Pilot Operating Handbook (POH)

Aircraft Operating Instructions (AOI)

ASTM Compliant Flight Manual

Ramphos Trident S

Revision 01

Part Type	Model	Serial Number
Carriage	Ramphos Trident S	
Wing	HZ15S	
Engine	Rotax 582UL/912UL Smart M160/1	
Propeller	Kiev Models 163/165/273/275 Bolly series 3	
Registration Number		

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Amendments:

Date Of Ammendment	Sections Affected	Pages Affected	Date Inserted	Signature
Revision 01 09/01/07	ALL	ALL		

List of Effective Pages

Pg.1 Rev. 01 09/01/07	**Pg.16 Rev. 01 09/01/07**	**Pg.31Rev. 01 09/01/07**	**Pg.46Rev. 01 09/01/07**	**Pg.60 Rev. 01 09/01/07**	**Pg.75 Rev. 01 09/01/07**
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NOTE

Manuals can be revised in the future and pages and/or sections re-issued. Amendments will also be available on the website www.ramphosusa.com amended pages and/or sections should be printed and replaced in the manual at the earliest possible time for safety of flight. The amendment should be logged and recorded in the table above by the owner.

Operator's Responsibility:

WARNING

THERE ARE INHERENT RISKS IN THE PARTICIPATION IN RECREATIONAL AVIATION AIRCRAFT. OPERATORS AND PASSENGERS OF RECREATIONAL AIRCRAFT, BY PARTICIPATION, ACCEPT THE RISK INHERENT IN SUCH PARTICIPATION ON WHICH THE ORDINARY PRUDENT PERSON IS OR SHOULD BE AWARE. PILOTS AND PASSENGERS HAVE A DUTY TO EXERCISE GOOD JUDGEMENT AND ACT IN A RESPONSIBLE MANNER WHILE USING THE AIRCRAFT AND TO OBEY ALL ORAL OR WRITTEN WARNINGS, OR BOTH, PRIOR TO OR DURING USE OF THE AIRCRAFT, OR BOTH.

THE OWNER AND OPERATOR MUST UNDERSTAND THAT DUE TO INHERENT RISK INVOLVED IN FLYING AN AIRCRAFT, NO WARRANTY IS MADE OR IMPLIED, OF ANY KIND, AGAINST ACCIDENTS, BODILY INJURY OR DEATH OTHER THAN THOSE, WHICH CANNOT BY LAW BE EXCLUDED.

THE SAFE OPERATION OF THIS AIRCRAFT RESTS WITH YOU, THE PILOT. WE BELIEVE THAT IN ORDER TO FLY SAFELY YOU MUST MATURELY PRACTICE AIRMANSHIP. OPERATIONS OUTSIDE THE RECOMMENDED FLIGHT ENVELOPE SUCH AS AEROBATIC MANOEUVRES OR ERRATIC PILOT TECHNIQUE MAY ULTIMATELY PRODUCE EQUIPMENT FAILURE. YOU ARE REFERRED TO THE OPERATING LIMITATIONS IN THIS MANUAL.

LIKE ANY AIRCRAFT, SAFETY DEPENDS ON A COMBINATION OF CAREFUL MAINTENANCE AND YOUR ABILITY TO FLY INTELLIGENTLY AND CONSERVATIVELY. WE HOPE THAT YOUR AIRCRAFT WILL PROVIDE YOU WITH MANY HOURS OF SAFE AND ENJOYABLE FLYING.

THIS AIRCRAFT WAS MANUFACTURED IN ACCORDANCE WITH LIGHT SPORT AIRCRAFT AIRWORTHINESS STANDARDS AND DOES NOT CONFORM TO STANDARD CATEGORY AIRWORTHINESS REQUIRMENTS

This aircraft is to be operated in compliance with the information and limitations contained herein.

Table of Contents

1 GENERAL

This Pilot Operating Handbook (POH) is designed for maximum utilization as an operating guide for the pilot. It includes the material required by the regulations to be furnished to the pilot. It also contains supplemental data supplied by the aircraft manufacturer.

This Pilot Operating Handbook is not designed as a substitute for adequate and competent flight instruction, knowledge of current airworthiness directives, applicable air regulations or advisory circulars. It is not intended to be a guide for basic flight instruction or a training manual and should not be used for operational purposes unless kept in a current status.

Assurance that the aircraft is in an air worthy condition is the responsibility of the owner. The pilot in command is responsible for determining that the aircraft is safe for flight. The pilot is also responsible for remaining within the operating limitations as outlined by instrument markings, placards, and this Pilot Operating Handbook.

Although the arrangement of this Pilot Operating Handbook is intended to maximize its in-flight capabilities, it should not be used solely as an occasional operating reference. The pilot should study the entire Pilot Operating Handbook to become familiar with the limitations, performance, normal and emergency procedures and operational handling characteristics of the aircraft before flight.

The Pilot Operating Handbook has been divided into numbered (Arabic) sections. The limitations and emergency procedures have been placed ahead of the normal procedures, performance and other sections to provide easier access to information that may be required in flight. The "Emergency Procedures" Section is quickly available, to present an instant reference. Provisions for expansion and/or updates to this Pilot Operating Handbook (POH) have been made.

Before flying the aircraft, read and familiarize yourself with this POH, the Engine Operators Manual and Maintenance Manual.

WARNING
RamphosUSA Inc. aircraft manuals may be revised in the future and safety directives may be issued for the aircraft. Hence, it is imperative that owners register their aircraft with RamphosUSA Inc. and promptly notify RamphosUSA Inc. of any changes to their contact details. Owners registered on RamphosUSA Inc. database will be notified of safety directives and directed to RamphosUSA Inc. web site (http://www.ramphosusa.com) for the applicable information. It is owner's responsibility to keep abreast of all safety of flight issues for the aircraft. It is required that the owner checks this website for updates and notices and acts accordingly.

1.1 Introduction

The Ramphos Trident has been designed and manufactured in accordance with the design standard specified by the ASTM consensus standards body for weight shift control aircraft. The design equirements that this aircraft complies with or exceeds are detailed in ASTM document **F 2317/F 2317M.** This manual follows the product information required and format listed under ASTM standard **F 2457**.

> **WARNING**
> **The operator must be thoroughly familiar with the aircraft and the contents of this manual before initial operation**.

Regular maintenance is required to keep your aircraft flying in a safe condition. Detailed maintenance requirements are outlined in the Maintenance manuals. Please reference these manuals to ensure your aircraft is maintained properly. The operating procedures contained in this handbook are derived from experience and testing of this model of aircraft.

1.2 Definitions, Terminology and Abbreviations

This is not a complete set of definitions. It is assumed that the audience of this manual is already trike pilots or pilots in training. Only those items and terminology that may not be covered sufficiently in a SP WSC pilot training regimen are expanded upon here. This is not a replacement for proper training or ground school with your instructor.

Weight-Shift-Control — Powered aircraft with a framed pivoting wing and a fuselage, controllable only in pitch and roll by the pilot's ability to change the aircraft's center of gravity with respect to the wing. Flight control of the aircraft depends on the wing's ability to flexibly deform rather than the use of control surfaces.

Trim Speed — Indicated airspeed at which the aircraft remains in a stabilized condition without pilot input.

Luff lines — The cable lines above the traditional flexwing that attach to the king post above the wing and trailing edge of the upper sail surface and help in dive recovery and pitch stability of the wing. Often this system is also referred to as reflex-bridle. This pitch or dive recovery system is replaced by a sprog in a topless or strutted wing which is a metal or composite material tube placed on the under surface of the sail at about 70% out on the wing span on either wing.

Definitions used in this handbook such as WARNING, CAUTION and NOTE are employed in the following context.

WARNING
Procedures or instructions that if not followed correctly may result in injury or death.

CAUTION
Procedures or instructions that if not followed correctly may result in damage to the aircraft or its parts.

NOTE
Procedures or instructions which are essential to highlight.

Abbreviations:

AOI — Aircraft Operating Instructions

FTS — Flight Training Supplement

MIP — Maintenance and Inspection Procedures

PIC — Pilot In Command

C — Celsius

CAS — Calibrated air speed

F — Fahrenheit

Hg — Mercury

IAS — Indicated Air Speed

ISA — International Standard Atmosphere

Kg — Kilogram

km/hr — Kilometers per hour

MPH — Miles per hour

kt(s) — Nautical Mile per Hour (knot) (1 nautical mph = (1852/3600) m/s)

lb(s) — Pound(s) (1 lb = 0.4539 kg)

mm — Millimeter

cm — Centimeter

m — Metre

in — Inch

ft — Feet

sq. m — Square Metre

sq. ft — Square Feet

cu. in — Cubic Inches

cm3 — Centimeter Cube

mb — Millibars

N — Newton

Nm — Newton Meter

kW — KiloWatt

HP — Horse Power

RPM — Revolutions Per Minute

ft. lbs — Foot Pounds

in. lbs — Inch Pounds

psi — Pounds per Square Inch gage pressure

s — Seconds

min — Minute(s)

hr(s) — Hour(s)

SI — International System of units

VA — Maneuvering Speed

VC — Operating Cruising Speed

VDF — Demonstrated Flight Diving Speed

VH — Maximum Sustainable Speed in straight and level flight

VNE — Never Exceed Speed

VS0 — Stalling Speed, or the minimum steady flight speed in the landing configuration

VS1 — Stalling Speed, or the minimum steady flight speed in a specific configuration

Vx — Speed at which Best Angle of Climb is achieved

Vy — Speed at which Best Rate of Climb is achieved

VT — Maximum Glider Towing Speed

TOSS — Take Off Safety Speed

Wsusp — Highest Trike Carriage Weight suspended under the wing

Wwing — Wing Weight

Wtkmt — Trike Carriage Empty Weight (including required minimum equipment, unusable fuel, maximum oil, and where appropriate, engine coolant, hangbolt and hydraulic fluid)

WMAX — Maximum Design Weight (Wwing + Wsusp)

WSC — Weight Shift Control (aircraft)

Max — Maximum

Min — Minimum

Units:

Speed: Kts (Knots) = 1.15 mph (miles per hour) = 1.84 km/hr

1 km/hr = 1.6 MPH

Pressure: PSI = Pounds per Square Inch

in Hg = inches of Mercury

mb = millibar

Distances: in. = inches = 25.4 millimeters

ft = foot (feet) = .305 meters

Weights: Kg = kilograms = 2.2 lbs = 2.2 pounds

Misc.

1 Pound (Ib) = 0.4536 Kilogram (kg)

1 Pound per sq in (psi) = 6.895 Kilopascal (kPa)

1 Inch (in) = 25.4 Millimeters (mm)

1 Foot (ft) = 0.3048 Meter (m)

1 Statute mile = 1.609 Kilometres (km)

1 Nautical mile (NM) = 1.852 Kilometres (km)

1 Millibar (mb) = 1 Hectopascal (hPa)

1 Millibar (mb) = 0.1 Kilopascal (kPa)

1 Imperial gallon = 4.546 Liters (I)

1 US gallon = 3.785 Liters (I)

1 US quart = 0.946 Liter (I)

1 Cubic foot (ft3) = 28.317 Liters (I)

1 Degree Fahrenheit (F) = (1.8 X C)+32

1 Inch Pound (in Ib) = 0.113 Newton Meters (Nm)

1 Foot Pound (ft Ib) = 1.356 Newton Meters (Nm)

1.3 General Description

1.3.1 Carriage

Please refer to section 7 of this manual for a general description of the Ramphos Trident Trike.

1.3.2 Wings

Ramphos trident is available with the following wings:
1) HZ15S
2)
3)
Please refer to section 7 of this manual for a general description wing.

NOTE
Manufacturer may approve the use of other certified wings for use with the Ramphos Trident. This written approval must be attached to the POH with a list of changes to relevant sections of the manual.

1.3.3 Engines

Ramphos Trident is available with the following ASTM complaint engines:

1.3.3.1 Rotax 912 UL2

<table>
<tr><th colspan="2">Version</th><th colspan="3">Performance</th><th colspan="3">Torque</th><th>Max RPM</th></tr>
<tr><td colspan="2"></td><td>kW</td><td>HP</td><td>RPM</td><td>Nm</td><td>ft.lb.</td><td>RPM</td><td>RPM</td></tr>
<tr><td colspan="2">912 UL2</td><td>58.0</td><td>79</td><td>5500</td><td>103</td><td>75.9</td><td>4800</td><td>5800</td></tr>
<tr><td colspan="2">Max 5 min (take-off)</td><td>59.6</td><td>81</td><td>5800</td><td></td><td></td><td></td><td></td></tr>
<tr><th colspan="2">Bore</th><th colspan="2">Stroke</th><th colspan="4">Displacement</th><th>Compression Ratio</th></tr>
<tr><td>79.5 mm</td><td>3.13 in.</td><td>61 mm</td><td>2.4 in.</td><td colspan="2">1211.2 cm^3</td><td colspan="2">73.91 cu. in.</td><td>9.0:1</td></tr>
</table>

1.3.3.2 Smart M160/1 UL

Version	Performance			Torque			Max RPM
	kW	HP	RPM	Nm	ft.lb.	RPM	RPM
M160-UL	58.0	79	5300	130	90	5300	5800
Max 5 min (take-off)	60	81	5800				
Bore		**Stroke**		**Displacement**			**Compression Ratio**
66 mm	2.59 in.	68 mm	2.67 in.	698 cm^3	42.5 cu. in.		9.5:1

1.3.3.3 Rotax 582 UL

Version	Performance			Torque			Max RPM
	kW	HP	RPM	Nm	ft.lb.	RPM	RPM
Rotax 582 UL	48	64.4	5300	75	55.3	6000	6500
Max 1 min (take-off)	48	64.4	6800				
Bore		**Stroke**		**Displacement**			**Compression Ratio**
76.0 mm	2.99 in.	64.0mm	2.52 in.	580.7 cm^3	35.44 cu. in.		11.5 T. 5.75 Effective

1.3.3 Propellers

The Ramphos Trident uses the following props:

1.3.3.1 Kiev Props

The Kiev prop series are a 3 or 5-blade composite propeller with an Aluminum hub and metric class 8.8 hardware. It comes with a simple tool to set the pitch on the ground. The acceptable pitch range is specified by markings of the pitch tool. For more information please refer to the propeller manual. The prop is rated to handle up to 100 HP in normal service.

NOTE
Manufacturer may approve the use of alternative propellers. This approval is only valid when the written authorization from the manufacturer is attached to the POH

1.3.3.2 Kiev Prop Installation Instructions

1. Disassemble prop hub, noting orientation of prop hub halves. **The stamped number on each Hub half must remain adjacent to each other during re-assembly!**

2. Install propeller blades into their positions between the hub halves. Install shoulder bolts with the Nyloc nuts and tighten slightly to hold blades in place.

