

Sonex Aircraft, LLC

883



Pilot's Operating Handbook

04/01/2015

Pilot's Operating Handbook

Make: Rui Sereno
Model: Sonex
Serial Number: 883

Owner Information

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I. Introduction and Description

The Sonex is a high-performance, homebuilt aircraft. Its compact external size and extremely efficient design results in superb performance and unequaled fuel economy using a relatively low horsepower engine. Pitch control is provided by elevators mounted on the horizontal stabilizer. Roll capability is provided by ailerons on the outboard portion of the main wing. Yaw control is provided by a rudder mounted on the vertical stabilizer, and is actuated by conventional rudder pedals. The pitch and roll capability is provided by conventional dual control sticks located at each seat.

Steering is provided by front wheel steering, providing exceptional control at all times while on the ground. Even though the Sonex has relatively low horsepower, it can outperform many general aviation aircraft while retaining unequaled fuel economy. Typical cruise speed is 130 mph, burning under 4 gallons per hour, yielding fuel economy in excess of 30 miles per gallon.

The structure of the Sonex is almost entirely 6061T6 aluminum, yielding a design that is easy to construct, conventional to maintain, and resistant the effects of weather and corrosion.

The engine that powers the Sonex is an Rotax 912S aircraft engine, produced by Rotax.

Ventilation and Heating

Fresh air ventilation is provided by NACA scoops on the forward fuselage sides. These scoops feed into rotating eyeball vents mounted in the corners of the instrument panel. The flow of air can be directed and controlled by adjusting the vent opening. No cabin heat is installed.

Landing Gear

The main landing gear legs are 1 1/8" titanium rod. Due to the mechanical properties of titanium, the Sonex gear is extremely robust, yet forgiving. The titanium gear legs will bend gently under landing loads, then rebound slowly without springing the aircraft back into the air. Steering is accomplished through a direct linkage to the rudder and front wheel, resulting in very accurate and positive directional control while taxiing, and during takeoff and landing.

Baggage Compartment

A baggage compartment is provided aft of the occupants heads. The baggage limit is 40 pounds. Depending on the pilot, passenger, and fuel to be carried, baggage may have to be limited because of gross weight or center-of-gravity (c. of g.) limits.

Flight Controls

Pitch and roll control is actuated by dual control sticks located between the pilot's and passenger's legs. The rudder pedals are conventional. All flight controls including the flaps are pushrod actuated.

An in-flight cockpit adjustable pitch trim system is provided. It works by adjusting a movable control tab mounted on the left elevator half. The trim system is completely independent of the normal pitch control system, thus providing back-up pitch control system in the event of a primary control problem. The primary pitch control system (i.e. the stick) can override any position of the trim system.

Engine Cowling

The cowling is split into upper and lower sections. To remove the cowling, loosen the 1/4 turn SouthCo fasteners along the upper part to separate it. Next, remove the lateral piano hinge pins, thereby separating the lower cowling sections.

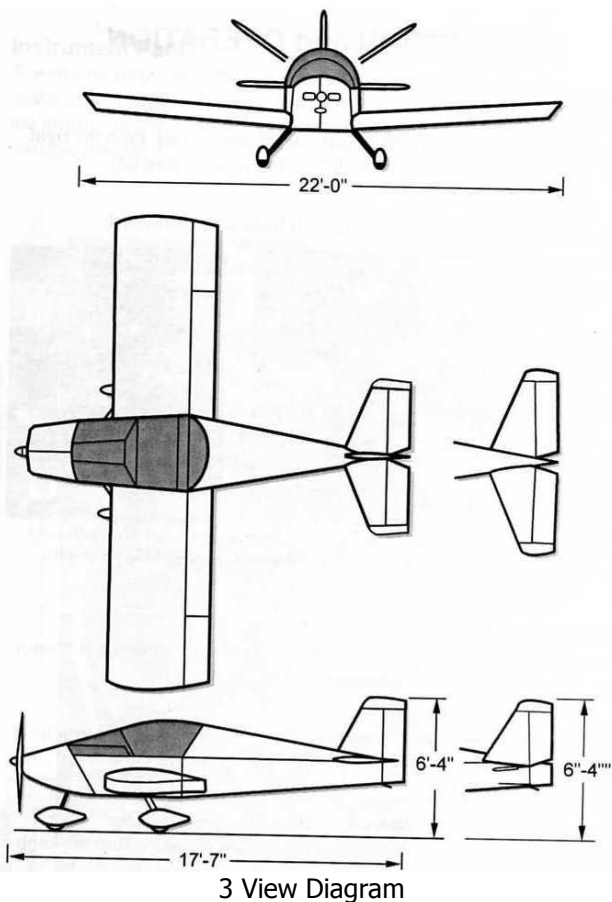
Brakes

The braking system consists of two hydraulic brakes one for each wheel dependent of a hydraulic pump actuated by an aluminium lever in along the left hand cockpit sidewall.

