detailed engine data refer to the CD included with the aircraft which contains the Rotax Operator Manual.

LANDING DISTANCES

Landing Roll: Full Flaps
390 Ft, dry paved runway
Landing Distance Over a 50ft Obstacle: 1150 Ft, Full flaps, dry paved runway.

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SECTION 6

WEIGHT & BALANCE INFORMATION

Table of Contents Page

INTRODUCTION

Section 6 contains a standard installed equipment list information pertaining to the weight and balance calculations for the airplane.

STANDARD INSTALLED EQUIPMENT LIST:

- ATTITUDE INDICATOR w TRACK DISPLAY & ANTENNA (ADI)
- AIRSPEED INDICATOR (ASI)
- ALTIMETER (ALT)
- AUTO PILOT SYSTEM MOUNTING BRACKETS
- AUXILIARY 12V POWER PORT (2)
- AUXILIARY 12V EXTERNAL POWER CONNECTION
- AUXILIARY ENGINE FUEL PUMP (AUX)
- AUXILIARY WING FUELTANKS, FILTER & PUMP (If Installed)
- CABIN HEAT SYSTEM
- CARGO (BAGGAGE) BOXES (2)
- EMERGENCY LOCATOR TRANSMITTER & AIRCRAFT ANTENNA (ELT)
- EMERGENCY LOCATOR TRANSMITTER PORTABLE ANTENNA
- EMERGENCY LOCATOR TRANSMITTER REMOTE CONTROL DISPLAY
- ENGINE INFORMATION SYSTEM & SENSORS (EIS)
- ENGINE CARBURETOR HEAT SYSTEM
- FIRE EXTINGUISHER
- FUEL GAUGE (FG)
- FUEL SHUT-OFF VALVE
- GLOBAL POSITIONING SYSTEM RECEIVER & ANTENNA (GPS)
- GROUND ADJUSTABLE PROPELLER
- HOBBS METER (HOBBS)
- INTERCOM SYSTEM
- LANDING & TAXI LIGHTS
- MAGNETIC COMPASS (MC)
- POSITION LIGHTS
- RECOVERY PARACHUTE SYSTEM (GRS)
- RPM TACHOMETER (TACH)
- 4POINT SAFETY HARNESSES (2)
- SLIP SKID INDICATOR
- STROBE LIGHTS (3)
- TRANSPONDER & ANTENNA (XPDR)
- TRANSPONDER MODE C ENCODER (MODE C)
- TURN COORDINATOR (TC)
- VERTICAL SPEED INDICATOR (VSI), (VVI)
- VHF COMMUNICATION RADIO & ANTENNA (VHF), (COM1)

LIST OF ADDITIONAL INSTALLED EQUIPMENT (add to above):

1. ____
2. ____
3. ____
4. ____
5. ____

AUXILIARY ITEMS

- COCKPIT COVER
- EQUIPMENT INFO & DATA MANUALS
- EXTRA KEY
- ROTAX ENGINE DATA CD
- MISCELLANIOUS TOOLS & SUPPLIES

WEIGHT & BALANCE

All aircraft are structurally and aerodynamically engineered for certain load conditions which result from specific weights and forces anticipated to occur in normal operations within the specified flight envelope. An Aircraft's handling qualities and structural integrity may be seriously compromised if the weight and balance limits are exceeded in normal operations.

It is the pilot's responsibility to make sure the weight and balance limits are not exceeded as to weight, its location, distribution and security prior to any flight.

DEFINITIONS

Empty Weight: The actual weight of the individual aircraft, including the structure, power plant, fixed equipment, any fixed ballast, unusable (in-flight) fuel, and coolant.

Original Empty Weight is determined by actually weighing each new aircraft before it is flown.

Any time a Major Alteration, Modification or Repair (WHICH MUST BE APPROVED IN WRITING BY THE MANUFACTURER.) is performed on the aircraft; a new Empty Weight must be determined by either weighing the aircraft again, or by accurate calculation of the weight changes and their effect on Empty Weight Center of Gravity (EWCG) location.

Major Alteration or Modification results from the addition, deletion, or redistribution of existing equipment and accessories, or from a repair which results in a significant increase of weight of the airframe or engine. For example, addition or removal of floats, skis, battery, radios, installation of a additional fuel tank(s) or engine change, painting the airframe, installation of heavier wheels and tires, etc.

Maximum Gross Weight: The maximum total weight for which an aircraft's structure and performance have been approved for normal operations by its manufacturer. It is the maximum weight (Empty Weight plus useful load) at which an aircraft can be safely operated. Maximum Takeoff Weight must never exceed the published Gross Weight.

Useful Load: The difference between the maximum ramp weight and the basic empty weight. Maximum Ramp Weight – Basic Empty Weight = Useful Load. The total amount of weight available for pilot, passengers, baggage, cargo and in-flight usable fuel.

Maximum and Minimum Weights: Due to certain balance, structural and aerodynamic considerations, sometimes a manufacturer may specify maximum, or minimum, weights for certain locations on the aircraft. For example, the pilot's minimum and maximum weight may be specified for all, or only for some operations. The same is true for baggage, cargo, fuel, and any other disposable or variable load.

Center of Gravity (CG): A point along an aircraft's longitudinal axis at which all the loads and forces are perfectly concentrated and balanced. It is computed by dividing the total moment by the total weight of the airplane. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
(Total Moment / Total Weight = Center of Gravity)

Center of Gravity Range: The horizontal distance, along an aircraft's longitudinal axis, within which an aircraft has been found to be fully maneuverable at all specified design speeds, weights and loading configurations. All aircraft are designed operate within a specific Center of Gravity Range.

Maximum Forward and Maximum Aft C.G. Locations: Every aircraft has specified a forward most and rear most Center of Gravity location, along its longitudinal axis. These Center of Gravity location limits are given from a convenient reference (Datum Plane) on the aircraft.

Datum: A convenient vertical reference plane along the longitudinal axis of an aircraft from which all horizontal measurements are taken.

Weight: Actual individual weight of each item such as airframe, persons, fuel, baggage, cargo, etc. in pounds or kilograms.

Arm: The horizontal distance expressed in inches from the reference datum plane to the center of gravity (CG) of an item or location along the fuselage.

NOTE

Units of measurements and weights must be consistent for each set of calculations and in the same system of units, i.e., pounds and inches, or kilograms and centimeters.

Moment: The product of the weight of an item multiplied by its arm.
(Weight x Arm = Moment)

Installed Equipment: All optional accessories and equipment permanently installed on an airframe or engine at the time of weighing. These items must be included in the "Installed Equipment List." Additions and deletions must be noted in the list each time they are made and new Weight and Balance calculations performed to determine the magnitude and effect of weight change. Ballast, if permanently installed, must also be listed.

Ballast: A specific amount of weight attached in a specific location, which can be temporarily or permanently installed in an aircraft, to help bring its Center of Gravity within the required limits. If temporary ballast must be used for certain operations, the exact amount and its location must be placarded on the instrument panel within clear view of the pilot. The use of Ballast increases Empty Weight and reduces Useful Load.

Loading Chart: Used to calculate the actual Center of Gravity location of a ready to fly aircraft. Care must be taken not to exceed the Maximum/Minimum Weight and Balance Limits stipulated for the aircraft. These limits are determined by structural, stability and control considerations throughout the aircraft speed range.

PROCEDURE

All permanent equipment, options and accessories should be installed on the aircraft prior to weighing. All equipment options and accessories installed in the aircraft must be listed on the "Installed Equipment List". That list becomes part of Weight and Balance Documents.

Be sure to remove any loose equipment, tools, etc. from the aircraft prior to weighing.

Sometimes it is necessary to adjust or reduce fuel, cargo, or passenger weights to remain at or below Maximum Allowable Gross Weight. Temporary or permanent ballast is sometimes necessary to bring the CG within specified limits. However, the Maximum Allowable Gross Weight should not be exceeded under any circumstances

The fuel tank should be empty except for unusable fuel. If the fuel tank is not empty, then the exact amount of usable fuel in the tank must be determined. Usable fuel weight and its moment must be deducted from the Empty Weight calculations before EWCG can be accurately determined.

Oil and coolant tanks and reservoirs must be properly filled before weighing. These and any other liquids necessary for normal operations are considered part of an aircraft's empty weight.

If weighing is done outdoors, make sure there is no wind to affect the weight measurements. For best results, weigh indoors.

The scales must be calibrated correctly and must be set on level ground.

Any equipment placed on the scales when weighing the aircraft, such as chocks or blocks, should be weighed separately and the weight deducted from the scale reading. These weights become Tare and should be noted for reference, if necessary.

Measurements for the exact horizontal distance from Datum plane to center of spindles of all wheel axles are included. These are recorded as measurements on "Empty Weight and Balance Calculations" Figure 6.1.

The aircraft <u>must</u> be weighed in a level flight attitude, both longitudinally (front to back) and laterally (side to side), as shown in the Moment Arm Drawing Data Sheet. Figure 6.2

Place a scale under each wheel of aircraft for all weighings. If only one scale is used, be sure to level the wheels not being weighed before taking the scale readings. Remember, the aircraft must be in proper level flight attitude to ensure accuracy. Figure 6.2

EMPTY WEIGHT CENTER OF GRAVITY CALCULATIONS

Complete each horizontal line of calculations by multiplying Weight from the scale by the Arm to find the Moment.

Total the Weight and Moment columns.

Divide the Total Empty Moment by the Total Empty Weight to determine the Empty Weight Center of Gravity location, from the Datum plane

In the example of Figure 6.3, the Empty Weight Center of Gravity (EWCG) is 80.83 inches aft of Datum. This distance is also known as the Empty Weight Arm.

Typical empty weight calculations for the StingSport aircraft

ITEM	WEIGHT	ARM	MOMENT
NOSE WHEEL	152	32.8"	4986
LEFT GEAR	327	94.2"	31130
RIGHT GEAR	326	94.2"	31035
TOTALS	**805**	**83.4**	**67151**

Therefore the aircraft Empty Weight Center of Gravity (EWCG) Location =
67151 (Total Moment) / 805 (Empty Weight) = 83.4 inches aft of Datum Plane

Example of Initial Empty Weights
Figure 6.1

LOADED WEIGHT AND BALANCE CALCULATIONS

Complete the Loaded Center of Gravity calculations as was done in the Sample Weight Center of Gravity Chart.

The Empty Weight, the Empty Weight Arm and the Empty Moment are shown in the Loading Chart Weight and Balance Work Sheet.

Write in the actual Fuel weight for each tank location for your aircraft load condition. Fuel weight is calculated at 6 pounds per U.S. gallon. The maximum weight for the Main fuel tank at 20.5 gallons is 120 pounds. If installed, the maximum weight for the Wing aux tanks at 6 gallons each side, 12 gallons total, is 72 pounds. Multiply the fuel weight times the Arm shown in each row to obtain the moment for each tank.

Write in the actual weight of Pilot1 and Pilot2, in the case of two occupants. Be sure not to exceed the individual maximum recommended weights for the seat load. Multiply the occupant weight times the Arm shown in each row to obtain the moment for each seat location.

Write in the actual weight of the baggage in all three locations, pilot side storage, copilot side storage and aft deck area. Multiply the total baggage weight times the Arm shown in the row to obtain the moment for the baggage.

Total the weights, including the empty aircraft weight which should not exceed 1320 pounds.

Total all the moments, including the empty aircraft moment.

Divide the total moment by the total weight. This is the current CG which should be between 80.2 and 86.7 inches from the Datum plane for the aircraft to be within its weight and balance for this flight loading.

Complete this chart for each of critical test loading conditions to be sure that your final Loaded CG position falls within the allowable CG limits, at all times, for all operations.

CRITICAL LOADING CONDITIONS

Each of the following eight critical loading conditions should be investigated for each individual aircraft, along with any other possible loading condition which may affect the Weight and Balance envelope of the aircraft. This is particularly important for aircraft operation close to the CG limits.

Be sure the maximum individual weights and the Gross Weight are not exceeded at any time.

Be sure all loaded items are placed in approved locations aboard the aircraft.