3. Note the small-machined insert that fits into the hub and / or spacer. On most 2-cycle applications, this insert must be installed into the hub. If you have a spacer, it too will have an insert and must be installed as well. Most 4-cycle applications have no need for the Hub insert, unless you are using a spacer. On Pusher configuration, with propeller assembly flush against the prop flange, make sure that there is at least 4.5” clearance between anything forward of the prop tips. If required, fit the prop spacer on the engine prop flange, followed by the prop hub onto the prop spacer. **NOTE:** On all applications, if you are using a Spinner, install the backing plate between the spacer and the hub.

4. Secure (finger tight) the prop hub and extension to the prop flange with the six 8mm x 160 mm bolts.
5. With all bolts slightly tightened, you should be able to easily adjust the pitch on the blades. Make sure at this time that the leading edge of all blades are facing in the right direction and are not backwards.
6. Set the reference scale on the protractor to the recommended arbitrary setting and clamp scale in place:
Rotax 582, between 11 and 14, between …912&up, between 12 and top of scale. Due to variations in gearboxes, etc. more adjustments are usually required to dial in the "perfect" pitch setting. Clamp the scale with a side clamp Cleco or small C-clamp
7. Fit the folded sheet metal end of the protractor into the center hole of the prop hub so that the sheet Metal ears are both touching the flat face of the hub.
8. Place the notch on the other end of the protractor against the trailing edge of a prop blade. Rotate the blade until the leading edge of the flat side just touches the rounded nose area of the notched section of the protractor. Ensure that the ears on the protractor are flush against the hub when the blade is pitched against the other end. Torque the two shoulder bolts to 3-4 foot lbs. to hold this blade at this setting. Then repeat the procedure for the other blades.
9. When all blades have been set, torque the Nyloc shoulder bolts sequentially with 5 ft. lb. Increments to **14.5-foot lb.** This will help to insure proper tracking. Check the pitch of all blades again, and once satisfied, begin torquing the long Hub bolts sequentially, opposing and with 5 ft. lb. increments to **14.5 lb.**

WARNING!!! DO NOT OVER OR UNDER TORQUE BOLTS! NEVER START ENGINE WITHOUT PROPER TORQUE ON BOLTS!!!

10. Install the six jam nuts or castellated nuts on the ends of the protruding prop bolts and torque to approximately 13-foot lbs. If your bolts have the drilled heads, secure them appropriately with .032 stainless steel wire. If your bolts have the drilled shaft and castle nuts, you can add a thin washer to line up the cotter pin holes, but DO NOT UNDER OR OVERTORQUE! **Bolts supplied differ according to engine type.** A static check of rpm's must be performed before flight. Refer to engine manual for specific instructions.

NOTE: DO NOT FLY UNTIL YOU HAVE CHECKED AND RECHECKED YOUR PROPELLER FOR PROPER MOUNTING AND PERFORMED A STATIC CHECK OF R.P.M.'s.

If you cannot reach recommended RPM, you may be Over/Under Pitched. Do not run in this condition or engine damage may result.

11. Re-check torque of prop bolts after first hour of operation and as routine maintenance. Never over torque or "*STRETCH*" prop bolts! The standard prop bolt for this propeller is a Grade 8 metric and will fit the Rotax 75mm bolt pattern. AN 5 prop bolts will fit the ROTAX 912 application, use the same torque value. NEVER OVER TORQUE or exceed established recommended usage of prop bolts.

MAXIMUM ALLOWABLE PROP SPEED IS 2700 RPM

1.3.3.3 Bolly Series 3 (Australia only) Please see Bolly prop supplement.

1.3.4 Fuel

The following fuels are preferred to be used on the Ramphos Trident:

1.3.5.1 Lead Free 89 Octane US or higher for 582/912UL
1.3.5.2 Lead Free 91 Octane or higher for Smart M160/UL

NOTE

Occasional use of Avgas 100LL is permitted. Due to higher lead content in AVGAS, the wear of the valve seats and deposits in the combustion chamber will increase. Therefore, use AVGAS only if you encounter problems with vapor lock or if the other fuel types are not available.

1.4 Dimensions

	Metric		USA	
Wing Span	HZ15S	10.38 m	HZ15S	34 ft
Wing Area	HZ15S	15 sq. m	HZ15S	161.46 sq. ft
Aspect Ratio	HZ15S	7.2	HZ15S	7.2
Wing Weight	HZ15S	55 kg	HZ15S	121 lbs
Lowest Overall Trike Height	HZ15S	2.4 m	HZ15S	7.9 ft
Wing Length (Long Pack)	HZ15S	5.18 m	HZ15S	17 ft
Wing Length (Short Pack)	HZ15S	4.6 m	HZ15S	15 ft
Hull Width Outside to Outside	1.74 m		5.71 ft	
Hull Length	3.57 m		11.71 ft	
Wheel Inside to Inside Width	1.30 m		5.4 ft (51.5”)	
Wheel Outside to Outside Width	1.46 m		4.6 ft (57.5”)	
Carriage Height	2.3 m		7.8 ft (93.5”)	

1.4.1 Empty Weight

Empty Weight	Metric	USA
582 UL	202 Kg	445 Lbs
Rotax 912 UL	280 Kg	617 Lbs
Smart M160/1UL	280 Kg	617 Lbs

1.5 Views

1.5.1 Front

1.5.2 Side

1.5.3 Rear

2 LIMITATIONS

2.1 General

The limitations section of this manual outlines the various operating limitations, instrument function and placards necessary for the safe operation of this aircraft, engine and standard equipment.

2.2 Airspeed Limitations

2.2.1 HZ15 S Wing

Speed	KIAS	Comments
VNE ---Never Exceed Speed	77 MPH (67 Kts) (125Km/hr)	Never exceed this speed in any operation
VA --- Max. Maneuvering Speed	65 MPH (56 Kts) (105Km/hr)	Do not make abrupt or full control deflections above this speed
VS0 --- Stalling Speed	35 MPH (31 Kts) (56Km/hr)	

NOTE
VNE ---Never Exceed Speed is and can be programmed as a limit in the digital ASI

2.3 Engine Operating Limitations

2.3.1 Rotax 912UL

Engine Limitations	Metric	Imperial
ENGINE RPM		
Max RPM	5800 RPM (5 minutes max)	5800 RPM (5 minutes max)
Maximum Continuous RPM	5500 RPM	5500 RPM
Idle RPM	Approximately 1400 RPM	Approximately 1400 RPM
POWER DATA		
Takeoff Performance	59.6 KW	80 HP
Continuous Performance	58 KW	78 HP
OIL PRESSURE		
Maximum Oil Pressure (allowed for short period at cold start)	7 bar	102 psi

Minimum Oil Pressure (below 3500 RPM)	0.8 bar	12 psi
Normal Oil Pressure (above 3500 RPM)	2 – 5 bar	29 – 73 psi
OIL TEMPERATURE		
Maximum Oil Temperature	140° C	285° F
Minimum Oil Temperature (idle at 2000 for 2 minutes and proceed to 2500 RPM till minimum oil temperature is reached)	50° C	120° F
Normal Oil Temperature	90 - 110° C	190 - 230° F
CYLINDER HEAD TEMPERATURE		
Maximum CHT	150° C	300° F
Normal CHT	75 - 110°C	167 - 230° F
EXHAUST GAS TEMPERATURE		
Maximum at max. Takeoff Power	880° C	1620° F
Maximum at max. Continuous Power	850° C	1560° F
Normal EGT	800° C	1472° F
FUEL PRESSURE		
Maximum Fuel Pressure	0.4 bar	5.8 psi
Minimum Fuel Pressure	0.15 bar	2.2 psi
AMBIENT OPERATING TEMPERATURE		
Maximum	50° C	120° F
Minimum	-25° C	-13° F

2.3.2 Rotax 582 UL

DESCRIPTION:	Two cycle, two cylinder, rotary valve engine, oil-in-fuel lubrication or oil pump, liquid cooled, with integrated water pump
BORE:	76.0 mm (2.99 in.)
STROKE:	64.0 mm (2.52 in.)
DISPLACEMENT:	580.7 cc (35.44 cu. in.)
COMPRESSION:	Theoretical: 11.5 - effective 5.75
POWER OUTPUT:	48 kw (64.4 HP SAE) at 6500 1/min
TORQUE:	75 nm (55.3 ft. lbs.) at 6,000 1/min.
MAX RPM:	6800 1/min.

DIRECTION OF ROTATION	Counter- clockwise, viewed towards PTO (Clockwise with Reduction installed)
CYLINDER:	2 light alloy cylinder with cast iron sleeves
PISTON:	aluminum cast piston with 2 piston rings
PISTON/CYLINDER CLEARANCE:	0.06 mm (.0024")
CHT: Cylinder Head Temperatures (Optional Values)	Normal: 110 C - 130 C or 230 F - 270 F Maximum: 150 C or 300 F Max. Difference: 10 C or 45 F
EGT: Exhaust Gas Temperatures	Normal: 500 C - 620 C or 930 F - 1150 F Maximum: 650 C or 1200 F Max. Difference: 25 C or 45 F Crankcase Temp. Max.: 80 C or 175 F Cooling Liquid Temp Max.: 80 C or 175 F
IGNITION SYSTEM:	Breakerless Ducati Capacitor Discharge Dual Ignition with magneto generator
GENERATOR OUTPUT:	170 Watts AC at 6000 RPM and 13.5 RMS
IGNITION TIMING:	1.96 mm or .077" (18 BTDC)
SPARK PLUG:	1.96 mm or .077" (18 BTDC)
ELECTRODE GAP:	0.5 mm (.02")
ROTARY VALVE TIMING:	Opens: 130 BTDC Closes: 50 ATDC
CARBURETOR:	2 x Bing 54 36 mm Slide Valve
FUEL PUMP:	Pneumatic fuel pump
FUEL:	Regular or Premium Gasoline, octane number not below RON 90 (unleaded)
ENGINE LUBRICATION:	Oil-in- fuel with Super two-cycle oil ASTM/CEC standard, mixing ratio
REDUCTION GEAR LUBRICATION:	Gear oil API-GL5 or GL6, SAE 140 EP or 85W - 140 EP
PROPELLER SHAFT DIRECTION:	Clockwise, viewed towards prop flange
STARTER:	Rewind Starter Standard
STANDARD VERSION INCLUDES:	Engine with carburetors w/ clamps, fuel pump, exhaust system

WEIGHT: Engine: wo/
exhaust, carb, fuel pump, radiator .lbs.......(27.4 kg.)
2 Carburetors with flanges...........4.0 lbs.......(1.8 kg.)
Exhaust system...........................11.2 lbs.......(5.1 kg.)
2 air filters..0.6 lbs.......(0.3 kg.)
Double air filter......................1.1 lbs........(0.5 kg.)
Intake Silencer with filter...........2.4 lbs........(1.1 kg.)

OPTIONAL EQUIPMENT: Integrated Radiator System
(#881-432) ....4.6 lbs........(2.1 kg.)
Electric start kit, PTO side ....7.5 lbs........(3.4 kg.)
Electric Start kit, MAG side ....9.9 lbs.........(4.5 kg.)
Reduction box "B" (dry)....................17.6 lbs........(8.0 kg.)

2.3.3 Smart M 160/1 UL

	60 KW	74 KW
Capacity(cm3)	**698**	
Compression Ratio	**9.5 (-04) :1**	
Stroke/Bore(mm)	**68/66**	
Cylinders/Valves	**3cyl: 2 valves per cylinder**	
Spark plugs (per cylinder)	**2**	
Engine weight per DIN (kg)	**57**	
Max. torque (Nm)	**110 at**	**130 at**
	2000-4750 RPM	**2500-5300 RPM**
Max. power output (kW)	**60 at 5200 RPM**	**74 at 5600 RPM**
	(continuous running) (continuous running)	
	5800	
Max continuous RPM	**RPM**	
	6000	
Max. short time RPM	**RPM**	
Max. manifold pressure (bar)	**0.9(+0.1 /- 0.2)**	**1.3 9+0.1/ -0.1**
Charge air control	**Map -guided**	
Oil pump	**Chain-driven, external gear pump; wet pump**	
Ventilation	**integrated full and partial load ventilation**	
Fuel injection/ injection	**Bosch EV6 / 3.8 bar via intake manifold**	
pressure	**(max. 4.8 bar)**	
Fuel	**Min. RON 95 (super unleaded)**	
		Bosch
Lambda sensor	**LSF4**	

Anti-knock control	**Electronic, adaptive; 1 knock sensor**
Max . Turbocharger RPM	**24000**
Max exhaust temperature	**950 C (at turbocharger inlet)**
	short time 980 C.
Engine Diagnostics	**Diagnostics module to read stored errors**

2.4 Engine Operating Media

Please refer to your engine Operator's manual section for Operating media approved for your engine.

2.5 Fuel and Oil Capacity

2.5.1 Fuel Capacity

Fuel Capacity	Unusable Fuel Capacity
58 Liters or 15.3 US Gallons	1.5 Liters or 0.4 US Gallons

2.5.2 Oil Capacity

Oil Capacity
3 Liters or 3.2 Quarts

2.6 Aircraft Operational and Maneuvering Limits

2.6.1 Centre of Gravity Limits

Centre of gravity limits are not critical in a flex wing weight shift control aircraft. The carriage attaches to the wing through a universal junction known as hang block assembly. Variations in cockpit and fuel loading cannot affect aircraft's balance. The Ramphos Trident is therefore not critical in terms of centre of gravity. However, distribution of load in a trike carriage affects the attitude of the trike carriage in-flight in a minor way.

Base Suspension Range (Measured from the front of the nose plate attached to the wing keel to the suspension point on the hang block)	**Dimension (Metric)**	**Dimension (Imperial/US)**
HZ15S	1570 mm-80mm	61.81" -3.15

2.6.2 Maneuvering Limits and Loads

WARNING
All aerobatic maneuvers including whip stalls, loops, stalled spiral descents, spins and any negative G maneuvers are prohibited

These maneuvers can never be conducted safely. These maneuvers can put the aircraft outside the pilots control and put both the aircraft and its occupants in extreme danger. Do not pitch nose up or nose down more than 30 degrees from the horizontal. The front support tube also known as the compression strut or nose strut of the trike and the pilot's chest limits the fore and aft movement of the control bar respectively. Do not bank more than 60 degrees angle of bank. In roll there is no artificial stop for bank angle.

