North Wing S-LSA Pilot Operating Handbook
Model: Sport X2 582

NORTH WING

LIGHT SPORT AIRCRAFT · ULTRALIGHT TRIKES · HANG GLIDERS

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Preface

The documents listed below are required for a complete S-LSA package for the North Wing Apache 582 S-LSA. This document is the North Wing S-LSASport X2 582 Pilot's Operating Manual for Types Navajo and Apache. It describes the information required and the procedures for the wing, carriage, engine, and propeller.

- **Pilot's Operating Handbook (POH)**
- **Northwing Maintenance Manual**
- **Rotax Owners Manual**
- **Rotax Maintenance Manual (Compact Disk)**
- **Radio Manual – If Installed**
- **BRS Parachute Manual – If Installed**
- **Manuals for all installed instrumentation**

Statement

This light sport weight shift aircraft has been manufactured in accordance with the ASTM specification F 2243-04 each Sport X2 582 TRIKE includes a Pilot Operating Handbook (POH). The content and format herewith is defined by F 2243-04. This is not a FAA certified aircraft.

A weight controlled aircraft means a powered aircraft with a framed pivoting wing and a trike carriage controlled only in pitch and roll by the pilot's ability to change the center of gravity.

Caution

Keeping your trike in a safe operating condition requires regular maintenance. Maintenance schedules are outlined in the maintenance manual. Please refer to this manual to properly maintain your trike.

Manual Amendment Record Sheet

Amendment Date	Affected Sections	Affected Pages	Date Inserted	Signature

Table 1 Amendment Record Sheet

NOTE:
North Wing's manuals will be revised as necessary. Registered North Wing S-LSA owners will be notified of any changes and directed to the North Wing web site (<http://www.northwing.com>) for the applicable pages. The amended pages should be printed and the prior page replaced in the folder as soon as possible. The amendment table should at that time be updated with the appropriate details and date.

Table of Contents

1. General Information

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This is not a FAA certified aircraft.

1.1. Symbols, Abbreviations and Terminology

In this Pilot Operating Handbook (POH) the following meanings are used:

AOI - Aircraft Operating Instructions

Gross Weight - the maximum allowable weight of the aircraft at take off specified by the aircraft manufacturer, including the empty aircraft, occupants, fuel, engine fluids, and removable and disposable equipment. Performance parameters such as stall speeds are based on this weight.

Wet Weight – Weight of aircraft with all fluids full.

Empty Weight – The weight of the aircraft with no fuel, oil or water.

CG – Center of Gravity

FAA – United States Federal Aviation Administration

fpm – feet per minute

CAS – Calibrated Airspeed, temperature and pressure compensated airspeed

IAS – Indicated Airspeed, as displayed on the cockpit mounted airspeed indicator

Landing Approach Speed – the airspeed which allows control in turbulence, wind gradient or sudden engine failure during landing

Take off Safety Speed – the airspeed that allows control in turbulence, wind gradient or sudden engine failure during the climb following take off

V_A – Maneuvering Speed – the indicated airspeed above which the pilot may not make full or abrupt control movements

Vc – **(Trim Speed)** Design cruising speed based on CG setting. The indicated airspeed at which the aircraft remains in a stabilized condition without pilot input

V_D – the aircraft design diving speed

V_H – maximum level speed

V_{NE} – the indicated airspeed that the aircraft is never to exceed for structural reasons

V_S - Stall Speed – the indicated airspeed at which an uncontrolled downward pitching motion of the aircraft occurs and sufficient lift to maintain level flight is no longer possible.

V_X – Maximum angle of climb speed (best speed for clearing obstacles on take-off)

V_Y – Maximum rate of climb speed

1.2. Use of English Units

This POH uses the English unit system as the basic system of measurement. The following conversion factors are presented as a ready reference for conversion to metric units if necessary.

Conversion Factors

1 Pound (lb)	-	0.4536 Kilogram (kg)
1 Pound per sq inch (psi)	-	6.895 Kilopascal (kPa)
1 Inch (in)	-	25.4 Millimeters (mm)
1 Foot (ft)	-	0.3048 Meter (m)
1 Nautical Mile	-	1.15 Statute Miles (SM)
1 Statute Mile	-	.869 Nautical Mile
1 Statute Mile	-	1.609 Kilometers (km)
1 Nautical Mile (NM)	-	1.852 Kilometers (km)
1 Imperial Gallon	-	4.546 Liters (l)
1 US Gallon	-	3.785 Liters (l)
1 US Quart (qt)	-	0.946 Liter (l)
1 Cubic Foot		28.317 Liters (l)
1 Degree Fahrenheit (F)	-	(1.8 x Cent. degree) +32
1 Inch Pound (in lb)	-	0.113 Newton Meters (Nm)
1 Foot Pound (ft lb)	-	1.356 Newton Meters (Nm)

1.3. Introduction

Read this before your first flight!

Every pilot has to understand the limitations and specifications of this light sport aircraft. The Pilot Operating Handbook must be read thoroughly. Please pay attention to the pre-flight and daily checks. Maintenance instructions for the Sport X2 582 are given in a separate maintenance manual.

Also note that no amount of information we can give you in writing will serve as a substitute for proper training. Before you attempt to fly your Sport X2 582 TRIKE, seek out a qualified instructor to teach you how to fly safely. **No other single factor is as important to your safety as proper training!** If you need help in locating an instructor in your area, contact North Wing UUM and we will help you find one. The pilot in command alone is responsible for ensuring the continued airworthiness of this aircraft and for its operation within the limits detailed herein. All persons entering this aircraft do so at their own risk.

1.3.1. Warning Notice

WARNING:

NO WARRANTY IS MADE OR IMPLIED OF ANY KIND!!!! NO WARRANTY FOR ANY ACCIDENT OR INCIDENT CAUSING INJURY OR DEATH TO P.I.C. OR PASSINGER.
SAFE OPERATION OF THIS OR ANY AIRCRAFT IS THE SOLE RESPONSABILITY OF THE P.I.C. AND/OR OWNER.

YOUR AIRCRAFT HAS A FLIGHT ENVELOPE THAT YOU MUST STAY WITHIN, (SEE FLIGHT OPERATING LIMITATIONS IN SECTION 2) OPERATION OUTSIDE THIS ENVELOPE BY DOING ERRATIC FLIGHT OR AEORBATICES MAY CAUSE EQUIPMENT FAILURE.

AVIATION OF ANY MANNER IS INHERENTLY DANGEROUS! PARTISAPATING IN AVATIONS ACTIVITIES WHETHER YOU ARE A PIOLT OR NOT, IS DANGEROUS! BY PARTICIPATING IN FLYING OR RIDING IN OUR AIRCRAFT YOU ACCCEPT THE RISK ASSOCIATED WITH FLYING.

Manufacturer:

North Wing UUM, Inc.
3904 Airport Way
E. Wenatchee, Wa. 98802

1.4. General Dimensions

Sport X2 582 - Apache/M-Pulse

DIMENSIONS	USA	METRIC
WING SPAN	31.5 ft	9.5m
WING AREA	160 sq.ft.	15m
ASPECT RATIO	5.8	5.8
WING WEIGHT	115 lbs	52kg
WING LENGTH (SHORT PACKED)	11.5 ft	3.5 m
WING LENGTH (PACKED)	18.5 ft	5.6 m
WHEEL BASE, CENTER (WIDE)	65 in	165 cm
WHEEL BASE, CENTER (LONG)	70 in	178 cm
TRIKE WIDTH (OUTSIDE WHEEL PANT)	75 in	191 cm
TRIKE LENGTH (WITH WING)	125 in	318 cm
TRIKE LENGTH (WITHOUT WING)	111 in	282 cm
OVERALL HEIGHT (C.B. forward)	118 in	299 cm
OVERALL HEIGHT (WING LEVEL)	102 in	259 cm

Sport X2 582 - Apache/GT5

DIMENSIONS	USA	METRIC
WING SPAN	31.5 ft	9.5m
WING AREA	147 sq.ft.	13.5m
ASPECT RATIO	6.2	6.2
WING WEIGHT	120 lbs	54kg
WING LENGTH (SHORT PACKED)	11.5 ft	3.5 m
WING LENGTH (PACKED)	18.5 ft	5.6 m
WHEEL BASE, CENTER (WIDE)	65 in	165 cm
WHEEL BASE, CENTER (LONG)	70 in	178 cm
TRIKE WIDTH (OUTSIDE WHEEL PANT)	75 in	191 cm

TRIKE LENGTH (WITH WING)	125 in	318 cm
TRIKE LENGTH (WITHOUT WING)	111 in	282 cm
OVERALL HEIGHT (C.B. forward)	118 in	299 cm
OVERALL HEIGHT (WING LEVEL)	102 in	259 cm

SX1-582 Navajo /M-Pulse

TRIKE LENGTH (WITHOUT WING	100 in	254 cm
TRIKE LENGTH (WITH WING)	114 in	290 cm

1.4.1. Main Systems

Full Fairing Model and Open Model

Your NW Sport X2 582 comes in two configurations the "Apache" (full fairing) and "Navajo" (open trike). This is a 2 seat (tandem), weight shift controlled aircraft. It is comprised of several components that are carefully matched by North Wing UUM, Inc. to meet our stringent quality standards. The components and their features are discussed in this manual.