1. Maximum Crew (Pilot/Co-Pilot) Weight (480lbs), with:
   a) Full Usable Fuel, Maximum Baggage
   b) Full Usable Fuel, Zero Baggage
   c) Zero Usable Fuel, Maximum Baggage
   d) Zero Usable Fuel, Zero Baggage

2. Minimum Crew Weight, (100lbs), with:
   a) Full Usable Fuel, Maximum Baggage
   b) Full Usable Fuel, Zero Baggage
   c) Zero Usable Fuel, Maximum Baggage
   d) Zero Usable Fuel, Zero Baggage

The Loaded Center of Gravity must fall within the specified Maximum Forward Limit of 80.2" and Maximum Aft Limit of 86.7" for all aircraft.

An aircraft log book entry should be made whenever a Weight Balance calculation is performed, indicating date, and nature of change, results and name of person performing the calculation. (If any changes are made to the instrument panel, an entry moment arm is included in the sample.) This document, in its entirety, becomes a part of the Aircraft Legal Documents. It must be kept aboard the aircraft and made available for inspection upon request.

WEIGHT & BALANCE DATA WORKSHEET NOTES

1. **Datum Plane:** Forward tip of nose cone at propeller.
2. **Maximum Forward CG Limit:** 80.2 inches aft of Datum
3. **Maximum Aft CG Limit:** 86.7 inches aft of Datum
4. **Maximum Gross Weight:** 1320 pounds
5. **Maximum Seat Load:** 240 pounds
6. **Minimum Pilot Weight:** 100 pounds
7. **Maximum Main Fuel:** 120 pounds
8. **Maximum Wing Fuel:** 72 pounds
9. **Maximum Baggage Weight:** 60 pounds (40 pounds used for example)

Notice! The information contained in this document is for reference and information only.
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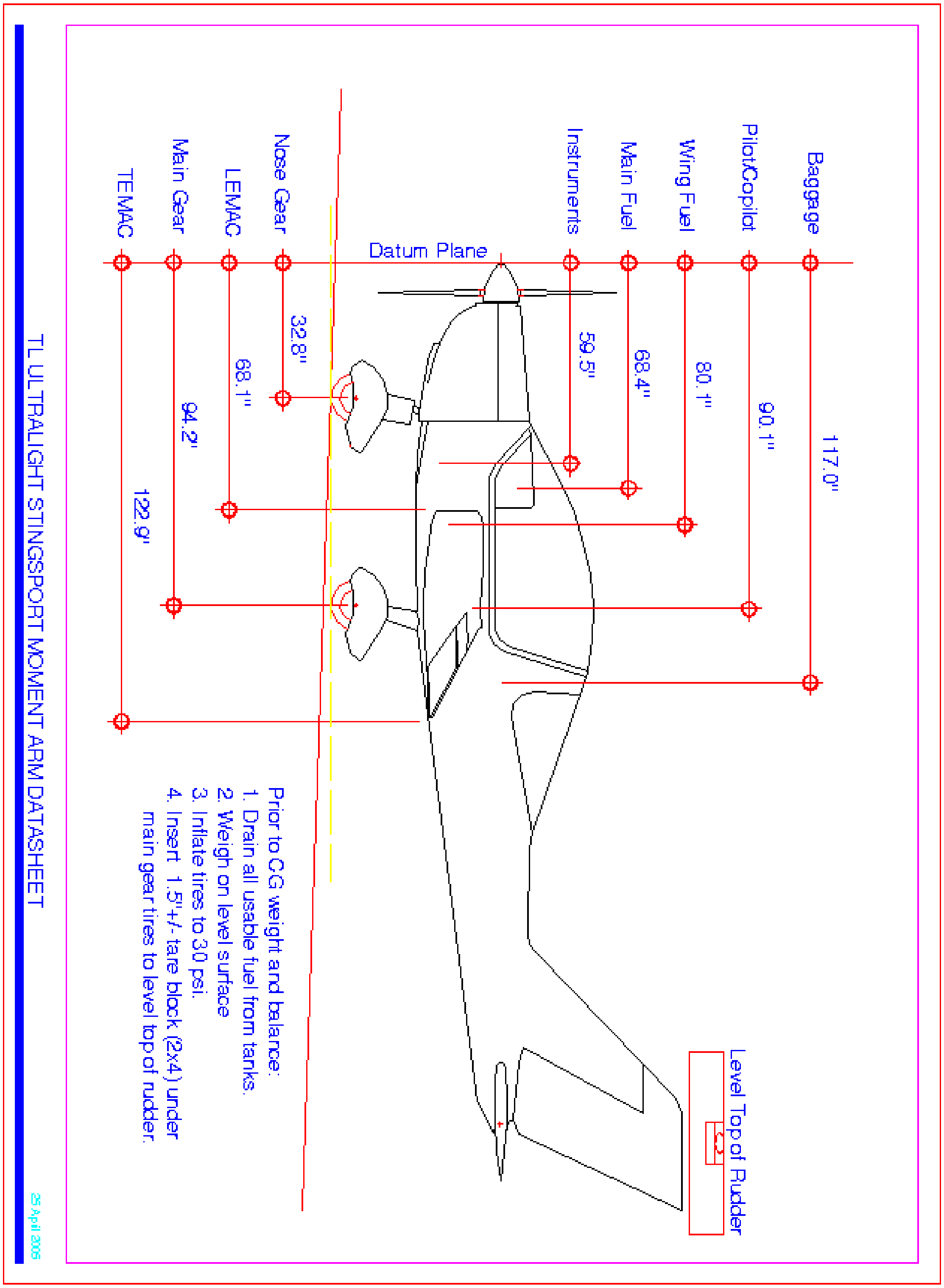

Figure 6.2, STINGSPORT MOMENT ARM DATA SHEET

Notice! The information contained in this document is for reference and information only.
The pilot is the final and only responsible party for the safe operation of this aircraft.

StingSport NXXXN

SAMPLE WEIGHT & BALANCE DATA

Date: *31 Dec 05* By: *MPM*

Item	Weight	Arm	Moment
Nose Wheel	152	32.8	4986
Left Gear	327	95.2	31130
Right Gear	326	95.2	31035
Empty A/C	805	83.4	67151
Instruments		59.5	
Crew	370	90.1	33067
Main Fuel	120	68.4	7387
Wing Fuel	0	80.1	0
Baggage	25	117.0	4680
Totals	1320	**85.1**	112285

		CG	
LEMAC	**22%**	**34%**	**TEMAC**
68.1	**80.2**	**86.7**	**122.9**

Test 1: Minimum Crew Weight, with:

a) Full Usable Fuel, Max Baggage =	84.8
b) Zero Usable Fuel, Max Baggage =	85.1
c) Full Usable Fuel, Zero Baggage =	82.7
d) Zero Usable Fuel, Zero Baggage =	84.1

Test 2: Maximum Crew Weight, with:

a) Full Usable Fuel, Max Baggage =	85.3
b) Zero Usable Fuel, Max Baggage = ***Over Limit!***	86.9
c) Full Usable Fuel, Zero Baggage =	83.9
d) Zero Usable Fuel, Zero Baggage =	85.5

SAMPLE WEIGHT & BALANCE DATA SHEET

Figure 6.3

StingSport NXXXN

WEIGHT & BALANCE DATA SHEET

Date: By:

Item	Weight	Arm	Moment
Nose Wheel		32.8	
Left Gear		95.2	
Right Gear		95.2	
Empty A/C		83.4	
Instruments		59.5	
Crew		90.1	
Main Fuel		68.4	
Wing Fuel		80.1	
Baggage		117	
Totals			
		CG	

LEMAC	22%	34%	TEMAC
68.1	**80.2**	**86.7**	**122.9**

Test 1: Minimum Crew Weight, with:

a) Full Usable Fuel, Max Baggage =
b) Zero Usable Fuel, Max Baggage =
c) Full Usable Fuel, Zero Baggage =
d) Zero Usable Fuel, Zero Baggage =

Test 2: Maximum Crew Weight, with:

a) Full Usable Fuel, Max Baggage =
b) Zero Usable Fuel, Max Baggage = ***Over Limit!***
c) Full Usable Fuel, Zero Baggage =
d) Zero Usable Fuel, Zero Baggage =

WEIGHT & BALANCE DATA WORKSHEET

Figure 6.4

SECTION 7
AIRPLANE & SYSTEMS DESCRIPTIONS

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INTRODUCTION

Section 7 describes the different systems specific to the StingSport. Some equipment described in this section may not apply to all StingSport serial numbers.

AIRFRAME

The StingSport is a carbon-composite, low-wing, single-engine, two-seat LSA aircraft. The fuselage is laminated and, in some areas, is sandwiched foam that allows for good structural integrity at a nominal weight. The largest sections of this material are the fuselage section, each wing, the rudder, and the horizontal stabilizer with the elevator. The canopy is constructed of Plexiglas supported by a fiberglass frame that pivots forward on two hinges, and it is fastened by three manually operated latches. The engine is fastened to a cradle mount that is secured to the firewall at four attach points by steel bolts.

The wings are attached to the fuselage by two, interlocking, box-type spars that cross beneath the cockpit and interlock with the opposite wing. These spars in turn are connected by a large over-center locking bolt. An optional six-gallon auxiliary fuel tank may be contained in each wing. Hinged ailerons and split-type flaps are affixed to the aft spar of each wing. The split-type flaps are attached by five hinges that allow the flap to rotate out of the lower surface of the wing when extended and for flush positioning with the lower wing surface when retracted. The cabin compartment is arranged as a side-by-side two-seat configuration with flight controls for both crew positions.

The empennage section is made up of the vertical stabilizer with the rudder and the horizontal stabilizer with the elevator. The vertical stabilizer is molded as a part of the fuselage section. The rudder is attached to the vertical stabilizer by slide-on pins and a rod that runs down the leading edge of the rudder, through ball bearing races, which connects to the rudder control cables. The horizontal stabilizer is attached to the fuselage section by two horizontal guide pins and a single vertical steel bolt. The elevator is affixed to the horizontal stabilizer by five bolted pivot points.

FLIGHT CONTROLS

The aircraft's primary flight control system consists of two ailerons, a rudder, and a large elevator. The aileron and elevator control surfaces are mechanically linked to two manually-operated flight sticks by a series of ball bearing push rods. The rudder is manually operated by two pair of control cables linked to foot pedals. The elevator control push rod and an adjustable trim tab control rod are attached externally beneath the horizontal stabilizer.

TRIM SYSTEM

The rudder and right aileron are equipped with fixed, ground-adjustable trim tab. The elevator has an in-flight, adjustable trim tab that is connected to a control lever in the cockpit by a series of cables and push rods. By moving the trim lever forward, the aircraft nose will trim down, and by moving the lever aft, the nose will trim up.

GROUND CONTROL

Maintaining positive ground control is accomplished through a combination of nose wheel steering and rudder usage. Nose wheel steering is operated by two control rods connected between each of the rudder pedals to either side of the nose wheel hinge. The rudder and nose wheel steering operate as follows: to turn left, the left pedal is depressed, and to turn right, the right pedal is depressed. This movement also deflects the rudder to the left and right assisting in directional control of the aircraft.

Moving the aircraft by hand is most effectively accomplished by a tow bar attached to the nose wheel for guidance and pulling or pushing on the hub of a propeller blade where it passes in to the spinner. The two-piece tow bar is not intended to be used with mechanical towing equipment or tugs. If a tow bar is not available, the aircraft may be turned by pressing down on the lower leading edge of the vertical stabilizer. This will raise the nose wheel off the ground allowing the operator to rotate the aircraft around the main gear axis.

CAUTION

Do NOT push or pull on any part of the rudder to move the aircraft.

INSTRUMENT PANEL

The instrument panel for the StingSport is arranged to suit the operator's needs. The specific instruments and/or the configuration in which they are arranged may vary slightly from aircraft to aircraft. The magnetic compass is centered on top of the glare shield behind the utility tray.

StingSport flight instruments are arranged in the basic "T" configuration on the pilot (left) side of the aircraft. Exceptions can include the absence of a particular instrument or a variation in the order of the instruments due to after market changes.

Flight instruments will be arranged in this configuration: (starting from the pilot-side top left) airspeed indicator (ASI), attitude indicator (ADI), altimeter (ALT), (to the second row from the left) turn coordinator (TC), tachometer (TACH), and vertical speed indicator (VSI).

The StingSport also includes a slip indicator and remote ELT control and front vent lever on the pilot-side panel.