Limit	
Maximum Takeoff Weight	**450 Kg, 992 pounds with HZ15S**
Maximum Weight in Each Seat	**114 Kg, 250 pounds**
Minimum Weight in the Front Seat	**54 Kg, 120 pounds**
Pitch	**+30°, -30° from Horizontal**
Roll	**+30, -30° AOB**
Maximum Positive Maneuvering Load Factor	**+6.0 G**
Negative Maneuvering Load Factors	**-4.0G**
Load Factors below 1.0 G	**Prohibited**

2.6.3 Minimum Flight Crew and Crew Weight

At least one pilot in the front seat is required to operate the aircraft. Minimum pilot weight is 120 pounds (54 kgs) in the front seat.
Maximum power at minimum takeoff weight can cause an abrupt climb rate that, if not corrected, may cause climb angles of greater than the placarded maximum.
Approximately 75% of maximum take off power is considered comfortable for a minimum weight takeoff. Take off distance will be extended at reduced power.

WARNING
Always operate the aircraft from the front seat when flying solo

2.6.4 Maximum Passenger Seating Limit

In addition to pilot in the front seat, a maximum of one passenger is allowed to be seated in the back seat. Maximum weight per seat is 115 Kg and a combination of pilot and passenger should not exceed maximum takeoff weight which is 600 Kg with HZ15S wing.

2.6.5 Operating Limits

Limit	**Allowed (Yes/No/Comment)**
Day VFR operations	Yes
IFR operations	No
Night VFR operations	Only if properly equipped and with a letter of authorization from the manufacturer which shall be attached/kept with the POH. When aircraft is equipped for night flying and the pilot has the relevant certifications for night flying and night flight is authorized for the machine in writing by the manufacturer, Ramphos USAstrongly recommends that the aircraft is kept within safe gliding distance of an airport with lighted runways for the entire flight.
Operations without engine monitoring instruments	No
Operation in continued medium to heavy rain	No
Operation without proper training on this particular combination of trike and wing from a qualified instructor	No
Operation without familiarity with this manual in full	No
Takeoff with a wing known to have moisture on it	No

Operation outside the CG limit trim set by the manufacturer	No
Flight without helmet, visor or eye protection	No
Low flying	Low flying is prohibited, even where permitted by local aviation law, unless the pilot has complete and recent knowledge of the area and obstacles in the vicinity
Congested area safe altitude	When the aircraft is certified by local CAA law to fly in congested areas, this may only be done with special attention to the 'cone of flight safety'. Furthermore, this aircraft may only be operated over congested areas when a safe landing can be made without damage to aircraft or person, vessel, vehicle, structure or property on the ground in the event of an engine failure. Ramphos USA recommends the aircraft be flown as much as possible within safe gliding distance of an actual airport.
Other Limitations	**Value**
Maximum Crosswind Component	14 MPH (12 Kts) (22 Km/hr) – See section 4.8.10 for additional clarification
Maximum Wind Strength	23 MPH (20 Kts) (37 Km/hr)
Maximum Ambient Operating Temperature	50°C or 120° F

WARNING
Moisture on the wing can increase the stall speed of the aircraft and should be removed prior to takeoff

2.6.6 Minimum Equipment List

Equipment Reading Required	Comment
Engine monitoring instruments if any required for safe operation of the engine by the engine manufacturer	Please consult the ASTM engine manual

3 Emergency Procedures

3.1 General

This section of the manual deals with procedures to be adopted during an abnormal event in the operation of the Ramphos Trident Steps listed should be performed in the order listed unless warranted and determined by a qualified pilot in command (PIC).

It is important to maintain correct and suitable pattern altitude and speed for safe operation of the aircraft. Never fly in adverse weather conditions and always fly within the limits of your skill and ability. Limit departures from your proven ability to instructional settings only under supervision of a qualified instructor acting as PIC of the aircraft.

Safe flight requires that you be aware of possible emergency landing areas along your flight path. Engines can stop regardless of how reliably maintained. Most engine outs don't happen because of the engine quitting but because of auxiliary systems fault or errors on the part of the pilot like turning the choke on by accident. Never put your life in the hands of an engine.

Always scan for other aircraft. Always show your intentions and be courteous to other aircraft. It should be noted that the manufacturer cannot possibly foresee all conceivable circumstances. Some circumstances such as multiple or unlisted emergencies, flight into adverse weather etc. may require modification to these procedures. A thorough knowledge of the aircraft and its systems is thus required to analyze the situation correctly and to determine the best course of action for the PIC.

3.2 Airspeeds for Emergency Operation

Wing	**Speed**	**Indicated Air Speed (IAS) - USA**
HZ15S	Maximum Maneuvering Speed (Va)	65 MPH (56 Kts) (105 Km/hr)
HZ15S	Best Glide (L/D max)	44 MPH (39 Kts) (72 Km/hr)

3.3 Emergency Procedures Checklists

3.3.1 Engine Out on Climb Out

If your engine quits on climb out, maintain airspeed, reduce angle of attack and land straight ahead if possible. Proceed as follows:

C Maintain Control
A Maintain Airspeed – best glide speed or higher
L Forced Landing (straight ahead if possible)

WARNING
If a minimum altitude of 496 feet (150 m) could not be obtained, immediately pull the control bar in; gain and maintain a speed close to best glide speed while seeking a place to land immediately in front to you.

IT IS IMPERATIVE THAT CORRECT GLIDE SPEED BE ATTAINED AND MAINTAINED! DO NOT TURN BACK TO THE RUNWAY! SLIGHT TURNS TO LEFT OR RIGHT DEPENDING ON HEIGHT ABOVE GROUND ACHIEVED CAN BE MADE IF SUITABLE LANDING SPOT IS AVAILABLE THERE. EXERCISE GOOD JUDGEMENT

WARNING
For establishing best glide your attention is drawn to section 5.5.1 of this manual. Keep in mind that 'best glide' is NOT ALWAYS desirable in engine out on climbout situation depending on runway length. Pilot should establish appropriate glide speed as necessary.

3.3.2 Engine Failure at Altitude
If the engine stops while operating at cruise or full power when the aircraft is well clear of the ground, proceed as follows:
E Establish Glide Speed
S Select Landing Area
P Proceed to Landing Area

NOTE
For establishing best glide your attention is drawn to section 5.5.1 of this manual
Check the following:
Fuel Contents
CI Carb Icing (Turn Carb Heat On)
Fuel Valve Off
Ignition On
Choke Of
Gear Up

Carry on with the rest of emergency landing procedure as listed in this section.

If your engine fails in flight, do not attempt to restart the engine unless one of these items is found to be incorrect and is able to be rectified. Relax and maintain control while concentrating on correct emergency landing techniques. Adopt a suitable glide speed preferably with a tail wind. With a tailwind, minimum sink speed would give you the longest glide. As a careful pilot, you should always fly in "a cone of safety", at sufficient altitude, with an understanding of the orientation of the wind. It is not enough to simply land on the area you have chosen. Do NOT forget to take into account the possible obstacles that you could discover only at the last minute (e.g. power lines, ditches etc…) and ground related and/or mechanical turbulence that may occur. Check that your seat belt and that of the passenger is securely fastened. The final approach should be made preferably into the wind. With the onset of night the approach should be with the sun at the rear if possible. Your aircraft will be quiet, check that there is nobody on the ground. Make a short landing run if possible.

If you have time, you can try to start the engine again whilst in flight. Verify that the problem is not from a memory lapse: choke lever actuated, fuel valve accidentally off, carb icing, ignition switches off... Remember, even if the engine starts again remains in the cone of flight safety and land on the area initially considered, so as to determine the possible origin of the engine failure **BEFORE** continuing the flight.

3.3.3 Stuck Throttle at Full Power (In Flight)

If the throttle should jam full open in flight, proceed as follows:
C Maintain Control
H Get Height. With engine at full power adjust height and ground position to improve the outcome of a forced landing.
A Increase Airspeed to keep the climb angle less than 30 degrees above the horizontal.
I Switch off Ignition.
L Prepare for forced Landing

3.3.4 Emergency Landings

Proceed as follows:
C Maintain Control and airspeed - nominated approach speed
T Throttle Closed
I Ignition off
F Fuel Valve Off
S Seat belts tight
H Helmets tight
B Body parts inside seat frame
P Contact ATC if necessary and if there is time to alert Position and Problem
E Turn **ELT ON** if equipped
Gear Up **It is recommended to leave Gear in UP position if field condition unknown**
A Advise passenger on how to communicate position using radio if pilot is incapacitated
B Decide whether or not to use **BRS** parachute (if equipped)
L Final Approach and Landing as closely as possible to normal power off landing procedure

3.3.5 Engine Fire While In-Flight

If fire occurs while in-flight, the initial procedure would be to maintain control of the aircraft and evaluate the extent of the fire. This emergency is unlikely to occur but to avoid any further problems, use common sense and land the aircraft safely. Proceed as follows:
C Maintain Control
F Fuel Valve Off
T Full Throttle (To exhaust engine system fuel as soon as possible and maximize slipstream to clear flames from passengers and airframe.)

When fuel is exhausted then:
I Ignition off
L Forced Landing
B After landing release seat Belt
P Release Passenger seat belt
E Evacuate aircraft and step away from it

3.3.6 Engine Fire On Ground
If fire occurs while aircraft is moving on the ground, proceed as follows:
C Maintain Control
S Use remaining Speed to clear people, other aircraft and property
T Throttle closed
I Ignition Off
B After stopping release seat Belt
P Release Passenger seat belt
F Fuel Valve Off
E Evacuate aircraft and step away from it

3.3.7 Propeller Damage

WARNING
Propeller blades are spinning at very fast speeds while cruising and at full power.
Propeller tip speeds may reach 0.7 Mach and even small objects can cause significant damage to the propeller blades if thrown into the prop during normal or full power operation

The indication of propeller damage is usually felt by extreme vibration and lack of thrust.
Proceed as follows:
C Maintain Control
T Throttle closed
F Fuel Valve Off
I Ignition off
L Forced Landing

Certain precautions prior to takeoff are extremely helpful in avoiding this problem. Inspect the strip or ground you are going to use as your take off area for anything that may be flicked up by the tires and goes through the propeller.

In pre-engine start checklist always ensure that any loose items on the trike and yourself and passenger are secured so they can't go through the prop and cause an unwanted situation.

3.3.8 Sail Damage
If you discover damage to the sail during flight, the first procedure is to maintain control of the aircraft. If the sail damage is not impairing the flight characteristics of the aircraft, land at the nearest landing field to inspect the damage.

3.3.9 Emergency Parachute (Optional)

WARNING
There is no guarantee of any kind that BRS will always work in all circumstances of an emergency in saving the occupants life. It should be used as a measure of last resort.

WARNING
It is important to realize that the parachute once deployed will control the rate of descent but the pilot will not have any control over where the aircraft will land.

WARNING
BRS safety pin should be removed before flight and REPLACED right after flight before getting out of the trike in order to avoid accidental deployment.

The emergency ballistic parachute can be fitted as an option.

The parachute-operating handle is fitted with a safety pin. This pin should be removed before each flight and the safety pin must be replaced before the pilot alights from the aircraft. A force of approximately 35 pounds (16 Kg) pull on the actuating handle is required to activate the BRS rocket motor.

This parachute release sequence should be explained by the pilot to the passenger, before flight. The parachute is only to be used in emergency situations as a last resort and when you are certain that:
the aircraft has suffered structural damage to the extent that control is not possible; or if the aircraft is in an irrecoverable situation where structural damage is likely to occur To operate the parachute pull the handle at least 8 inches (20 centimeters) for the parachute rocket projectile to be activated. The parachute will allow the complete aircraft to be lowered to the ground. The aircraft will descend with a nose down attitude. Further information can be found in section 7.18.

Proceed as follows:
T Throttle closed
I Ignition off
S Seat belts tight
P Check parachute Pin removed
D Deploy parachute
SF Safety Position assumed
F Fuel Valve Off (if possible)

3.3.10 Ignition Circuit Failure
The Rotax engine requires a short circuit on the ignition circuit to stop the engine. If the ignition circuit is broken using full choke to flood the engine should stop the engine.

It is possible to starve the engine by switching the fuel valve off. This method is not as quick as using the choke. Choke Lever is located on pilots right side . Become familiar with its location and operation prior to flight. Do not restart the engine until the fault has been fixed.

3.3.11 Spins and Spiral Descents

WARNING
No deliberate spin attempts are permitted
Spiral Dives should not be attempted
During descending turns aircraft attitude should be kept within operating limitations for pitch, roll and airspeed

Any attempt at deliberate spinning of the aircraft is prohibited.
After a stall a spiral dive may develop if the bar is maintained at the forward limit and fast roll rate is allowed to develop or continue. If this condition is not corrected it will lead to large and increasing bank attitudes (beyond the 60 degree limit). Increasing attitude, increasing speeds and large control bar feed back forces will occur. Spiral dives can be terminated at any time by rolling wings level.
If the spiral dive is allowed to develop to extreme bank attitudes, recovery is helped by relieving control bar forces and then rolling wings level and recovering from high-speed condition.

3.3.12 Unusual Attitudes

Unusual attitudes where the nose is raised or lowered more than 30 degrees from the horizontal are to be avoided. On recognizing a situation where the aircraft is approaching these pitch angles proceed as follows:

3.3.12.1 Nose High Attitude

To recover from the situation where the nose of the aircraft is pitched up more than 30 degrees from the horizontal proceed as follows:
P Reduce Power appropriately
C Pull in the Control bar slightly if necessary to get within limits
N The aircraft will rotate Nose down
P once the attitude lowers level the wings and increase Power to prevent over pitching
R Recover from dive and Resume desired flight path

3.3.12.2 Nose Down Attitude

To recover from the situation where the nose of the aircraft is pitched down more than 30 degrees from the horizontal proceed as follows:
O Raise attitude - push Out
P Apply Power
R Recover from dive and Resume desired flight path

3.3.13 Instrument Failure

Instrument failure may happen through an electrical fault or through exposure to High Intensity Radio Fields (HIRF).
The aircraft can be equipped with a digital engine management system. If there is a problem with the digital system the correct procedure is to fly to the nearest safe landing area and investigate the cause of the malfunction. Correct the problem before flying again.

3.4 Emergency Sea operations

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Warning
Sea operations are very challenging to both pilot and aircraft. Extra care must be given to both operational and maintenance considerations. Especially in salt water environments.

Warning
Life preservers should be donned for all water operations by both pilot and passenger. The life vest must be the airline type inflatable vest. Under no circumstance should a standard non-inflatable vest be worn.

3.4.1 Emergency Equipment (Water Operations)

When operating on water the Coast Guard considers all sea borne aircraft as being boats. Therefore the standard personal watercraft emergency equipment is required. The following list illustrates the requirements generally specified but not limited to . The PIC should be familiar with specific local Coast Guard regulations.

- Fire extinguisher
- Signaling device e.g. Mirror, signal flares, smoke markers and marker dyes
- Aural signaling device e.g. whistle and
- Stout rope or line to be used for towing and anchoring.
- Anchor

The following items are strongly suggested to have on board for water operations.