The main systems that make up the Sport X2 582 Trike are:

- **Carriage** - Engineered and constructed by North Wing UUM, Inc.
- **Electrical System** - A self-charging system that powers all accessories, made up of OME components i.e.: "hot box" electrical system and "EIS" digital gauge.
- **Rotax 582 Engine and 3.47:1 Gearbox** - Manufactured by Bombardier
- **Cooling System** - Engineered to keep your engine running at optimal temperature
- **Exhaust System** - Durably mounted to the engine
- **Warp Drive** – Composite constructed for smooth and balanced combination
- **Wing, MP2-15 – North Wing Inc.** Engineered and constructed by North Wing UUM, Inc.

2. Operating Limitations

In order to safely enjoy flying your Sport X2 582 Trike, the following precautions must ALWAYS be followed. **Failure to do so could result in serious bodily injury or death!**

• Never fly in winds stronger than your piloting skills will allow you to be safe. Winds above 20 mph can be considered dangerous for a TRIKE.
• Do not fly in rain or snow, or when conditions could turn rainy or snowy. Stall speeds will increase when the sail is wet. Overall aircraft performance will decrease.
• Never fly if you are impaired by alcohol or medications.
• Do not fly if you have any medical conditions, which could cause you to black out or lose control of the aircraft in any way.
• Always fly from a field that is of sufficient length and free of obstructions.
• Always take off and land directly into the wind. NEVER take off or land with the wind.
• You should never attempt to operate your TRIKE without proper training.
• Use of helmets is always recommended.
• Your TRIKE should always be operated within the legal boundaries set up by the FAA for these types of crafts. This means you must be a licensed pilot and have your craft legally registered with the FAA and carry an airworthiness card and limitations.
• If you only hold a student pilot certificate, you cannot (under any circumstances) carry a passenger.
• Never overload your craft or exceed the manufacturers recommended gross weight limit.
• Your craft must be carefully inspected before each and every flight.
• Always warm your engine up to operating temperature before flying.
• Always wear lap and shoulder belts.
• NEVER fly your aircraft if you know of a problem or suspect there to be one.
• Always fly in a safe manner, and never fly over anything that you wouldn't want to land on!
• Never modify your Sport X2 582 TRIKE without the express written consent of North Wing UUM, Inc.

2.1. Speeds to fly

2.1.1. Stall speeds

Vs @ Gross weight	33 mph
Vs @ 650 lbs	27 mph

2.1.2. Trim Speed (control bar has neutral pressure)

Trim speed can be adjusted for desired speed and handling by moving the trike forwards (speed up) or back (slow down) on the keel tube of the wing. See range setting in Section 6.

2.1.3. Maneuvering and Never Exceed Speed

Va = 50 mph - Do not make fast or full control movements at or above this speed!
Vne = 65 mph - Do not exceed this speed in any operation.

2.2. Center of Gravity Limits

Center of gravity limits are not critical on a trike (flex wing aircraft). Having the trike carriage attached to the wing at a single point (tether point) with a universal bracket, variations in weight in the cockpit or fuel loading cannot influence the aircraft balance. The weight loading in the trike only has an effect on the angle of attack at which the trike moves through the air.

The range that you can move the trike forwards or back on the keel of the wing is 50½" to 52½" see page 28.

2.3. Operating Weight Limits

Max. take off weight	990 lbs
Wet trike weight (with 16.25 gal fuel)	550 lbs
Empty Weight	
w/Fairing	480 lbs
wo/Fairing	450 lbs
Front seat load range:	140 – 280 lbs
Rear seat load range:	0 – 280 lbs
Total max crew weight w/full fuel	440 lbs Sport X2/ Apache
Total max crew weight w/full fuel	460 lbs Sport X2/ Navajo

NOTE: Max crew weight can change depending if the trike is full of fuel.
NOTE: Minimum flight crew is 1 person (Front Seat).
Maximum crew is 2 persons.

Wet and Empty weights are defined in Section 1.1

2.4. Maximum Wind

Maximum wind speed 20 mph, no gust factor
Maximum cross wind 10 mph, no gust factor
Cross wind take offs and landings demand a lot of training and skill, the higher the cross wind, the greater your skill must be. In gusty wind with more than 5 MPH gust factor and/or wind over 20 MPH flight operations should stop!

2.5. Service Ceiling

Maximum service ceiling is 10,000 ft due to sport pilot restrictions.

2.6. Flight Limit Load Factor

Positive Limit Load factor = 4 G's
Negative Limit Load factors = - 1.5 G's. Load factors more then -1 G should be avoided

2.7. Prohibited Maneuvers

- The Sport X2 582 is not certified for aerobatics.
- Pitch angles more then 30 deg +/- should not be performed.
- Steep turns beyond 60deg bank should not be performed.
- Acceleration or deceleration should be limited to 4 mph per second.
- Changing bank angles more then 30 degrees per second and pitch angles more then 15 degrees per second.
- Flights in VFR conditions only.
- Night flight requires special optional lighting and a Private Pilots license with a night flight endorsement.

2.8. Engine Temperature Limits

- Max RPM: 6800 rpm for take off / 6400 rpm continuous operation
- Max EGT: 1200F
- Min EGT: 930F
- Max CHT: 300F
- Min CHT: 230F
- Max Coolant: 180F
- Min Coolant: 140F

2.8.1. Engine Cooling

We use the Rotax suggestion of 50% non-corrosive antifreeze to pure water.

Warning: do not open the cooling system when engine is hot.

For complete coolant specifications see Rotax manual .

2.8.2. Fuel and Fuel Capacity

Fuel Specification: Good Quality Automotive Unleaded Min 87 octane
Aviation 100LL gas may be used for short periods in emergency

Fuel capacity: 16.25 US gallons

Useable fuel capacity: 15.0 gallons

2.8.3. Engine lubricating Oil & Gear lubrication

For oil specifications see Rotax Manual located in the Sport X2 582 maintenance manual.

3. Emergency Procedures

3.1. Engine Failure On Take off

Engine failure on climb out is one of the more dangerous times for the engine to fail. Preflight and good maintenance is key. To make the best possible landing if engine does fail; maintain airspeed, reduce angle of attack (pull the nose down a little). If possible, land straight ahead into the wind. If this is not possible, turn as shallow as possible to get to a better landing option. Remember you will need to round out for the flair a little higher than a normal landing. Practicing power off landings with an instructor would be a great benefit to your flying skills.

3.2. Engine Failure at Altitude

If engine stops and you have sufficient altitude you can check this list to determine if you should attempted to restart the engine.

- Adequate fuel
- Mag switch on
- Choke lever in off position

The most likely emergency in flight is loss of engine power. The first priority in such an occurrence is to pick out an emergency landing site and begin procedures to approach and land maintaining control of the aircraft throughout. If you are at low altitude you may have very little time to make a safe landing. Concentrate on the safe landing task first and foremost.

If you have sufficient altitude allowing time to determine the cause of the engine stoppage, you may attempt a restart or other action **after** selecting a landing site and beginning the emergency approach. In the majority of cases a safe restart is unlikely so do not spend a excessive time on this effort. Concentrate on making a safe landing first.

The power off landing will be at a much higher sink rate that the "normal" landing with power on being used to control the sink rate. Begin your landing rotation higher up and use full flare to keep the touchdown as light as possible.

3.3. Forced Landings

Use power off landing procedure that you have practiced with your instructor.

Do the following:

1. Turn ignition off
2. Tighten Seat belts
3. Keep Hands and Feet inside Frame (if possible)
4. Tighten Helmet

3.4. In-Flight Engine Fire

In the unlikely event of an in-flight fire, follow the procedure below:
1. Try to determine the cause in case it can be distinguished.
2. Maintain control of the aircraft.
3. Look for good landing area and land as soon as possible.
4. Try to put out an engine fire by shutting off fuel pump, (if you have one) adding full throttle and speeding up.
5. Eventually you will need to land with or without the fire out. Use forced landing procedure if the engine is out.
6. If you cannot extinguish the fire and there is no safe landing area, the parachute system could be the best option. However, wait until you are about 500 – 1000 feet above the ground to minimize the possibility of the parachute igniting also.
7. Do not use the parachute at higher altitudes (use that altitude to put out the fire) fly the aircraft to within 700 ft of the ground over the best looking terrain to come down under parachute.
8. After landing, evacuate aircraft ASAP! Advise your passenger what to do upon landing. Help your passenger to get out as soon as you're out!!

3.5. Sail Damage in Flight

Sail damage in flight rarely occurs, but if it does, fly at the slowest controllable speed to avoid accelerating the damage, and try to determine if the damage is progressing. If the damage is not progressing, and it does not hinder the aircraft from being flown safely, find a suitable landing area and land to inspect the damage further. If the sail damage is progressing while flying, and a safe landing is in question, before a catastrophic failure occurs, climb to at least 700 ft and activate your parachute system. If you do not have a parachute system, fly as low as possible over the trees until you can find a suitable landing site. If a total failure occurs before finding a suitable site, flying low and slow over the trees maximizes the chance of survival.