Other items located on the instrument panel are the avionics stack in the center panel. This is made up of the GPS, Engine Information System (EIS) display, a red EIS alert light, a red battery discharge (low voltage) light, a green auxiliary fuel pump “ON” light, and VHF radio.

Along the base of the center panel are the starter push button, guarded left and right ignition switches, guarded main and instrument switches, a guarded strobe light switch, and the unguarded aux engine fuel pump switch (IGN1, IGN2, MAIN, INST, AUXP). Below the center panel are the fuel shut-off valve, the fuel gauge, the cabin heat control, and the “choke” knob. The aux engine fuel pump will always be located on the last right position and will be unguarded for immediate access. All StingSports will have this switch arrangement.

Located on the co-pilot’s panel first row are the transponder and a Hobbs meter. On the second row are three blank 3 1/8 inch instrument locations. Five Breaker switches, for the Landing, Taxi, WigWag, Cockpit and Position Lights, (TAXI, LAND, WgWg, CKPT, POSN), the intercom control, and 12 circuit breakers, complete this panel. An auxiliary 12 VDC power port are located outboard (facing forward) on the forward portion of each crew seat support.

WING FLAP SYSTEM

The aircraft utilizes split-type flaps that are controlled by a three-position lever positioned next to the arm rest in between the crew seats. The lever has a locking button that prevents the flaps from being operated inadvertently. When the lever is locked down in the first position, the flaps are totally retracted. In order to extend the flaps to Half (15°), press the button in and move the lever up to the second locked position. From this position, the flaps may either be extended to Full (30°) or retracted. To fully extend the flaps (Full) the button again must be depressed and the lever moved up to the third, locked position.

LANDING GEAR

The landing gear is a fixed, tricycle type with a steerable nose gear and two main landing gears. Shock absorption for the nose wheel is provided by a spring/rubber strut cylinder. The main landing gear strut is made from a multi-layer composite that provides spring action and support. Hydraulically-actuated brakes are attached on each main landing gear wheel. The brakes are operated by toe pedals attached to the tips of the pilot rudder pedals. The left toe pedal will actuate the left main landing gear brake, and the right toe pedal will actuate the right main landing gear brake.

SAFETY HARNESSES

Each seat in the aircraft is equipped with a four-point safety harness. Each of the shoulder harnesses is latched to a strap that extends aft over the rear baggage deck into which it is secured. The outboard lap belt is secured to the rear bulkhead, and the inboard lap belt is secured to the middle console. The right shoulder harness is attached to the right lap belt, and the left shoulder harness is attached to the left lap belt. One main latch attaches the entire harness, as it fastens the two lap belts together. The shoulder harness strap that is secured to the rear deck can be unfastened if need be by a latch that is located just above the junction where the two shoulder harnesses meet.

To use the safety harnesses, fasten the main latch and then adjust the lap belt to fit tightly as low as possible on the hips. After the lap belts have been properly fitted, adjust the shoulder harnesses. To release the main latch, simply press down on the release button and the harness will unlatch.

CANOPY

The canopy is designed to allow for a maximum outside view. It is a one-piece construction that is hinged in the front and opens upward assisted by two gas struts. The canopy is secured by three separate latches. Two are operated from the inside only and are located next to each crew position. The third latch is located in the rear of the canopy above and between the crew seats. It is accessible from both inside or outside of the aircraft, and it includes an exterior lock to secure the cockpit when unoccupied.

ENGINE

The aircraft is powered by a normally-aspirated, liquid/air-cooled, gear-reduced drive, dual carburetor-equipped, four-cylinder, four-stroke, horizontally-opposed Rotax 912UL engine with 73.91 cu. in. displacement; and is rated at 80 BHP at 5800 RPM. Main accessories associated with the engine include an electric starter, internal alternator, dual electronic ignition modules, and main engine driven fuel pump. The crankcase is internally cooled by engine oil, and the cylinder heads are cooled externally by flowing air, as well as internally by circulating coolant.

WARNING

The Rotax® 912UL engines are not certified. Even though the quality of assembly is of the highest priority to Rotax®, failure of the engine may occur at any time. The operator assumes full responsibility when operating the engine.

The operator is also responsible to fly the airplane at all times with the ability to glide and land safely in a predetermined area in case of engine failure.

ENGINE CONTROLS

The throttle controls the engine's manifold pressure, and is located on the middle console between the two crew positions. As the throttle is advanced forward, or opened, more fuel will be provided for the engine. As the throttle is moved aft, or closed, less fuel will be provided for the engine. The throttle is at the "idle" position when the lever is completely aft, or "closed".

NOTE

Do not pull hard on the throttle to lower the engine rpm. The engine throttle stops can be bent by high pulling forces from the throttle cables. If the engine rpm is too high, the idle speed should be adjusted by the engine idle screws.

ENGINE INSTRUMENTS

The Engine Information System (EIS) is the primary display for monitoring engine operation. The EIS displays the following data: RPM, manifold pressure, fuel pressure, oil temperature, oil pressure, 2 cylinder head temperatures, 4 exhaust gas temperatures, voltage, elapsed engine time, and total engine time. Individual input limitations are preprogrammed into the system. If any of these limits are exceeded, a red EIS alert light will illuminate. The EIS data display will then flash the reading that is in alert.

NOTE

A difference of as much as 200 RPM can exist between the Rotax® tachometer and the RPM indication on the EIS. The EIS digital RPM readout is more accurate and should be relied upon when in doubt.

Engine manifold pressure is monitored in the AUX1 display on the EIS. The indication interpreted from the remote sensor is displayed in two digits with a decimal point and one more digit (eg 25.5) which is an indication of induction air manifold pressure, and is measured in inches of mercury.

Fuel pressure is monitored in the AUX2 display on the EIS. The indication interpreted from the remote sensor is displayed in two digits without a decimal point (eg 35) which is an indication of 3.5 and is measured in pounds per square inch (PSI).

ENGINE OIL SYSTEM

The components of the oil system include: oil reservoir tank, oil cooler, oil filter, engine-driven oil pump, and crankcase. Oil is introduced into the system via a cap in the oil reservoir tank. The engine driven pump then draws the oil from the reservoir, through the oil cooler, through the oil filter, and into the pump. Then the oil is forced into the crankcase oil galleries for engine lubrication where it then drains into the crankcase. Blow-back pressure forces the oil back into the reservoir, and the process repeats itself. An overflow line is provided from the reservoir tank. Refer to Section 9 for checking and servicing the oil.

IGNITION-STARTER SYSTEM

Two electrical ignition modules and two spark plugs per cylinder provide engine ignition. Each ignition fires the top plugs for one side of the engine and the lower plugs for the opposite side of the engine.

Two ignition switches are incorporated into the system (IGN1, IGN2). They provide a means of activating and deactivating, or grounding, the two ignition modules. These switches may also assist the operator in isolating engine deficiencies.

Starter operation is controlled by a momentary-push button. The starter solenoid is then energized, which in turn activates the starter.

AIR INDUCTION & EXHAUST SYSTEM

Unlike most conventional aircraft, air for induction is not ducted or baffled into each carburetor. Rather, the engine uses the air flowing around the engine that enters through two air intakes in the cowling behind the prop. An air filter is attached to each carburetor where air is drawn into the induction system. After being mixed with fuel in the carburetors, the fuel/air is then sent through the engine intake manifolds into the cylinders for combustion.

The carburetors are not inter-connected, so the engine can be described as two engines sharing one crankshaft. Because of this arrangement, the carburetors should be balanced at regular intervals or as noted to obtain best engine performance and to minimize engine vibration.

The exhaust system for the aircraft is made up of exhaust manifolds, a muffler, and an exhaust pipe. After the cylinders complete the exhaust stroke, the mixture is expelled through manifolds into a muffler and finally out through an exhaust pipe that extends downward from the engine cowling out the pilot side.

CARBURETOR SYSTEM

The aircraft's Rotax® engine is equipped with two horizontally-mounted, float-type, fixed jet, self-leaning carburetors. The right carburetor fuels the right side of the engine, and the left carburetor fuels the left side of the engine. The purpose of a carburetor is to mix air and fuel for combustion in the engine. Outside air is drawn into the carburetor where a fuel jet will atomize fuel, mixing them together. After mixing, the fuel/air mixture is sent to the cylinders for combustion. Both carburetors contain a rubber diaphragm that self-leans the mixture as altitude increases. As air pressure changes, a diaphragm will move a piston controlling the amount of fuel/air sent to the fuel jet.

Each carburetor is also equipped with a small starting carburetor, commonly referred to as a choke, for starting. Starting a cold engine may be difficult, and the cylinders may need more fuel than air to burn. A starting carburetor is used to enrich the fuel/air mixture thus allowing more fuel to enter the combustion chamber. Both starting carburetors are tied to one control knob labeled "choke" located near to the throttle lever in the cockpit. The throttle must be in the idle position for the choke to operate.

PROPELLER

The aircraft has a three-bladed, fixed-pitch, ground-adjustable, composite propeller. The core of each blade is made from two types of wood and coated with a carbon-fiber composite. Adjusting the pitch angle of the blades should be performed only by precisely following directions provided by the manufacturer. Any cracks or nicks in the blades can cause a catastrophic failure of the propeller. Therefore, if any flaws are discovered in the propeller, have them repaired before operating the engine.

WARNING

It is imperative that if the pitch of one propeller blade is adjusted, each remaining propeller blade must be adjusted to the exact same degree as the first. Indications of the blade pitch angles being set differently are rough operation and vibration.

NOTE

High Propeller pitch settings or different pitch settings on each blade will cause vibrations that appear to be a rough idle.

FUEL SYSTEM

The aircraft's fuel system consists of one vented, 20.5 gallon main tank; two optional vented, 6 gallon auxiliary wing tanks; a shut-off valve; a fuel filter; an electric auxiliary pump with green indicator ON light; an engine-driven fuel pump; and two carburetors. There is also a metered "bleed" return from the fuel pressure line that returns to the main tank.

The shut-off valve located next to the fuel gauge has two positions: OPEN (vertical) and CLOSED (horizontal). No fuel will be available from the tank when the valve is in the CLOSED position, but it will be available when in the OPEN position. When closed, the shut-off valve is designed to touch and "poke" the pilot's right leg.

Fuel is drawn from the main tank through the shut-off valve where it then passes through the fuel filter. From there the fuel is drawn through the electric-driven auxiliary pump to the engine-driven pump and then to the carburetors. When the auxiliary fuel pump is activated, fuel is drawn from the filter and through the by-pass side of the engine-driven pump, and then sent to the carburetors. Whenever the auxiliary pump is ON, a green indicator light located on the center instrument panel will be illuminated.

Ventilation of the fuel tank is provided by a vent line from the top of each tank. The main vent line runs up the cockpit side of the firewall, is directed downward, and is exposed outside beneath the cowling. Each of the fuel tanks must receive ventilation for proper operation. Ensure that no blockage occurs in the vent line by compression or blocks the exposed end of the line where it protrudes from the engine cowling or either of the under wing vents for the wing tanks.

CAUTION

The main tank has a 21.5 gallon total capacity when completely filled to the neck. However, filling the fuel tank to the top of the filler neck will cause fuel to be vented overboard due to liquid expansion. For this reason, fill the main tank to only 20.5 gallons. Similarly the wing tanks have a capacity of 6.3 gallons but should only be filled to 6.0 gallons.