Fuel System

The 17 gallon main fuel tank is located just aft of the firewall above the occupant's legs. The unusable fuel quantity is less than ½ gallon. The engine is gravity fed with a fuel shutoff valve located inside the cockpit at the tank outlet. It consists of a brass ¼ turn ball valve. The valve is closed by rotating the handle perpendicular to the valve body. The fuel tank has a capacitance fuel probe installed to measure fuel quantity. The fuel gauge should be checked while in level, balanced flight to avoid inaccurate fuel quantity measurements. The fuel filler cap is provided on the upper forward fuselage, accessible from the outside of the aircraft. Approved fuels include 98 octane automotive fuel and 100LL aviation fuel.

II. Aircraft Specifications



Exterior Dimensions

Span:	22 ft
Length:	17 ft, 7 in
Height:	4 ft, 4 in
Wing Area:	98 sq ft

Weights

Empty Weight:	271Kg
Gross Weight:	450Kg
Useful Load:	179KG
Fuel (17 gal):	43Kg
Max Baggage:	18,14Kg

CG Limitations

Datum	125,0cm from wing leading edge
Mean Aerodynamic Cord:	137,16cm
Forward CG Limit:	152,432 (20% MAC)
Aft CG Limit:	168,89 (32% MAC)

Loadings

Wing Loading:	494,5gr/dm ²
Load Factor Limit	
- 850 lbs	+6.0, -3.0
- 1200 lbs	+4.0, -2.0

Powerplant

Engine:	Rotax 912S
Prop:	<u>Neuform (Two Blade)</u>

Control Surface Deflections

Ailerons	20° up, 12° down
Flaps	0°, 10°, 30°
Rudder	25° right and left
Elevator	25° up, 20° down
Elevator Trim Tab	30° up, 30° dow

Engine Information

Specifications

Model:	Rotax 912S
Serial #:	4427777
Carburetor:	Bing x2
Type:	4 cylinder, 4 stroke, horizontally opposed, normally aspirated

Cooling:	Air and water cooled, with external oil and water cooler
Weight (complete, less oil)	58,3Kg
Rated HP:	100
Maximum RPM:	5800(5min.)
Cruise RPM:	4500
Idle RPM:	1400
Bore:	84mm
Stroke:	61mm
Compression Ratio:	10,5:1

Fuel

Approved Fuel Grades:	98 octane unleaded 100LL Avgas
Total Fuel Capacity:	60 l

Operating Conditions

Oil Temp:	90°:110° 130° Max
Oil Pressure (bar):	2,0:5:0 7,0 Max 0,8 Min
Fuel Pressure (bar):	0:15 Min, 0,4 Max
Cylinder Head Temp:	135° Max
Exhaust Gas Temp:	880° max

Airspeed Limitations

	Speed	IAS	Remarks
V_{NE}	Never Exceed Speed	197 MPH	Do not exceed this speed in any operations
V_{NO}	Maximum Structural Cruising Speed	125 MPH	Exceed this speed only in smooth air
V_A	Maneuvering Speed	125 MPH	Do not make full control movements above this speed. Full elevator deflection will result in a 6 G load at this speed
V_{FE}	Maximum Flap Extended Speed	100 MPH	Do not exceed this speed with flaps down
V_y	Best Rate of Climb	85 MPH	
V_x	Best Angle of Climb	75 MPH	
V_S	Stall Speed Clean	46 MPH	
V_{SO}	Stall Speed Landing Configuration	40 MPH	

Airspeed Indicator Markings

Marking	Value / Range	Significance
White Arc	40–100 MPH	Full Flap Operating Range. Lower limit is V _{SO} . Upper Limit is maximum speed with flaps extended.
Green Arc	46–125 MPH	Normal Operating Range. Lower limit is V _S . Upper limit is maximum structural cruising speed.
Yellow Arc	125–197 MPH	Operations must be conducted with caution and only in smooth air.
Red Line	197 MPH	Maximum speed for all operations.