- Portable, waterproof marine band radio
- Sea anchor (Generally a bag like anchor used to stabilize drift).

3.5 Safe Water operations

All emergency procedures described above are the same for both land and water operations. All required knowledge and skills for safe operation of an amphibian type aircraft are beyond the scope of this manual.
The following section will try to generally describe the basics of water operations.

3.5.1 Basic Water operations

Taxiing the Ramphos Flying Amphibious Boat

Foreword
Any vessel that floats or sails can capsize, if adverse conditions exist and errors are made in the proper handling of the craft. This is also true for the Ramphos. In fact, capsizing during taxiing is a common incident experienced with this type of machine.

Normally takeoffs and landings are made as directly into the wind as possible. This places the relative wind (i.e. a combination of the surface wind velocity and the speed of the Ramphos and their relative directions) to the front of the Ramphos, which is its most stable condition. When taxiing across the water to your takeoff position or returning to the beach or dock after landing, the Ramphos is usually traveling at a slower speed; therefore the surface wind has a greater effect upon the Ramphos and its large wing. Since the Ramphos has a large wing, required for lifting a boat with two pilots, it is easy to see that even a light wind impacting the wing from an adverse direction (i.e. under the 39 wing tip, or under the wing's trailing edge) can result in stability problems and even cause a capsize.

This chapter is designed to point out some very important points and techniques to prevent this from happening to you. Obviously your risks are greater in moderate to strong winds, but it is important that you read, understand, apply and practice these procedures even in light wind conditions. All flying demands constant vigilance; and operations off the water also require added attention while taxiing. Inattention can turn a planned flight into an unplanned swim!!!!

1) Weight-shift system and our sensory perceptions

The wing of the Ramphos moves separately from the rest of the machine and this leads to the main problem that can cause a capsize. This same capability also allows the Ramphos to operate in choppy waters that would challenge or ground a fixed wing craft. The key to safe operations is to always be aware of the wind direction and the wing's position. By coordinating one's actions to properly position the wing, an experienced Ramphos pilot can operate in conditions that would keep other lightweight aircraft in the harbor.

One of the Ramphos's great seaworthy traits is its deep "V" hull that allows the boat to roll quite a lot in the water, due to turns or waves; but during taxiing the wing needs to stay perfectly horizontal on the water to expose the least wing surface area to the wind. Unfortunately this is a bit unnatural for the pilot. Ever since we began walking, our reflexes have been developed in reference to a base established by our feet in a standing position. These reflexes work the same when we are seated and we automatically tend to think that anything parallel to our bottom is the horizon (see Fig. 1).

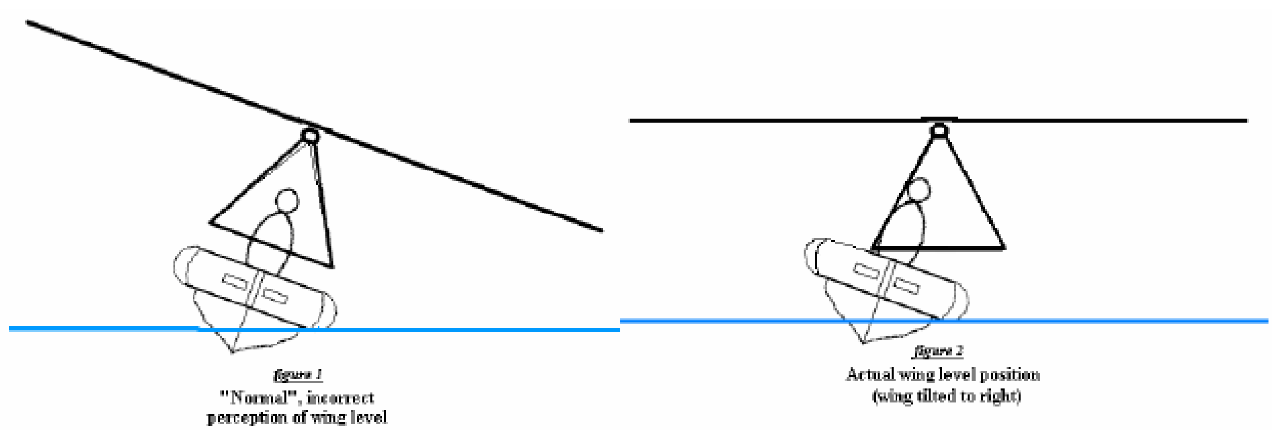


figure 1
"Normal", incorrect perception of wing level

figure 2
Actual wing level position (wing tilted to right)

As we have seen above, this is not the case with the Ramphos in the water as it constantly rolls to compensate for waves and turns. As the boat tilts to one side for some reason, the control bar must be moved from its "normal" horizontal position in order to keep the wing parallel to the water's surface (see Fig. 2).

The control bar now, is no longer parallel to your bottom, but parallel with the earth's horizon and the water's surface. This is important to remember and to train yourself to switch the bar position from your normal sensations to the actual horizontal position. It is helpful to look at the control bar itself in respect to the horizon, or to alternately look to the left and right wing tips to check that they are parallel to the water's surface.

2) Relative wind

The wind that you feel in a moving vehicle is different in strength and direction from the actual wind that you feel when the vehicle is stopped. We call this wind; "Relative Wind".

The strength of the relative wind is the sum of your speed and the wind speed if you are moving directly into the wind (i.e. headwind; see fig. 3). It is the difference between the 40 wind speed and your speed if the wind is directly behind you (i.e. tailwind). In fact, if you go faster than the wind in this situation, you will feel the relative wind in front of you (i.e. If there is a 10 mph tailwind and you are moving at 15 mph, you will "feel" a wind of 5 mph from the front (see fig. 4).

In this situation as you accelerate you will experience the relative wind shifting from the rear to the front.

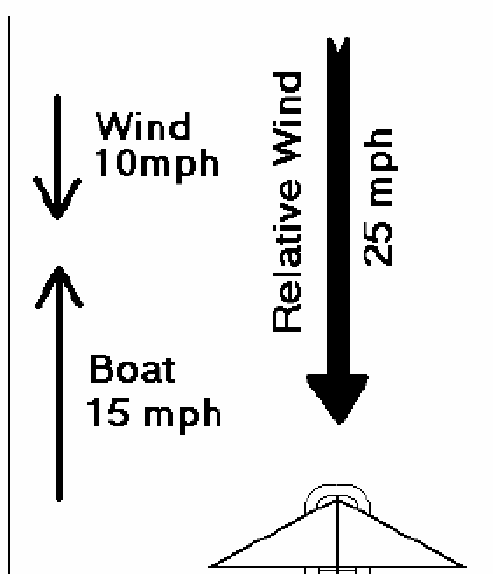


figure 3
headwind

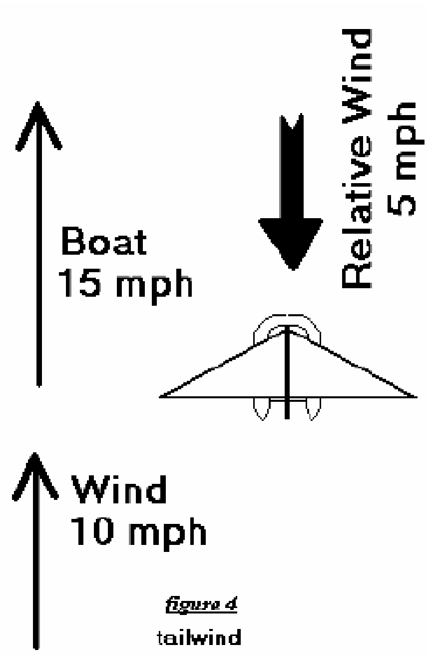


figure 4
tailwind

The direction of the relative wind is the vector sum of the two strength components; vehicle speed and wind speed. With a direct crosswind, the relative wind will move from the side more to the front as your vehicle speed increases (see fig. 5).

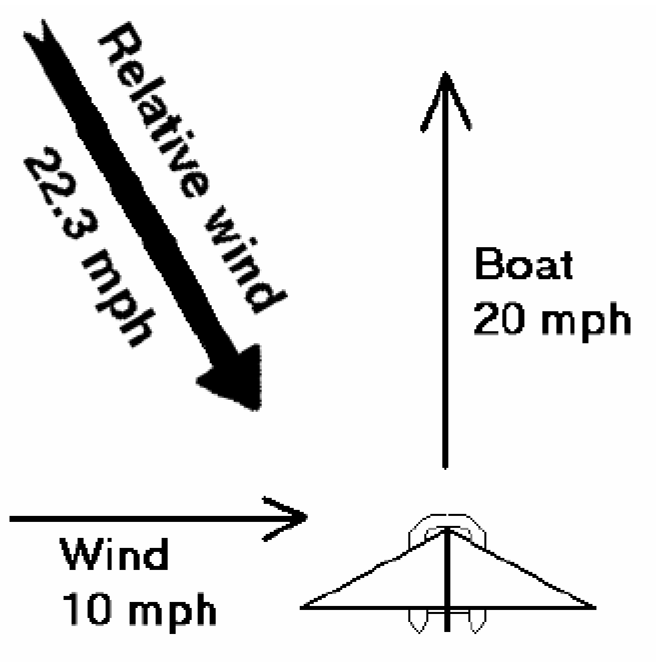


figure 5
crosswind

On the front cable at the nose of the Ramphos wing there should be a wind direction indicator made with a strip of sail material. It shows you the relative wind If yours is missing or has been damaged, be sure to replace it with a strip of light to medium weight nylon or other waterproof material that will indicate a light breeze. It is advisable to put one on both of the front cables and position them low enough that they are easily visible from the pilot's seat. These indicators give you the direction of the relative wind.

WHILE TAXIING ALWAYS LOOK AT THE WIND INDICATORS AND MOVE YOUR STEERING BAR ACCORDINGLY; SLIGHTLY TILT THE UPWIND WING TIP (the tip opposite the direction the wind indicator is blowing) DOWN IN RESPECT TO THE HORIZON.

For example, if you have a crosswind from the left or port side, the wind indicators will be blowing to the right or starboard. Therefore, you should move the control bar very slightly to the right, causing the left wing tip to dip a bit below the horizontal, thus preventing the crosswind from striking the under side of the left wing (see fig. 6).

3) Efficiency of the rudder

The rudder of the boat becomes progressively more effective the faster you go. If you are moving slowly, you will have to move the rudder more to turn than if your are moving faster. And if the boat is nearly stopped, the boat will not turn no matter how you move the rudder.

4) Torque effect of the prop

As the propeller of the 582 Ramphos turns clockwise, its mass causes a torque effect that causes the boat to tilt to the left. When the boat is tilted onto its left side, the curvature of the hull causes the boat to turn to the right (see fig. 7).

With the 912 and Smart, the prop turns counter clockwise. This causes the aircraft to tilt to the right and the boat to turn left. These two reactions require you to move the steering control bar to the left or right to keep the wing horizontal (see fig. 2) and to correct the turn by pushing your foot on the appropriate 42 rudder bar (see fig. 8). The amount of these movements depends on the speed of the boat(see par. 3 & 5).

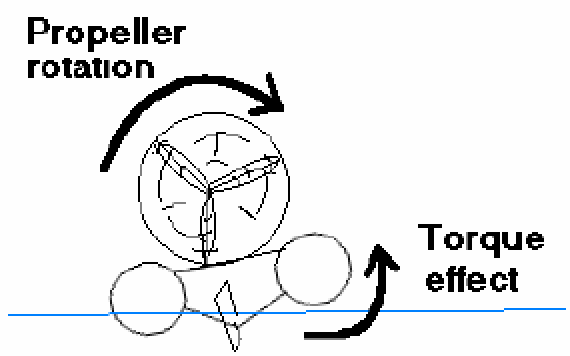


figure 7

Torque effect

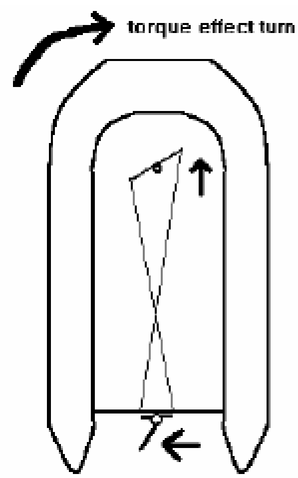


figure 8

countering right turn
caused by torque effect

5) Speed ranges: Slow, Plowing, and Planing

a.) Slow: The boat is flat in the water; the rudder is not very efficient.

b.) Plowing: The boat has the bow raised, the stern deep in the water. The boat is pushing a great deal of water and is quite unstable. Due to the propeller torque the boat is tilted to the left (see par. 4). The rudder does not work well.

c.) Planing: The boat is fast and flat on the water; the rudder is very efficient.

The best speeds for taxiing are either slow or planing speed. The boat is flat on the water and the movement needed to keep the wing horizontal is limited. Of the two, planing is the better one because the rudder is more efficient.

Beginners are normally quite scared to go fast. But they must remind themselves that if obstacles are present in the water, maneuverability is much better at planing speed, and if you have to stop, releasing the power stops the boat almost immediately.

6) Starting from the beach or dock

It seems strange, but many capsizes with seatrikes occur in just this situation. The pilot is busy launching or making other preparations and forgets the position of the wing (see par. 1). When the wing is improperly tilted it exposes a large surface for the wind to push against.

WHILE TAXIING, ALWAYS TAKE CARE OF THE WING POSITION. EVERYTHING ELSE CAN WAIT! ALWAYS KEEP AT LEAST ONE HAND FIRMLY ON THE STEERING BAR AND LOOK AT THE WING POSITION AND NOT YOUR FEET OR ANYTHING ELSE.

7) Taxiing crosswind

Try to start your taxi with the wind coming from the front, as much as possible. If you have to go in some other direction, you should make your turn later when you are moving faster. If the wind is coming from the back just go as fast as you can. Possibly faster than the wind speed (see par. 2 & fig. 4) so that you will have a relative wind from the front. As stated before, this is a stable condition for the wing and the greater boat speed gives you increased maneuverability (see par. 3).

The main thing to remember when taxiing in a crosswind is obviously to keep the wing nearly horizontal to the surface. "Nearly" because you have to tilt it a little (not too much that would make it difficult to maintain the desired direction) on the side that the wind is coming from (see fig. 6).

While at lower speeds you should direct your attention mainly, if not entirely, at the windward wing tip. You do not need to look forward very often, since we normally taxi and land in wide-open areas with few obstacles or traffic. When the wind is on your right remember that the torque effect, especially at plowing speed, tilts your boat a lot and you will have to move the steering bar quite a bit to the left.

As we learned in par. 2 it is advisable to taxi crosswind at a high speed, as this will move the relative wind more to your front (see fig. 5). But remember, if you have to reduce speed abruptly, the direction of your relative wind will veer back to a crosswind, requiring you to correct the bar position in order to maintain the wing horizontal.