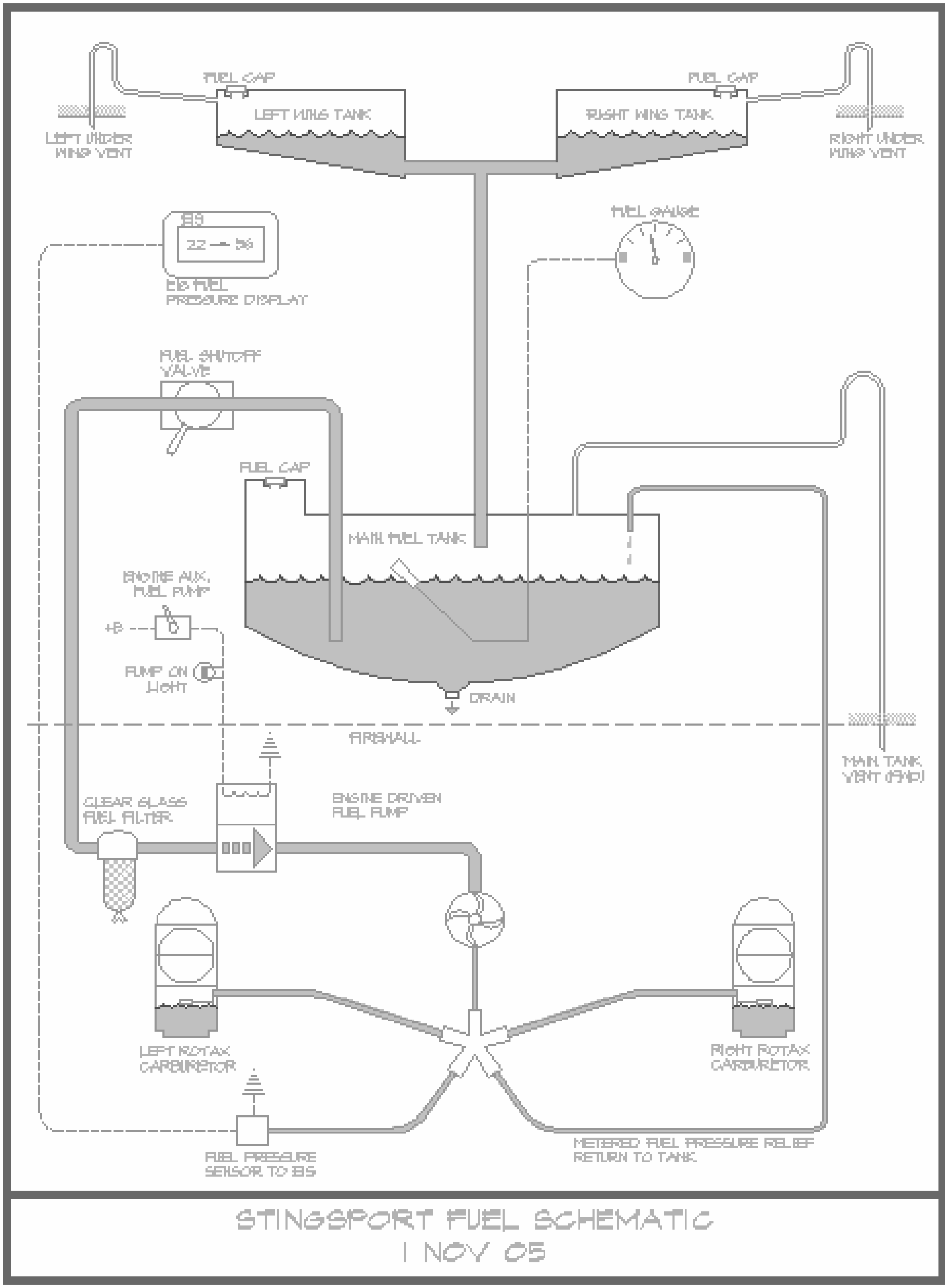


Figure 7.1 StingSport Fuel Schematic

CABIN HEATING AND VENTILATION

Outside air can be vented into the cockpit for cooling purposes by opening any of three vents located in the canopy. Two are located in the canopy next to either crew position above the outboard armrest. They can be opened simply by pushing them out and rotating them to the desired position. Each side vent should be closed and rotated down when parked for rain protection.

NOTE

If they are closed and “aimed” forward, the canopy fresh air vents will pop open at high speeds, The resulting air pressure “pop” and noise may be momentarily distracting.

The third vent is located at the front of the canopy, and it can only be operated from the pilot’s position. A pull knob is located forward of the pilot’s armrest which is connected to the vent by a Bowden cable control wire. By pulling the knob aft, the vent opens; to close the vent, push the knob forward.

Warm air for the cabin is directed from behind the engine’s radiator into an air scoop. Ducting from this scoop carries the air to a heat box mounted on the firewall. A valve inside the heat box is opened and closed by a Bowden cable linked to a knob labeled Cabin Heat to regulate warm air entering the cockpit. By pulling the knob out, warm air is allowed to flow into the cabin, and by pushing the knob back in, the warm air is closed off and vented overboard.

BRAKE SYSTEM

The aircraft has two single-rotor, hydraulically-actuated brakes located on the main landing gear, one on each wheel. Each brake is connected to a brake piston cylinder attached to the toe pedals of the rudder pedals. When the operator presses the left brake pedal, hydraulic pressure is sent down hydraulic line to the left wheel brake pads, which in turn press on both sides of the rotor. The same process also applies the right brake pedal to the right brake rotor.

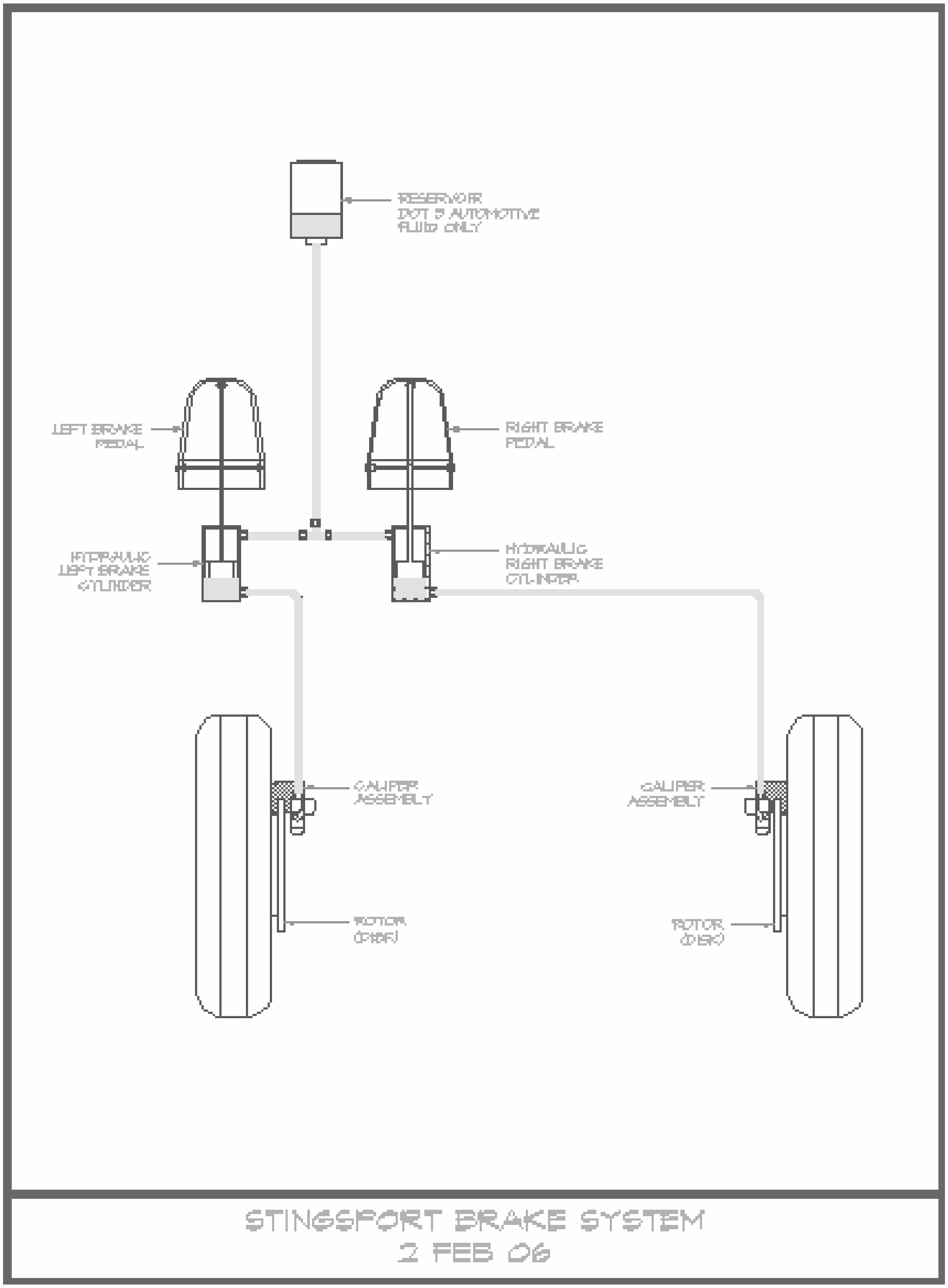


Figure 7.2 StingSport Brake System Schematic

ELECTRICAL SYSTEM AND INSTRUMENTS

This aircraft is equipped with a 12-volt, direct-current electrical system. The source of electrical power is a battery that is attached on the engine side of the firewall. An internal alternator located at the rear of the engine block will charge the battery up to 13.5 VDC. Power is supplied to the electrical and avionics circuits through a main bus bar located behind the center instrument panel. This bus bar is energized anytime the Main switch is ON. The ELT is independent from the aircraft electrical system.

Two 12 VDC auxiliary power ports are installed in the lower right and left vertical surface of each seat. The ports are directly "hot-wired" to the battery and can be used to charge the battery without the operator having to connect additional leads directly to the battery.

CAUTION

Do not attempt to start the engine with a dead battery by using either 12VDC port. The current load will exceed the wire capacity and a fire may result.

The Instrument Switch activates all avionics equipment tied into the circuit. This instrument switch should always be in the OFF position before the main switch is turned on or before the main switch is turned off.

Both the GPS and the Emergency Locator Transmitter (ELT) contain internal batteries, and therefore can be operated when Main switch is OFF. The Garmin 296GPS contains six AA batteries. The ELT contains eight D-cell batteries, as well as one small battery in the remote control panel. All batteries should be replaced at each annual inspection. The Garmin 396GPS contains a rechargeable lithium-ion battery pack. The battery furnished with the Garmin 396 should be checked at each annual condition inspection and replaced in accordance with the manufacturers instructions.

CIRCUIT BREAKERS AND FUSES

Circuit breakers and fuses are the best protection for electrical loads and malfunctions. The most common form of protection for this aircraft is circuit breakers (CB) and circuit breaker-switches (CBS). The CBs cannot manually be pulled out to disconnect the circuit. If a surge or over-loading amperage is placed on a CB switch, the built-in circuit breaker will open turning the switch off, thus protecting the circuit. After reducing the electrical load, turn the switch back to the ON position to reset the breaker.

LIGHTING SYSTEM

EXTERIOR LIGHTING

Conventional anti-collision, safety strobe lights are located on each wingtip and one on the lower aft tail. These lights are encased in a clear-plastic, flush-mounted cover for protection and decreased drag. The center panel has an ON/OFF circuit breaker-switch (CBS) for the strobe lights.

LED high intensity position-navigation lights are mounted on each wingtip and on the lower aft tail. The co-pilot panel has an ON/OFF circuit breaker-switch (CBS) for the position lights.

Two wing tip mounted HID lamps are used for taxi and landing illumination. The co-pilot panel has an ON/OFF circuit breaker-switch (CBS) for each of these (LAND, TAXI) lights.

PITOT-STATIC SYSTEM AND INTRUMENTS

The pitot-static tube consists of a ram air duct located inside a cylindrical static air chamber. With this construction both the ram and static ports are located on the same device which is a tube positioned underneath the right wing. The tube supplies ram air pressure to the airspeed indicator, and the static ports supply outside atmospheric pressure to the airspeed indicator, altimeter, mode C, and vertical speed indicator. If installed, the altitude hold portion of the autopilot is also connected to the pitot system.

AIRSPEED INDICATOR

The airspeed indicator (ASI) is the instrument that displays how fast the aircraft is traveling, in knots, through the air. Ram air pressure and static atmospheric pressure supplied by the pitot tube are compared by a diaphragm that expands and contracts as the difference between the two varies. Linkages are connected between the diaphragm and the indicator needle gives the operator a visual reading of the indicated airspeed at any given time.

ALTIMETER

The altimeter (ALT) contains aneroid wafers that expand and contract as atmospheric pressure changes. As altitude increases, the atmospheric pressure decreases, and the aneroid wafers expand. As altitude decreases, the aneroid wafers will contract. Atmospheric pressure is supplied to the altimeter by the static ports on the pitot tube. Mechanical linkages attached to the aneroid wafers move the needles on the altimeter face. A knob on the altimeter's face allows the operator to enter the correct barometric pressure into the Kollsman window.

