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Airmasters

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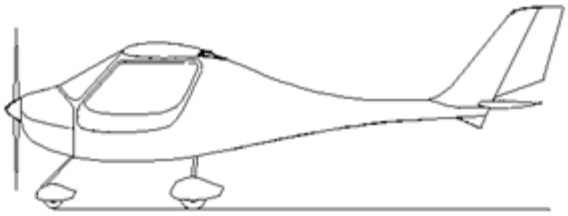
FLIGHT DESIGN



CTSW & CTSL

SERIAL NO:

Pilot Operating Handbook Issue 3.0

Amendments

Issue	Change	Date
3.0	Derived from P & M POH at issue 2.1: Airmasters added. Amendment sheet, page numbering, automatic contents page added. Document reformatted Section 6 numbering corrected. Autopilot: preflight check added at 5.5; notes added at Appendix 2.	29/5/24

Contents

SAFETY NOTICES

This product has been manufactured for use in a reasonable and prudent manner by a qualified operator.

The minimum qualification for flying this aircraft is a UK NPPL (Microlight). In addition, it is your personal responsibility to ensure that you are trained and in current practice on the CTSW / CTSL as a type. The CTSW / CTSL is easy to fly but requires skill, judgement and practice especially with regard to speed and control in different configurations.

For your personal safety, the safety of others and the safe operation of the aircraft, it is very important that this operator's manual is read in full before operating or flying the aircraft for the first time, and that the relevant sections are understood before any maintenance work is undertaken. Should you not understand any of the Aviation terms to be found in this manual, then ask your Flight Instructor or Flight Engineer for clarification.

The engine installed in the CT is not certified and can fail at any time. Never fly over areas on to which a safe landing cannot be made in the event of an engine failure. On cross country flights, continually update safe landing fields as the journey progresses.

If you have just acquired this aircraft then it is important that you register as the new Owner / Operator with your nearest Flight Design Distributor,

Airfield Farm Hangar
Sulby
Northampton
NN6 6EZ

Tel. 01858 880008
Mobile 07976 707855
email: rotaxservice@gmail.com or online at airmasters.co.uk

Failure to register will mean that you may not get important safety information issued by the company in support of its products.

IMPORTANT! Wherever you see the symbols below, heed their instructions.

Always follow safe operating and maintenance procedures and practices.

⚠ WARNING

This WARNING symbol identifies special instructions or procedures which if not correctly followed, could result in personal injury or loss of life.

CAUTION

This CAUTION symbol identifies special instructions or procedures which, if not strictly observed, could result in personal injury, damage to or destruction of equipment.

⚠ WARNING

Microlight flying and all other airsports can be dangerous even when practised under ideal circumstances. Pilot error, component failure, adverse meteorological conditions or sheer bad luck can, as in all aviation, result in injury or death. Every customer purchasing goods or services whether directly or indirectly from the Company is warned that Microlight flying and similar air sports are not controlled in the same way that are other forms of aviation. As a result Microlight aircraft components and related equipment are manufactured from commercially available materials and components and some of these materials and components are not designed specifically for aviation use. Every purchaser must ensure that he inspects fully every primary product (part or service) item upon delivery and before every flight thereafter and he must make himself aware of all trends or changes which may make a particular item unsuitable for the use for which it was originally purchased. He must also satisfy himself totally that a purchased item is suitable for the use to which he intends to employ it. The Company can offer advice but the final responsibility for the use of the goods purchased, primary product (part or service) rests solely with the purchaser (whether direct or indirect) or other user who employs such goods at his own risk. This Warning applies to every part, item or service offered by the Company and acceptance of or payment for goods is an implicit acceptance of this Warning.

The CTSW/CTSL must only be flown where the following conditons apply:

1. The aircraft must not be flown over any terrain except where it may be landed safely and without harm to occupants or third parties in the event of a power reduction or failure of the engine at any stage of the flight.

2. The pilot of the aircraft is competent and has been trained to land the aircraft safely and without harm to occupants or third parties in the event of a power reduction or failure of the engine at any stage of the flight and is in current practice of forced landing procedures.

FOREWORD

We wish to thank you for choosing this Flight Design aircraft.

Read this Operator's Manual before flying so you will be thoroughly familiar with the proper operation of your CTSW or CTSL controls, its features, capabilities and limitations. This manual offers many safe operating and flying tips, but its purpose is not to provide instruction in all the techniques and skills required to fly the CTSW / CTSL safely.

To ensure a long and trouble free life from your CTSW / CTSL, give it the proper care and maintenance described in this manual. For Engine Information and Service & Maintenance schedules, please refer to the Rotax 912S Engine Manual.

Flight Design's UK agent appointed before Airmasters, was P & M Aviation. This company published two issues of this Operator's Manual whose major changes from the original Flight Design issue were:

Issue 2
Inclusion of the CTSL type (P & M Aviation submission M267)

Issue 2.1
CG fwd. limit 257mm AOD (solo loading) 271mm AOD (dual loading)

The CTSL (BCAR-S) is a further development of the CTSW and incorporates:

1. Composite undercarriage beam, which is a single member running across the fuselage and attached by 4 clamp bolts. The fuselage is modified to accept the new undercarriage.
2. Winglet style wingtips replacing the earlier drooped type.
3. Electric pitch trimmer option.
4. Upgraded avionics fit, typically a Dynon Skyview EFIS and EEIS.

Plus other small improvements e.g. the fuel tank pickups are at the very bottom of the tank and do not use a goose neck design.

For the UK market as a microlight aircraft, the CTSL is only available with ballistic parachute fit and a maximum all up weight of 472.5kg

1. PREPARATION.

WARNING

Do not attempt to operate the aircraft without having carried out the full training syllabus and having satisfied a qualified instructor/examiner of your competence to do so and having been issued with a certificate of competency. Without proper instruction the CTSW aircraft is not safe to operate and almost certainly will cause injury or death.