3.6. Propeller Damage

Many things could cause propeller damage, such as:
1. Debris on the runway (walk your runway and clear rocks, sticks, etc…)
2. Items carried by you or your passenger (make sure all items are in a secure place and can not fall out of the trike)
3. Loose items on the trike or engine. One common thing is a tool left on the aircraft (do a good preflight!)

Should propeller damage occur in flight, it will most likely create a severe vibration due to imbalance. Shut down your engine immediately before the vibration does further, and perhaps more critical damage.

Do an emergency landing at the nearest possible landing site.

3.7. Optional parachute system

An optional parachute may be added to your aircraft. We highly recommend one. It is very inexpensive insurance. Remember ANY AIRCRAFT CAN HAVE MECHANICAL FALURES…… CERTIFIED OR NOT! With Light Sport Aircraft, at least you have an economical insurance not easily available on certified aircraft.

See the manual or online information provided by your parachute system for set up, installation and use of the parachute.

3.8. Failure of Ignition

If the ignition switch will not turn off the engine, you can use the choke to stop the engine by flooding it. Do not try to restart the engine till the problem has been found and fixed.

3.9. Spins and Spiral Descending turns

Deliberate spins and severe spiral turns are **prohibited** in this aircraft. A spin is a difficult situation to get into. Flex wings resist spins and you would have to physically hold the trike wing into a spin. Spins can happen when you stall at a low speed and high angle of attack (AOA). If a turn is then induced and you continue to hold the bar forward (nose up), the trike will spin. To get out of a spin release the backpressure on the control bar to allow the nose to lower and recover from being stalled. Manage speed and AOA as you exit the spin.

Mild descending turns (45 degrees of bank or less) at less then Vne can be used to reduce altitude.
Fast spirals over 45 degrees of bank and above Vne could result in being locked in a turn unable to roll out, a non-recoverable situation resulting in impact with the ground. If you find yourself in a spiral dive and feel you can still recover you must try to roll out of the turn and then pull out of the dive very gradually to avoid rapid pitch up and structural damage or failure to the aircraft. A rapid pitch up from Vne can cause loads that exceed the design limits of the wing.

4. Normal Procedures

4.1. Training Supplement

There are some unique characteristics of weight shift aircraft that need to be learned during training. All students should be trained using the FAA prescribed standards for examination and practical tests as a guide as to what knowledge and skills are needed. The manufacturer's Pilot Operating Handbook should also be used as a guide for training. For beginning students

unfamiliar with any form of flight, this should be a straightforward process. Particular care on the part of the instructor however needs to be paid to weight shift students who may have experience with other forms of flight. The weight shift trike has some characteristics that are quite different from other aircraft. Pilots of other aircraft develop habits that could be a hindrance to safe flight in a weight shift trike without proper training.

4.2. Wing Setup from Shipping Box

See wing manual provided by the wing manufacturer

4.3. Wing Setup and Breakdown Procedure

See wing manual provided by the wing manufacturer

4.4. Attaching Wing to Trike

Once the wing is setup, it is ready to be attached to the trike. When done properly this is a very simple task that should take no more than 5 minutes to complete. The detailed recommended procedure is given below.

1. Remove the nose cone from the nose of the wing. Face the wing into the wind. Set it on the base tube and rotate the wing forward to rest the nose on the ground. Roll the trike up to the wing until the front wheel is about 2"-3" from the base tube. It is important that the keel tube of the wing be aligned with the axis of the trike. If it is not, it will be difficult to slide the pivot block plates in position over the carbon/nylon pivot block. Apply parking brake or chock the rear wheels.
2. Remove the hold down pulley from its storage pouch on the trike root tube and lay out for convenient access in the next step. Confirm that it is firmly attached to the root tube using the velcro strap. Be sure to understand how the hold down pulley works before trying to use it. (Figure 1.

Figure 1

3. Pull mast down/forward (which will compress the lift cylinders) to position shown in Figures 2 and 3 and clip the mast hold down pulley ring into the small hole at bottom of square tube at mast apex. Be sure the hold down pulley is adjusted to a reasonable length by catching the loose end of the rope in the V-notch of the pulley. The rope must be in the V-notch to prevent the mast from springing back up.
4. If the nose compression strut is not already attached to the trike, attach it now while the mast is in the lower position.
5. Lift the nose of the wing so that the wing is nearly parallel with the ground, and walk around behind the downtubes so you can reach the hold down rope and the pivot block assembly. At this point the trike, wing, and YOU should be positioned as shown in Figures 2 and 3 below. Be sure to hold on to the wing to balance it in this position until the pivot block is attached.

Figure 2: Starting Position

Figure 3: Front View

6. Loosen the three bolts in the pivot block plates slightly so that the plates will slide easily onto the pivot block. About 2-3 turns on each nut is sufficient.
7. Rotate the wing backward until the pivot block aligns approximately with the apex of the mast. Slowly release the hold down rope and allow the mast to rise. As it rises, guide the plates into position on either side of the pivot block. (Figure 4 below.) Let the mast rise until the top hole in the plates align with the top hole in the pivot block. Slide the bolt

into position through the top hole and put nut on opposite side. (Figure 5) It is usually convenient during preflight to have all 4 pivot block nuts on the same side.


Figure 4: Guide Plates onto Block


Figure 5: Insert Bolt in Top Hole

8. Release the hold down pulley tension , unclip the rope, and restore the pulley assembly in its storage pouch on the root tube.
9. Tight all four nuts to "Snug". Do not overtighten.
10. While the wing is in the lower position, attach the ballistic parachute straps to the D-ring and close the D-ring nut securely. (Figure 6)
11. Attach the safety cable. The safety cable should wrap once around the keel tube between the pivot block and the control frame apex as shown in Figure 7. This is also a good time to preflight the bolts in the control frame apex and the cross tube pull back cable.


Figure 6: Attach BRS Straps


Figure 7: Attach Safety Cable

12. Reinstall the nose cone on the wing nose. (Figure 8)
13. Your wing is now ready to lift into position. The lift cylinders will provide about 95% of the lifting force needed. BE SURE NOT TO LIFT VIGOROUSLY OR YOU COULD FLIP THE TRIKE OVER BACKWARDS ONTO THE PROPELLOR. Slowly lift the wing using the base tube or downtubes until the lift cylinders are fully extended. This will provide just enough clearance to position the nose compression strut onto its mating tube. (Figures 9 and 10)
14. Install the bolt, nut, and safety clip on the nose compression strut. (Figure 11)

Figure 8: Reinstall Nose Cone

Figure 9: Lift Wing into Position

Figure 10: Seat Compression Strut

Figure 11: Install Nut in Compression Strut

4.5. Preflight Checklist (Detailed)

Before each flight the pilot in command of the flight should conduct a preflight inspection to assure that the aircraft is in a safe condition for flight. The following is a detailed description of a suggested procedure for such a preflight inspection. The pilot in command is encouraged to develop his or her own inspection routine to suit their own individual aircraft configuration and needs. The following is only a suggested guide.

For convenience this suggested procedure starts at the left side of the front or nose wheel and proceeds rearward, around and back to the right front side of the nose wheel examining each point along the way. This is a detailed description of suggested procedure. An abbreviated checklist will be repeated afterwards which can be used as a checklist in the field to remind the pilot of what items are suggested to be covered in the preflight inspection.

Nose wheel, brake and ground steering.
Check for security of the nose wheel on its axle with nut secure, security of wheel fork and pivot bolts. Wheel and fork turns freely.

Instrument Pod, instruments, switches, displays.
Check that instrument pod is secure (Navajo), all instruments and switches secure.
Switches in safe position before engine startup.

Front t & Rear seat belts left hand side.
Check that front seat and seat belts are securely fastened to airframe.

Rear suspension and pivots left side.
Check that all left side suspension pivots are smooth and free from excessive wear, springs shocks and tubes in good order.
Wheel, tire and axle left side.
Check that left side tire is in good condition, properly inflated, axle secure, axle nut secure. Wheel pants secure.

Left side battery, radiator and radiator mounts.
Check battery mount secure, battery secure and free of leaks, left side radiator mounts secure, radiator and hoses free of leaks.

Fuel tank and fuel gauge.
Appropriate fuel for the flight planned.
Check fuel tank for leaks and secure mountings. Check fuel tank cap for security and lack of blockage or leaks. Check the fuel filter for any contamination.

Fuel filter, lines and fuel sample.
Visually check fuel filter and fuel lines, draw sample, check for water, correct fuel color, dirt or other contamination.

Left side of engine.
Check left side exhaust, exhaust springs, sparkplugs, plug caps and plug wires.

Oil Tank
Check that oil bottle is secure, filled to proper level, lines are secure, no leaks and cap is secure.

Propeller and gearbox.
Check gearbox for leaks, move prop to check for normal gearbox backlash, examine prop for damage, cleanliness, distortion, etc.