NOTE

When setting the current barometric pressure in the Kollsman window for the first flight of the day, note the difference between the indicated altitude and the known field elevation. This will give you a correction factor for airborne resetting.

VERTICAL SPEED INDICATOR

The vertical speed indicator (VSI) provides the operator with rate of climb and rate of descent. It acts quite similar to the altimeter. Atmospheric pressure is supplied by the static ports on the pitot tube, and this air is sent into a holding chamber. However, unlike the altimeter, this chamber also has a metered leak attached to it that allows the pressure inside the chamber to eventually equalize with the pressure outside of the chamber. As the aircraft climbs, pressure decreases and this is displayed by the needle on the VSI as a rate of climb. When the aircraft stops climbing, the metered leak allows the pressures to equalize, and thus the indicator needle returns to zero, or no rate of climb. The same holds true for a descent. The indicator will show a rate of descent so long as the aircraft continues to lose altitude, but will return to zero whenever level flight is reached. Because of the metered leak, there is a small delay in the VSI's indication and a change in altitude may be noted first from the altimeter.

AVIONICS EQUIPMENT

NOTE

For specific operational instructions, see the manufacturer's operation manual corresponding to each piece of equipment.

TRANSPONDER

The transponder provides altitude information to air traffic control (ATC) radar. The transponder contains a computerized altimeter connected to the pitot-static system that allows it to calculate the aircraft's altitude. This data is then transmitted to the ground radar of ATC. This altitude information passed onto ATC is known as Mode C. The transponder display inside the cockpit reads the present squawk code entered into the system. Control knobs allow the operator to change the digits of the squawk code and enter various modes.

GLOBAL POSITIONING SYSTEM RECEIVER

The global positioning system provides a vast amount of navigational information, such as: present coordinate position, distance, course headings, groundspeed, altitude, ETAs, ETEs, and a scrolling visual representation of the ground and surrounding airspace. Push buttons located on the cockpit display allow the operator to enter information, toggle between screens, and interact with the scrolling map. The operator should consult the provided GPS operations manual for maintaining, updating, or operating the GPS.

NOTE

The Garmin 296GPS internal AA batteries should be replaced at each annual condition inspection. The battery furnished with the Garmin 396 should be checked at each annual condition inspection and replaced in accordance with the manufacturers instructions.

SECTION 8
REQUIRED PLACARDS
& MARKINGS

Table of Contents Page

INTRODUCTION

Section 8 contains a list of both placards and markings located inside the cockpit and on the exterior of the airplane. These placards and markings provide guidance, instruction, or caution. It is the responsibility of the owner/operator to understand and comply with the directions of both the placards and markings.

PLACARDS

Below the fuel gauge:

ALL AEROBATIC MANEUVERS
INCLUDING SPINS
PROHIBITED

Near the airspeed indicator:

Max flap speeds:
75kt – HALF
65kt – FULL

Attached to the safety pin on the GRS activation handle:

SAFETY PIN, REMOVE BEFORE FLIGHT

MARKINGS

Above main fuel tank cap: FUEL CAPACITY 20.5 US GALLONS

Attention!
Ground aircraft
during refueling.

Aux wing fuel tank filler neck rims:

FUEL CAPACITY 6 US GALLONS

Main landing gear wheel pants, nose gear wheel pant:

TP: 30 PSI

Wing trailing edges (x2), left aileron trim tab, elevator trailing edge (x2), rudder trim tab:

NO PUSH

Elevator trim tab:

NO LIFT

Lower external cowling, pilot side of nose gear:

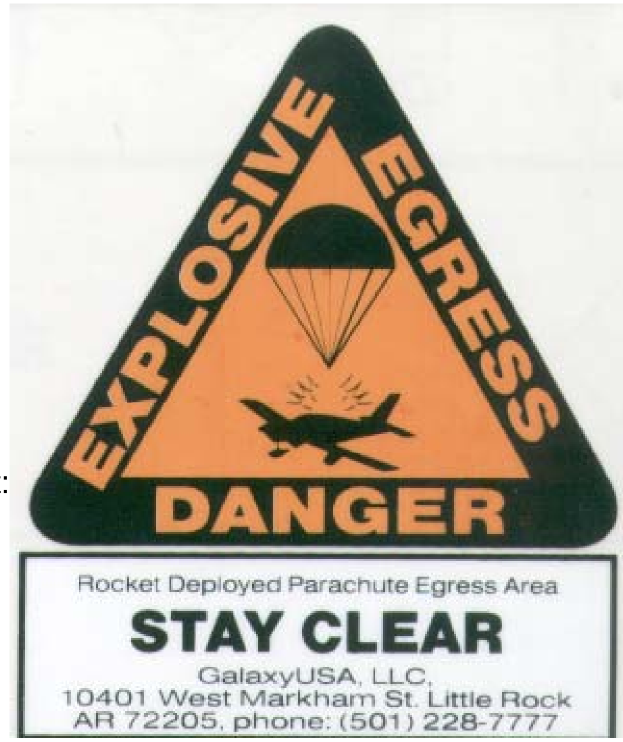
**EXTERNAL POWER
12 VOLTS D.C.**

Aircraft parachute warning labels
Interior co-pilot panel:

Below aft canopy (x2):

CAUTION! BALLISTIC RECOVERY SYSTEM

Exterior aft canopy near rocket exit:



GRS rocket interior front of rocket motor:

**DO
NOT
PUSH**

Rocket Exhaust Port:

**ROCKET EXHAUST
DO NOT TOUCH**

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SECTION 9
AIRPLANE HANDLING, SERVICE, & MAINTENANCE

Table of Contents **Page**

INTRODUCTION

Section 9 provides instruction and procedures for handling and care of the airplane. This section also contains information on inspection and maintenance requirements necessary to maintain airworthiness for the aircraft.

AIRPLANE FILES

Certain items must be with the airplane at all times. The following is a list of these items and when they are required:

1. To be carried in the airplane at all times:
    1. Aircraft Operating Instructions (AOI)
    2. Weight and Balance Data
    3. Operating Limitations issued by FAA at airworthiness inspection.
    4. Aircraft Airworthiness Certificate (FAA Form 8130-7)
    5. Aircraft Registration Certificate (AC Form 8050-3)

2. To be with the pilot during flight
    1. Airman Certificate
    2. Medical Certificate
    3. Aviation Charts

3. To be made available upon request:
    1. Airplane Log Book
    2. Engine Log Book
    3. Propeller Log Book
    4. Pilot Log Book

AIRPLANE INSPECTION PERIODS

FAA REQUIRED INSPECTIONS

As required by Federal Aviation Regulations, all LSA aircraft of U.S. registry must undergo a complete condition inspection ("annual") every twelve calendar months. It is the responsibility of the owner/operator to assure compliance with all applicable aircraft manufacturer directives.

ALTERATIONS OR REPAIRS

All alterations or major repairs to the airplane must be approved in writing by the aircraft manufacturer.

GROUND HANDLING

TOWING

The best way for maneuvering the aircraft on the ground is by use of the included tow bar connected to the nose gear on the aircraft. The tow bar should be used to guide the aircraft and actual force of pushing or pulling should be done by the operator holding onto a propeller blade.

PARKING

The aircraft will roll with very little effort. When parking the aircraft, it is recommended to chock the tires in order to ensure that the aircraft will not move. The aircraft is not equipped with a parking brake. Tie down rings are installed underneath each wing if a greater need for security is considered necessary by the operator.

TIE-DOWN

In the event that gusty or strong wind conditions exist, tying down the airplane is the best precaution to prevent damage. Metal screw rings are located underneath each wing tip for fastening tie-down straps or ropes. The nose gear can be tied down by attaching a rope or strap around and through the wheel rim. To tie down the rear of the airplane, sling a strap over the top of the empennage and fasten down. Be sure to place padded material in between the strap and the empennage to ensure that the painted surface of the airplane is not damaged.

JACKING

If the aircraft needs to be raised off the ground for any purpose, the specific jack locations are on the end of each main gear strut and on the engine mount. These are to be used to raise or support the airplane in order to prevent damage to its composite surface. For jacking the main gear, jack points are at the base of the gear strut below the axle assembly. The jack pad should contact the airplane on the end tip of the strut which bends down.

NOTE

To prevent damage to the landing gear strut, place a pad in between the jack and the composite material of the strut.

Two jack points attached to both sides of the engine mount are used for holding the nose elevated. These points appear as short rods that are concealed within the cowling. To reach these points, both the upper and lower cowlings must be removed.

SERVICING

ENGINE OIL

Servicing the oil of the Rotax® 912 engine is dependant mainly upon two factors: fuel type and engine operation temperature. Because of the high lead content, 100LL Avgas deposits a residue leading to operation difficulties more frequently when Rotax® engines are operated with leaded Avgas fuels. The lead contained in Avgas will deposit in the piston rings and in the rocker arms of the valve train. Use Avgas only while traveling when unleaded fuel is not available. When you return from traveling, change the oil to help eliminate the lead from the engine.

'MoGas', motor fuel, available at some airports, is not a suitable fuel. The octane rating for MoGas is usually only 87 and therefore may cause detonation during engine operation.

Therefore, specific oil types coincide with fuel types and engine temperatures. Fig. 9.1 lists the oil types recommended for use with unleaded fuels. Fig. 9.2 lists the oil types recommended for use with leaded fuels. The information provided in these figures is in accordance with Rotax® Service Instruction SI-18-1997 R5. This instruction or its latest revision should be followed by the owner/operator.

Engine Oils Recommended for Use with Unleaded Fuel (92 OCTANE AUTO GAS, *not 87 Octane 'MoGas'*)

Brand	Name	Type	Viscosity	Use (engine temps & fuel types)
MOBIL®	Mobil 1	APISJ/CF	SAE 5W-30	Full-synthetic oil: for high temps; unleaded fuel only
MOBIL®	Mobil 1	APISJ/CF	SAE 15W-50	Full-synthetic oil: for high temps; unleaded fuel only
SHELL®	Advance VSX 4	APISG	SAE 10W-30	Semi-synthetic motorcycle oil w / gear additives: for normal-high temps; leaded/unleaded fuel
SHELL®	Advance VSX 4	APISG	SAE 15W-50	Semi-synthetic motorcycle oil w / gear additives: for normal-high temps; leaded/unleaded fuel
SHELL®	Advance Ultra 4	APISJ	SAE 10W-40	Full-synthetic motorcycle oil w / gear additives: for high temps; unleaded fuel only
SHELL®	Formula Shell Synthetic Blend	APISJ	SAE 10W-30	Semi-synthetic oil: for normal-high temps; leaded/unleaded fuel
Yacco®	MVX 500 Synthetic	APISJ	SAE 10W-40	Semi-synthetic motorcycle oil w / gear additives: for normal-high temps; leaded/unleaded fuel
Yacco®	MVX 500 Synthetic	APISJ	SAE 15W-50	Semi-synthetic motorcycle oil w / gear additives: for normal-high temps; leaded/unleaded fuel
Valvoline®	Dura Blend Synthetic	APISJ	SAE 10W-40	Semi-synthetic oil: for normal-high temps; leaded/unleaded fuel
Pennzoil®	Motorcycle Motor Oil	APISH	SAE 20W-50	Semi-synthetic motorcycle oil w / gear additives: for normal-high temps; leaded/unleaded fuel

*normal temperatures are defined as lower than 250ºF

*high temperatures are defined as higher than 250ºF

Fig. 9-1

Engine Oils Recommended for Use with Leaded Fuel (100LL AVGAS)

Brand	Name	Type	Viscosity	Use (engine temps & fuel types)
SHELL®	Advance VSX 4	APISG	SAE 10W-40	Semi-synthetic motorcycle oil w / gear additives: for normal-high temps; leaded/unleaded fuel
SHELL®	Advance VSX 4	APISG	SAE 15W-50	Semi-synthetic motorcycle oil w / gear additives: for normal-high temps; leaded/unleaded fuel
SHELL®	Formula Shell Synthetic Blend	APISJ	SAE 10W-30	Semi-synthetic oil: for normal-high temps; leaded/unleaded fuel
SHELL®	Formula Shell	APISJ	SAE 10W-30	Petroleum-based oil: for normal temps; leaded fuel only
SHELL®	Formula Shell	APISJ	SAE 20W-50	Petroleum-based oil: for normal temps; leaded fuel only
Valvoline®	Dura Blend Synthetic	APISJ	SAE 10W-40	Semi-synthetic oil: for normal-high temps; leaded/unleaded fuel

*normal temperatures are defined as lower than 250ºF

*high temperatures are defined as higher than 250ºF

Fig. 9-2

CAUTION

100LL Avgas is to be used **only as an alternate fuel type** if 92 octane auto fuel is not available. **The use of 100LL Avgas is restricted to *less* than 30% of engine operation time.**

Prior to checking the engine oil level, run the engine at idle for a few minutes. Then, shut it down. As an alternate method, turn the engine by pulling the propeller over, by hand, through approximately 20-30 engine compression strokes until air is heard being pushed into the oil reservoir (gurgling sound). This will transfer all of the oil drained into the engine crank case back to the oil reservoir.