1.1. TRAINING

Safety is no accident. The safe operation of an aircraft stems from many factors, but one of the most important is pilot training. Please ensure that the following conditions always apply:

Before flying your Microlight in the UK, you must possess an appropriate, valid pilot's licence.

a. The minimum qualification required to fly the aircraft in the UK is an NPPL (Microlight) which must be revalidated / renewed and kept current.
b. An NPPL Medical declaration must be in force which has been signed by the pilot's GP or
c. The pilot must hold an EASA class 1 or 2 medical.

For holders of a UKPPL or JAR-FCL or EASA PPL gained after 1999, the pilot must first pass the microlight aeroplanes type (part 2) oral examination which must include pilot maintenance requirements and conditions of the Permit to Fly and pass the NPPL (Microlight) GFT. For holders of a UKPPL issued before 1999 and kept valid, the NPPL (Microlight) rating can be added with no further required testing or training.

Even if you are an experienced pilot of flex-wing aircraft, you should never under any circumstances attempt to fly a fixed wing aircraft until you have qualified by passing an alternative controls test with a qualified 3 axis microlight instructor.

Before flying as pilot in command of your aircraft, or if you have not flown it in the last 3 months, it is strongly recommended to be checked out to fly the type by a qualified instructor who must be experienced and current on the CT range. Do not operate the aircraft until the Instructor is satisfied with your ability.

1.2. PRE-FLIGHT PLANNING

Planning is pivotal to the legal safe operation of all aircraft. Please ensure that the following conditions always apply:

Air Law

Before flight, check that your aircraft documents and pilot qualifications qualify in the states or countries in which you intend to operate. Air Law can vary from country to country and from state to state; be sure to always fly within the letter of the Air Law that operates in your state or country. Make sure you have permission to fly from both your take-off site and your intended landing site.

Weather Conditions

The prudent pilot takes care to avoid flying with strong cross-winds or in stormy conditions or heavy rain. Remember also that the weather at your destination may be different from your starting point, so check before you set off. Detailed aviation weather reports are usually available from your local airfield, and on the internet. If the weather unexpectedly changes for the worse during a flight, then the safest option is to land at a suitable landing site at the earliest opportunity.

Route Planning

Plan your route using an appropriate and current pilot's map. GPS should only be used as a back-up. Check the route complies with air law including the microlight aircraft Permit to Fly. Observe sector safe height and divert or land if cloudbase descends below it. Check the forecast and NOTAMS before setting out, check weather, surface conditions and PPR at your destination. Always plan your route so that you fly within safe gliding distance of a suitable landing area in the event of power loss or complete engine failure. Avoid flying over mountains or large hills, seas or lakes, built-up areas, woods or forests, deserts with soft sand or anywhere else that renders a safe landing impossible in the event of an emergency. Remember that there is a greater risk of turbulence when flying near mountains. Never fly in the lee of hills or mountains if the surface wind is anything other than calm, since lee rotor can be extremely dangerous. Always plan for the possibility of having to divert to an alternate airfield because of bad weather, and make sure you carry enough fuel to reach your alternate destination with a further 60 minutes of flying time in reserve. Use the advice in this paragraph in conjunction with that obtained in your formal training. This advice must not be taken as a substitute for proper training.

Clothing

Although the aircraft has in-cabin heating, this is dependent on engine power selected at the time. In a long decent on a cold winter's day, the cabin can quickly get very cold. Both extreme heat and extreme cold can be dangerous to pilot and passenger, since they can affect the human brain's decision making process. Please ensure that you wear clothing appropriate to the conditions in which you fly, and remember that the cabin environment is more akin to a light aircraft, so avoid loose and bulky clothing. Remember that the outside air temperature drops 2-4 degrees Celcius per 1000 feet of altitude, so clearly if your route demands high altitude flying you should expect the cabin temperature to drop. In bright conditions, high quality unbreakable sunglasses are also a sensible precaution.

The Payload

The aircraft available payload is the difference between its dry empty weight (see section 4.4) and its maximum authorised take off weight (MAUW – see section 4.4). Before each flight you should calculate the combined weight of the aircraft, fuel, pilot and passenger and ensure that it never exceeds 450 kg (472.5 with parachute).

⚠ WARNING

It is extremely dangerous to exceed the 450/472.5 kg. take-off weight limit, it could cause structural failure or loss of control leading to injury or death.

Fuel

Before each flight, you should calculate your fuel requirement. (For an approximate fuel consumption guide, see Section 3.2; remember that fuel consumption can be affected by many factors including engine condition, take off weight, density altitude, speed). You should ensure that you have enough fuel and reserve for your planned flight (See paragraph on Route Planning above), by dipping the fuel tanks

with the aircraft set on level ground. Check the fuel level sight gauges before you set off and calculate the endurance limit of the aircraft leaving at least a 30% reserve factor. Never rely only on fuel gauges, use them only in conjunction with your calculated fuel endurance notes. Check the fuel is of the appropriate quality (see Section 2.3) and properly filtered against impurities. Drain at least 50cc of fuel via the drain valve before each day's flight and after refueling, to check for water. It is a must for owners to prepare and calibrate a fuel tank dipstick. Wood is an excellent material as the level is clearly shown by a change of colour.

⚠ WARNING

Never rely on the fuel gauge accuracy alone when calculating flight distances left to run. A forced landing due to running out of fuel could result in injury or death.

Human Factors

Never fly with a cold, under the influence of drink or drugs or after an illness/accident without clearance from your Doctor, or when feeling depressed.

1.3. MODIFICATIONS

You must not carry out unauthorised modification to the aircraft. It is illegal and for the most part unsafe to carry out unauthorised modifications to your aircraft.

⚠ WARNING

Unauthorised modifications, including the fitting of optional electrical equipment, must not be carried out under any circumstances without official modification authorisation issued by the factory.