III. Performance

Speed – Solo Weight

Top Speed	150 MPH
Cruise 75% power @ 8000 ft:	130 MPH
Stall Speed:	40 MPH

Speed – Gross Weight

Top Speed	150 MPH
Cruise – 75% power @ 8000 ft:	130 MPH
Stall Speed:	40 MPH

Ground Performance – Solo Weight

Takeoff Distance:	500 ft
Landing Distance:	450 ft

Ground Performance – Gross Weight

Takeoff Distance:	850 ft
Landing Distance:	650 ft

Climb / Ceiling – Solo Weight

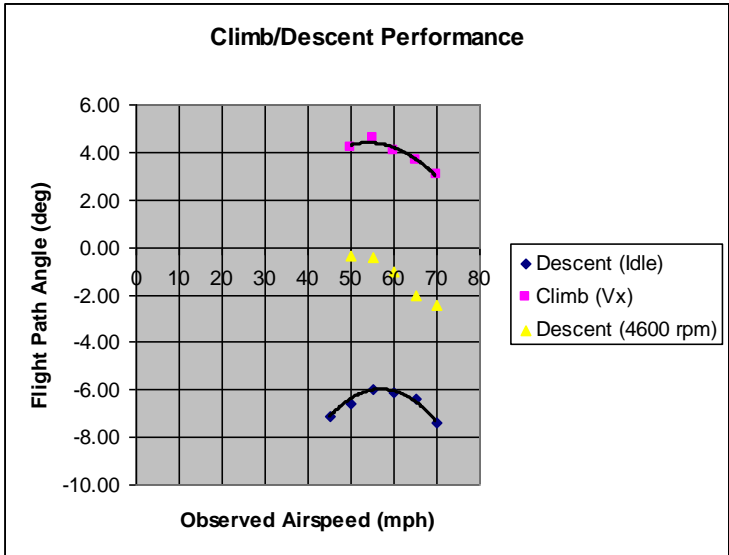
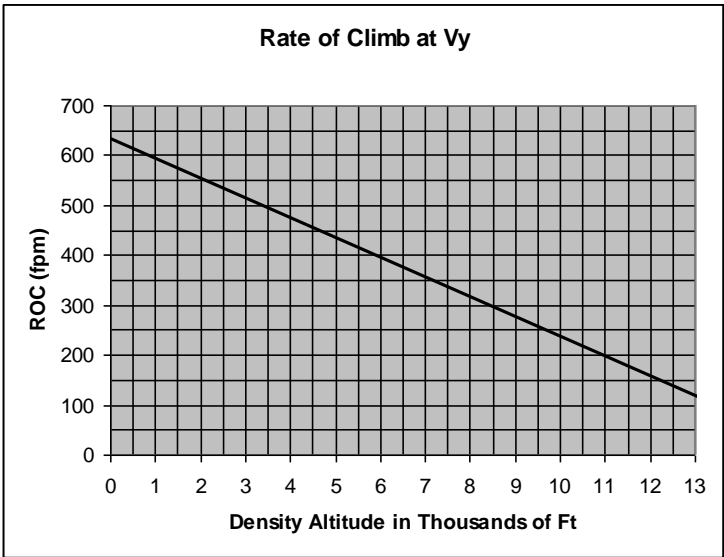
Rate of Climb:	900 fpm
Ceiling:	12500ft

Climb / Ceiling – Gross Weight

Rate of Climb:	750 fpm
Ceiling:	12500 ft

Endurance





Fuel Quantity:	60l
Fuel Consumption: 100%	27l
Fuel Consumption: 75%	18,5

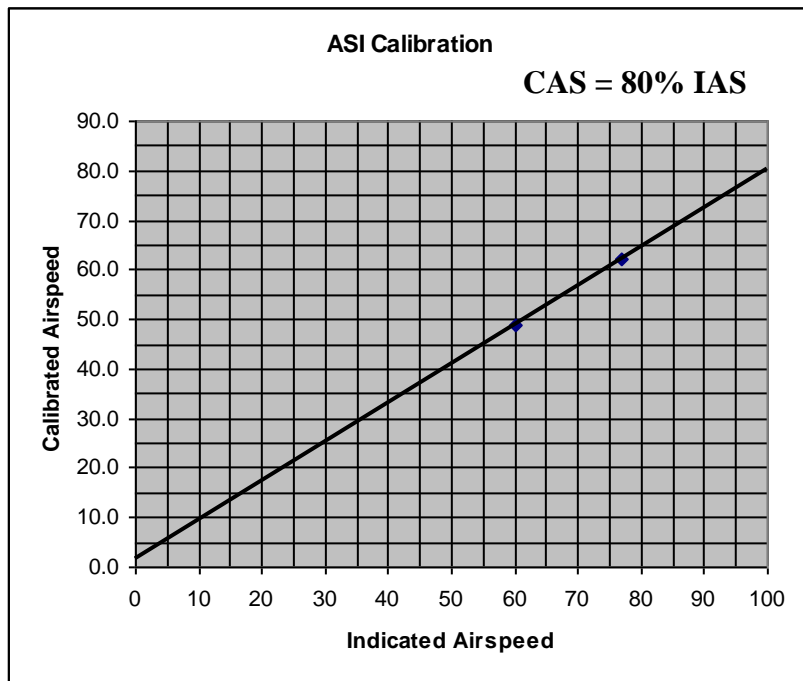


Range: 75% @ 8000 ft:

674K_m

STALL SPEEDS - POWER OFF, MPH IAS

Gross Wt. Condition	Angle of Bank			
	 0°	 20°	 40°	 60°
1200 lbs				
0° Flaps	40	40	40	40
10° Flaps	40	40	40	40
30° Flaps	40	40	40	40



TAKE OFF DISTANCE

Elevation and Temperature	IAS MPH	Ground Run Feet	To Clear 50 ft Obstacle (Feet)
Sea Level @ 59° F			
2500 ft @ 50° F			
5000 ft @ 41° F			

1. Figures for clean, level, hard surface runway.
2. Takeoff Weight: 450Kg
3. Full Throttle
4. Increase distance 10% for each 35° F increase in temperature above standard day temperature.
5. For operation on dry grass runway, increase distance by 7%

LANDING DISTANCE

Elevation and Temperature	IAS MPH	Ground Run Feet	To Clear 50 ft Obstacle (Feet)
Sea Level @ 59° F			
2500 ft @ 50° F			
5000 ft @ 41° F			

1. Figures for full flap, no wind conditions, on clean, level, hard surface runway.
2. Landing Weight: 450Kg
3. Decrease distance by 10% for each 4 knots of head wind.
4. Increase distance 10% for each 35° F increase in temperature above standard day temperature.
5. For operation on dry grass runway, increase distance by 7%

CRUISE PERFORMANCE (Full Fuel 60lt)

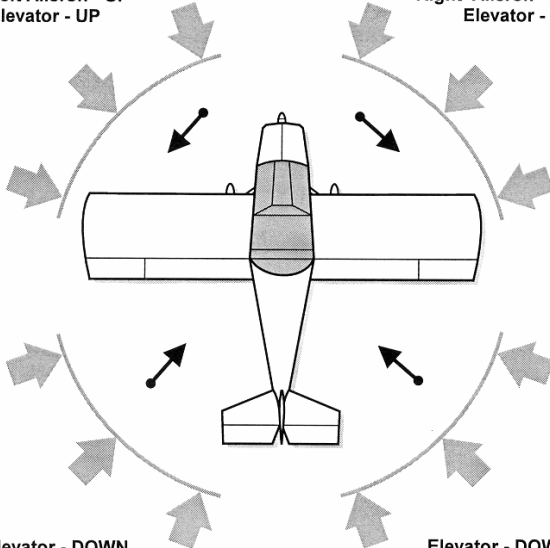
Altitude (Feet)	RPM	% BHP	TAS (MPH)	Fuel Flow (GPH)	Endurance (Hours)	Range (Miles)
2500	3400					
	3300					
	3200					
	3100					
	3000					
	2900					
	2800					
5000	3400					
	3300					
	3200					
	3100					
	3000					
	2900					
	2800					

1. Maximum Cruise is normally limited to 75% power.
2. Endurance and Range are for no-wind conditions.
3. Figures do not include take off, landing, or reserve.

CONTROL POSITIONS while TAXIING

Left Aileron - UP
Elevator - UP

Right Aileron - UP
Elevator - UP




Elevator - DOWN
Left Aileron - DOWN

Elevator - DOWN
Right Aileron - DOWN

KEY:

 Wind Direction

 Position of Stick (Top View)
Arrow represents top of stick

IV. Weight and Balance

Weight and Balance

Datum: Front Tip of spinner

Datum: 1250mm from Wing Leading edge

Maximum gross weight: 449,8 Kg

Empty Weight CG

Empty Weight Weighing Point	Weight(Kg)	Arm(cm)	WtxArm Moment
Right main	109	185,0	20165,0
Left main	105	185,0	19425,0
Nose	57	53,0	3021,0
Total	271		42611,0
Moment/Weight= Empty Weight CG(cm)			157,2

Forward CG Limit: 157,1

152,432 = 20% MAC

Aft CG Limit: 167,4

168,891= 32% MAC

Take off Max Weight,(ULM Cat)

Item	Weight(Kg)	Arm(cm)	Moment
Aircraft empty	271	157,2	42611,0
Pilot	75	185,7	13926,0
Passenger	75	185,7	13926,0
Fuel(40 l)	28,8	106,6	3068,8
Baggage	0	249,4	0,0
Total	449,8		73531,8
		Most Aft CG	163,5
		% MAC	28,1
		Limit	168,891