Coolant overflow bottle and header tank.
Check that coolant expansion tank is secure, filled to proper level, hoses are secure, no leaks, cap is secure. Tank secure, cap secure, lines and clamps secure, no leaks.

Right hand side of engine.
Check right side carburetor and mounting, throttle and choke linkages, fuel lines, and air filter is secure.

Right hand suspension.
Check that all right side suspension pivots are smooth and free from excessive wear, shocks and tubes in good order.

Wheel, tire and axle right side.
Check that right side tire is in good condition, properly inflated, axle secure, axle nut secure.

Strobe light.
Check strobe light for secure mounting, wiring in good order, lens secure, etc.

Rear throttle.
Check rear throttle control and linkage for proper action and security.

Rear seat and belts right hand side.
Check that rear seat and seat belts are securely fastened to airframe.

Front seat & belts right hand side.
Check that front seat and seat belts are securely fastened to airframe.

Throttle controls.
Check throttle controls, assembly secure to airframe, linkages secure, cables and housings in good condition, friction set correctly, throttle levers move smoothly thru full range. **Leave throttles in closed position**

Nose wheel, right side.
Brake mechanism secure and operating with no leaks. Check for security of the nose wheel on its axle with nut secure, security of wheel fork and pivot bolt.

4.6. Preflight Checklist (Abbreviated)

The following is an abbreviated checklist, which can be used during a preflight inspection to remind the pilot of those items to be checked. See the detailed preflight checklist for exact procedures to follow.

- Nose wheel and ground steering.
- Instrument Pod, instruments, switches, displays.
- Front seat & belts left hand side.
- Rear seat and belts left hand side.
- Rear suspension and pivots left side.
- Wheel, tire and axle left side.
- Battery, radiator and radiator mounts.
- Left side of engine.
- Coolant overflow bottle and header tank.
- Oil tank.
- Fuel quantity
- Fuel sample
- Propeller and gearbox.
- Right hand side of engine.
- Right hand suspension.
- Wheel, tire and axle right side.
- Strobe light.
- Rear throttle.
- Rear seat and belts right hand side.
- Front seat & belts right hand side.
- Throttle and choke controls.
- Nose wheel and hydraulic brake right side.
- **Check fuel level**!!!

4.7. Before Starting Engine - Checklist

Before starting the engine, perform the following checks:

• Pre-Flight Inspection (above)	Completed
• Fuel level	Adequate for intended flight
• Full/free wing movement	Completed
• Passenger Briefing	Completed
• Safety Belts	Secure
• Helmets	Secure
• Intercom Connection	Secure and intercom volume adjusted
• Brakes	On / Park
• Parachute (if installed)	Remove Safety Pin

- Wing base tube Secure

For the person in the front seat, the seat belts should be fastened as shown below even when there is a person in the back seat. This prevents the shoulder harnesses from sliding down over the shoulder and becoming ineffective.

4.8. Starting Engine - Checklist

When starting the engine, follow the procedure below:

- Brake — On
- Choke — On (if engine is cold)
Off (engine hot)
- Hand and Foot Throttle — Off – (idle position)
- EIS Panel — Off
- Ignition (mags) — On
- Propeller — Shout "Clear Prop" and visually assure no one is near propeller or any other aircraft in line of prop wash
- Turn Key to Start — when engine starts, immediately **Release**
- Choke — Off (usually after about 10-20 seconds depending upon temperature)
- EIS Panel — On
- Check Engine idle — About 2000 rpm after engine is warm

4.9. Taxiing

To taxi,

- Take the parking brake off
- Use engine power as needed to maintain 5 mph tax speed. Do not taxi faster than 5 mph
- Control bar in trim position if no wind
- For windy conditions, keep the top of the wing dipped into the wind by approximately 10 degrees. For a tailwind, hold base tube out beyond trim about 3 – 4 inches. For a headwind, hold base tube in from trim position about 3 - 4 inches
- Do not make sharp turns faster than 3 mph. This puts an unnecessary strain on the pivot block assembly
- Avoid taxiing in high grass or gravel. Both will cause significant propeller damage.
- Pay particular attention to the direction of your prop wash. Avoid "washing" other aircraft, people on the ground, and blowing loose dirt or debris at vehicles, people, or buildings.

4.10. Before Take Off - Checklist

Just prior to take-off perform the following pre-take-off checks. The pilot should have a checklist to assure all checks are performed, or, at a minimum, he should have an acronym or phrase to serve as a reminder of the pre-take-off checks. For example,

ICETS could be used which stands for:

I - Instrument check
- Set altimeter to field elevation
- Assure EGT, CHT, water temperature and tach are working and are in acceptable range
- Adjust radios to desired frequency
- Adjust intercom volume and squelch as needed

C – Controls free and clear
- Move base tube full out to compression strut and full back to chest.
- Move base tube at least 18" left then 19" right of center to assure no binding occurs

E – Engine run-up and checks
- With foot on brake, set engine to about 3500 rpm
- Confirm that choke is off
- Perform mag check (speed change should be within 300 rpm for each side of mag check)
- Note EGT should have increased to about 800 degrees
- Return throttle to idle position and confirm that engine returns to idle RPM

T – Traffic clear in all directions

- Check for traffic in downwind, base, and final.
- Check for obstructions on or near the runway

S – Seat belts, straps, and loose clothing items

- check security of your own seat belt, helmet strap, and clothing straps
- Ask passenger to confirm security of his seat belt, helmet strap, and any loose straps on his clothing

Establish a procedure, and use it.

4.11. Take Off and Initial Climb

The initial take off roll can be performed with the base tube in the fully extended position or in the trim position. Until you become familiar with your trike, it is usually better to start with the bar in the fully extended position. This will lift the trike off the ground as soon as it achieves flying speed and will minimize the stresses on the trike during the ground roll. This is especially true on rough or grass runways. Do NOT use this technique for cross wind take-offs as these require greater lift off speed to overcome any turbulence or loss of lift at the critical lift off point.

When starting from the fully extended position,

- Apply full power using foot throttle only while holding the base tube against the front compression strut (nose tube)
- When the nose wheel lifts off the ground, smoothly, but without hesitation, bring the base tube back until it is about 2" behind the normal trim position. This will provide a little excess speed in case of an engine out while close to the ground.
- Keep the base tube behind the trim position (faster) until an altitude of at least 300 feet AGL is achieved. At that point, the base tube can go to trim and the engine power can be slightly reduced.
- Continue climbing at trim position to the desired altitude staying within glide distance of an emergency landing site. NOTE! This may require staying near the airport until sufficient altitude is achieved to leave the field pattern.
- On initial climb out where engine failure is most dangerous, do not pitch the nose up more that 45 degrees. Very steep climbs are dangerous and cause a full stall followed by rapid pitch down moment especially if the engine quits.

**** **Never operate your trike where you leave yourself no option to bailout to a safe landing area if your engine were to stop or any other mechanical failure.**

4.12. Approach & Landing

The ground distance covered starting from an approach at 50 ft. above the runway elevation to where the aircraft can be stopped determines landing distance.

Land into the wind and on a long approach if at all possible.
You can land a trike safely with or without power. Either way you will need to maintain an air speed higher than normal trim speed. You will need to adjust the approach speed for the conditions you are flying in. The general rule is: the more active air the more airspeed.

If a "go around" becomes necessary add power and lower angle of attack for max control then start your climb out.

4.13. Cross Wind Landings and Take Off

Beginners and novice pilots should limit crosswind conditions to less then 30 degrees and 5 mph with no gust factor, anything more then that requires more advanced skills. For advanced pilots, 90 degree crosswinds over 5 mph should be avoided. Crosswind component with more then 5 mph gust should be avoided as well.

Most the time pilot skills do not match the capabilities of the aircraft.

5. Performance

The performance figures stated below are given at sea level of the international standard atmosphere conditions. Operations at higher altitudes and temperatures WILL reduce takeoff and climb performance.

5.1. Sport X2 582 Trike Performance

Wing: 15 Meter M-Pulse II

Power	65 horsepower @ 6800 RPM
Cruise Speed	47 mph
Speed for Best Angle of Climb (Vx)	42 mph
Glide Ratio	6:1 best L/D @ 45 mph
Best Rate of Climb	600 fpm at gross weight @ 47mph
Landing Distance	750 feet at gross weight

5.2. Take off Distances

The numbers presented below are for specific loads, altitudes, and conditions as listed. Anytime the available runway is within 10% of these distance limits, the speed for best "angle" of climb given in the table above should be used rather than trying to achieve the best "rate" of climb.

- Take-off distance to clear 50ft obstacle at 990 lb @ Sea Level: 550ft @ 600 fpm
  Conditions:
  - Sea level
  - Full Power
  - Level and paved runway
  - Calm wind
  - 70 deg F

- Take-off range over a 50ft obstacle with 990 lb gross @ 4000 MSL: 780ft @ 425 fpm

- Factors that will increase take off distance ie; Pilot is require to take into account all factors and determine if a safe departure is possible
  - Grass runway
  - Tail wind
  - Loss of power
  - Uphill takeoff
  - High temperature
  - High humidity
  - Altitude

5.3. Rate of Climb/Sink

The Best "Rate" of Climb (V_Y) values below are for a climb speed of 47 mph. These numbers only serve as an indication of performance and will vary with many parameters such as loading, temperature, humidity, engine and wing condition, etc. For clearing obstacles, the most important speed is V_X, the best "angle" of climb given above.