1.4. PRE-FLIGHT CHECKS

It is essential that rigorous checks are carried out at the beginning of the day and before flight. These checks should be to the full daily inspection and preflight checks detailed in Section 5. Ensure that the engine and airframe are within Service limits (see Section 9). If there are any grounds for suspicion about any element of your aircraft's safe operation, do not fly.

1.5. SAFETY HARNESSES

Your aircraft is equipped with four point harnesses for both pilot and passenger. These should be worn at all times.
Double check that both harnesses are secure as part of the Pre-take-off check (see Section 5.2).

⚠ WARNING

Both safety harnesses must be used in full with shoulder restraints. This must be checked before take off. Failure to put on safety harness and wear shoulder straps could be the cause injury of death in the event of an accident.

1.6. GROUND HANDLING & PICKETING.

A flight has not been successfully and safely concluded until the engine has been stopped, the aircraft has been securely parked and picketed or hangared, and the pilot and passenger have disembarked. Do not make the mistake of losing concentration just because you have landed safely. Unless a strong tailwind is present, when taxiing on grass pull the stick back to ease the weight on the nose wheel. Never taxi at more than walking pace. Use the brakes gently. Remember to make sufficient allowance for the span of the aircraft when maneuvering in confined spaces. Always be ready to switch off the engine in the event of any problem. Respect ground-handling limitations and avoid taxiing in strong winds and gusty conditions.

1.6.1 Picketing.

In transit, the aircraft should be parked nose into the wind, parking brake on, tied down using the dedicated wing tie down points and the bottom of the engine mount frame. If the aircraft is to be left overnight or longer, the main wheels should be chocked rather than to keep the hydraulic system under pressure. The controls can be locked using the seat harness straps. The structure and controls must be carefully inspected before flying after a period of high winds.

1.7. AIRSTRIP CRITERIA

Your airstrip should be smooth, flat, devoid of obstructions, clear of stones and other obstacles, which may damage the aircraft and more, particularly the propeller. Short cut grass or tarmac are ideal surfaces. The strip should be sufficiently long to allow for a straight-ahead landing in the event of an engine failure on takeoff. Both the approach and the climb out zones should be free of any high obstructions like trees, pylons & buildings, and ideally there should be some alternate landing fields in these zones to allow for safe landings in the event of engine problems when landing or taking off. Airstrips surrounded by trees or other obstacles should be avoided, particularly in windy conditions, since low-level turbulence and rotor are likely to be present. Exercise great care when visiting other airstrips for the first time, since it is quite possible that they are not suitable for safe Microlight operation.

1.8. SPECIAL HAZARDS

You should be aware of the following special hazards and it is your duty to point them out to passengers and spectators:

Propellers

Rotating, and indeed even stationary propellers pose potential dangers. Rotating propellers are very hard to see, so special attention should be made to keep persons, and especially children and pets, clear of the aircraft once it has been started. Persons should never stand either in line with the arc of the propeller or behind it since there is always a possibility that stones or other objects can be picked up and hurled at great speed in any direction. In the event of a propeller strike close down the engine immediately and do not re-start until you are satisfied that no structural damage has been done to the propeller. If any damage is visible, do not fly until the damaged blade has been repaired or replaced and the engine has been inspected for shock load damage.

▲ WARNINGS

THE RADIATOR SYSTEM: The cooling system is pressurised when the engine is warm, so you should never open the header tank cap until the engine has cooled down. The coolant in the system is very hot and will

inflict serious scalding if it comes into contact with human skin. The coolant contains Ethylene Glycol which is harmful if swallowed. Do not attempt to syphon or drain the coolant system by sucking on a tube. Failure to observe this Warning could result in injury or death.

THE OIL SYSTEM: engine oil is stored in the reservoir on the left side of the engine. This becomes very hot in use and will inflict serious burns if it comes into contact with human skin.

Running up and testing the engine on the ground

Whenever you need to perform an engine check of any sort, particular care must be taken to observe the following procedures:

1. Move the aircraft to an area clear of people, animals etc. ALWAYS LEAVE AMPLE ROOM AHEAD IN CASE THE AIRCRAFT BREAKS FREE WHILE RUNNING UP.
2. Check the ground around the propeller area for loose stones etc. and remove any such objects.
3. Chock all three wheels of the aircraft.
4. Carry out a proper inspection before starting. See Section 5.2.
5. Do a full pre-start security check as described in Section 5.4.
6. Make sure there is a qualified pilot on board, properly strapped in and with his/her fingers on the ignition switches at all times when the engine is running.
7. Hold the stick in a neutral pitch position when the engine is running.
8. Maintain an adequate lookout while conducting tests; adults, children & animals may approach from behind.

⚠ WARNINGS

Unprotected exposure to engine noise on test will cause long or short term hearing loss. Wear ear defenders or appropriate ear defending headset at all times when in the vicinity of a running engine. Ensure that the headset connecting cables cannot get near the propeller or rotating parts of the engine.

The pilot must always be in the aircraft, harness properly fitted and hatches closed, during run-up. Be ready to turn off at the ignition switch. Failure to follow these instructions could result in injury or death.

The brakes/parking brake are not designed to hold the aircraft against a full power run-up. Exercise extreme caution when ground running the engine.

2. GENERAL DESCRIPTION

Before flying the aircraft, all pilots must study this handbook and become familiar with the characteristics and limitations of the aeroplane. Operation and maintenance handbooks for the engine, instruments and any other equipment fitted must also be studied. The aircraft has a wide speed range requiring some in-flight familiarization with an experienced pilot, especially for those used to flying simpler aircraft of limited performance.

The aircraft is fitted with a non-certificated aero engine. The aircraft must be operated in accordance with the limitations of the Permit to Fly. In particular, the aircraft must always be flown so that a safe landing is possible in the event of an engine failure.