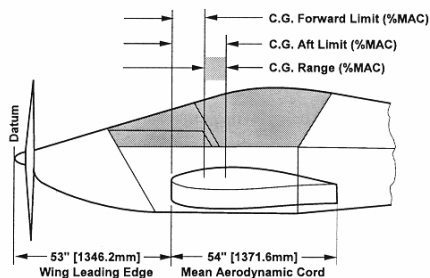
Most Adverse AFT CG (ULM Cat)

Item	Weight(Kg)	Arm(cm)	Moment
Aircraft empty	271	157,2	42611,0
Pilot	75	185,7	13926,0
Passenger	75	185,7	13926,0
Fuel(0 l)	0	106,6	0,0
Baggage	0	249,4	0,0
Total	421,0		70463,0
		Most Aft CG	167,37
		% MAC	30,9
		Limit	168,891

Most adverse For CG (ULM Cat)

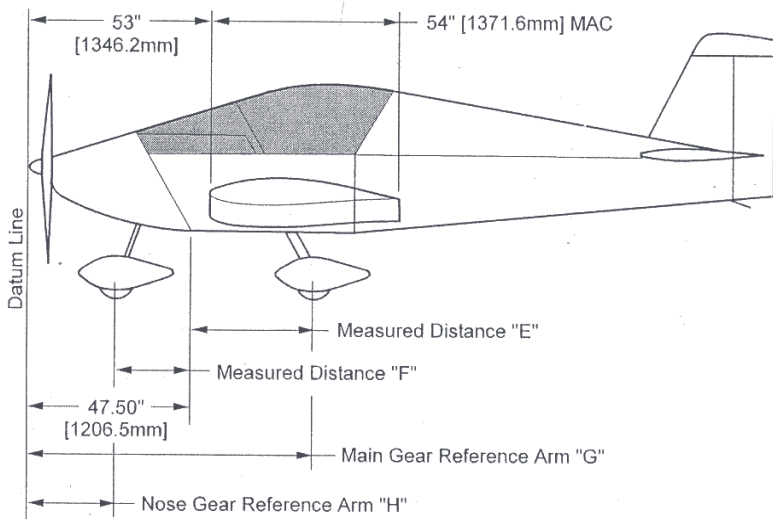
Item	Weight(Kg)	Arm(cm)	Moment
Aircraft empty	271	157,2	42611,0
Pilot	75	185,7	13926,0
Passenger			0,0
Fuel(60 l)	43	106,6	4603,2
Baggage	0	249,4	0,0
Total	389		61140,2
		Most Aft CG	157,17
		% MAC	23,4
		Limit	152,432

ALLOWABLE CENTER OF GRAVITY RANGE



	Utility Category	Aerobatic Category
Maximum Forward C.G.	20% MAC	23% MAC
Maximum Aft C.G.	32% MAC	29% MAC

ARM DIAGRAM - TRICYCLE GEAR



Datum = Tip of Spinner

Measured Distance "E" = 74cm
Measured Distance "F" = 58cm
Main gear reference Arm "G" = 185cm
Main Wheel reference Arm "H" = 53cm
Right and Main Gear weight = 109Kg
Left hand Main Gear weight = 105Kg
Nose Wheel weight = 57 Kg

Blank Weight and Balance Worksheet

The following table can be used to determine the aircraft's weight and center of gravity for any loading situation. Complete the weight column in the table below using the fuel, baggage, and pilot/passenger weights for the situation being considered. Next, using the moment charts on the following pages, record the appropriate moments into the table. Use the Total Weight and Total Moment from the table to find the aircraft's loaded center of gravity using the Allowable Weight and Balance chart.

Item	Weight (Kg)	Arm (cm)	Moment (Kg*cm)
Aircraft, Empty	271	157,2	42611
Fuel		106,6	
Baggage		249,4	
Pilot & Passenger		185,7	
Total		---	

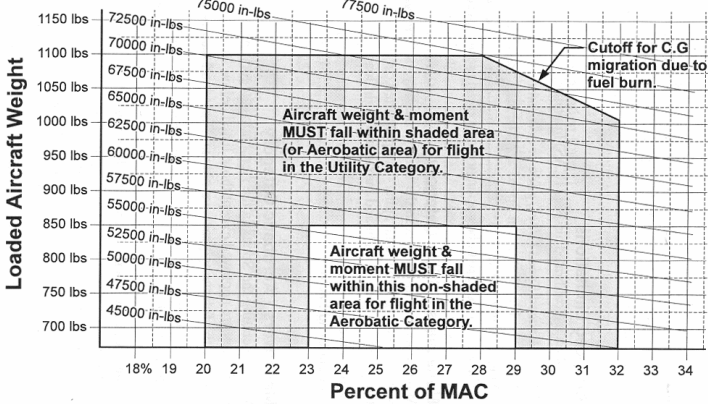
$$\text{CG (cm)} = \frac{\text{Total Moment}}{\text{Total Weight}} = \begin{array}{|c|} \hline \\ \hline \\ \hline \end{array}$$