	Climb	Sink
▪ Best Rate of climb/Sink ***Sea Level*** at 700lbs:	1150 fpm	360 fpm
▪ Best Rate of climb/Sink ***Sea Level*** 990lbs:	600 fpm	540 fpm
▪ Best Rate of climb/Sink ***4000 ft*** MSL at 700lbs:	820 fpm	590 fpm
▪ Best Rate of climb/Sink ***4000 ft*** MSL 990lbs:	420 fpm	700 fpm

5.4. Fuel Consumption

Fuel consumption is variable based on the payload and engine rpm at cruise. At max cruise power 6400 rpm the Rotax 582 will burn 4.5 US Gallons per hour. Average cruise settings should yield 3.5 – 4.0 US gallons per hour depending on DA and gross weight.

5.5. Speed

Speed at any trim will be affected by the weight of the trike, loading, and RPM. For example, for forward most trim will be approximately:

- 49mph @ 700 lbs
- 45 mph @ 990 lbs

6. Weight and Loading

Contrary to airplanes, weight shift aircraft use Weight and "Loading" calculations rather than "Balance". This is due to the pendulum connection between the trike and the wing. No matter where the load is on the trike, the wing will always "see" the load at the pivot block assembly. Hence, there is no comparable "balance" calculations for a weight shift aircraft.

Aircraft Information:

N #: _____

Serial No._____

Empty Weight _____

Gross Weight_____

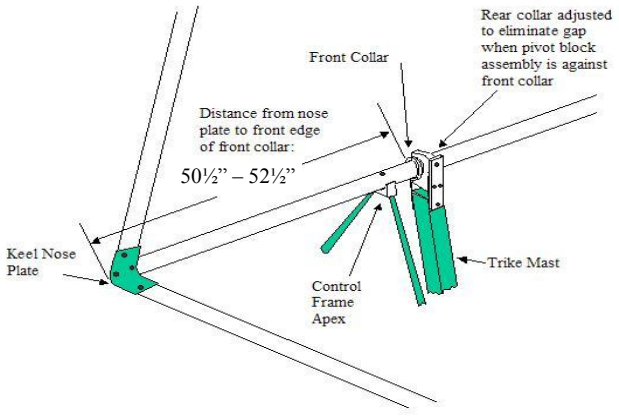
Useful Load_____

Wing Make and Model_____

Notes: *Rear seat falls in the Center of Gravity and is not a factor.*

Empty Weight: The total weight of the complete trike with all permanently installed accessories and equipment.
Gross Weight: The maximum authorized weight as specified by the wing manufacture for particular wing being used. See your wing manual.
Useful Load: The difference between empty weight and Gross Weight.

If weights fall outside specified range please contact a North Wing dealer



7. Performance

The performance figures stated below are given at sea level of the international standard atmosphere conditions. Operations at higher altitudes and temperatures WILL reduce takeoff and climb performance.

7.1. Sport X2 582 Trike Performance

Wing: Quest GT5

Power	65 horsepower @ 6800 RPM
Cruise Speed	60 mph
Speed for Best Angle of Climb (Vx)	55 mph
Glide Ratio	6:1 best L/D @ 60 mph
Best Rate of Climb	550 fpm at gross weight @ 60 mph
Landing Distance	800 feet at gross weight

7.2. Take off Distances

The numbers presented below are for specific loads, altitudes, and conditions as listed. Anytime the available runway is within 10% of these distance limits, the speed for best "angle" of climb given in the table above should be used rather than trying to achieve the best "rate" of climb.

- Take-off distance to clear 50ft obstacle at 990 lb @ Sea Level: 700ft @ 550 fpm
  Conditions:
  - Sea level
  - Full Power
  - Level and paved runway
  - Calm wind
  - 70 deg F

- Take-off range over a 50ft obstacle with 990 lb gross @ 4000 MSL: 850ft @ 400 fpm

- Factors that will increase take off distance ie; Pilot is require to take into account all factors and determine if a safe departure is possible
  - Grass runway
  - Tail wind
  - Loss of power
  - Uphill takeoff
  - High temperature
  - High humidity
  - Altitude

7.3. Rate of Climb/Sink

The Best "Rate" of Climb (V_Y) values below are for a climb speed of 47 mph. These numbers only serve as an indication of performance and will vary with many parameters such as loading, temperature, humidity, engine and wing condition, etc. For clearing obstacles, the most important speed is V_X, the best "angle" of climb given above.

	Climb	Sink
▪ Best Rate of climb/Sink ***Sea Level*** at 700lbs:	750 fpm	360 fpm
▪ Best Rate of climb/Sink ***Sea Level*** 990lbs:	550 fpm	540 fpm
▪ Best Rate of climb/Sink ***4000 ft*** MSL at 700lbs:	600 fpm	590 fpm
▪ Best Rate of climb/Sink ***4000 ft*** MSL 990lbs:	400 fpm	700 fpm

7.4. Fuel Consumption

Fuel consumption is variable based on the payload and engine rpm at cruise. At max cruise power 6400 rpm the Rotax 582 will burn 5 US Gallons per hour. Average cruise settings should yield 3.5 – 4.0 US gallons per hour depending on DA and gross weight.

7.5. Speed

Speed at any trim will be affected by the weight of the trike, loading, and RPM. For example, for forward most trim will be approximately:

- 60mph @ 700 lbs
- 65 mph @ 990 lbs

8. Weight and Loading

Contrary to airplanes, weight shift aircraft use Weight and "Loading" calculations rather than "Balance". This is due to the pendulum connection between the trike and the wing. No matter where the load is on the trike, the wing will always "see" the load at the pivot block assembly. Hence, there is no comparable "balance" calculations for a weight shift aircraft.

Aircraft Information:

N #: _____

Serial No._____

Empty Weight _____

Gross Weight_____

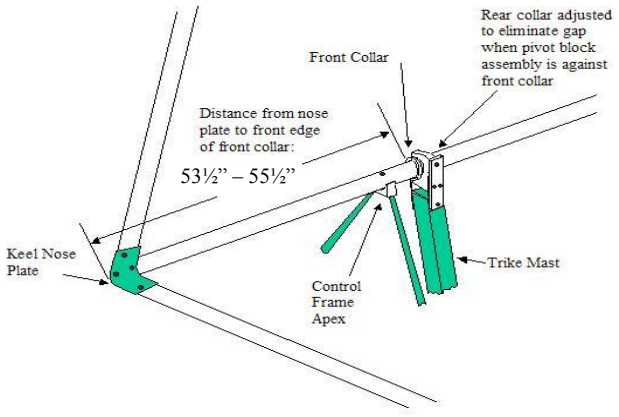
Useful Load_____

Wing Make and Model_____

Notes: *Rear seat falls in the Center of Gravity and is not a factor.*

Empty Weight: The total weight of the complete trike with all permanently installed accessories and equipment.
Gross Weight: The maximum authorized weight as specified by the wing manufacture for particular wing being used. See your wing manual.
Useful Load: The difference between empty weight and Gross Weight.

If weights fall outside specified range please contact a North Wing dealer



9. Systems and Descriptions

9.1. Sport X2 582 Trike Components

The airframe of the Sport X2 582 Trike is constructed of 6061-T6 aircraft-grade aluminum and 4130 chrom-moly steel to be durable yet lightweight. The frame includes many features, which differentiate it from most of the competition, including dual mast, fiberglass suspension with gas shock and side-mounted radiator for better airflow. It also includes two separate tandem seats for comfort and safety. The Sport X2 also has high ground clearances making it a great all terrain chassis.

9.2. Carriage Overview

Serial Number - The serial number of your Sport X2 582 TRIKE is located on a plate located just under the exhaust canister on the side of the engine mounting plate. You should refer to this serial number in any communications with North Wing UUM regarding your Sport X2 582 Trike.

Seat Rail - The seat rail of the Sport X2 582 is constructed of sturdy chrom-moly steel alloy and 6061-T6 Alum. This gives it the strength it needs to support the occupants and flight loads.

Back Frame (spine) -The back frame is unique to the North Wing Sport X2. It is the main component that all other parts attach to. It is made of strong chrom-moly alloy tubing, steel tubing, and plate.

Mast- Another very unique feature to the Sport X2 is the "Dual Mast". This allows for comfortable shoulder and headroom in the rear seat. It also makes for a very stable mast that will not flex side to side and triangulates the whole structure.

Fuel Tank - The fuel tank on your Sport X2 582 TRIKE is an aviation grade tank. Your North Wing trike comes standard with a fuel level sensor that can be read from the gauge mounted in your dash.

Adjustable Front Forks - The front seat of the Sport X2 582 TRIKE is mounted in one of the three pivot bearings, which allows it to be adjusted to suit the pilot's height and preferred flying position.