WARNING

Before hand-cranking the propeller, ensure that both ignition switches are in the off position. For safety purposes, always treat a propeller as though the engine could start at any time while cranking.

WARNING

Never turn the engine backwards (clockwise when viewed from the front to the rear of the aircraft). Permanent damage to the engine may result due to loss of oil pressure to critical components.

Open the access panel on the upper cowling. To check the oil, unscrew the cap of the oil reservoir located at the rear of the firewall. Remove the dipstick to check the oil level. A flattened segment at the end of the dipstick represents the oil capacity range. The top of this segment is the MAX limit and the bottom of the segment is the MIN limit. Ensure the oil level is between these limits, but it must **never** fall below the MIN limit. The difference between MIN and MAX is 0.8 Qts.

To best protect your engine, change the engine oil and replace the oil filter every 25 hours of engine operating time or after cross-country operation with 100LL Avgas. To properly change the oil and replace expended components, proceed as follows:

NOTE

In order to keep all foreign deposits in suspension, only drain the oil after the engine has been warmed.

1. Remove the upper engine cowling.
2. Remove oil filler cap and dipstick from the oil reservoir.
3. Remove lid of oil reservoir by unfastening the clamp-down ring.
4. Remove inner screen and baffle insert from oil reservoir. Do not damage the large “O” ring.

WARNING

The careless draining of hot engine oil may cause scalds or burns. Use caution when dealing with hot engine oil.

5. Using a handheld pump, suck out the entire oil contents of the reservoir.

NOTE

Environmental regulations prohibit dumping of engine oil. To properly dispose of used oil, refill it into empty containers and take it to any participating automotive store or service station for recycling.

6. Unscrew old oil filter and remove using a plastic bag to prevent spillage.
7. Fill the new oil filter half full with new engine oil before installation.

NOTE

To ensure a better seal, rub fresh oil around the sealing ring of the new oil filter.

8. Snuggly screw on new oil filter by hand. Turn until hand tight and the seal is compressed – do not over-tighten or use a tool.
9. Place screen and baffle back into the oil reservoir and refasten the reservoir lid. Do not damage the large "O" ring.
10. Refill oil reservoir with new oil until the level is within range marks on the dipstick. Do not overfill; the oil will be blown out the overflow line.
11. Refasten the oil filler cap.
12. Start the engine and check for oil pressure indication. Then, shutdown the engine and check for oil leaks.
13. Recheck the oil level on the dipstick.

ENGINE COOLANT (Glycol – Non-Silicone)

The standard engine coolant/antifreeze is an automotive, silica free, (usually orange color) mixed 50/50 with distilled water.

Capacity: Replenish as required up to maximum of half the coolant overflow bottle. The level in the overflow bottle should be about in the center of the bottle when the engine is *hot.* Filling the bottle with the engine cold may result in overflow after expansion from the hot engine.

CAUTION

Rotax has advised that in some instances, conventional coolant (mixture ratio of 50% water and 50% antifreeze) can vaporize or boil before the maximum permissible cylinder head temperature is reached. This means the liquid cooling system can lose a substantial amount of coolant while operating in the allowed cylinder head temperature range. Evans NPG+™ coolant is then recommended only if required due to high engine temperatures from normal operation. Evans NPG+™ is a waterless coolant and may not be recognized by line personnel prior to the addition of water to top off the system.

To add engine coolant:

1. Remove the cap and inner screen of the coolant system's overflow bottle located on the upper right (co-pilot's side) of the firewall.
2. Fill as needed not to exceed the MAX line marked on the outside of the reservoir.

WARNING

Never add water or water-containing coolant in any circumstance to an Evans NPG cooling system.

FUEL

Approved Fuel Grade:
92 Unleaded Auto Gas (Yellow)
Alternate Fuel Grade (for ***less*** than 30% of engine operation time):
100LL Avgas (Blue)
Total Capacity: 20.5 Gals
Total Unusable: 1.5 Gals

WARNING

When fueling the airplane, ensure the airplane is electrically grounded by verifying that the grounding wire located on the right main gear wheel makes adequate contact with the ground's surface. Also, ensure the fueling container remains adequately grounded to fuel neck ring and nozzle. A ground wire from the refueling container should be attached to the engine exhaust pipe. The exhaust pipe is electrically connected to the aircraft ground system as are all fuel tanks and tank opening ports.

CAUTION

The main tank has a 21.5 gallon total capacity when completely filled to the neck. The wing aux tanks (if installed) have a 6.3 gallon (each) capacity. However, filling the fuel tanks to the top of the filler neck will cause fuel to be vented overboard due to liquid expansion. For this reason, fill the main tank to only 20.5 gallons and the wing aux tanks (if installed) to no more than 6 gallons each

NOTE

To minimize the condensation of water inside the fuel tank, fill and service the fuel tanks after each flight.

TIRE PRESSURES

Nose Wheel Tire Pressure: 30 psi (2 bar)
Main Gear Wheel Tire Pressure: 30 psi (2 bar)

CLEANING AND CARE

CANOPY

The canopy surface should be cleaned only with an aircraft windshield cleaner and one of the micro-fiber cloths which are provided. Do not wipe the canopy in a circular motion. If the canopy is covered with dust, use flowing clean water and lightly wipe the dust away with a clean hand (remove finger rings). This will remove (flow away) the grit that will scratch the plastic surface. Apply a sufficient but modest amount of cleaner to the canopy surface and wipe in a long stroke fore/aft **linear** motion with light pressure until the surface is clear. Attempt to lift the dirt from the surface; don't rub it into the canopy or light scratches will appear in the sunlight reflections.

NOTE

Never use glass cleaner, MEK, acetone, benzene, gasoline, fire extinguisher, anti-ice fluid, or lacquer thinner to clean plastic. These materials will attack the plastic and cause it to craze.

Do not use a canvas cover on the canopy unless freezing rain or sleet is anticipated because the cover may scratch the plastic surface. Use only the proper canopy cover provided with the aircraft.

PROPELLER CARE

Proper preflight inspections of the propeller blades for nicks and cracks are key to maintaining a good propeller. Wiping down the blades to clean off bugs and grass is also advisable after EVERY flight. Whenever the airplane is parked, place the propeller covers over the blades to ensure that they are protected from the environment. A clean waxed propeller resists stains and is more efficient.

ENGINE CARE

Routinely perform a visual inspection of the engine. Check all oil, fuel, and coolant lines for any leakages, defective seals, or faulty connections. Ensure all electrical leads are fastened down tightly to help prevent intermittent electric problems. Check coolant, brake fluid, and engine oil levels to determine if there are any losses.

Clean the radiator vanes of bugs and debris using a low pressure water hose and a cloth. Never use high pressure water to clean out the radiator. If a fault or discrepancy is discovered or any question is raised about the condition of the engine, consult a properly trained professional before operating the engine.

INTERIOR CARE

To remove dust, loose dirt, and other debris from the upholstery and carpet, clean the interior regularly with a vacuum cleaner. Blot up any spilled liquids promptly and use stain remover as needed. Sticky substances can be removed by using a knife or scraper and then stain remover. Clean the instrument panel and control knobs with a very mild, non-conductive cleaner in order to remove oily deposits without compromising any electronic components.

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SECTION 10

SUPPLEMENTARY INFORMATION

Table of Contents Page

INTRODUCTION

This section includes informal advice and familiarization procedures; a mention of some flight characteristics and a copy of checklist procedures for operating the StingSport which are available in Appendix A. The checklist procedures are intended be cut out from this manual and may be used while operating the airplane.

FAMILIARIZATION FLIGHT PROCEDURES

So let's go on a typical flight to discover the little things and informal hints that you may only find here in the supplementary and training section.

TAXI

The visibility in all directions allows clear and safe maneuvering in the taxi area.

HANGAR RASH NOTE:
If your aircraft shadow does not touch anything, you won't touch it either.

Taxi speeds should be low - at a brisk walk. The airplane will accelerate at idle power, and you will need to use the brakes. Don't 'drag' the brakes; just apply them, slow – almost to a stop — and release. The brake pads will 'glaze' and create a vibration/chattering noise if you unintentionally ride the brakes while taxiing. It is an irritant not a serious problem and can be fixed by removing the pads and scrubbing them with a file to remove the glaze.

Use the nose wheel steering and make it a habit to keep your aircraft on the taxiway centerline. You are protected by required taxiway clearances if you are on the centerline. If you are not and hit something….just stay on the centerline.

Stop well ahead of the runway hold line for the engine run-up. The brakes will have a hard time holding with such high engine thrust and you may move forward. So give yourself some room to move and you won't violate the runway environment with your head in the cockpit.

Wait for engine temps to stabilize before the doing the engine ignition checks. Don't spend a long time at high power setting. Run the power up to 4,000 RPM, quickly switch off and back on each electronic ignition and immediately reduce the power. Don't wait while the engine stabilizes at the lower RPM and you record the data. Look at it and quickly return the ignition switch back to ON and go to the next one. IF you inadvertently turn off both ignition switches, don't flip them back on, just wait for the prop to stop and restart the engine. Your propeller will thank you, your maintenance folks will thank you and your check book will thank you.

Complete the pre-take-off checks and confirm that the safety pin is removed from the aircraft parachute (GRS) ballistic recovery system. Don't forget to check for traffic on short final approach.

TAKEOFF

When the approach is clear, make your departure radio call and taxi to align with the center of the runway. Set the flight controls for any crosswind component. Check the time, release the brakes, again don't hurry, just power up to 4000 rpm to do a 'last chance' instrument check. If everything is 'in the green', immediately advance to full power and check that the prop rpm is within limits. Lift the weight off of the nose wheel and rotate at 40Kts.

CLIMB

You will find that the climb out for obstacle clearance at less than 60Kts, V_y, has a rather steep deck angle. (Be prepared to lower the nose if the engine performance diminishes.) Maintain the runway heading adjusted for any crosswind and continue the climb out with Half flaps.

If you have less than 5600 RPM then there is another technique that will help your engine last longer. During the climb out, while safely above the ground and stabilized in the climb, move the throttle slightly back until you see the RPM affected. That throttle position is the most power that your engine can produce with the pitch setting on the prop. Any more throttle does not get you more power, it only runs the engine slightly leaner and slightly hotter. So become familiar with the power band that you use and adjust the throttle to match the engine power available with the current prop setting.

Above 500', retract the flaps prior to 75Kts and continue the climb at 75Kts for a good visual clearance climb speed.

CRUISE

Level off at your enroute altitude and allow the plane to accelerate to cruise speed. If you climb slightly above your desired level-off altitude and slowly descend at climb power you will quickly get to cruise speed. Just take care to watch the prop RPM limits. You will get an EIS alert at 5700 RPM to let you know that you are near the 5800 RPM limit.

Once at your altitude, set power to 75% and enjoy the flight. High cruise power is about 5000 to 5200 RPM. Cruise speeds with the StingSport will be about 95-105 Kts or with the 912ULS engine about 105-115 Kts depending on weight and altitude. Don't be surprised if you have difficulty reaching the high side of these indicated airspeed numbers. Remember indicated decreases as you go up and true airspeed is how you determine performance at altitude.