$$\text{CG (cm)} = \underline{\hspace{10cm}}$$

Safe to Fly? YES / NO

ALLOWABLE WEIGHT & BALANCE

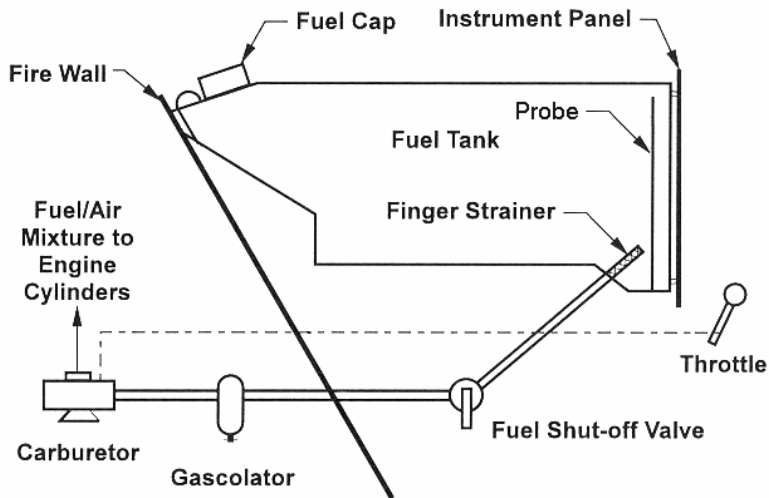
Fuselage Station: 63" 64" 65" 66" 67" 68" 69" 70" 71"



V. Systems

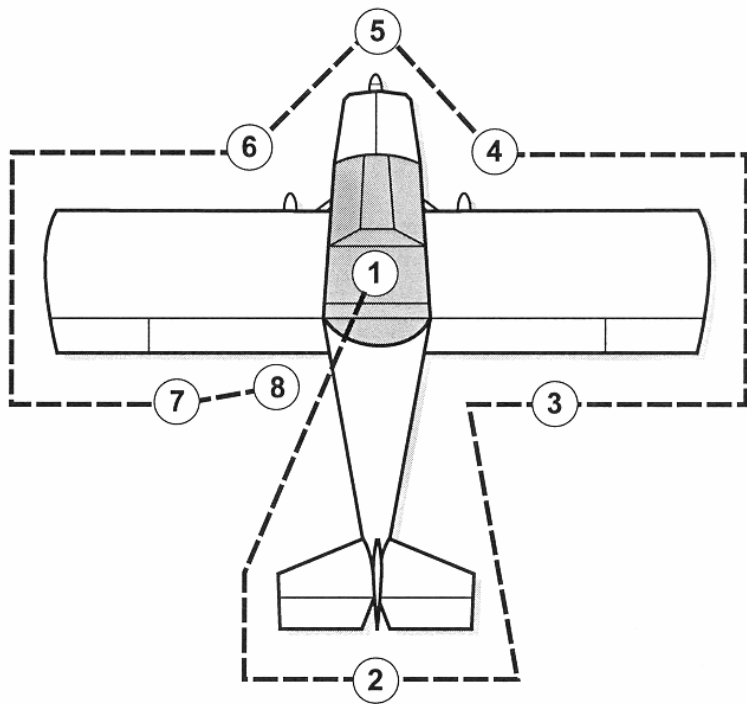
Fuel System Diagram

FUEL SYSTEM SCHEMATIC



VI. Pre-Flight Inspection / Checklist

WALK AROUND INSPECTION



1. CABIN

- AROW
- Aeronautical Charts – **CURRENT & APPROPRIATE**
- Seat Belt Securing Control Stick - **RELEASE**
- Ignition Switch – **OFF**
- Battery – Alternator Switch – **BAT**
- Fuel Gauge – **CHECK** quantity
- Flight Instruments – **SET**
- Flaps – **DOWN**

2. EMPENNAGE

- Control Surfaces – **CHECK** for movement & security
- Empennage Fairing – **CHECK** for security
- Elevator Trim – **CHECK** for movement & security
- Rudder Cables – **CHECK** for security

3. RIGHT WING

- Aileron – **CHECK** for movement & security
- Flap – **CHECK** for security

4. RIGHT FRONT

- Wing Tie-Down – **REMOVE**
- Wheel Chock – **REMOVE**
- Pitot/Static Tube – **REMOVE** cover – **CHECK** for obstruction
- Main Wheel Tire – **CHECK** for proper inflation