Suspension System - The rear suspension of the Sport X2 582 TRIKE has been engineered to smooth out bumps on even the roughest flying surfaces. The suspension consists of flexible yet durable epoxy/fiberglass spring rods coupled with gas shock/springs and tires. This combination provides a suspension that is effective, durable, and lightweight. Because the tires are an integral part of the suspension system, North Wing UUM recommends that you keep the

air pressure in them to no more than 20lbs. This will keep them with sufficient pressure to help smooth out rough terrain.

Ground Steering - As you sit in the front seat of the Sport X2 582, the ground steering is front wheel. Steering is push-right / go-left and Push-left / go- right.

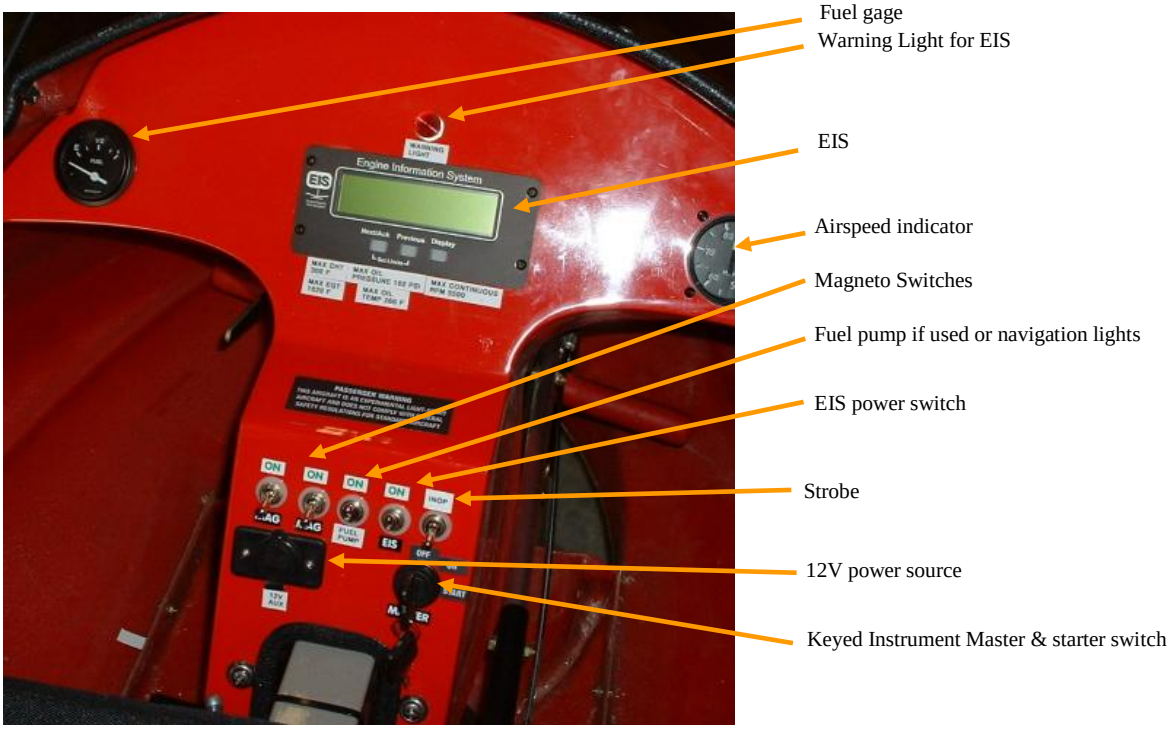
Cruise Throttle Lever - The throttle lever (located on the quadrant just in front on the pilot seat on the left hand side along with the choke) regulates the output of the engine. The throttle is lifted up to increase throttle.

Foot "Main" Throttle – The throttle lever is located on the right side of the front fork. Engine RPM is increased by pushing the throttle lever forward with your foot. Release pressure to reduce RPMs. If you choose the instructor package option, rear throttle is on the rear steering bar which allows the throttle to be controlled from the rear seat.

Choke - The engine choke is located below the pilot seat on the right side. The choke is used to aid in easy engine starting. The choke can also be used in an emergency to shut down the engine (should your mag switches fail, for example). To shut the engine down with the choke, simply choke the engine till it floods with fuel and shuts down.

9.3. Instrument Panel

A standard Instrument panel is shown below with a brief description of the functional components.



- **Strobe Light** - For safety, the Sport X2 582 includes a standard strobe light to the rear and below the trike. The strobe pulses brightly, allowing you to be seen by other aircraft. The strobe does not allow you any extra time of flying time each day. To fly after sunset see info on positioning lights.

- **Positioning Lights**- To fly after sunset until civil twilight you need to have to have the wing equipped with green and red positioning light (green-right and red-left). To fly into night you are required to have a private pilot weight shift.

- **Instruments-** The sophisticated instruments included on the Sport X2 582 TRIKE provide a wide range of engine and flight monitoring capabilities. All the instrumentation is housed in the instrument pod, which is located directly in front of the pilot. In addition to the computerized Engine Information System (EIS), the instrument pod also includes a warning light, two magneto switches, a keyed ignition switch, and an on/off switch for the EIS system. The other analog gauges that come standard are airspeed and fuel gauge. The fuel gage is located on the left hand and the airspeed indicator is on the right.

- **EIS System -** The EIS system, located in the center of the pod, is a state-of-the-art instrument that monitors vital engine functions, as well as providing valuable flight information such as altitude and rate of climb. The EIS system can be set with limits on each of the inputs it monitors, and will trigger the warning light when any of the limits are exceeded. To get the most out of the EIS system, it is strongly recommended that you carefully read the EIS manual that came in your Sport X2 582 documentation package.

- **EIS Power Switch -** Located to the right of the mag swiches, this switch controls power to the EIS system. This allows you to turn the EIS system on without the machine running (to check your hours, for example), or to shut the EIS off while flying (although there is no logical reason to want to do this). When starting engine, always turn the EIS on after the engine starts.

- **Magneto Switches -** The magneto switches (or mag switches for short) are located on the left side of the dash, and control power to the two separate ignition systems on your engine. With both mag switches in the OFF (down) position, your engine will not run. In fact, the mag switches are used to shut down the engine after you land. The mag switches are also used to test the dual ignitions during engine warm-up. During the warm up period, the switches should be flipped OFF one at a time to make sure that the engine will run on each of the ignition systems by itself. During normal flight, both switches should be in the ON (up) position.

- **Warning Light -** The warning light is connected to the EIS system and flashes whenever any of the set limits are exceeded. The light will flash until the input being gathered returns to the "normal" range as defined in the EIS system.

- **Keyed Master Switch** - The key switch controls power to the starter and to any accessories. With regard to starting, the Master Switch works just like an ignition key on a car provided the magnetos are ON. Turning the switch all the way to the right

(clockwise) activates the starter. Releasing it will cut the flow of power to the starter, but will keep accessories on. Turning the key to the left (counter clockwise) will shut off any accessories tied to the key switch. However, the actual "ignition" circuit it controlled by the magnetos. Turning the Master switch off will NOT shut down the engine.

NOTE: The key should NEVER be left in the ignition when the plane is unattended. Even with the mag switches in the OFF position, turning the key to the right WILL turn the engine over and will cause the propeller to turn.

9.4. Electrical System Overview

Your Sport X2 582 TRIKE includes a self-charging, state-of-the-art electrical system that provides power to all onboard accessories, as well as keeping the starting battery charged. The main components of the electrical system are:

- **Lighting Coil** - An integral part of the Rotax engine, the lighting coil provides AC output.
- **Regulator/rectifier** - Located on the fuse box ("Hot Box"), the regulator/rectifier receives the AC input from the lighting coil and converts it to a 12 volt DC output. This 12 volt DC is then fed to the battery for charging and powering accessories.
- **Battery** - It is located behind the rear seat below the engine.

9.5. Rotax 582 Engine

Bombardier builds the Rotax 582 engine that is used on the Sport X2. The engine is specifically for the light aircraft applications. The Rotax 582 is extremely powerful and reliable. The following features contribute to its suitability for this application:

- Dual ignition systems provide redundancy. This is a feature unique to aircraft engines.
- High power output. The Rotax 582 delivers 65 h.p., @ 6800 rpm, enough power to safely lift the maximum payload specified by North Wing for this machine.
- Liquid cooling provides reliable operation even in the hottest weather.
- Oil injection prevents having to pre-mix oil with your fuel. You can fill up directly from the fuel pump, and the oil injector will make sure your engine gets the optimal amount of oil. (Always fill oil to the top line every time you add fuel!)
- The built-in electrical circuits provide power for onboard accessories and charging your starting battery.
- Rotax has a large network of service professionals to provide service on your engine.

Engine Break-In:

Few things will impact the life of your engine more than properly breaking it in. The Rotax engine manual outlines a very specific and precise procedure for breaking in the 582 engine. The process takes about an hour to complete, and involves running the engine at specific rpm levels for specified periods of time. Your Rotax 582 engine is NOT broken in at the factory unless stated by North Wing at time of purchase. Consequently, it is very important that you or a qualified dealer perform the break-in procedure before attempting to fly or use your TRIKE.