DESCENT

Plan the descent from altitude well ahead of your arrival point. Although shock-cooling is minimal in these engines, it is 'bad form' to do an idle-power descent. V_{ne} arrives quickly and you will still need to descend. At high speed, that only leaves heavy maneuvering to scrub off the speed and altitude. So don't place yourself in that situation and plan the decent to remain well below $V_{ne.}$ If you anticipate the descent, you will also be in good position to handle any turbulence at a reasonable airspeed that is not high into the yellow arc.

Lead your level-off altitude by 10% of the VVI descent rate. Level off and reset power to maintain about 90Kts for the pattern altitude.

TRAFFIC PATTERN

When approaching an uncontrolled airport, you should be at, or slightly above, the traffic pattern altitude some distance out from the pattern area. This will keep you from interfering with other aircraft climbing to downwind from the crosswind location. Always monitor the correct comm frequency on the VHF radio to determine the flow of traffic for your landing area. To enter the airport traffic pattern, check for traffic, position yourself at the pattern altitude and make your radio call.

DOWNWIND

On downwind, reduce power, hold your altitude and allow your airspeed to decay to 75Kts. Across from your intended landing point, reduce power to IDLE. Hold altitude and continue on downwind doing your pre-landing checklist. At no faster than 75Kts (be kind to your airplane), extend the flaps to Half. Continue on downwind until reaching 60Kts then start your base turn with a traffic check and radio call. Keep the power at idle and use pitch to keep your speed at 60Kts. Cross check the VVI. If your decent rate is about 600 feet per minute, you have it figured out. If you are at maximum weight the VVI will of course be higher. Keep the 60Kts as your speed around the initial portion of the base turn, always looking for traffic as you pitch the nose of the aircraft to maintain the 60Kts.

BASE

Half way through the turn to final you should be half way through the altitude difference between the traffic pattern and the runway elevation. Establish and continue to hold 60Kts in final portion of the base turn. This will show up in your VVI as a decent rate of about 600 fpm. Check final approach for traffic and make your final approach radio call.

Make the turn to final with varying degrees of bank to allow for the wind and your distance from the runway centerline. The 60Kts speed will give you plenty of maneuvering energy for any turns you have to make. If you find that **you are overshooting the final approach course, don't tighten the turn**; just continue the turn through the runway heading to an intercept angle from the other side. Then correct with a new turn in the opposite direction to final. You should still arrive on final with 60Kts, which will allow you to roll out and extend the flaps to Full.

FINAL

Complete the final landing checklist; maintain the proper glide path, and allow the speed to stabilize at 55Kts on short final. Setting the flaps to Full will increase your decent rate even though you have slowed to the final approach airspeed. So the VVI will display about 650 fpm +/- to indicate a stabilized approach. If necessary make any last minute SMALL (1/8" of throttle movement) power changes to allow for wind gusts or deviations from the proper glide path.

The most important point is to be STABILIZED on the approach as far out as possible, while keeping your landing point (aiming point) in the same reference area of the windscreen. Initially the pitch attitude to the landing point may seem steep. However, without a large instrument panel in your way, the view needs to be learned by repetition.

Small throttle movements will generate large increases in speed and may cause you to over-shoot the glide path or the 65Kt flap limit. (Remember exceeding any aircraft limit cancels a check ride immediately and is not kind to your aircraft.) Abrupt throttle control will also prevent a stabilized approach which is the primary key to any good landing.

LANDING

While close into your aiming point and into the area of 'ground effect', simply stop your decent just above the runway and start the landing flare. Attempt to touch down at your intended landing point with little or no vertical descent rate. The aiming point will pass underneath while you are working at holding the nose wheel off the runway. This is normal and don't worry about it. Spot landing will come later and be much more accurate if you continue to train to use the stabilized approach and a non-moving aim point.

You know from your stall practice that the StingSport will continue to fly well below the speed of the approach and flare. You will be using that difference in speed (energy) to maneuver the plane during the last few inches above the runway. The intent of any landing is to contact surface of the earth at a tangent to the runway surface so that (in theory) you touch down at minimum speed just as you stop the descent rate. The most common problem is the pilot stops flying the controls at touchdown and lets the nose wheel flop onto the runway. Keep flying the plane with full crosswind authority and use full aft controls if necessary to protect the nose gear and tire.

ROLL OUT

But the landing is not over! Continue to fly the airplane, both with ailerons and rudder, for crosswind control just as you did for takeoff. Use the elevator for pitch control and keep the nose wheel from dropping to the runway as you touch down. Hold the nose wheel in the air and gently lower it to the surface at about 35Kts. Make sure that you do not have any rudder input when the nose wheel touches the ground. The rudder is directly connected to the nose wheel steering and the aircraft will turn in the direction of rudder pedal deflection. Continue to use the ailerons as required for crosswind control.

Now primary steering control will be with the rudder pedal interconnect to the nose wheel. Apply the brakes gently at first to determine the braking effectiveness for the surface conditions. Do not 'ride' the brakes or 'slam' them on. Apply the brakes as firmly and evenly as is required for the desired stopping distance in coordination with the nose wheel steering to a perfect stop.

TURN OFF

A courteous pilot does not just stop on the runway without a radio announcement of his intentions, even at an uncontrolled airport. However, when you are on the runway, it is you, the pilot, who is in control of the landing area. Don't be inconsiderate, but do not rush the plane off the nearest exit unless you have total control of the aircraft and it is clearly within your skill level to turn and exit. Heavy, excessive braking will cause extreme premature wear and possible tire failure. Finally, make your radio call that you are clear of the landing area. The gradient at some uncontrolled runways does not allow direct vision of all the exit taxiways from the runway hold position.

PARKING

As in the taxi for takeoff, do not let the ground speed increase as you return to parking. The engine RPM should be kept at 2000 to allow the engine to cool before shutdown. This is also the best RPM to reduce the load on the gearbox, therefore, use 2000 RPM for all ground operations. Even at this RPM the aircraft will want to accelerate. Do that braking thing.

Complete the 'after-landing' checklist in a non-congested area. After engine shutdown, don't forget to replace the safety pin in the aircraft parachute system. Recheck that all switches are off and exit the cockpit. Chock the wheels, and check the engine oil immediately after engine shutdown to obtain the correct oil level reading.

Lock the canopy; install the canopy cover and tie-downs; then log your flight time. Don't forget to close your flight plan! Congratulations on another fun flight with your new StingSport!

AIR MANUVERS

STALL RECOVERY

The primary indication of a stall in a StingSport is a BURBLE and vibration of the airframe caused as the air begins to separate from the wing surface. The nose will lower but not excessively. Break the stall by slightly lowering the nose.

If the aircraft is slightly yawed, not aligned with the direction of travel (ball not centered), one wing will stall and the other will continue to produce lift. The result can be a dramatic roll into the stalled wing that is initially disturbing to new pilots because the large canopy gives you no sense of 'enclosure'. Without a surrounding structure, where you only see out a small window, the unobstructed view of the earth at 75 degrees of bank is dramatic! Do not attempt to 'pick-up' the low wing with the ailerons. That only adds to the adverse yaw already on the aircraft. Allow the nose to fall, (remember you are practicing a stall), regain airspeed and recover from the stall as well as the low wing condition at a gentle pace.

If a stall is encountered proceed as follows:

1. Lower the nose to break the stall. (It is not necessary to place the airplane in a dive to break the stall.)

CAUTION

If the aircraft is not in coordinated flight, rudder and ball centered, one wing may stall prior to the other. This condition will result in a rotation resembling a spin entry but is the result of the remaining lift on the un-stalled wing tilting (rotating) the aircraft abruptly. Do not attempt to level the wings with the ailerons. Allow the nose to descend and recover from the resulting dive.

2. Steadily reapply back pressure on the flight stick.

CAUTION

When recovering from an extreme nose-low attitude, do not over-stress the airframe by pulling back abruptly on the flight stick. Pulling back abruptly could also result in a (high speed) secondary stall.

3. Add power as required.
4. Establish a positive rate of climb.

The airplane has recovered from a stalled condition when the altimeter or VSI reverses its trend.

BOUNCE RECOVERY ON LANDING

Occasionally an airplane will "bounce" when forced into a hard landing. The primary concern after an initial bounce on the runway is to recover, go around, and attempt a second landing. Do not try to force the airplane back onto the runway. An aggravated "porpoising effect" can develop if an attempt is made to save the landing, and this could result in loss of ground control or damage to the landing gear. If the airplane bounces initially, recover as follows:

1. Keep the nose slightly high.
2. Add full power smoothly.
3. Perform a go-around
4. Retract flaps to Half

NOTE

At any point during the recovery, the airplane may settle back down to the runway and bounce a second time. This is acceptable, but the go-around should be continued, rather than trying to complete the landing.

STINGSPORT OPERATIONAL CHECKLISTS ARE INCLUDED IN THE FOLLOWING PAGES.

StingSport

PILOT COCKPIT CHECKLIST

TLUSA XXX
NXXX

NORMAL PROCEDURES

PREFLIGHT INSPECTION

COCKPIT

1. **All Switches — OFF**
2. **Fuel Valve — OFF**
3. **Main Switch — ON**
4. **Fuel Gauge — CHECK QUANTITY**
5. **Main Switch — OFF**
6. **ELT Panel Indicator — CHECK STATUS**
7. **Flight Controls — PROPER OPERATION**
8. **Flaps — OPERATION, SET FULL**
9. **Trim — CENTERED**
10. **Required Documentation — ON BOARD**
11. **Baggage — SECURED**
12. **Seats — SECURE**
13. **Proceed to Exterior Checklist**

EXTERIOR CHECKLIST

NOSE AREA

1. **Windshield — CLEAN**
2. **Cowling — SECURE, screws tight**

StingSport Abbreviated Operational Checklist

3. **Prop/Spinner — CHECK**
4. **Air Inlets — CLEAR**
5. **Oil — CHECK QUANTITY**
6. **Coolant – CHECK QUANTITY**
7. **Nose Strut Assembly — CHECK**
8. **Nose Tire — CHECK INFLATION and WEAR**
9. **Chock — REMOVE**
10. **Firewall Fuel Gascolator – CHECK for debris**
11. **Fuel and Oil Tank Vents — CLEAR**
12. **Traffic Alert Antennae — Secure**
13. **Transponder Antennae — Secure**
14. **Fuselage Fuel Sump — DRAIN, Check for water and contaminates.**

RIGHT WING

1. **Main Fuel Tank — CHECK QUANTITY / CORRECT FUEL TYPE**
2. **Main Fuel Cap — SECURE**
3. **ELT – Check armed and secure**
4. **Gear Leg and Brake Line — CHECK**
5. **Wheel Pant and Bracket — SECURE**
6. **Brake Pads and Disk — CHECK FOR WEAR**
7. **Tire — CHECK INFLATION and WEAR**
8. **Chock — REMOVE**
9. **Wing Leading Edge — CHECK**
10. **Wing Aux Tank (if installed) – CHECK QUANTITIY / FUEL TYPE**
11. **Wing Aux Tank Cap — SECURE**
12. **Under wing Inspection Ports – SECURE / CHECK CONTINUITY**
13. **Pitot Tube — SECURE - CHECK PITOT / STATIC OPENINGS**
14. **Tie Down Strap — REMOVE**
15. **Wing Tip and Enclosed Lights — CHECK**

EMERGENCY PROCEDURES

PARACHUTE RECOVERY SYSTEM

Slow the Aircraft, If Possible

1. Ignition — OFF
2. Harnesses — TIGHTEN
3. GRS Activation Handle — PULL FIRMLY (25 POUNDS)
4. Radio — SET TO 121.5. TRANSMIT "MAYDAY, MAYDAY, MAYDAY!" with AIRCRAFT ID and CURRENT POSITION
5. Transponder — SET TO 7700
6. Glidepath — CONTROL IF POSSIBLE
7. Impact Position — PULL LIMBS CLOSE TO BODY and COVER FACE

ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF ROLL (ABORT)