8) Taxiing downwind

At low speed this is the other (see par. 6) most common cause of capsizing seartikes.
Wind that hits the trailing edge of the wing, which unlike the leading edge is not rigid, can lift it on one or both sides making the Ramphos turn or swivel at a time where your rudder is very inefficient and waves from the stern can make boat handling even more critical.

When you are coming up to planing speed with a moderate to strong tail wind, be sure NOT to pull the control steering bar to the rear as this will raise the wing's trailing edge and allow the wind to strike the bottom surface of the wing. Since at slow and plowing speeds the stability of the boat and the effectiveness of the rudder are less than optimum, wind under the wing can initiate an uncontrolled turn and place the Ramphos in danger of a capsize. The key is to accelerate to planing speed as quickly as possible while maintaining proper wing control. Your best solution: ALWAYS TAXI DOWNWIND AT HIGH SPEED!

9) Wide turns
At low speed wide turns are not a problem if you watch your upwind wingtip and keep it slightly tilted down.

In any case, remember that a boat in a turn leans toward the inside. This means that if you turn to the left the torque effect (see par. 4) is added to this tilting and you will have to move your steering bar quite a bit to the left to maintain the wing horizontal to the water. When you turn to the right the two effects cancel each other and you will have to tilt the wing less. With this in mind, there is no problem and in fact it is advisable to make wide turns at high speed for the reasons explained in par. 2.

10) Tight turns
If you have to make a turn of approximately 180 there are two different maneuvers depending upon your starting point.

> **a.) Taxiing downwind with a 180 degree turn into the wind. (Left turns are best)**
> As stated earlier, it is advisable to be taxiing at planing speed while traveling downwind. In this situation it is preferable to make your turn to the left. You begin the turn and slow down after tilting the left wingtip down slightly (steering bar moved slightly to the right). The torque effect and the natural movement of the boat in turns (see par. 9) will augment this tilting and keep the boat in a safe condition. Just remember to level the wing when you are faced into the wind and do not allow the boat to turn off the wind line. 44
> **b.) Taxiing into the wind and turning 180 degrees to downwind. (Right turns are best)**
> This is a more critical turn and should be avoided in strong wind conditions. It is preferable to use the old seaplane technique of stopping the engine and letting the wind push you backward to your destination. This maneuver is described in another section of the owner's manual. This must be taught by your instructor and perfected in light to moderate wind conditions.

If you must make a 180 degree turn downwind, do it slowly and make your turn to the right. In this way the torque effect counters some of the tilting of the boat in a turn (see par. 4) and you will have to move the bar less. From 0 to approximately 100 degrees there is no problem if you have your upwind (left) wingtip slightly down in relation to the horizon. After that the problem can begin. You are at a slow speed (with inefficient rudder), possibly waves that can swivel the boat and wind that begins pushing on the trailing edge of the wing.

All of these can, quickly and without much notice, turn the Ramphos well past the intended 180 degrees (190-200-220 degrees) and then you will have the wrong side of the wing tilted down!

Solution to avoid this problem:
When you have turned approximately 100-110 degrees, gain speed as quickly as possible (remember that the added torque of the prop will tilt the boat and you will have to adjust the steering bar). Your rudder will work more efficiently and your relative wind will move to the front or at least lessen the tailwind effect. After you have completed the turn maintain planing speed for normal downwind taxiing.

11) Choosing your landing spot as a function of required taxiing
From the information above, we consider taxiing a critical maneuver for the Ramphos in strong winds. (We do not define strong wind, as it is a term relative to the experience level of the pilot.)

With the Ramphos we have the advantage of generally flying at locations that afford a very large landing area and we can easily choose a landing location and direction (advisable with a headwind). For these reasons a competent Ramphos pilot plans his landing spot in a way to minimize the risks while taxiing. This means that he:

a.) Lands downwind of his final stopping location.

b.) Minimizes the need to make tight turns, taxi crosswind or downwind.

c.) If a downwind turn is required to return to the beach or dock, lands to the left of the final destination so that he can make the downwind turn to the right as recommended.

d.) If he lands past or to the right of his intended touchdown point, he does not hesitate to takeoff again and repeat the operation.

e.) After landing he does not stop the boat, but continues taxiing at planing speed, if possible, to have the advantage of a relative wind from the front, until reaching his destination.

f.) Suddenly slowing after landing might cause the large wake to catch up to the Ramphos and spill over the transom spoiler.

4 Normal Procedures

4.1 General

This section of the manual describes procedures for normal operations of this aircraft.

4.1.1 Speeds for Normal Operation

4.1.1.1 HZ15S

Trim Speed	47 – 56 MPH (45 – 48 Kts) (84 – 90 km/hr)
Stall Speed at Maximum Take Off Weight	38 MPH (31Kts) (62 Km/hr)
Take Off Safety Speed - TOSS	46 MPH (40 kts) (74 Km/hr)
Maximum Speed in Turbulence (Va)	60 MPH (52 Kts) (96 Km/hr)
Maximum Level Speed (Vh)	77 MPH (67 Kts) (125 Km/hr)
Maximum wind operating conditions (At ground level)	23 MPH (20 Kts) (37 Km/hr)
Maximum Crosswind Component	14 MPH (12 Kts) (22 Km/hr)

4.1.2 Normal procedures Check List

This section provides more comprehensive information regarding normal operations of this aircraft and assumes the pilot has been trained in the assembly and use of a weight shift controlled aircraft by a qualified instructor.

PIC has the ultimate responsibility for determining if the aircraft is in a safe condition for flight. Pre-flight inspections, post-flight inspections and securing the plane all fall on the PIC. Unlike the highway, there is no place to pull over and remedy an unsafe problem once you are flying. Use of common sense, conservative approach and ADM will help you enjoy your flying career for a long time.

4.2 Wing Assembly Procedure

4.2.1 HZ15S

Please refer to the HZ15S wing manual supplement

4.3 Wing Pre-flight inspection

The design of the wing is such that junctions not open to view may be reached from zipped inspection panels. Start at the A-frame or control frame of right wing and move around the wing making the following checks. Familiarize yourself with the wing so your pre-flights are effective and orderly.

Wing Pre-Flight Inspection	
Start with the Right Wing	
A-frame/Control frame Locked	√
A-frame/Control frame cables secure	√
Downtube not kinked or damaged	√
Hangblock secure	√
Crosstube haulback tensioning cable secure	√
Nose swan catch secure, nose plates secure, nose cables secure	√
Leading edge tube undamaged and not bent	√
Main cables/struts inspected for any damage	√
Leading edge tube and crosstube junction area inspected and secure	√
Wing tip secure and webbing not worn	√
Washout strut/dive stick secured if applicable	√
Leading edge tube inspected from the wing tip, condition good, no bends or abnormalities	√
Battens secure and pockets free from damage	√
Trailing edge sail condition good, no tears	√
Sprog secure (HZ15S)	√
Haulback cable secured on back of the wing keel. Bracket in good shape	√
Continue to Left Wing	
Trailing edge sail condition good, no tears	√
Sprog secure	√
Battens secure and pockets free from damage	√
Washout strut/dive stick secured if applicable	√
Wing tip secure and webbing not worn	√
Leading edge tube undamaged and not bent	√
Leading edge tube and crosstube junction area inspected and secure	√
Main cables/struts inspected for any damage	√
Downtube not kinked or damaged	√
A-frame/Control frame cables secure	√
A-frame/Control frame Locked	√
Nose area (plates), bolts, nuts secure and catch in good shape. No cracks	√

General Extended	
Top rigging secure	√
All Inspection zips secure	√
Sail condition inspection	√
Sail free from water accumulation	√
Full / free movement of the wing when attached to the trike base to be completed before flight	√
Inspect all cables. Inspect for kinks fraying, corrosion, particularly around the NICO press fittings	√
The symmetry of the wing (Batten profile check)	√
All sail seams intact, with no frayed stitching	√
Nose cone centered and secured	√

4.4 Attaching Wing to Trike and Hull

Attaching Wing to Trike Carriage (refer to photos in Appendix A)
Make sure that the ignition is off
Remove bolt at forward end of compression strut
Position the wing on its A-frame, facing into the wind, with the nose on the ground
Release the mast swivel locking bolt located on the mast behind the back seat.
Lower mast and compression strut. It is recommended to lay some protective material (such as cloth or towel) on both forward upper sides of hull to accommodate control bar.
Mounting of the wing requires two people. They must position themselves at the leading edge near the upper strut connection.
Wheel the Ramphos up to the wing
The wing must now be lifted and balanced so that the control bar can slip under the compression strut and over the instrument pod. The control bar should now be on the protective material of forward deck.
One helper should now position themselves at the nose of the wing and stabilize it as the second person climbs into the Ramphos and straddles the pilot seat facing foward.
One helper will now lift the nose as the second person raises the mast and connects the mast to the hang block with supplied hang bolt. BE ABSOLUTELY SURE THAT YOU SECURE AND SAFETY PIN THE WING HANG BOLT AT THIS TIME.
The person in the Ramphos must now raise the control bar as the helper assists by raising the compression strut into the forward strut bracket and replaces bolt and nut.
The mast swivel locking bolt can now be replaced and secured.
NOW IS A GOOD TIME TO INSURE THAT UPPER AND LOWER COMPRESSION STRUT BOLTS, HANG BOLT AND MAST SWIVEL BOLTS ARE PROPERLY SECURED.
The wing should now be secured by attaching optional lanyards that will tie each corner of the trapezium to the inboard sides of the hull.
The Ramphos is now ready for pre-flight.

4.5 Complete Ramphos Pre Flight inspection

Ensure that the ignition switches are off prior to inspection. Daily inspections as outlined in the Rotax Engine Operator's Manual should be carried out in conjunction with the following inspections.

Trike Carriage Pre-Flight Inspection	
No oil or coolant leaks visible	√
Check oil level	√
Fuel vent line unobstructed	√
Check remote oil tank (912) secure	√
Check enough fuelfor fligh	√
Check coolant present in overflow bottle between max and min marks	√
Check propeller blades and Hub for nicks, cracks and de-laminating and bolts and nuts secure	√
All engine components secure - air filter, muffler, plug leads. Engine cowling secure	√
Check tyre tread	√
Check main wheels	√
No bolts and nuts fractured or cracked. Evidence of corrosion	√
Mast locking bolt and nut secured	√
Electrical system operational and secure	√
Foot throttle and cruise hand throttle operation	√
Seat belt condition good	√
Compression strut locking pins on top and bottom secured. Brackets not cracked or bent	√
Hangblock secured to mast properly.	√
Mechanical Components. Rotate propeller anti-clockwise for912 and Smartabout half a turn (not more) and observe for noise or excessive resistance (clockwise for 582)	√
Front and rear fork area checked for general condition	√
Parachute if attached secure and cable and pull handle securely in place	√
General inspection of Ramphos complete	√

4.5.1 Before Water operations pre-flight items

- Open main wheel inspection porthole and check that wheels in full up and locked position and bungee cords have fully retracted gear doors.
- Open aft hull compartment inspection porthole to check for any water accumulation and empty if necessary.
- Feel all gear doors (if in water) to ensure all three are closed tightly
- Inspect water rudder for correct positioning (down for water operations) and that bungee cords are in good condition

4.6 Fueling

WARNING
Make sure aircraft is GROUNDED while fuelling to avoid static discharge from igniting fuel
Fuel flow is from a single fuel tank fitted with a self-venting tube vented behind and at the bottom side of the trike and labeled. The fuel system is fitted with a shut off valve located on the rear left hand side of the back seat on the fiberglass. Be sure this valve is in the ON position before starting engine.
Never refuel if fuel could be spilled on hot engine components. Use only approved fuel containers. Never transport fuel in an unsafe manner. Fuel fill cap has a key lock mechanism.

4.6.1 Fuel Filter

The fuel system has an in-line fuel filter, which is mounted between the fuel tank and the engine. This filter can be replaced and should be checked for debris once a week for cleaning and inspection (See maintenance manual)

4.6.2 Fuel Level

NOTE
Note fuel level to determine how much fuel will be required to fill the tank
The fuel tank on the Ramphos has a clear viewing strip on the port side. Fill conservatively. The tank capacity is 15.3 US Gallons or 58 Liters.

4.6.3 Fuel Vent

A fuel vent line is located near the filler cap and is guided/vented to the outside of the Ramphos near the back on the bottom. Make sure this isn't obstructed before flight.

4.6.4 Quick Drain

The fuel tank has a Quick drain valve mounted with a T-fitting at the base and to the rear of the tank visible from underneath the tank.

4.7 Helmet, Ear and Eye Protection Requirement

The open cockpit of trikes exposes the occupants to the elements during flight and exposes them to objects outside of the aircraft in an emergency situation. Helmets, ear and eye protection are required for occupants for protection from wind, light rain and strike by insects and so on. Helmets are also required for risk reduction during an emergency landing of the aircraft.

4.8 Normal Procedures Check List

The following checklists should be used as a reference or a guide. Ultimately its PIC's responsibility to develop checklists that work for their flights. Prior to flight a thorough pre-flight inspection of the aircraft should be carried out. Details of the pre-flight inspection are shown earlier in this manual.

4.8.1 Before Engine Start

Pre-Flight inspection complete	√
Controls deflections free and full on the ground	√
Passenger Briefing completed	√
Helmets secure	√
Seatbelts secure	√
Loose objects secure (trike and persons)	√
Intercom ON	√
Brakes ON	√
Parachute handle pin released (if applicable)	√
Area Clear	√

4.8.2 Starting Engine

WARNING

Never leave your aircraft unattended while the engine is running!

WARNING

Remember to Yell CLEAR PROP!

Brakes ON	√
Fuel valve ON	√
Throttles to idle (hand and foot)	√
Master/Main ON	√
Choke ON	√
Mag switches to ON (upward)	√
Clear Prop	√
Ignition button engaged –Release when engine fires	√
Oil Pressure (2 bars or 30 PSI within 10 seconds)	√
Choke OFF	√
Idle adjusted to 2000 RPM for Rotax 912 and 582 and 800 for Smart	√
Radio check – if applicable	√

4.8.3 Taxiing

Taxiing in normal conditions is fairly straight forward.
With the engine idling the brake should be released gently which will disengage the brake. The Aframe should be positioned so that it is in the approximate position for normal trim speed. The pilot's feet actuate steering on the ground. Left turn occurs when the right foot-peg is pushed forward. Right turn occurs when the left foot-peg is pushed forward.

NOTE
Control sense for turning is opposite to that of a conventional three axis aircraft.