5. NOSE

- Engine Oil Level – **CHECK**
- Propeller & Spinner – **CHECK** for security & condition
- Cowl Hinge Pins – **CHECK** for security
- Cooling Inlets – **CHECK** for obstructions
- Fuel Tank – **CHECK** for quantity
- Fuel Tank Cap – **CHECK** for security
- Fuel Tank Vent – **CHECK** for obstruction
- Gascolator Sump – **DRAIN** sump 4 seconds
- Exhaust – **CHECK** for security

6. LEFT FRONT

- Wing Tie-Down – **REMOVE**
- Wheel Chock – **REMOVE**
- Main Wheel Tire – **CHECK** for proper inflation
- Gear Leg Fairing – **CHECK** for security

7. LEFT WING

- Aileron – **CHECK** for movement & security
- Flap – **CHECK** for security

8. COCKPIT

- Canopy – **CHECK** for condition
- Canopy Latch – **CHECK** for operation and security

VII. Normal Procedures

BEFORE STARTING ENGINE

- Preflight Inspection – **COMPLETE**
- Passenger Briefing – **COMPLETE**
- Seat Belts & Shoulder Harnesses – **ADJUST & LOCK**
- Fuel Shutoff Valve – **ON**

STARTING ENGINE

- Master-**On**
- Instruments-**ON**
- Throttle – “**CRACKED**” **OPEN** approx. ¼”
- Flaps – **UP**
- Shock -**ON**
- Brakes – **ENGAGED** to “park”
- Propeller Area – **CLEAR**
- Ignition Switch – **START**
- EIS – **CHECK** for alerts

BEFORE TAKE-OFF

- Fuel Shutoff Valve – **ON**
- Flight Controls – **FREE & CORRECT**
- Elevator – **BACK**
- Throttle – **3000 RPM**
- Engine Run-up - **CHECK MAGS** – 100 RPM drop on each
- Flight Instruments – **SET**
- Engine Instruments – **CHECK**
- Radio – **SET**
- Seat Belts – **ADJUST & LOCKED**
- Canopy – **CLOSED & LATCHED**
- Fuel pump -**On**

NORMAL TAKE-OFF

- Brakes – **HOLD**
- Throttle – **FULL OPEN**
- Brakes – **RELEASE**
- Climb Speed - 80 MPH

MAXIMUM PERFORMANCE TAKE-OFF

- Throttle – **FULL OPEN**
- Elevator – **LIFT TAIL**
- Airspeed – **ROTATE** at 60 MPH*
* 65 MPH with 2 people on board
- Climb Speed - 85 MPH

CRUISE CLIMB

- Airspeed – **100-110 MPH**
- Throttle – **5400 RMP** or full throttle
- Engine Instruments – **MONITOR** Temperatures

CRUISE

- Throttle – **4500 RPM**
- Trim – **ADJUST**

BEFORE LANDING

- Airspeed – **REDUCE** to 100 MPH or less
- Fuel pump-**ON**
- Flaps – **AS DESIRED**
- Airspeed – 70 MPH*
- Throttle – **AS NEEDED** to maintain 70 MPH*
* 78 MPH with 2 people on board

BALKED LANDING (GO AROUND)

- Throttle – **FULL OPEN**
- Flaps – **RETRACT** slowly
- Climb Speed - 85 MPH
- Climb out and reenter traffic pattern

NORMAL LANDING

- Throttle – **CLOSED**
- Flaps – **AS NEEDED**
- Touchdown – Main wheels first
- Landing Roll – Maintain straight line down runway
- Brakes – Minimum required

AFTER LANDING

- Flaps – **UP**
- Fuel pump-**OFF**
- Taxi – At slow walking speed, observe other traffic

ENGINE SHUTDOWN

- Throttle – **1400RPM**
 - MAGS – **CHECK** for cut-off
- After Engine Stops**
- MAGS – **OFF**
 - Fuel Shutoff Valve – **OFF**
 - Instruments – **OFF**
 - Master-**OFF**

SECURE AIRCRAFT

- Brakes – **SET**
- Fuel Shutoff Valve – **CHECK OFF**
- Pitot Tube – **INSTALL COVER** as required
- Cockpit – **CLEAN & SECURE**
- Master & MAG Switches – **CHECK OFF**
- Canopy – **LATCHED AND LOCKED**
- Wheel Chocks – **INSTALL** as required
- Wing & Tie-Downs – **INSTALL** as required

VIII. EMERGENCY PROCEDURES

POWER LOSS ON TAKEOFF

- Stick – **FORWARD**
- Airspeed – **70 MPH**
- Throttle – **CLOSE**
- Fuel Valve – **OFF**
- Master & MAG Switches – **OFF**
- Flaps – **AS REQUIRED**
- Land and/or Stop Straight Ahead
- Brakes – **AS REQUIRED**