With the high cruising speed of the aircraft, deteriorating weather can be encountered quickly. Flight into Instrument Meteorological Conditions (IMC) without a fully IMC equipped aircraft and current instrument rated pilot is often fatal. The CTSW or CTSL is a daytime VFR aeroplane only. The speed range available from 40 – 125 kt enables the pilot to slow down, make a precautionary landing or divert as appropriate.

2.1 Aircraft Description

- High wing, cantilever, all composite, fully enclosed two seat aeroplane.
- Side by side seating with full dual controls.
- Conventional tail unit with all-flying stabilator.
- Fully mass balanced control surfaces.
- Tricycle undercarriage with hydraulic disc brakes.
- Powerful Fowler flaps with pre-selector control.

Aircraft Dimensions

Span	8.53m
Length	6.22m
Wing area	9.98 m^2

Powerplant

ROTAX 912 ULS	Horizontally opposed 4 cylinder 4 stroke engine
Power	74.5 KW / 100 HP @ 5.800 rpm
Carburation	Twin Bing CD carburetors
Ignition	Dual Ducati CDI electronic ignition
Reduction Ratio	2.43: 1
Noise output	59.0 db (A) to LS-UL 96 standard

CAUTION
Damage may result on CDI engines if the engines are turned over without the spark plug leads connected.

Propeller

Type	Neuform Novaprop TXR2-65 two bladed 1.65m dia ground adjustable composite
Pitch	21° at 75% blade radius (206mm from tip), noise certificate 174m issue 1
Type	Warp Drive 66" 3 bladed parallel chord ground adjustable
Pitch	19° at the tip, noise certificate 174m issue 2

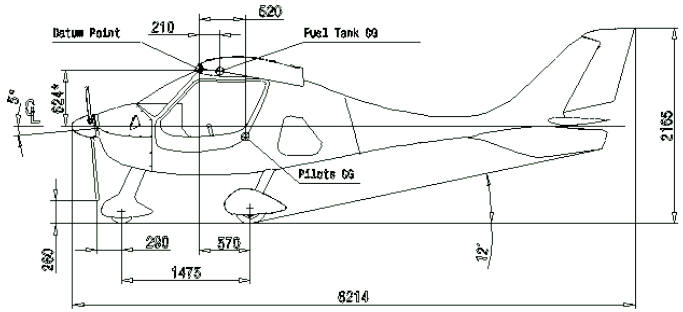
NOTE: changing the propeller pitch invalidates the Permit to Fly and the Noise Certification.

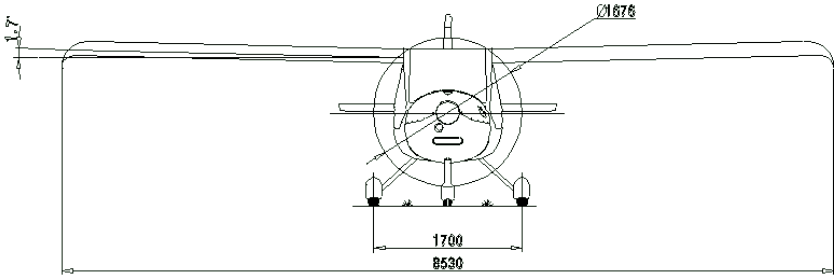
2.2 Minimum equipment required for flight.

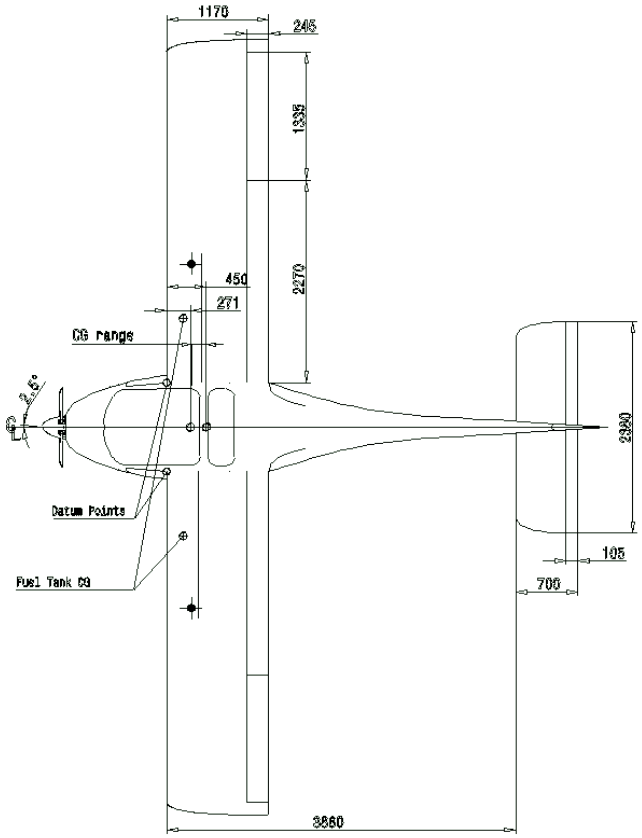
AlphaMFD / Dynon D-180 / Dynon Skyview combined flight/engine instrument;
Four-point Harness for each seat;
Magnetic compass with Deviation placard (when fitted with AlphaMFD; not required with Dynon);
Slip indicator (not required with Dynon Panels);
Flap position indicator;
Current checklist.