Failure to perform the break-in procedure per the Rotax specifications can greatly reduce the reliability and shorten the life of your engine.

NOTE! Use mineral oil (Pennzoil Premium) for break-in. Also, even though you have an oil injector, mix the first 2 gallons of fuel with the oil at 50:1 . The injectors sometimes takes several minutes before they deliver adequate oil to the carburetors.

Engine temperatures range - Quick Ref. For "break in" and flying
CHT= 240 to 300 (degrees F)
EGT = 1100 to 1200 max
WATER = 140 to 180

Always refer to the Rotax manual for break in and running procedures.

9.6. Engine Systems

In addition to the engine itself, there are several other engine-related components on your Trike:

9.6.1. Rotax Exhaust System

The exhaust system provided by Rotax is engineered to provide optimal performance and reliability for your engine. The exhaust system should never be altered in any way. The joints between the sections of the exhaust should periodically be lubricated with anti-seize compound to allow the joints to remain flexible. The springs and the rest of the exhaust system should be carefully inspected before every flight. Optional ceramic-coated exhaust is available.

9.6.2. Carburetors and Air Filters

The dual Bing carburetors supplied with your engine come pre-set from the factory for optimal performance. Under normal flying conditions, your EGT readings should be between 1100 and 1200 degrees F at cruise throttle (and should never exceed 1220 F). If your EGT readings fall outside this range, you will need to adjust your carburetors to compensate. (See section of engine maintenance manual on carburetors for instructions).

9.6.3. Radiator

Your water-cooled engine uses a North Wing designed and manufactured radiator to keep the coolant at the optimal temperature. The radiator and all coolant hoses should be inspected for leaks before every flight. It is also very important to use a 50/50 mix of distilled water and antifreeze in your cooling system. Antifreeze should be free of silicates and phosphates, or the seal on your rotary valve will be damaged. The radiator is filled through the expantion tank located above the engine.

9.6.4. Fuel Pump

The fuel pump pulls fuel from your fuel tank and supplies it to your carburetors. The fuel pump works off of a pulse line from the engine. The fuel pump should be carefully inspected for leaks before every flight. It is strongly recommended that you replace or rebuild your fuel pump annually. A new pump is about $30, and a rebuild kit (which contains all the delicate parts) costs under $10. Note: Pulse line is not the same as the fuel line.

9.6.5. Gearbox

The gearbox takes the high RPM output of the engine and reduces it down to the proper RPM range for the propeller. The oil in your gearbox should be changed after your first ten hours of operation and then every 100 hours thereafter. (See Rotax engine manual for details). Your aircraft comes the Rotax "E" Gearbox (electric start). The E Gearbox is a heavy-duty gearbox. We use a 3.47:1 reduction" that provides smooth operation for many years if properly cared for. A "***C" gearbox is required if you want to use a clutch. The front mounted GPL starter is used in this case.***

9.7. Recommended Fluids

The following are North Wing recommendations for fluids in your Sport X2 582 TRIKE:

- **Fuel –** 87 octane minimum. Gas/ethanol mixture may be used for short periods when pure mineral fuel is not available. Ethanol fuels are not recommended due to their tendency to absorb water into the fuel which lowers the performance and octane slightly.

- **Oil** - High quality TCW-3 rated 2-stroke oil. Use oil formulated for air-cooled engines if possible (We use Premium Pennzoil). If you do decide to switch brands, it is recommended that you empty all of the oil out of your oil reservoir and clean it well before adding the new oil. Switching oil brands is strongly discouraged.

  Synthetic oil may be used in the Rotax engine. However, it should never be mixed with mineral oils. Once synthetic oil is used, it should not be changed back to mineral oil

  NOTE! Engine break-in should be done with mineral oil for at least 25 hours, not synthetic oil, to allow the rings to properly seat in the cylinders.

  You must also maintain the proper oil level in the small oil bottle that supplies lubricant to the rotary valve on the 582 engine. (Located next to the radiator fill bottle) Use the same oil you use in your engine, and keep the level up to the fill line on the bottle.

- **Coolant** - Your Sport X2 582 TRIKE should always contain a 50/50 mix of anti-freeze and distilled water. Use only anti-freeze that is free of both phosphates and silicates. In addition, use only distilled water. The rotary shaft seal in the 582 engines is extremely susceptible to leaks caused by mineral buildup on the rotary shaft. The exclusive use of

distilled water and phosphate/silicate free anti-freeze eliminates this problem.

- **Gear Oil** - Use gear oil that conforms to the specifications found in your Rotax Engine Manual. The gear oil should be changed after the first ten hours of operation and every 100 hours thereafter.

9.8. Propeller

The Warp Drive carbon fiber propeller is made from a composite material and is specifically made for sport aircraft. The propeller can be pitch adjusted to produce the maximum amount of thrust from a wide variety of engines. The pitch of your propeller should be adjusted so that your engine turns 6600-6700 RPM at full throttle while anchored on the ground. Note that the maximum RPM level will vary slightly from day to day and the RPM will be 100 to 200 Rpm high while in flight. This is normal and not cause for concern. To adjust the pitch of your composite propeller, follow the instructions in the Sport X2 582 Maintenance Manual Warp Propeller insert. You should periodically check the torque on the mounting bolts to make sure they are within the specs outlined on the propeller instruction sheet. The propeller should also be cleaned periodically to remove bugs, oil, and grime. Many enthusiasts find that Dow Bathroom Cleaner (with "scrubbing bubbles") works very well to clean the stubborn grime from their propellers.

9.9. Wing

North Wing, one of the premier wing manufacturers in the global market, manufactures the M-Pulse wing that comes with your Sport X2 582 TRIKE. Your North Wing wing has been carefully engineered with the finest materials and workmanship to last many flying seasons with the proper care.

The Sport X2 582 light sport trike comes standard with the M-Pulse 2-15 wing. If you are registering your trike as an experimental, E-LSA, other North Wing wings can be purchased as options. See North Wing web site.

Wing Care - Follow the guidelines included in the maintenance manual or the wing manual for care instructions and inspection procedures for your wing sail. Dirty spots may be cleaned with a damp rag (water only), and very small puncture-type holes can be repaired with sail tape, available from North Wing or a North Wing service facility.

NEVER try to repair sail damage yourself! This could result in serious injury or death. Refer to the maintenance manual.

9.10. Ballistic Recovery System (BRS Parachute)

Skill level: Owner, LSR-M, Task Specific, A&P

Tools: Standard sockets and open end wrenches and drill

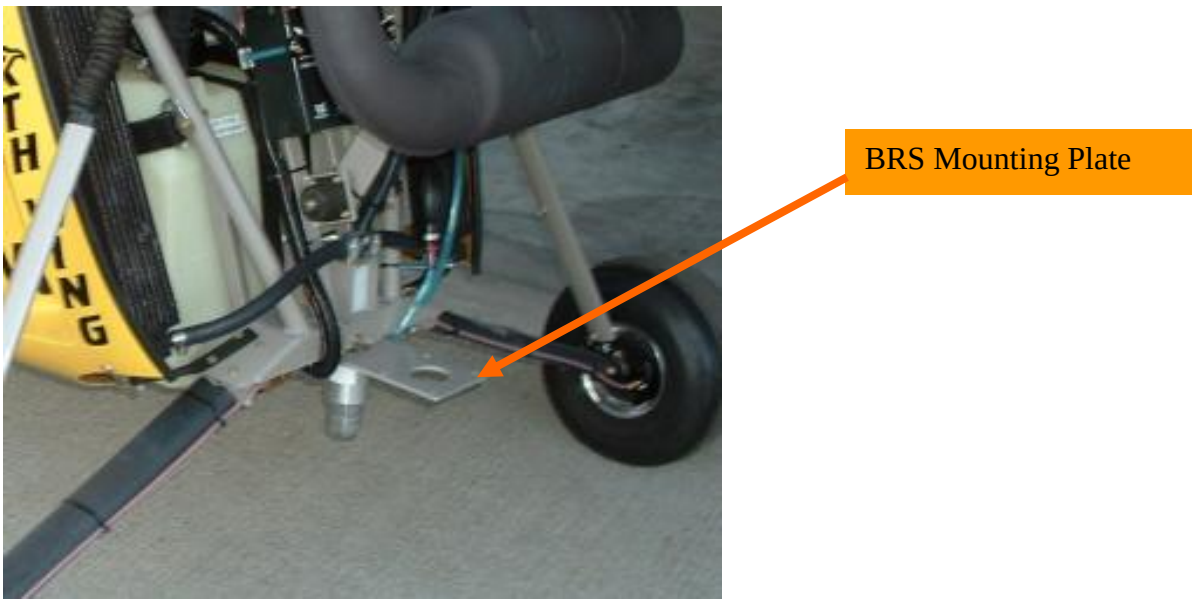
Parts: All components provided by BRS shipped separately in two separate packages

Task Description:

The BRS is a special option that is addressed herein because it cannot be mounted by the factory due to shipping restrictions of hazardous material (the rocket fuel). For the same reason, a ballistic parachute is shipped in two separate shipments or packages. One shipment contains the parachute and all related mounting equipment, and a second shipment contains the rocket propellant. They may arrive on different days.