POWER LOSS IN FLIGHT

- **TRIM FOR BEST GLIDE – 70 MPH**
- Note Wind Direction & Velocity
- **PICK A LANDING SPOT**
- Fuel Valve – **ON**
- **MAGS – ON**
- Master – **ON**
- Engine – **CHECK EIS**
- **If Power Not Restored & Time Permits**
- Maintain Best Glide – **70 MPH**
- Fuel Selector – **OFF**
- Master – **OFF**
- Flaps – **AS NEEDED**
- Canopy – **UNLATCH**
- Seat Belts & Shoulder Harnesses – **PULLED TIGHT**
- Land Tail Low

OIL PRESSURE LOSS

- Locate Suitable Landing Site & Land ASAP
- Prepare For Off Field Landing If Necessary

HIGH OIL TEMPERATURE

- Reduce Power
- Increase Airspeed
- Observe Trend

If Oil Temperature Cannot Be Stabilized

- Locate Suitable Landing Site & Land ASAP
- Prepare For Off Field Landing If Necessary

ENGINE FIRE DURING START-UP

- Throttle – **FULLY OPEN**
- Starter – **CRANK**
- Mixture – **IDLE CUT-OFF**
- Fuel Selector – **OFF**
- Master and MAG Switches – **OFF**

ENGINE FIRE IN FLIGHT

- Throttle – **CLOSED**
- Fuel Selector – **ON**
- Master & MAG Switches – **OFF**
- Locate Suitable Landing Site & Land ASAP

IX. SERVICING REQUIREMENTS

Exterior Care

Sonex 883 is painted with Meyer Coatings urethane paint system. The exterior coat is Loehle urethane clear coat. The paint may be washed with mild soap and waxed with automotive waxes as desired.

Windshield and Canopy Care

The windshield and canopy are standard Plexiglass acrylic. Care must be taken to keep the plexiglass clean and unscratched. Flush away grit with water to prevent scratching, then wash with water with mild detergent or commercial plexiglass cleaner, such as Novus or Plexus. Never use benzene, gasoline, alcohol, acetone, carbon tetrachloride, lacquer thinner or glass cleaner to clean plastic. These materials will damage the plastic and may cause severe crazing.

Brakes

Sonex 883 uses hydraulic brakes, and machined aftermarket disks, purchased locally.

Pads should be checked for wear annually. Normal brake pad life is estimated at 500 hours.

Propeller

The two blade Neuform is a composite propeller. It is extremely durable, and resistant to corrosion and damage. Re-torque propeller bolts every 100 flight hours, or with drastic seasonal changes. Place the propeller in a horizontal position when not in use. Routine cleaning can be accomplished with mild detergents.

Tires

Cheng Shin 11-400x5 8-ply tires and tubes are used. Tires should be replaced when the remaining tread depth reaches 1/16". Inflate tires to a pressure of 50 PSI. Use of higher tire pressures is not recommended due to loss of shock absorption and increased wear of the tires. Clean and repack the main wheel bearings after the first 100 hours, then every 200 hours thereafter.

Fuel and Oil Requirements

The engine is rated for 98 Octane unleaded Automotive fuel. Aviation grade 100LL fuels may also be used. . Automotive regular unleaded gasoline is preferable to 100LL for engine operation.

Use Oil accordingly the engine manufacturer recommendations. Oil change is recommended every 100 hours of operation. Otherwise follow the maintenance manual for Rotax 912S.

The aircraft is equipped with a fuel gascolator attached to the bottom of the firewall. Inside the gascolator is a fine-mesh wire screen designed to filter out debris and contaminants. This screen should be inspected and cleaned every 100 hours, or annually. Replace screen as needed.

Spark Plugs

Spark plugs should be replaced every 100 hours.

Carburetor Air Filter

Inspect and clean air filters at 100, 200, and 600 hours.

X. Equipment List

Engine: **Rotax 912S**

SN: 4427777

Propeller: **Neuform(Two Blade)**

SN: 14938061934/14938060934

Hub S/N: 081

Color: Red

Engine Info System: **Stratomaster Ultra Horizon XL**

SN:XL020600138

Airspeed Indicator: **Winter**

58 mm diaASI, 20-200MPH

SN: 35865

Altimeter: **Winter**

20,000 ft,

58mm dia.

SN: 16277

Variometer: **Winter**

SN A4653

Compass: **Compab airpath 2400**

SN35241

Comm: **XCOM-760**

SN 1903

Transponder: **Beecker-ATC 4401**

SN 2206