2.3 GENERAL ARRANGEMENT DRAWING

(CTSW, Metal main gear legs and drooped tips)







2.4 AIRFRAME

The airframe is produced from carbon composite materials, using hand lay up vacuum bagging techniques. In general, the fibres are impregnated with epoxy resin first and then transferred to the moulds. Strength-critical parts are post cured at 80°C. With composites, strength decreases in hot conditions especially when it is moist. To minimise the structure temperature, the aircraft must keep to a generally white colour scheme especially on the top surfaces. The structure is approved for temperatures up to 55°C. In addition to the required registration letters on the sides and lower surfaces, colour stripes on the sides of the aircraft up to a total width of 100mm are acceptable. Dark red, blue or black colours must be avoided. Repainting the aircraft is not recommended and paint stripper must NEVER be used! Where it is absolutely necessary to repaint the aircraft, you must contact Airmasters for a repair scheme and the aircraft empty weight must not be increased above 268kg (291 kg for parachute equipped aircraft).

Fuselage

The fuselage is of Monocoque composite sandwich structure, made of carbon/Airex/carbon with Aramid layers in the cabin structure to improve crashworthiness. The fuselage is formed from 2 main left and right hand mouldings, a main frame and cockpit tunnel. These parts are all bonded together and the fin is an integral part of the fuselage.

Wings

The wing skins are of composite sandwich structure, carbon/Airex/carbon. The main spar is a composite sandwich box beam with glass/epoxy shear webs and U.D. carbon roving spar caps.

Control Surfaces

The control surfaces are Aramid sandwich construction for minimum weight. The flaps have carbon skins.

2.5. FUEL SYSTEM

The CTSW and CTSL is equipped with one integral baffled fuel tank in each wing. Each tank has a capacity of 65 litres

63 useable). A sealing plate is fitted at the wing root, which is removable for inspection of the feed strainer and tank interior. The sealing plate is provided with a fuel contents sight gauge. The fuel tanks are vented from the filler caps in each wing.

Fuel lines run from each tank down to a common fuel valve. The valve operating lever has placarded on and off positions defined by stops. The fuel feed runs from the valve to the flow-meter and then through the firewall to the gascolator, which is a combined fuel filter and water separator unit. Filtered fuel is drawn from the gascolator by the engine-driven pump on the front of the reduction gearbox. Fuel is delivered to the two flexible pipes leading to the carburettors. A metering tee junction in the fuel line returns excess fuel to the gascolator. This system helps prevent vapour locks.

A step ladder will be required in order to fill the fuel tanks. When filling the tanks, Earth the airframe using the exhaust stub. If filling from a can, use a water trap funnel, or a syphon with a filter. Be careful not to drop the can onto the structure surface. Ensure caps are secure when the tanks have been filled. Fuel caps may break if dropped onto concrete.

The aircraft must be parked in a wings level attitude to prevent cross feeding and loss of fuel from a vent tube.

The fuel type must be a minimum of RON 95, EN228 PREMIUM PLUS, UL-98 or AVGAS 100LL. Use of Avgas 100LL should be kept to an absolute minimum as it fouls the spark plugs and contaminates the engine oil as well as causing lead pollution. Unleaded fuel to EN228 is recommended. The fuel type and quantity is placarded near each filler neck.

A fuel flow rate and contents display is provided on the Braungier MFD (or Dynon) unit, based on flow-meter readings. You may need to calibrate the flow-meter fuel gauge on your particular aircraft. As is general practice in aviation, you should visually check the fuel tanks to confirm that the contents match the flow-meter fuel gauge reading before flying. When flying, use your watch to time the flight against known fuel burn at a given RPM and always leave plenty of fuel in reserve.

A Gascolator with fuel drain valve is provided at the bottom of the cowl. Test the fuel for water or other contamination as part of the daily inspection. If running on Mogas, use the fuel within 3 months. UL91 and 100LL are more stable and have a longer storage life.

The CTSL fuel tanks are protected with an alcohol resistant sealer. Earlier CTSW and CT2K aircraft may suffer tank degradation and leakage with alcohol in fuel, requiring an approved repair and re-seal.

⚠ WARNINGS

- Filtered fuel only should be added to the fuel tank. Contaminated fuel may cause engine failure.
- Gasoline is extremely flammable and can be explosive under certain conditions.
- Refuel in a well-ventilated area with the engine stopped.
- Do not smoke or allow flames and sparks in the area where the engine is refuelled or where fuel is stored.
- Turn the ignition and Master switches OFF. Earth the aircraft.
- Never fill the tank so that the level rises into the filler neck. If the tank is overfilled, heat may cause the fuel to expand and overflow through the tank vents.
- After fuelling, make sure the fuel cap is securely replaced.
- Be careful not to spill fuel when refuelling. Spilled fuel or fuel vapour may ignite. If any fuel is spilled, make sure the area is dry before starting the engine.
- Avoid prolonged or repeated contact with skin or breathing of vapour. KEEP FUEL OUT OF REACH OF CHILDREN.
- Never rely on the fuel gauge accuracy alone when calculating flight distances left to run. A
- forced landing due to running out of fuel could result in injury or death.

2.6. ELECTRICAL SYSTEM

Flywheel alternator with Rotax regulator giving 13.5 – 14.2 V dc, 250 W, 18 A.

Battery 12 V 5ah Cyclon type or Supr B 5200 LiFe.

Electric flap actuator.

Rotax electric starter.
Ducati dual electronic ignition system (Not dependent on the main electrical supply).

⚠ WARNINGS

Unauthorised modifications, including the fitting of optional electrical equipment, must not be carried out under any circumstances without official modification authorisation issued by the factory. In particular, short circuits to the carbon structure pose a fire hazard.

The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging or using batteries in an enclosed space. The battery contains sulphuric acid (electrolyte). Contact with skin or eyes may cause severe burns, wear protective clothing and a face shield.
If electrolyte gets on your skin, flush with water.

If electrolyte gets in your eyes, flush with water for at least 15 minutes and call a physician immediately.

Electrolyte is poisonous, if swallowed, drink large quantities of water, follow with milk of magnesia and call a physician immediately.

CAUTION

When the aircraft is stored for an extended period of time, remove the battery and charge it fully. Then store it in a warm dry place. Never leave the battery discharged.