The installer is referred to the BRS manual for installation, maintenance, and repairs. However, the parachute canister itself must be mounted to the trike on a mounting plate unique to North Wing. This mounting is not addressed in the BRS installation procedures. Furthermore, when the parachute is due for re-packing, it must be removed from the frame and sent back to the BRS factory. With the exception of mounting the BRS bracket to the NW trike mounting plate, the installation and removal tasks are described in the BRS manual. All tasks associated with the BRS can be performed by a conscientious and mechanically adept owner.

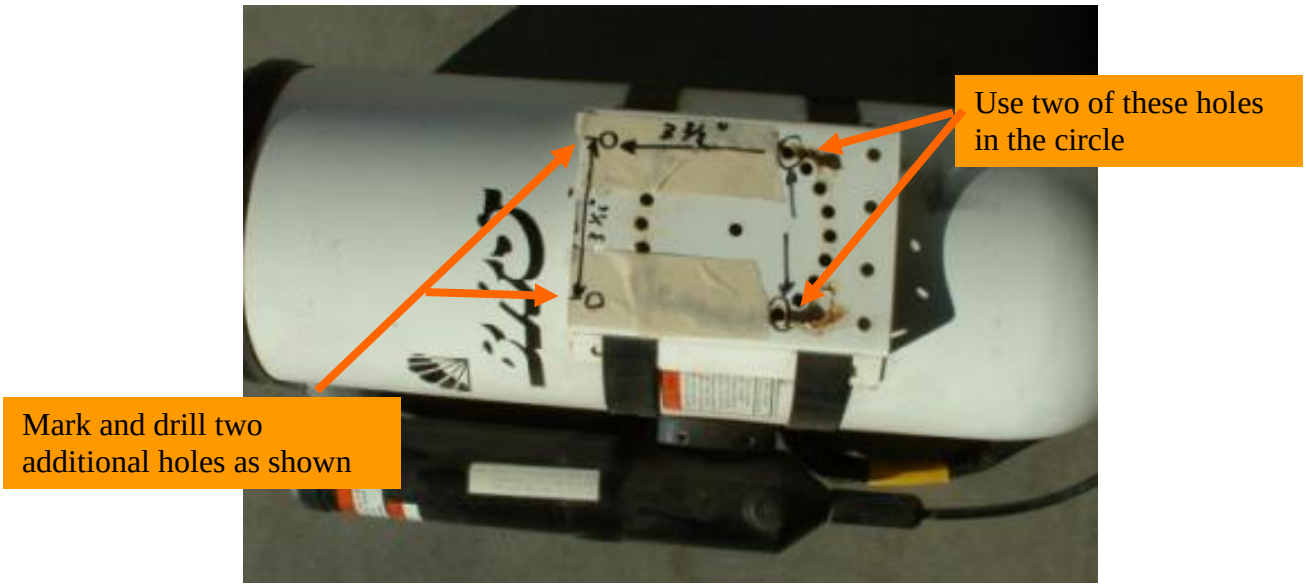
The BRS mounting plate on the North Wing trike is located at the lower back of the root tube as shown below.



The BRS canister bracket is a white flanged bracket with a ring of holes. The recommended mounting arrangement for the BRS on an Apache is to aim the chute to the left. To attach the

bracket to the trike mounting plate, follow the procedure below.

1. Align two of the holes in the BRS bracket with two of the holes on the trike mounting plate and install a bolt in each holes. See BRS bracket below.



2. With these two bolts in place and using a felt tip pen, reach underneath the mounting plate and mark the location of the other two mounting plate holes on the BRS bracket.
3. Remove the BRS mounting bracket and drill a ¼" hole where marked for the mounting plate.
4. Replace the BRS bracket on the mounting plate and install and tighten all four bolts.
5. Continue from this point on using the BRS supplied instructions.

10. Handling, Service , and Maintenance

10.1. Servicing Fuel, Oil, and Coolant

Fill up fuel tank.

Remove fuel cap and fill tank with min 87 Octane or higher unleaded fuel to your desired amount. Close cap.

Fill Oil Tank.

Fill oil tank any time fuel is added even if it is a partial fill. Use only recommended 2-stroke oil. (Pennzoil Premium for air-cooled engines only)

Coolant level

Check expansion tank for adequate amount of coolant. Open the tank on the expansion tank. Water level should be ¼ from the bottom of the tank. Add coolant mixture if needed.

More detailed maintenance issues are addressed in the Sport X2 582 Maintenance Manual.

10.2. Transporting

One of the most compelling reasons for owning a Trike is their portability. You can take your Sport X2 582 TRIKE with you on vacation, or easily transport it to fly-ins on a trailer. There are 4 basic ways to trailer your aircraft, options are: enclosed trailer, open trailer, with or without the wing folded and attached to the trike.

10.2.1. Enclosed Trailers

The enclosed trailer is a great way to transport your Sport X2 582 TRIKE while protecting it from the elements. An enclosed trailer also functions as a hangar when you are not transporting your TRIKE. Enclosed trailers are more expensive than open trailers, and generally require a more powerful vehicle to pull them.

10.2.2. Open Trailers

Open trailers are an economical choice that works well for many TRIKE enthusiasts. There are open trailers designed specifically for Trikes, or you can use a standard open trailer such as a snowmobile trailer. North Wing UUM carries a line of open trailers that are extremely lightweight to pull and custom designed to fit the Sport X2 582 Trike. Virtually any vehicle can pull these trailers.

10.2.3. When You Trailer Your Sport X2 582 TRIKE

Regardless of the trailer you choose for your Sport X2 582 TRIKE, there are a few

considerations you should always adhere to:

Always make sure your TRIKE is securely strapped down to the trailer. North Wing UUM recommends running a heavy-duty strap over each rear wheel or axle to hold them down to the deck of the trailer. It is also important to secure the front end of the Sport X2 582 TRIKE. Because the front end is very light, it will bounce considerably if not secured.

The wing can be carried on the flat deck of the trailer or better yet in a 14" PVC pipe with cap on the ends. We prefer to carry the wing on top of a car or truck that is equipped with a rack with at least a 3 support points.

Make sure the instrument pod, seats, and engine are well protected while trailering. You should also cover the air filter with a plastic bag or a cover designed specifically for it, and make sure the open end of the exhaust pipe is covered.

If you plan to trailer your Sport X2 582 TRIKE often on an open trailer, you may want to consider having your exhaust system coated with ceramic to prevent it from rusting. Rotax exhaust systems that are exposed to the elements tend to weather very quickly. See your Sport X2 582 dealer for details, or call North Wing.

11. Environmental Restrictions

Weight shift aircraft (trikes) by their vary nature have restrictions and limiting factors that need to be taken into consideration. The Trike was designed to fly in moderate winds and usually not in mid afternoon strong thermal conditions. During the midday there are usually thermal activity that can make flying the TRIKE very uncomfortable for most pilots. Flying in strong thermal conditions is not recommended. Above average flying skills would be required to manage air speed and pitch angles. Below is a list of limitations that are maximum limits for very experienced pilots. The pilot in command needs to know his or her own limits based on the amount of training and experience.

- Max wind speed should be Max 20 mph (N0 GUST FACTOR!)
- Max Crosswind component 10 mph (N0 GUST FACTOR!)
- Do not fly in rain or snow.
- Do not fly if rain or thunderstorm activity is approaching or in the area.
- Always fly from a field that is of sufficient length and free of obstructions.
- Always take off and land directly into the wind if possible. NEVER take off or land with the wind.

12. Supplements

Intentionally left blank…….

13. Data Location and Contact Information

North Wing UUM, Inc.
3904 airport way
E. Wenatchee, Wa. 98802
www.northwing.com

14. Warnings and placards

"There are inherent risks in participation in recreational aviation aircraft. Operators and passengers that participate in recreational aviation, accept the risk inherent in such participation of which the ordinary prudent person is or should be aware. Pilots and passengers have the duty to exercise good judgment and act in a responsible manner while using the aircraft and to obey all oral and written warnings, prior to and during the use of the aircraft."

Pilot In Command must observe operating limitations on instrument panel and aircraft.

- Max: RPM 6800, EGT 1200, CHT 300, Coolant Temp 180F
- No Spins or turns greater than 60 deg.
- Never fly over anything you would not intend to land on without proper altitude to glide to a safe landing area.
- Always make sure you have adequate fuel quantity for the desired flight time.
- Never fly over gross payload capacity.
- Never fly without being mentally prepared for the flight ahead.
- Always brief the passenger about safety precautions and proper seat belt configuration.
- Remember you are Pilot in Command and have final say on whether you and the plane are in airworthy condition and the weather is safe to fly.

15. Revisions

Revision pages are updated by North Wing UUM each time a revision is issued. They contain a list of all revisions made to the Pilot Operating Handbook since its original issue.