When taxiing in strong wind conditions the following procedures apply:

- Head Wind conditions requires the nose of the wing to be lowered just below the trim position
- Down Wind conditions requires the nose of the wing to be raised just above the trim position
- Cross wind conditions requires the upwind tip to be lowered

4.8.4 Before Take Off

CAUTION
Be careful of loose objects in the engine run-up and take off area. These objects can be sucked up by the propeller and can cause damage to the aircraft

Before Take Off	
Brakes ON	√
Choke OFF	√
Warm up engine – adjust idle to 2400 RPM till reach 50ºC or 120º F	√
Oil – check temperature and pressure	√
Mags check – increase rpm to 3800for Rotax 582. 3000 Smart and Rotax 912 Rpm drop with one ignition must not exceed 300 rpm	√
Fuel quantity – sufficient for flight	√
Instruments – set	√
Seatbelts secure	√
Helmets secure – chin strap secure, visor down and locked	√
Throttle Response – 80% On for 3 seconds	√
Controls – pitch and roll, full and free movement	√
Base and final – clear of traffic	

WARNING
Keep an aircraft and engine log and enter any unusual engine behavior. Do not fly unless you have corrected a given problem and recorded the correction in the log.

4.8.5 Take Off and Initial Climb

CAUTION

High angle climb outs near the ground should be avoided

WARNING

At low takeoff weights the TOSS can result in nose high angles that can be out of prescribed limits of +30º. The pilot must be aware of this and should keep the aircraft within prescribed limits by lowering the nose or reducing engine power appropriately

4.8.5.1 Normal Take Off and Initial Climb

Normal Take Off and Initial Climb	
Pitch Control – past neutral towards the compression strut. As you speed up there may be noticeable back pressure from the control bar, keep it pushed forward	√
Hand Throttle OFF	√
Foot Throttle – full ON	√
Directional Control – maintain centered	√
Speed – build up TOSS TOSS – HZ15S = 46 MPH (40 kts) (74 Km/hr)	√
Rotate - push control bar smoothly forward until take off.	√
Control bar pressure released smoothly and speed adjusted for shallow nose angle climb close to ground	√
Gear Up	√

4.8.5.2 Crosswind Take Off and Initial Climb

Crosswind Take Off and Initial Climb	
Pitch control neutral	√
Hand Throttle OFF	√
Foot Throttle – full ON	√
Directional Control – maintain centered	√
Speed – build up TOSS TOSS – HZ15S = 47 MPH (41 kts) (76 Km/hr)	√
Rotate - push control bar forward until take off	√
Control bar pressure released smoothly and speed adjusted for shallow nose angle climb close to ground	√
Gear Up	√

4.8.6 Climb

Climb	
Throttle – ON	√
RPM – Reduce to 5000 if necessary to maintain climb angle within limits (+30º)	√
Airspeed – Best Climb Speed – HZ15S = 50 MPH (44 Kts) (81 Km/hr)	√

4.8.7 Cruise

Cruise	
Cruise Throttle – adjust foot throttle for level flight at desired speed and then adjust cruise hand throttle on right hand side of the trike to release pressure	√
Airspeed – HZ15S = 52 – 56 MPH (45 – 48 Kts) (84-90 Km/hr)	√

NOTE
When the hand throttle is actuated increase power can still be achieved with the use of the foot throttle. The rpm will always return to the set cruise RPM when foot throttle is disengaged.

4.8.8 Descent
NOTE
You can increase these speeds for gusty conditions

Descent	
Foot Throttle – reduce	√
Hand Throttle – OFF	√
Airspeed – HZ15S = 54 – 62 MPH (47 – 54 Kts) (87 – 99 Km/hr)	√
Gear Down	√

4.8.9 Landing

Landing	
Hand Throttle – OFF	√
Airspeed – HZ15S = 37 – 49 MPH (32 – 42 Kts) (60 – 80 Km/hr)	√
Gear Down check	√
Nose Wheel – straight	√
Final – clear	√
Landing – execute properly per training	√
Braking – OFF and then as required	√

Landing should always be into the wind with a long straight approach.
The landing distance specified in performance section is the measured ground distance covered from an approach at 50 feet (15 meters) above the average elevation of the runway used until the aircraft makes a complete stop.

An approach to the runway can be with or without power. However, the airspeed should be maintained above the nominated approach speed in either case. The aircraft should be flown on final approach at or above the nominated safety speed. The additional airspeed allows for wind gradient, and to provide greater controllability in the rough air that may lie close to the ground. Maintaining airspeed on final is very important for engine-off landings, allowing a margin for round out before touchdown.

The trike is designed to land with the rear wheels touching down slightly before the nose wheel. Once all three wheels are solidly on the ground, aerodynamic braking may be achieved by pulling in the control bar, then applying the front nose wheel brake.

NOTE
In the case of a hard landing the maintenance manuals for both the wing and the carriage should be referenced. It must be noted that after a hard landing, your aircraft must be completely checked.

4.8.10 Crosswind Operation

Pilots with low hours should avoid landing or taking off with high crosswind components. Pilot skills and aircraft capabilities are two separate things and lack of either one can set events in motion to cause problems or accidents. Crosswind landings or take off with low wind components up to 7 knots are quite safe and controllable, even in the hands of qualified but relatively inexperienced weight shift control pilot.

The nominated approach speed should be on the higher side of the range listed when landing in cross wind conditions of 8 knots or more.

WARNING
In crosswind landings, after planting the mains on the ground, it is very important especially on paved runways as opposed to grass fields, inhigher crosswind component that the nose wheel be kept flying and kept above the ground till the trike carriage has time to lines up straight with the direction of travel before nose wheel comes in contact with the ground. Not doing so can flip your trike on its side and cause injuries possibly serious

On grass runways, the wheel can possibly slide sideways on the grass but that will not be the case on paved runways. Proper technique and instruction is a must for crosswind landings in the higher range crosswind component.

After a full touchdown in crosswind conditions the relative airflow over the wing will become increasingly from tip to tip as the aircraft slows down. The upwind wing tip should be lowered slightly. This amount depends on the wind strength, and the carriage wheels should retain firm contact with the ground.

Take off procedure is unchanged for the nominated crosswind component. The upward wing may need to be lowered at the start of the take off procedure in higher crosswinds but make sure the wings are level at the point of liftoff or a turn immediately following the liftoff will result.

WARNING
The upward wing may need to be lowered at the start of the take off procedure in higher crosswinds but make sure the wings are level at the point of liftoff or a turn immediately following the liftoff will result.

4.8.11 After Landing

After Landing	
Controls – secure (wing tied properly to the compression strut, upwind wing tip down)	√
Ignition – OFF	√
Electrical Switches – OFF (landing light, strobe, master)	√
Carb Heat Switch – OFF	√
Radio – OFF (if applicable)	√
Seatbelts – unlatched	√
Parachute Pin – inserted	√
Exit – exit the aircraft and help passenger exit if necessary	√

4.8.12 Parking the Aircraft
The aircraft should be parked in a direction facing the wind. Wing should be secured with optional lanyards.

4.8.13 Go Around
During a situation where a go around is required, normal take off power and procedures should be used and enough airspeed should be built up before raising the nose of the trike for climb out.

4.8.14 Ideal Minimum Safe Runway Length
It is common for pilots to try to calculate the shortest possible runway to use. RamphosUSA Inc. strongly recommends using a runway that is long enough so that a straight ahead landing can be made on the runway in the event of an engine failure on takeoff, up until safe altitude is reached whereby a 180 degree turn can be made to land downwind on the same runway. Pilots often have a false sense of security when overhead a runway, when in reality they are in the danger zone and outside the cone of flight safety. Often the runway is too short to land straight ahead on and too short to allow sufficient altitude for a 180 degree turn back to the runway, thus an engine failure over the runway could lead to an off-field accident. The approximate lowest altitude, dependant on pilot skill and environmental factors, etc., for a 180 degree turn to landing is 300-500' AGL.

NOTE
Ideal minimum safe runway length can be calculated like this:
Takeoff distance to 15 m (50 feet) + distance to climb to 300 + feet at best climb + distance to descend from 300 feet to 50 feet + landing distance from 15 m (50 feet).

This assumes perfect pilot skill, and thus should be multiplied by a safety factor.

CAUTION
Pilots may be surprised to discover that this ideal safe runway can be over 3,000ft. long, and also to discover that the runway they operate from has an unsafe zone right overhead the runway.

Runways surrounded by safe landing areas or with good overshoots, however, do not need this ideal length.

4.9 Separating Wing from Trike Carriage

Separating Wing from Trike Carriage
Remove upper mast retaining bolt
Remove nut from forward compression strut bracket
Place protective material on hull deck to accommodate lowered control bar
While helper, positioned at the nose, removes forward compression strut bracket bolt, the second person will gently lower the control bar to the hull deck and on to protective padding
Hang bolt will now be removed as helper will support nose of wing
Both people should now position themselves at leading edge neat the strut attachment points
The nose should now be lowered so that the control bar can be raised over the instrument pod
The wing should now be carefully placed in the nose down position on the ground in front of the Ramphos
Make certain that the wing is positioned into the prevailing wind
Replace forward compression strut into bracket and replace bolt
Replace upper mast bolt
Break down wing and store in wing bag as per wing assembly manual

4.10 Wing Break Down Procedure

4.10.1 HZ15S

Please refer to the HZ15S wing manual supplement

4.11 Transportation and Storage

4.11.1 Transporting by Trailer

The wing must always be transported packed in its bag, and the bag zip should face downwards to prevent the entry of rain water. During transportation, or when stored on slings, the wing must be supported at three places;

a) Its centre and

b) Two points less than 3 feet (1 meter) from each end.

The padding supplied with the wing must be used to prevent chaffing during transport. Supports should be softly padded, and any support systems used for transport, such as roof racks, must use attachment straps that are sufficiently secure to eliminate the possibility of damage from vibration and movement.

Avoid damage to your wing by using well-padded racks. As the wing is quite heavy a strong set of racks are required. During transport the trike carriage should be firmly held at both the front and the rear to prevent movement. Tie down straps should be used with a ratchet system so preload can be applied, this allows the tires to be compressed slightly so as to firmly hold the base in place during transport

When transporting the trike carriage the use of trike and prop covers to protect your aircraft from road grime (and idle fingers) is recommended. Tie the propeller to the trike to stop it from rotating at speed. Check that the back of the wing is well clear of the front mast with the trike on the trailer. Remember that you have an overhanging load when maneuvering in tight places. Store the wing in a dry room off the ground; air the wing out regularly to avoid mildew, and never store wet.

4.11.2 Packed in a Crate

The fuel tank, as well as the carburetor bowls, must be emptied! The propeller must be removed and packed properly with its blade covers and bubble wrap or soft packing material and put in a box. The battery ground must be disconnected. The rear landing gear should be removed and engine supported up in the crate using welded engine stand for crate (generally provided with the trike originally). The airframe should be secured by the propeller shaft. The radiator and bottom of the fiberglass pod should not be touching the crate floor.

4.11.3 Parachute

Aircraft equipped with a parachutes deployed by pyrotechnic rockets are covered by particular Regulations according to the Country of Registration of the Aircraft, you must know and adhere to these Regulations.

4.11.4 Storage

The trike carriage should be thoroughly checked and cleaned prior to storage. After cleaning, wipe all metal components with a clean lightly oiled cloth, while avoiding joints and rubberized parts.

If the trike carriage is to be stored for a long period (e.g.:2-3 months):

- Place a well oiled cloth in the open end of the exhaust
- Cover the air filter with several layers of protection to prevent condensation.
- Drain the fuel tank.

See your engine manual for precautions to be observed if you intend to store the aircraft without use for extended periods.

5 Performance

5.1 General

The performance data in this section has been gathered from flight testing the aircraft with power plant and wing in good condition and using average piloting techniques. It should be noted that climatic conditions, piloting techniques and aircraft condition will cause significant variation to this data.

5.2 Take Off and Landing

5.2.1 Take Off

5.2.1.1 ISA conditions, clean dry runway, calm seas, calm winds, sea level

Performance at MTOW with 912 UL (80 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	240 m	787 ft
HZ15S Water – Take off distance to 50 ft (15 m)	300 m	984 ft

Performance at MTOW Smart M160/1 (80 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	240 m	787 ft
HZ15S Water – Take off distance to 50 ft (15 m)	300 m	984 ft

Performance at MTOW with 582 UL(64 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	275 m	902 ft
HZ15S Water – Take off distance to 50 ft (15 m)	330 m	1082 ft
`		

Performance at typical weight of 1125 lbs (510kg) with 912 UL (80 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	200 m	656 ft
HZ15S Water – Take off distance to 50 ft (15 m)	260 m	853 ft

Performance at typical weight of 1125 lbs (510kg) with Smart M160/1 UL (80 HP)	**Metric**	**Imperial**
H12 Classic - Take off distance to 50 ft (15 m)	200 m	656 ft
H12S Topless – Take off distance to 50 ft (15 m)	260 m	853 ft

Performance at typical weight of 755 lbs (342 kg) with 582 UL (64 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	235 m	771 ft
HZ15S Water – Take off distance to 50 ft (15 m)	310 m	1017

5.2.1.2 3000 feet (914 m) density altitude, calm sea, clean dry runway, calm winds

Performance at MTOW with 912 UL (80 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	350 m	1148 ft
HZ15S Water – Take off distance to 50 ft (15 m)	470 m	1541 ft

Performance at MTOW with M160/1 (80 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	350 m	1148 ft
HZ15S Water – Take off distance to 50 ft (15 m)	470 m	1541 ft

Performance at MTOW with 582 UL (64 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	390 m	1279 ft
HZ15S Water – Take off distance to 50 ft (15 m)	405 m	1328 ft

Performance at typical weight of 1125 lbs (510 kg) with 912 UL (80 HP)	**Metric**	**Imperial**
HZ15s Land - Take off distance to 50 ft (15 m)	310 m	1017 ft
HZ15S – Take off distance to 50 ft (15 m)	420 m	1377 ft

Performance at typical weight of 1125 lbs (510 kg) with Smart M160/1 UL (80 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	310 m	1017 ft
HZ15S Water – Take off distance to 50 ft (15 m)	420 m	1377 ft

Performance at typical weight of 755 lbs (342 kg) with 582 UL (64 HP)	**Metric**	**Imperial**
HZ15S Land - Take off distance to 50 ft (15 m)	340 m	1115 ft
HZ15S Water – Take off distance to 50 ft (15 m)	375 m	1230 ft

The following factors will increase takeoff distance:

Tail wind
Tall grass on the runway
Glassy water
Rough water
Higher density altitude
Pilot skill

PIC is required to take into account the effects of these adverse factors while planning a takeoff.