2.7. UNDERCARRIAGE

Tricycle undercarriage with steerable nose-wheel and cantilever sprung light alloy main legs are fitted to the CTSW.
The main legs on the CTSL are one-piece composite structures.

2.8. BRAKES

Brakes are hydraulic disc brakes, on each main wheel, activated by a single brake lever, with a parking brake system engaged by a valve in the hydraulic circuit. The master cylinder pushrod can be adjusted to provide the correct parking brake pressure. The brake master cylinder is inside the cockpit tunnel behind the brake lever. The hydraulic fluid reservoir is situated behind the main fuselage frame.

⚠ WARNING

Ensure Parking Brake Valve is OFF before take-off and before landing. Otherwise, brakes will lock on after the brake lever is released.

2.9. THROTTLE AND CHOKE

These are operated by Bowden cables. Friction of the throttle and choke levers can be adjusted by varying the tightness of the pivot bolt under the lever box cover.

⚠ WARNINGS

The throttle lever is set by means of a friction device, which means it could be left open. Always check it is fully closed before start-up (the choke function requires this).

Check the choke is off before take-off. A warm engine with choke on will not develop full power, could cause serious problems in the climb and could cut out altogether if the power is reduced.

2.10. IGNITION SYSTEM

The dual ignition systems are controlled by a key switch on the instrument panel. The OFF position is fully anti-clockwise. Rotating clockwise, first position is ignition 1, second position is ignition 2 and in position 3 both ignition circuits are live. Position 4 is a momentary spring return position for starting the engine.

⚠ WARNING

The switch operates in the "normally open" mode, so it has to close the circuit to kill the engine. In the unlikely event of a switch failure, kill the engine using the choke. If this fails, turn off the fuel. With the fuel turned off, the engine may take some minutes to stop, as all the fuel in the carburetters must be used up.

Ensure the key switch is off whenever you leave the aircraft. Failure to do so could result in injury or death when the propeller is handled during the next pre-flight check procedure.

2.11. SEATS

The seats are supported by a webbing strap on the rear and a rail at the front with spring-loaded pins. By pulling the cable under the front of the seat, the pins retract and the seat position can be adjusted. The seats cannot be adjusted whilst occupied. Ensure that the pins are properly located in matching holes before flight. Ensure the rear of the seat is supported by the strap or damage to the seat can result.

2.12. FLIGHT CONTROL SYSTEMS

NOTE: ***Any connection or adjustment of a primary control system not intended for regular rigging/de-rigging must must have an independent, second inspection by a suitably qualified person for security and full and free movement in the correct sense (and maximum deflections if affected). Airmasters recommends using a factory Inspector, BMAA Inspector (3-axis), or similarly qualified person.***

2.12.1 Rudder

The rudder control system comprises two pairs of rudder pedals connected to torque tubes which carry a pair of horns. The lower ends of the horns drive the nose-wheel steering and the spring centraliser. The top ends of the horns drive the rudder cables via turnbuckles. The rudder cables run through teflon guides on the bottom of the fuselage, to the bottom of the rudder.

The rudder cable tension is set up as follows:

Disconnect the battery and remove the lower central instrument panel. Slacken off the rudder turnbuckles and support the nose-wheel off the ground (a helper may do this by depressing the rear fuselage). Ensure the nose-wheel steering is free and the spring centering system provides 12-14kg of pedal force to get full deflection with the nose-wheel off the ground. Ensure all bearings are lubricated and free. Adjust the turnbuckles so that slack is taken out, but the rudder still centralises after it is deflected. The centre position should be adjusted so that the aeroplane maintains balanced flight in the cruise; 1 or 2 degrees of right rudder (Approximately 8mm offset measured at the rudder balance horn) may be necessary to do

this. The friction in the system must be low enough to allow the rudder to centralize itself when the rudder pedals are moved to full deflection and released.

2.12.2 Stabilator

The joysticks are connected to a torque tube running across the center line of the fuselage. The torque tube carries a horn, which drives the Flexball type stabilator control cable. The Flexball cable runs along the bottom of the fuselage to the stabilator mounting horn. The ends of the Flexball cable should be lubricated periodically with a light oil.

2.12.3 Trim/anti balance tab

The stabilator carries a trailing edge tab, which is used as a combined trim and anti-balance tab. The anti-balance action is to deflect the tab in opposition as the stabilator moves, providing a lift force, which returns it to a given position. This gives stability and force feedback to the pilot in pitch.

The setting of the tab is adjusted by the trim control. On the CTSW, the Elevator trim control is operated by a trim wheel, position indicator and drum which operates a trim control cable which runs back to the fuselage mounted spring-loaded trim horn. The trim horn drives a duplicated pushrod, which operates the trim tab.

On the CTSL, pitch trim is effected by an actuator which drives the trim tab via a pushrod in the rear fuselage. Elevator Trim is adjusted by a rocker switch in the cockpit and a position indicator. If the Elevator trim motor should stop or run to an extreme position, maintain the correct airspeed using the elevator and land the aeroplane to investigate.

Set Elevator trim to the takeoff position (approximately mid range) for each takeoff.

2.12.4 Ailerons

The joysticks connect via pushrods to a central torque tube running inside the central cockpit tunnel. The output of the torque tube is a horn giving differential action to two pushrods behind the main fuselage frame. The differential horn carries a pair of centralising springs, which must be set to give 2kg stick force at full deflection each way. The pushrods run up to horns on a pair of torque tubes mounted on the flap drive mechanism. In this way, the ailerons are arranged to droop when the flaps are moved down, giving a reduction in flaps-down stall speed. Each torque tube drives a pushrod between the cabin wall and root wing rib. Each pushrod is connected to a wing root bell-crank via a nut and bolt. The nut and bolt is disconnected when removing the wing. The wing root bell-crank drives a long pushrod inside the wing. The pushrod motion is turned through 90^{o} by a bell-crank inside the wing, which drives the aileron. The wing bell-crank is visible through a transparent inspection window in the wing lower surface.