1. Throttle — IDLE
2. Brakes — APPLY
3. Wing Flaps — RETRACT

ENGINE FAILURE (LANDING) IMMEDIATELY AFTER TAKEOFF

1. Airspeed — 70 KIAS
2. Wing Flaps — HALF
3. Fuel Valve — OFF
4. Main Switch — OFF

16. Aileron, Tab, and Hinges — CHECK
17. Flap and Hinges — CHECK

AFT FUSELAGE

1. Right Entry Step — SECURE
2. Chute Window and Shroud Lines – FREE FROM INTERFERENCE
3. VHF Antenna — SECURE
4. Aft Tie Down — REMOVE (if installed)
5. Right Horizontal Stabilizer — CHECK
6. Rudder and Tab — CHECK
7. Elevator, Trim Tab, and Hinges — CHECK
8. Tail Cone Control Bolts and Hinges — SECURE / FREE TO MOVE
9. Tail Cone – FREE OF DEBRIS
10. Left Horizontal Stabilizer — CHECK
11. Aft Inspection Cover — SECURE
12. Aft Strobe and Position Light — CHECK
13. Left Entry Step — SECURE

LEFT WING

1. Flap and Hinges — CHECK
2. Aileron and Hinges — CHECK
3. Wing Tip Cover and Enclosed Lights — CHECK
4. Tie Down Strap — REMOVE
5. Wing Leading Edge — CHECK
6. Under Wing Inspection Ports – SECURE / CHECK CONTINUITY
7. Wing Aux Tank (if installed) – CHECK QUANTITY / FUEL TYPE
8. Wing Aux Tank Cap — SECURE
9. Gear Leg and Brake Line — CHECK
10. Wheel Pant and Bracket — SECURE
11. Brake Pads and Disk — CHECK FOR WEAR

ENGINE FAILURE DURING FLIGHT

1. **Airspeed — 70 KIAS**
2. **Fuel Valve — ON**
3. **Aux. Fuel Pump — ON**
4. **Ignition Switches — ON**
5. **Starter — ENGAGE**

FORCED LANDINGS

EMERGENCY LANDING WITHOUT ENGINE POWER

1. **Airspeed — 70 KIAS**
2. **Landing Zone — DETERMINE and FLY TOWARDS**

ENGINE SHUTDOWN:

3. **Aux. Fuel Pump — OFF**
4. **Fuel Valve — OFF**
5. **Radio — SET TO 121.5; TRANSMIT "MAYDAY, MAYDAY, MAYDAY!" and AIRCRAFT ID with CURRENT POSITION**
6. **Transponder — SET TO 7700**
7. **Landing Zone — CIRCLE OVER (if necessary)**

BEFORE LANDING

8. **All Switches — OFF**
9. **Harnesses — TIGHTEN**
10. **Flaps — FULL (on final)**
11. **Touchdown — PREFERABLY INTO WIND, NOSE HIGH**
12. **Brakes — APPLY AS REQUIRED**

StingSport Abbreviated Operational Checklist

12. **Tire — CHECK INFLATION and WEAR**
13. **Chock — REMOVE**

OPERATING CHECKLIST

Board the aircraft

ENGINE START

1. **Canopy — CLOSED and LOCKED**
2. **Harnesses — ADJUST and FASTEN**
3. **Headsets — ON and ADJUST**
4. **All Switches — OFF**
5. **Fuel Valve — ON**
6. **Throttle — IDLE**
7. **Main Switch — ON**
8. **Aux Fuel Pump — MOMENTARILY ON**
9. **Aux Fuel Pump — OFF**
10. **Ignition Switches — ON**
11. **Check Area Visually / Call Out — "CLEAR PROP!"**
12. **Brakes — HOLD**
13. **Choke — AS REQUIRED**
14. **Starter — ENGAGE**
15. **Throttle — 2000 RPM**
16. **Oil Pressure — CHECK**
17. **Choke — CLOSED as engine warms**
18. **Instrument Switch — ON**
19. **Strobe Lights — ON**
20. **Intercom — ON**

PRE-TAXI

1. **Oil Pressure — CHECK**

PRECAUTIONARY LANDING WITH ENGINE POWER

1. **Airspeed — 70 KIAS**
2. **Flaps — HALF**
3. **Harnesses — TIGHTEN**
4. **Selected Field — EXECUTE LOW PASS (only if practical)**
5. **Electrical Equipment — OFF (EXCEPT IGNITION!)**
6. **Flaps — FULL (on final)**
7. **Airspeed — 60 KIAS**
8. **Touchdown — PREFERRABLY INTO WIND, NOSE HIGH**
9. **Canopy — UNLATCH**
10. **Brakes — APPLY AS REQUIRED**

DITCHING – WATER FORCED LANDING

1. **Airspeed — 60 KIAS**
2. **Flaps — FULL**
3. **Radio — SET TO 121.5; TRANSMIT "MAYDAY, MAYDAY, MAYDAY!" and AIRCRAFT ID with CURRENT POSITION**
4. **Transponder — SET TO 7700**
5. **Baggage — SECURE**
6. **Harnesses — TIGHTEN**
7. **Power — ESTABLISH MIN DESCENT RATE AT MIN SPEED**
8. **Approach — INTO WIND with high winds PARALLEL TO SWELLS with light winds**
9. **Canopy — UNLATCH**
10. **Touchdown — NOSE HIGH WITH MINIMUM DESCENT RATE, AVOID STALLING THE AIRCRAFT ON WATER!**
11. **Airplane — EVACUATE**

2. **Transponder — STANDBY**
3. **VHF – ON**
4. **GPS — ON**
5. **Other Avionics — ON**
6. **Turn Coordinator — LEVEL**
7. **Altimeter — SET (note any field elevation variance)**
8. **GRS Safety Pin — REMOVED and STOWED**
9. **Warm-up — AS REQUIRED**

TAXI

1. **Area — CLEAR**
2. **Brakes — CHECK and APPLY AS NEEDED**
3. **Steering — CHECK**
4. **Compass — CHECK**
5. **ADI Track Display — CHECK**
6. **Turn Coordinator — CHECK (in turns)**

ENGINE RUN-UP

1. **Brakes — HOLD**
2. **Oil Temperature — 110°F min.**
3. **Oil Pressure — 29 – 73 PSI**
4. **Cylinder Head Temperature — 110º F min.**
5. **Throttle — 4000 RPM**
6. **Ignition switches — 300 RPM DROP (max), 120 RPM DIFF (max)**
7. **Throttle — 2000 RPM**
8. **Fuel Pressure — CHECK**

BEFORE TAKEOFF

1. **Harnesses — SECURE**

FIRES

ENGINE FIRE DURING START

1. **Starter — CONTINUE CRANKING**

If engine starts:

2. **Power — 2000 RPM for a few seconds**
3. **Fuel Valve — OFF**
4. **Engine — SHUTDOWN and INSPECT FOR DAMAGE**

If engine fails to start:

5. **Throttle — FULL OPEN**
6. **Starter — CONTINUE CRANKING**
7. **Ignition Switches — OFF**
8. **Fuel Valve — OFF**
9. **Main Switch — OFF**
10. **Fire Extinguisher — OBTAIN**
11. **Airplane — EVACUATE**
12. **Fire Extinguisher — USE AS REQUIRED**
13. **Airplane — INSPECT FOR DAMAGE**

ENGINE FIRE IN FLIGHT

1. **Fuel Valve — OFF**
2. **Throttle — FULL OPEN**
3. **Aux. Fuel Pump — OFF**
4. **Ignition Switches — OFF**
5. **Cabin Heat — OFF**
6. **Air Vents — AS REQUIRED**
7. **Radio — SET TO 121.5. TRANSMIT "MAYDAY, MAYDAY, MAYDAY!" AIRCRAFT ID and CURRENT POSITION**
8. **All Non-Essential Switches — OFF**
9. **Airspeed — 60 KIAS**

2. **Loose Items — SECURE**
3. **Instruments — CHECK and SET**
4. **EIS Data — CHECK**
5. **VHF Radio — SET**
6. **Transponder — ON/ALT**
7. **Trim — AFT**
8. **Flaps — HALF**
9. **Controls — FREE and CORRECT MOVEMENT**
10. **Canopy — LOCKED (x3)**
11. **GRS Safety Pin — CHECK REMOVED**
12. **Aux Fuel Pump — AS REQUIRED**

TAKEOFF

1. **Flaps — CHECK (HALF)**
2. **Throttle — FULL**
3. **Rotate — 45 KIAS**
4. **Throttle — MONITOR (5800 RPM maximum)**
5. **Climb — 75 KIAS**
6. **Flaps — RETRACT SMOOTHLY AT 500 AGL**

CLIMB

1. **Throttle — SET TO 5500 RPM (or as required)**
2. **Climb — 75 KIAS**
3. **Trim — ADJUST AS NEEDED**
4. **EIS Data - CHECK**
5. **Aux Fuel Pump — OFF (if used)**

CRUISE

1. **Throttle — 5000 TO 5200 RPM**
2. **Trim — LEVEL FLIGHT**
3. **Fuel Status — MONITOR**

10. **FLAPS - FULL**
11. **Execute a Forced Landing**

ELECTRICAL FIRE IN FLIGHT

1. **Main Switch — OFF**
2. **All Switches Except Ignition Switches — OFF**
3. **Cabin Heat — OFF**
4. **Air Vents — AS REQUIRED**
5. **Fire Extinguisher — USE (if practical)**
6. **Execute an immediate forced landing if fire continues**
7. **Land ASAP**

If fire appears out and electrical power is necessary for extended flight:

8. **Main Switch — OFF**
9. **All Switches Except Ignition Switches — OFF**
10. **Circuit Breakers — CHECK for faulty circuit (do not reset)**
11. **Main Switch — ON**
12. **Instrument Switch — ON**
13. **Avionic/Electrical Switches — ON, ONE AT A TIME to locate fault**
14. **Land ASAP**

CABIN FIRE

1. **Main Switch — OFF**
2. **Cabin Heat — OFF**
3. **Air Vents — AS REQUIRED**
4. **Fire Extinguisher — USE AS REQUIRED**
5. **Execute a forced landing if fire continues**
6. **Land ASAP**

4. **EIS Data — CHECK**

Sea Level Power and Fuel Consumption for Rotax 912 UL Engine

Power Setting %	65	75	100
R.P.M.	4800	5000	5800
Horsepower	50.6	58.4	81.0
Torque (Ft * lbs)	55.3	61.2	72.3
Fuel Consumption (GpH)	4.2	5.1	6.3

Fig. 4.1

BEFORE LANDING

1. **Harnesses — SECURE**
2. **Airspeed — 75 KIAS**
3. **Fuel — CHECK QUANTITY**
4. **Secure Loose Items**
5. **Aux Fuel Pump – AS REQUIRED**

LANDING

On downwind leg:

1. **Throttle — SMOOTHLY TO IDLE**
2. **Airspeed — 75 KIAS**
3. **Flaps — HALF**

On base leg:

4. **Airspeed — 60 KIAS**
5. **Trim — ADJUST TO AFT**

On final approach:

6. **Airspeed — 60 KIAS**
7. **Flaps — FULL**
8. **Trim — AFT AS REQUIRED**
9. **Throttle – IDLE (or as required)**
10. **Airspeed — 55 KIAS (on short final)**
11. **Touchdown — MAIN WHEELS FIRST, NOSE HIGH**
12. **Braking — MINIMUM**

SPIN RECOVERY

1. **Throttle — IDLE**
2. **Ailerons — NEUTRALIZE**
3. **Rudder — APPLY FULL (in opposite direction of rotation)**
4. **Elevator — FORWARD (to break stall)**

When rotation stops:

5. **Rudder — NEUTRALIZE**
6. **Elevator — RECOVER SMOOTHLY FROM NOSE-LOW ATTITUDE**

StingSport Abbreviated Operational Checklist

BALKED (GO-AROUND) LANDING

1. **Throttle — FULL**
2. **Flaps — SET TO HALF**
3. **Airspeed — 50 KTS, V_X**
4. **Flaps — RETRACT WHEN CLEAR OF OBSTACLES**
5. **Airspeed — 60 KTS, V_Y**

AFTER LANDING

1. **Flaps — UP**
2. **Aux Fuel Pump — OFF (if used)**
3. **Transponder — STANDBY**

SHUTDOWN

1. **Throttle – IDLE**
2. **GPS – OFF**
3. **Transponder – OFF**
4. **Other Avionics — OFF**
5. **Strobes – OFF**
6. **Instrument Switch — OFF**
7. **Main Switch — OFF**
8. **Ignition Switches – OFF (one at a time)**
9. **Fuel Valve — CLOSED (horizontal)**
10. **GRS Safety Pin — INSERT**
11. **Canopy — OPEN**