5.2.2 Landing

5.2.2.1 ISA conditions, calm sea, clean dry runway, calm winds

Performance at MTOW with 912 UL (80 HP) and Smart M160/1 (80 HP)	Metric	Imperial
HZ15S Land – Landing distance from 50 ft (15 m)	250 m	820 ft
HZ15S Water – Landing distance from 50 ft (15 m)	200 m	656 ft

Performance at MTOW with 582 (64 HP)	Metric	Imperial
HZ15S Land – Landing distance from 50 ft (15 m)	220 m	820 ft
HZ15S Water – Landing distance from 50 ft (15 m)	180 m	590 ft

Performance at typical weight of 1125 lbs(510 kg) with 912 UL(80 HP) and Smart M160/1(80 HP)	Metric	Imperial
HZ15S Land – Landing distance from 50 ft (15 m)	200 m	656 ft
HZ15S Water – Landing distance from 50 ft (15 m)	180 m	590 ft

Performance at typical weight of 755 lbs (342 kg) with 582 UL (64 HP)	Metric	Imperial
HZ15S Land – Landing distance from 50 ft (15 m)	200 m	656 ft
HZ15S Water – Landing distance from 50 ft (15 m)	180 m	820 ft

5.2.2.2 3000 feet (914 m) density altitude, clean dry runway, calm winds

Performance at MTOW with 912 UL (80 HP) and Smart M160/1 (80 HP)	Metric	Imperial
HZ15S Land – Landing distance from 50 ft (15 m)	300 m	984 ft
HZ15S Water – Landing distance from 50 ft (15 m)	280 m	918 ft

Performance at MTOW with 582 UL (64 HP)	Metric	Imperial
HZ15S Land– Landing distance from 50 ft (15 m)	300 m	984 ft
HZ15S Water – Landing distance from 50 ft (15 m)	280 m	918 ft

Performance at typical weight of 1125 lbs (510 kg) with 912 UL (80 HP) and Smart M160/1 (80HP)	Metric	Imperial
HZ15S Land – Landing distance from 50 ft (15 m)	280 m	918 ft
HZ15S Water – Landing distance from 50 ft (15 m)	280 m	918 ft

Performance at typical weight of 755 lbs (342kg) with 582 UL (64 HP)	Metric	Imperial
HZ15S Land – Landing distance from 50 ft (15 m)	250 m	820 ft
HZ15S – Landing distance from 50 ft (15 m)	250 m	820 ft

The following factors will increase landing distance:

Brake not working optimally
Tail wind
Downhill landing
Higher density altitude
Pilot skill

PIC is required to take into account the effects of these adverse factors while landing. Direct crosswind components of up to 12 knots at gross weight are within Ramphos Trident's operating limitations.

Always plan conservatively when selecting locations for take-off and landing. Leave some margin for appropriate procedure to be performed in the event of sudden engine failure or turbulence.

5.3 Climb

5.3.1 ISA conditions, calm winds, sea level, MTOW

Performance at MTOW with 912UL/M160 80 HP	**Metric**	**Imperial**
HZ15S		
Climb Rate	5.0 m/sec	980 FPM
Best Climb Speed	81 km/hr	50 MPH (43 KTS)
Performance at MTOW with 582 UL (64 HP)		
HZ15S		
Climb Rate	4.0 m/sec	800 FPM
Best Climb Speed	81 km/hr	50 MPH (43 KTS)

5.3.2 ISA conditions, calm winds, sea level, typical weight

Performance at typical weight of 1125 lbs (510 kg) with 912UL, Smart M160/1 (80 HP)	**Metric**	**Imperial**
HZ15S		
Climb Rate	5.5 m/sec	1080 FPM
Best Climb Speed	83 km/hr	52 MPH (43KTS)

Performance at typical weight of 755 lbs (342 kg) with 582 UL (64 HP)		
HZ15S		
Climb Rate	4.5 m/sec	860 FPM
Best Climb Speed	83 km/hr	52 MPH (43KTS)

5.3.3 3000 feet density altitude, calm winds, MTOW

Performance at MTOW with 912UL,Smart M160/1 (80 HP)	**Metric**	**Imperial**
HZ15S		
Climb Rate	4.0 m/sec	800 FPM
Best Climb Speed	84 km/hr	53 MPH (45 KTS)
Performance at MTOW with 582 (64 HP)		
HZ15S		
Climb Rate	3.5 m/sec	690 FPM
Best Climb Speed	84 km/hr	53 MPH (45 KTS)

5.3.4 3000 feet density altitude, calm winds, typical weight

Performance at typical weight of 1125 lbs (510 Kg) with 912UL, Smart M160/1 (80 HP)	**Metric**	**Imperial**
HZ15S		
Climb Rate	4.5 m/sec	860 FPM
Best Climb Speed	84 km/hr	53 MPH (45 KTS)
Performance at typical weight of 755 lbs(342 kg) with 582 UL (80 HP)		
HZ15S		
Climb Rate	4.0 m/sec	800 FPM
Best Climb Speed	84 km/hr	53 MPH (45 KTS)

5.4 Stall Speeds

Performance at MTOW	**Metric**	**Imperial**
HZ15S		
912/Smart M160/1	62 km/hr	38 MPH (34 KTS)
582	56 km/hr	35 MPH (31 KTS)
Performance at typical weight of 1125 lbs (510 kg) for 912/Smart M160/1 and 755 lbs (342 kg) for 582		
HZ15S		
912/Smart M160/1	60 km/hr	37 MPH (32 KTS)
582	54 km/hr	33 MPH (29 KTS)

5.5 Glide

Glide data has been gathered with the engine off at MTOW at best glide speed for each wing at ISA conditions, calm winds. The best speed to use in an emergency to achieve most travel will vary with conditions. Generally if you wanted to cover more distance in a headwind by gliding, you will have to compensate the best glide speed for calm conditions by increasing the speed a bit. If you had a tailwind and wanted to cover more distance by gliding then the speed to establish would be slower than best glide speed and possibly minimum sink speed.

WARNING
Pilot training, experience, familiarity with your aircraft is your responsibility. We suggest experimenting with these scenarios when your engine is running by going to idle so you have a better idea of how your aircraft will behave in glide in different wind conditions.

Performance for Best Glide (L/D max) Speed	Metric	Imperial
HZ15S		
Rotax 912/Smart M160/1 MTOW	72 km/hr	44 MPH(39 KTS)
Rotax 582 UL MTOW	70 km/hr	43 MPH(38 KTS)
Performance for Minimum Sink Speed		
HZ15S		
Rotax 912/Smart M160/1 MTOW	66 km/hr	41MPH(36 KTS)
Rotax 582 UL MTOW	60 km/hr	37 MPH(32 KTS)

5.5.1 Max Glide Speeds to Fly (Rules Of Thumb)

- Speed to fly for max glide in a tailwind = min sink speed
- Speed to fly for max glide in a headwind = best L/D speed + 1/2 wind speed

5.6 Cruise

Cruise performance on Ramphos Trident is listed for mid trim setting with bar pull in pressure that can be easily held for long periods for time without much effort on the part of the pilot. Trim speed settings are also listed. We suggest keeping the trim setting in the holes that came from the factory for best overall experience. The data is listed in IAS.

Performance at Slowest Trim Setting (hands off cruise)	Metric	Imperial	Fuel Burn Metric	Fuel Burn US
HZ15S				
Rotax 912 UL	84 km/hr	47MPH(45KTS)	10 ltr/hr	2.64 Gal/hr
Smart M160/1 UL	84 km/hr	47MPH(45KTS)	6 ltr/hr	1.59 Gal/hr
Rotax 582 UL	84 km/hr	47MPH(45KTS)	8 ltr/hr	2.11 Gal/hr

Performance at Fastest Trim Setting (hands off cruise)				
HZ15S				
Rotax 912 UL	90 km/hr	56MPH(48KTS)	11 ltr/hr	2.42 Gal/hr
Smart M160/1 UL	90 km/hr	56MPH(48KTS)	7 ltr/hr	1.85 Gal/hr
Rotax 582 UL	90 km/hr	56MPH(48KTS)	9 ltr/hr	2.38 Gal/hr

NOTE
Fuel consumption data was collected in US units and are included as a guide only. They should not be used for flight planning purposes. Changes in aircraft configuration, load, altitude, wind strength and direction as well as climatic conditions can cause significant variation in fuel consumption.

6 Weight and Balance

Centre of gravity limits are not critical in a flex wing weight shift control aircraft. The carriage attaches to the wing through a universal junction known as hang block assembly. Variations in cockpit and fuel loading cannot affect aircraft's balance. The Delta Jet is therefore not critical in terms of centre of gravity. However, distribution of load in a trike carriage affects the attitude of the trike carriage in-flight in a minor way. Please refer to weight and balance calculation for airworthiness as well.

6.1 Centre of Gravity Limits

Base Suspension Range (Measured from the front of the nose plate attached to the wing keel to the suspension point on the hang block)	**Dimension (Metric)**	**Dimension (Imperial/US)**
HZ15S	1570 mm – 80 mm	61.81" – 3.15"

7 Description of the Aircraft and its Systems

7.1 General

This section gives general description of the aircraft, controls, instruments, and optional equipment. Information on the aircraft flight controls is detailed in this section, but it is mandatory that you receive professional training prior to any solo flight. Local laws govern the use of this aircraft where applicable.

7.2 Airframe

7.2.1 Wing

Ramphos Trident is available with the following wing:

1) HZ15S

NOTE

Manufacturer may approve the use of other certified wings for use with the Ramphos Trident. This written approval must be attached to the POH with a list of changes to relevant sections of the manual.

7.2.1.1 HZ15S Wing Dimensions

	Metric	USA
Wing Area	15 sq. m	161.46 sq. ft
Wing Span	10.38 m	34 ft
Aspect Ratio	7.2	7.2
Nose Angle	130 degrees	130 degrees
VNe	125 km/hr	77 MPH (67 KTS)
Stall Speed at gross weight	62 km/hr	38 MPH(34 KTS)
Cruise Speed	84-90 km/hr	45-56 MPH(45-48 KTS)
Speed of max glide angle		
L/Dmax, (with max load) Operational G Loads	+4g(positive) -2g Neg.	+4g(positive) -2g Neg.
Ultimate tested Strength,	+4g positive -2g Neg.	+4g positive -2g Neg.
G's Wmax	600 Kilos	1125 Lbs.
Wwing	55 Kilos	121 Lbs.

7.2.2 Carriage/Hull

The Ramphos Trident is a two seat tandem WSC aircraft. The layout is typical for two seat trike design with the passenger and hull/frame being suspended by a triangular frame, hanging from the top of the mast about the pitch and roll axes, to provide for weight shift control.

The Ramphos Trident has amphibious capability. The repositionable gear system is actuated by a single lever. The frame and gear system of the Ramphos Trident is constructed of high quality stainless steel and the hull is made with vinyl ester resin and several types and weights of fiberglass cloth.

The front wheel is equipped with a type of scrub brake. The nature of salt water operations precludes the use of more traditional braking systems. The pilot and passenger seats are made of water proof cloth.

Under the back seat is a 15.3 gallon(US), 58 liter fiberglass gas tank, securely fastened to the seat frame and base tube of the trike frame.

7.3 Flight Controls

Flight controls are as follows:

- Control bar move right = Left turn
- Control bar push out = Pitch up
- Push right toe = Throttle open
- Hand throttle forward = Throttle open
- To raise gear (after positive rate of climb established) raise gear lever located to the right side of the pilot. The gear lever should be moved in a smooth but positive action until in the vertical position
- To lower the gear, the gear lock lever must be actuated to release safety gear lock mechanism. The gear lock lever must be moved towards the pilot.
- Once the gear is unlocked rotate gear lever forward and down to the limit of travel. This will lower the gear.
- Visually confirm the gear is down and locked by viewing the gear trough the clear lexan cover over the nose gear and main gear viewing ports.

7.4 Ground / Flight Control

Ground Controls are as follows:

- Push left pedal = Taxi steering right
- Push right pedal = Taxi steering left
- Pull brake/gear unlock lever towards pilot= Brakes on
- Ignition key switch to BOTH position = Both magnetos on
- Choke (under dash) to ON position = Choke on
- Fuel Shut Off valve to "ON" position = Fuel on

7.5 Instrumentation

The Ramphos Trident is offered with the standard analog instruments or the optional AMPtronic digital instrument system.


Standard Analog Instruments

AMPtronic GX1/GX2 Digital Instrument System

7.6 Occupant Restraint Harness

Both front and rear seats are fitted with a 2-point front seat and 3-point restraint harness system rear seat. When flying the Ramphos solo it is important to fasten the rear seat belt to prevent contact with hot engine components in flight.

7.7 Engine

The power units available with the Ramphos Trident are the Rotax 912 UL 80hp 4 stroke and the 582 UL 64hp 2 stroke. These engines are designed and built in Austria. The Rotax 912 UL engine is fitted with a gearbox, (2.43:1 reduction ratio) and for the (582 UL 3.00:1 to 3.50:1) , which delivers smooth thrust via a reduction drive. This power unit is complemented with a ground adjustable propeller giving the ultimate in performance and reliability. The engine is fitted with Bing carburetors with an external dry filter. The Smart Turbo Gas M160/1 is built in Germany by Mercedes. The Smart is an 80hp four stroke. The Smart engine delivers power through a centrifugal clutch and a sturdy belt drive. The available drive ratios are 2.00:1 and 2.50:1.

7.8 Carburetor Heating

The system is designed to minimize the risk of carburetor icing. A heating element is wound around the air filters which then are protected with plastic covers. The heated air flows in helping in preventing icing. The carburetor heat switch will actuate the electric valve that allows the heated coolant to flow through the wound copper element around the air filters to heat the air. The carburetor heating system will work automatically when on. An occasional check that the heater bodies are getting warm is advisable after engine running.

The system has not been tested under all possible conditions that may prevail, therefore its effectiveness cannot be guaranteed in all circumstances. Aircraft equipped with this device should never be flown in circumstances where a successful 'no power' landing cannot be made in the event of engine failure. Some power degradation will be noticed when carburetor heat is activated and is normal.

7.9 Propeller


Kiev Props


Kiev Prop Adjuster

The aircraft is equipped with 3 or 5 blade ground adjustable pitch composite propeller. The hub is an anodized alloy, on which blades are ground adjustable. The performance listed is at the pitch set so that maximum of 5800 RPM can be achieved at full throttle in level flight. A pitch tool is provided with the propeller. Please refer to the propeller manual for further information.

NOTE
Manufacturer may approve the use of alternative propellers. This approval is only valid when the written authorization from the manufacturer is attached to the POH.

7.10 Brake System

The Ramphos Trident is equipped with a nose wheel scrub type brake. The option to operate in salt water environments precludes the possibility of using standard braking systems. The brake is actuated by moving the brake/gear lock release lever towards the pilot.