2.12.5 Flaps

The flaps are driven by a 12V DC electric actuator, which is attached to a structure on the main fuselage frame. The actuator drives the flap torque tubes via a lever close to the top of the baggage hold. The flap torque tubes are bolted together with an adjustable joint at the centre to synchronise the flaps.

Flap position over the range -12^{o} to $+35^{o}$ in the CTSL (-12^{0} to $+40^{0}$ in the CTSW) is demanded in steps by means of a vane-shaped rotary control, which is connected to a 5 position switch. The switch causes the flap motor to run until the demanded flap position is achieved. Motion sensing of the flap mechanism is by means of a potentiometer, which also drives an LED display next to the flap control, of flap position. The flaps take about 8 seconds to travel the whole range.

If selection of flap is attempted above the flap limiting speed, the control card will trip. It will reset itself every 12 seconds. If the speed has dropped and the flap load has dropped in that time, the flaps will continue to run.

The flap actuator is provided with limit switches, which turn off the flap motor at the extremes of travel. If the switches fail, then the motor will drive the flaps to the stops, when the motor will stall. It is then switched off by an over-current circuit breaker located inside the cockpit tunnel. Inspection and operation of the flap system is easy, through the baggage bay doors.

For control surface deflections refer to the BMAA Type Approval Data Sheet (TADS) for the CTSL or CTSW as appropriate.

3. GENERAL INFORMATION

3.1. WEIGHT & CENTRE OF GRAVITY (CG)

3.1.1 Weight

The aircraft is designed for maximum capability within the UK definition of a microlight aircraft. The weight is close to the applicable limits with no room for even the lightest extra equipment. The empty weight of 268kg (291kg including ballistic parachute fit) must not be exceeded for the CTSW. The CTSL is only available with parachute fit and the empty weight must not exceed 291kg. It is not recommended to add modifications which increase weight, or to paint the aeroplane. A margin must be maintained for repairs & moisture uptake.

⚠ WARNING

Unauthorised modifications, including the fitting of optional electrical equipment, must not be carried out under any circumstances without official modification authorisation issued by the factory.

The aeroplane must be re-weighed following any modification, significant repair or whenever required by the CAA. When flying the aeroplane dual, the fuel loading placard MUST be consulted to determine the maximum fuel load that can be carried.

3.1.2 Centre of Gravity (CG)

The CTSW has been designed so that the CG travel due to fuel, pilot and baggage loading is small. Baggage MUST be properly stowed so that it is impossible to slide along the fuselage.

CG range(Solo)	257 – 450mm aft of datum (22% - 38% Mac)
CG range (Dual)	271 – 450mm aft of datum (23% - 38% MAC)
MAC	1.17M
CG Datum	Wing leading edge at any point (there is no leading edge sweep)
CG Attitude	Cockpit tunnel top surface must be horizontal

3.1.3 Empty weight & CG Table.

Empty weight is measured with the aeroplane prepared as if ready for flight with full oil, coolant, unusable fuel and required minimum equipment. The aeroplane must be weighed in dry conditions. If the aeroplane is kept outside, a drying out period of up to a week may be necessary to remove standing moisture. Muddy spats & wheels must be cleaned out. Enter the actual aircraft weight and CG here. Ensure the fuselage

tunnel top surface is level. Using the table below, with three point aircraft scales, note the nose wheel and main wheel weights and total them. Multiply the nose wheel and mainwheel weights by the arm dimensions and note the resulting moments and total the moments. Divide the moment total by the aircraft empty weight and note the empty cg position. See BMAA TADS for CG arm positions for the CTSW and CTSL.

Weight x arm = moment (note nosegear arm is negative)

CG position = total moment / total weight

Aircraft Registration: _____

PART	WEIGHT KG	ARM M	MOMENT	CG POSN
NOSEWHEEL				
MAINWHEELS				
TOTAL WT & CG				
Date:		Modification State:		

3.1.4 Example Weight & CG Table for Flight

The CG limits are not liable to be exceeded if the loading limitations are respected. The fuel loading placard must be installed in the cockpit – see placards section 3.3.

Calculate the weight and CG loaded for flight as follows. Density of fuel is taken to be 0.718 g/cc. For an example aeroplane:

Example:

PART		WEIGHT KG	ARM mm	MOMENT	CG POSN
AEROPLANE		290.5	300	87.15	
PILOTS		147	520	76.4	
FUEL	18 LTR	12.924	210	2.7	
LUGGAGE		22	1200	26.4	
CG AOD		472.5		192.65	0.407

3.2. PERFORMANCE & ENGINE DATA

Parameter	Condition	Warp Drive Propeller	Neuform 2bladed propeller
Stall speed Vs1	Flaps -12°	40 kts	40 kts
Stall speed Vs0, CTSW	Flaps 40°	33 kts	33 kts
Stall Speed Vs0, CTSL	Flaps 35°	34 kts	34 kts
Cruise, smooth air, flaps –12°	Yellow arc	115-150 kts	115-150 kts
Cruising speed range, flaps –12°	Green arc	50-115 kts	50-115 kts
Take off distance to 15m, 450kg, flaps +15°		312m	312m
Take off distance to 15m, 472.5kg, flaps +15°		364m	364m
Landing distance from 15m, 450kg, with brakes		286m	286m
Landing distance from 15m, 472.5kg, with brakes		325m	325m
Best climb rate @ MAUW 450kg, flaps +0°		1270 fpm	1270 fpm
Best climb rate @ MAUW 472.5kg, flaps +0°		980 fpm	980 fpm
Best climb speed		60kt	60kt
Best glide speed, flaps +0 °		60kt	60kt
Glide distance nm/1000ft		1.9	1.9
Cruise @ 4800 rpm		110kt	110kt
Fuel consumption @ 100% power		24 L/hr	24 L/hr