7.11 Electrical System

An electrical diagram for the aircraft is shown in the diagram in the engine manuals.
The Electrical circuits comprise:

- The master switch located on lower left side of seats, when in the off position, disables the entire electrical system
- There are two magneto switches on the instrument panel the up position is ON and down position is OFF
- A starter button activates the starter
- The landing light and sump pump switches are also located on the instrument panel
- A charging circuit protected by a GMA fuse of 15 amps and
- An ignition circuit
-

NOTE
I lieu of fuses optionally Ramphos Trident can be fitted with 15 and 10 amp circuit breakers on the instrument pod.

It should be noted that the ignition circuit is a fail-safe system whereby the engine will run in the event of the ignition circuit becoming disconnected. Switching the coil to ground stops the engine. When stopping the engine the magneto switches should be lowered to the OFF position. Landing light and sump pump switches should be turned OFF if applicable. If necessary the motor can be stopped using the choke to flood the engine as mentioned in the emergency procedure section of this manual.

Refer to the Rotax manual for more details for the engine electrical system.

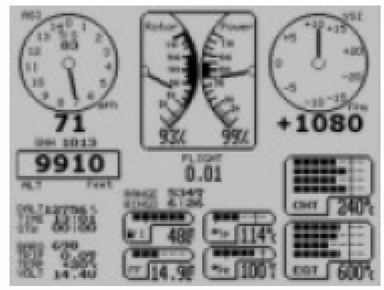
7.12 Pitot Static System and Instruments

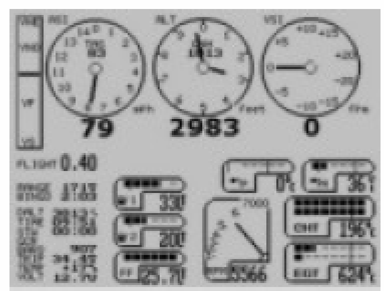
The pitot static system supplies ram air pressure to the air speed indicator from the nose of the pod. The static pick up is at the rear of the instrument under the dash.

7.13 AMPtronic digital instrument system

The AMPtronic instrument has preset alarm limit thresholds. If any of the temperature, pressure or flight speed limitations are reached the "Instrument Alarm" light will start to flash. Please refer to the AMPtronic operations manual.

7.13.1 Basic system functions





- Altitude to 40,000 ft (12,195 m) calibrated, 1ft dynamic resolution
- Airspeed ASI analog and digital, TAS digital
- Stopwatch
- Glide and climb ratio to 1/99
- Altimeter setting 28.30 - 31.30"Hg (QNH 960 to 1060 mb)
- Quick select standard altimeter 29.92"Hg (QNE 1013 mb)
- Time of day, Date for flight log entries
- Air time since take-off (or lesson time)
- Ambient temperature using external sensor
- Up to two Fuel levels using flow sender or optional level senders
- Fuel flow using **optional** flow sender
- Current range estimate (range at current speed and fuel burn)
- Fuel bingo estimate (time until tank empty)
- Range calculator using manually entered ground speed
- Air distance made good
- Voltage. Supply to unit. Usually 12V battery.
- VSI +/- 9 990 ft/minute (50.7 meters per second) range
- Flight log storing up to 200 entries
- Hobbs meter
- Density altimeter
- Barometer for ambient pressure
- Aircraft registration number display
- Maintenance timer
- Warnings for engine temperature, speed high, speed low, maximum altitude, low fuel level, etc
- Alarm output to switch a warning lamp
- Audio alarm output to drive a panel speaker or low level output for alarm tone injection into a suitably equipped headset or intercom system.
- Measuring take-off run to 50 ft (15.24 m) above ground level
- Air talk link for connection to (optional)
    - o PC's and Laptops using optional cable
    - o Stratomaster 'Black Box' flight recorder
    - o Stratomaster Ultra secondary instrument
    - o Download keyring flight log device
    - o Compass and AHRS sensor packages

NOTE : For more information on using this instrument please refer to the AMPtronic GX1/GX2 manuals.

WARNING It is prohibited to fly this aircraft with the AMPtronic Alarm thresholds set outside the engine manufacturer's limits or to set the VNe and VSo limits different than what's listed in this manual.

7.14 Emergency Parachute. Optional Equipment

NOTE
The parachute is optional unless governing body of the country where the aircraft is to be flown requires a parachute.

The BRS emergency parachute system has a double acting firing mechanism. The parachute-operating handle is fitted with a safety pin and is located on the right side of the cockpit dash. This pin should be removed before each flight and the safety pin must be replaced before the pilot gets out of the aircraft. A force of approximately 33 pounds (15 kg) pull on the actuating handle is required to activate the BRS rocket motor. Emergency procedures for use of the BRS can be found in emergency procedures section of this manual. Additional information including service and maintenance requirements can be found in the BRS manual.

WARNING
There is no guarantee of any kind that BRS will always work in all circumstances of an emergency in saving the occupants life. It should be used as a measure of last resort

7.15 Secondary Engine Kill Ignition Switches for the Back Seat

These secondary ignition switches are located on the trike pod on the left hand side easily reachable by the back seat occupant when needed. The switches are protected by switch guards. Operation is switch guards down for on and switch guards and switches up for off. This is done to prevent an accidental engine shutoff by the back seat occupant. When the switches are in the off position the switch shorts the engine coils to ground causing the engine to stop.

8 Handling, Servicing and Maintenance

8.1 Introduction

This section contains factory recommended procedures for proper handling and routine care for your Delta Jet weight shift control aircraft. Included in this section is relevant information required by the operator.

WARNING
It is the PIC's responsibility to ensure that all airworthiness directives have been complied with and all required and recommended servicing and maintenance has been performed as listed in the relevant maintenance manuals of the wing, aircraft and the engine, in accordance with applicable regulations.

8.2 Identification plates

The trike's identification plate is located on the forward lower frame starboard side . The wing's identification plate and serial number will be located on the wing's keel. Serial numbers, model name and date of manufacturer for both trike and wing should be used when corresponding to the factory.

8.3 Documents

This POH is one in a series of documents for the aircraft. Other documents include:

- Wing(s) manual
- Propeller manual
- Engine Owner's Manual
- Engine Installation and Maintenance Manual (pdf on cd)
- AMPtronic manual(s) for instrumentation
- Fuel Flow Sensor Manual (optional)
- Flight Training Supplement
- Maintenance and Inspection Manual

These manuals should be consulted for information not included in this section

8.4 Aircraft Inspection, Maintenance and repair

Qualifications for the person doing the maintenance vary from country to country. The operator/mechanic should be familiar with the local requirements. Maintenance requirements are outlined in the maintenance manual for the base unit and in the wing manual for the wing and for engine maintenance refer to the engine manuals.

NOTE
To protect hardware from elements it is highly recommended that a water displacement compound like WD-40 or the like be sprayed from time to time to prevent galvanic corrosion. This can be done by the owner. Excess should be wiped off immediately after spray. Alternately compounds like Pennzoil Marine sprays after replacement of hardware can be used as they make a waxy film around the metal and protect it from the elements for up to 6 months or as advertised. Treating engine with WD-40 or another water displacement compound also makes it easier to clean and maintain engine's appearance. Excess should be wiped off with a soft cloth.

Caution

Please refer to Ramphos Maintenance manual page 40 Section 2.3.3 for complete list of lifed items.

8.4.1 Hangbolt Replacement
Hangbolt (10 mm, class 8.8) should be replaced every 50 hours with a bolt supplied by the Ramphos factory. Refer to the maintenance manual for further information.

8.4.2 Mast Bolts and Nuts Replacement
Mast bolts and nuts (8 mm, class 8.8) should be replaced every 200 hours with a bolt supplied by RamphosUSA Inc. or specialty metric aviation grade bolts of the same size from an aircraft or ULM factory. Refer to the maintenance manual for further information.

8.4.3 Engine Mount Bolts and Nuts Replacement
Engine mount bolts and nuts (10 mm, class 8.8) should be replaced every 200 hours or on annual (whichever comes first) with hardware supplied by RamphosUSA Inc. or specialty metric aviation grade bolts of the same size from an aircraft or ULM factory. Refer to the maintenance manual for further information.

8.4.4 Wing Hardware Replacement
Generally anything in the wing that looks suspicious should be replaced immediately with hardware supplied by the manufacturer before continuing flight. For further information please refer to the maintenance manual.

8.4.5 Wing Sail Condition
If there is any doubt as to the wing sail condition of a tear or stitching coming apart, it is recommended that you refer to the maintenance manual or authorized sources of information about your wing or the manufacturer (RamphosUSA Inc.) and not fly the trike till proper evaluation of the condition can be made.

8.4.6 Propeller
Propeller hub and prop blade bolts (8 mm, class 8.8) should be re-torqued after first 5 hours of flight and then every 25 hours with an accurate torque wrench to propeller manufacturer values. Refer to the propeller manual.

8.5 Fuel System

Please refer to section 3.5 Ramphos Maintenance Manual

8.6 Engine Oil Replenishment

Please refer to the engine manual.

8.7 Engine Coolant Replenishment

Please refer to the engine manual.

8.8 Tire Pressures

Tires should be inflated to between 20 and 25 psi (1.38 to 1.72 bars) for both front and back tires.
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8.9 Electrical Fuses and Battery

GMA 15 amp fuse is used for the charging system and GMA 10 amp fuse is used to protect the instrumentation. I lieu of fuses optionally Ramphos Trident can be fitted with 15 and 10 amp circuit breakers on the dash. A sealed battery is located under the pilot seat and properly secured. If replacement is warranted, please use a sealed battery as recommended by the engine manual of similar size as original battery. The glass cockpit shows voltage of the battery while in flight. It should be in excess of 13.2 Volts if charging system is working properly and about 12 Volts when engine isn't running.

8.10 Parking, Moving on the Ground and Storage

Make sure area is clear, ignition is Off and if applicable BRS safety pin is in before moving the aircraft on the ground manually. While moving the aircraft take care to not put weight or excessive pressure on the front fiberglass or engine cowlings. Before moving, the aircraft secure the wing's A-frame and move carefully negotiating the wind direction with the wing's position

Pulling the trike: Moving the base (with or without the wing) is facilitated by lifting the front wheel and walking the base. Do not pull excessively hard on the compression strut or nose strut of the aircraft carriage. If a hard pull is needed, its best to push the aircraft from the prop hub (back). Steer the trike while manually moving by pushing the nose wheel or front steering in the desired direction. Alternately the front wheel can be placed on a castering support and steered freely.

Pushing the trike: The trike can be pushed using pushing on the prop hub (NOT BLADES) on even surface. Steering is slower and harder using this method except when using castering support on the front wheel.

Parking: Parking the aircraft requires using chocks and securing the wing with the upwind wing down. In higher or gusty wind conditions, the wing should be tied down or if appropriate taken down or the trike should be moved indoors.
Please refer to section 4 for further information.

NOTE

The trike carriage or base can be moved with or without the wing

Long term Storage: Long term storage will require the supplied air filter(s) be covered to prevent foreign objects getting in the air intake area. Full covers for the carriage and prop blades are advisable, which are available as after market items from RamphosUSA Inc.. The engine manual should be consulted for long term storage practices for the engine. Refer to section 4 for further information for storage

NOTE

Do not store the trike outside for any appreciable length of time where it is exposed to the elements. This may reduce life of the sail and other items

8.11 Transporting the Aircraft

Custom or flatbed trailers can be used to transport the aircraft if they are capable of securing the carriage properly. A carriage cover and propeller cover should be used to minimize damage from flying debris. Propeller blades should be tied in place with soft straps so they are not allowed to move in the air. Propeller blades should never be moved more than a half rotation in the opposite direction to the general direction of rotation of the engine. Wing should ideally be transported fully packed separately.
Please refer to section 4 for further information

8.12 Cleaning

8.12.1 Frame

The frame is Stainless Square stock. It is generally maintenance free. It should be rinsed with fresh water after salt water contact.

8.12.2 Painted Surfaces

The painted exterior surfaces of the aircraft can be washed using a mild detergent and water, alternatively an automotive liquid detergent may be used. Soft wax polish applied with proper procedure is recommended every 4 months on painted surfaces to maintain luster and protect the paint.

8.12.3 Engine

An engine and accessories wash down should be performed regularly to remove any oil, grease, and other residue. Periodic cleaning allows proper inspection of the engine components and can be an aid to discovering defects during inspection as well as reducing the potential for an engine fire during aircraft operation. The engine may be washed down using a suitable solvent, then dried thoroughly. During cleaning, the Air intakes, BRS parachute, and the electronics should be protected with a thin plastic film like saran wrap.

8.12.4 Propeller

The propeller should be cleaned occasionally with water and a mild detergent with a soft cloth or sponge to remove dirt, grass and bug stains. The opportunity should be taken to visually check the condition of the propeller during cleaning. Proper wax could be applied. Please consult the propeller manual for proper installation, usage, care and maintenance procedures.

8.12.5 Upholstery and Interior

The hull interior area should be vacuumed out to remove all loose dirt/gravel etc. All Care should be taken to not spray any substance that will degrade the webbing material, vacuuming is recommended for the upholstery. Alternately, seats can be taken off easily and washed with mild detergent and cool water.

WARNING

Do not use gasoline or any highly flammable liquid for any wash down or cleaning. Do not wash a hot engine. Wait for it to completely cool off. Perform all cleaning in a well ventilated area and take proper precautions for the materials used

CAUTION

Precautions should be taken so that cleaning agent or water does not damage electrical circuits. Electrical components should be protected before using any solvent on the engine. All fuel, air and electrical openings or components on the engine should be covered before cleaning the engine. Caustic cleaning agents should be first tested before being used on a larger area

8.13 Approved Sources of Information and Maintenance

The following are the approved sources for further information regarding maintenance:

- Ramphos USA (http://www.ramphosusa.com)
- Rotax Austria and its authorized representatives (Rotax Engines)

For a list of whom is allowed to do maintenance on this aircraft please refer to the maintenance manual

Appendix A

Wing Mounting Procedure

Step 1. Remove bolt at forward compression strut bracket.

Step 2. Lower mast.

Step 3. Move wing into position.

Step 4. Lift control bar under compression strut and over instrument pod.

Step 5. Place control bar on protective material on deck.

Step 6. Helper must stabilize wing holding the nose.

Step 7. Helper must raise nose to put hang block in position to mate with mast.

Step 8. Mast must now be raised to hang block.

Step 9. Holes for hang block should be lined up with upper mast hole.

Step 10. Hang bolt is now inserted into hang block.

Step 11. Safety pin installed on hang bolt wing nut.

Warning: Hang bolt must be secured with wing nut and safety pin at this stage.

Step 12. Control bar must be raised as helper prepares to re-install bolt at forward compression strut bracket.

Step 13. Helper secures nut and bolt at forward compression bracket position.

Step 14. Upper mast bolt is now secured.

Mounting complete. Now is the time to inspect all connections.