Fuel consumption @ 4800 rpm		14 L/hr	14 L/hr
Cruising fuel consumption range		10 – 14 L/hr	10 – 14 L/hr
Max range		1070nm at 90kt, no reserve	1070nm at 90kt, no reserve
Static max rpm		4600 – 4750 rpm	4600 – 4750 rpm
Max power at 5,500 rpm	Max 5 minutes	100 bhp	100 bhp
Cruising RPM range		3100 – 4800 rpm	3100 – 4800 rpm
Idle RPM		1400-1600	1400-1600

(

⚠ WARNINGS

Take-off and landing performance figures were measured from a short dry grass surface at maximum weight 450kgs at sea level @ 15° Celsius (59°F) (ISA). Temperature, air density, altitude and take off surface can severely affect take-off and landing performance. Make the appropriate calculations before take-off. Loss of brakes can double the landing distance on grass, more on tarmac.

Fuel consumption figures are guide figures only; always fly with a minimum of 1 hour's reserve fuel.

HIGH WINDS & CROSS WIND LANDINGS AND TAKE-OFFS the figures shown above were demonstrated by experienced factory test pilots. Lower limits apply for low-hour and student pilots. Cross wind take-offs & landings should only be undertaken by well-trained pilots in good current practice. The higher the crosswind component, the more important good current

3.3. PLACARDS

Refer to the BMAA TADS for the CTSW and CTSL types' placards which must be displayed.

4. OPERATING LIMITATIONS

⚠ WARNING

It is extremely dangerous to fly outside the designated Flight Envelope, or outside any of the limitations detailed below. If you need to practice stalls, climb to at least 3000 ft above ground level and heed the advice given in 8.5 Stalls. Failure to heed this warning could result in injury or death.

4.1. SPEEDS

Stall speed Vs 1, flaps full up	Flaps -12°	40 kts
Stall speed Vs 0, flaps full down, CTSW	Flaps 40°	33 kts
Stall speed Vs 0, flaps full down, CTSL	Flaps 35°	34 kts
Caution range – for smooth air with 1/3 max control deflections	yellow arc	118–150 kts
Cruising speed range	green arc	40–118 kts
Manoeuvre speed	Va	105 kts
Vne (red line)	Vne	150 kts
Flap limiting speeds 0	White arc	100kts
0 to +15		80kts
+15 to +40		64kts
Max crosswind component Flaps +15		13kt
Max crosswind component Flaps +40		11 kts

4.2 LIMIT MANOEUVRING LOAD FACTORS

Up to Va	**+3.8g,-1.5g**
Va to Vne	**+3.8g, -1.5g**

NOTE:

1. *Up to Va speed full control deflections may be made without exceeding the positive load factor.*
2. *Between Va and Vne (150kt) only 1/3 of full deflection may be made.*
3. *Up to VC 115kt, the aeroplane may encounter a vertical gust of up to 15m/sec without being overloaded. In very rough turbulent conditions, it is recommended to reduce speed to Va or less.*

4.3. TYRE PRESSURES

Main undercarriage	2 ATU / 28 PSI
Nosewheel	2 ATU / 28 PSI

4.4. WEIGHT & CG LIMITATIONS

Minimum Cockpit Load	55kg on either seat
Maximum Cockpit Load	100kg on each seat, 180kg total
Maximum empty weight, no parachute	268kg
Maximum all up weight – MAUW, no parachute	450 kg
Maximum empty weight, with parachute	291kg
Maximum all up weight – MAUW, with parachute	472.5 kg
Maximum fuel at maximum cockpit load	10kg (14 litres) (1 hour at max continuous power)
Maximum Baggage (total)	50kg
CG range, loaded for flight (Dual loading)	271 – 450 mm aft of datum, (23% - 38% wing chord)
CG range, loaded for flight (Solo loading)	257 – 450 mm aft of datum, (22% - 38% wing chord)

▲ WARNING

The maximum empty weight limit must not be exceeded. Exceeding the empty weight limit invalidates the Permit to Fly and also invalidates an NPPL group M.

4.5. POWERPLANT LIMITATIONS - ROTAX 912 ULS engine:

Takeoff performance	100 HP @ 5800 rpm (max 5 min)
Max continuous rpm	4400 rpm
Idle rpm	1400-1600
Oil pressure	1.5 – 5 bar (Up to 7 bar short period after cold start)
Minimum oil temperature	50^{o}C
Maximum oil temperature	130^{o}C
Oil type*	Semi-synthetic high performance four stroke motorcycle engine oil, e.g. Castrol GPS
Oil quantity	2.5 L - min 1.75 L
Oil consumption	maximum 0.1 L/hr
Max CHT (coolant temp)	135^{o}C
Coolant type	100% glycol
Coolant type	50% water/ethylene glycol, coolant temp monitoring required
Coolant temp	120 ^{o}C for water based, 135 ^{o}C for 100% glycol.
Fuel capacity	2 x 65L wing tanks, 130ltr total
Unusable fuel	4 Litres total
Fuel type	SUPER leaded, DIN 51600 EURO SUPER RON 95 unleaded SUPER PLUS RON 98 unleaded / UL91

	AVGAS= 100 LL (see below)

NOTE: *See chapter 9 of the Rotax 912 ULS engine manual. Light aircraft aviation oil NOT recommended.*
NOTE: *AVGAS has a high lead content which tends to foul the spark plugs and form deposits on the valves. It should therefore only be used in the case of vapour lock problems or where MOGAS is unavailable. You should switch back to UL91 or MOGAS as soon as possible.*

For further engine data see the Rotax 912 ULS engine handbook.

⚠ WARNING

If any limitations are reached or abnormal readings noted in flight, land immediately and investigate the cause. Do not attempt to fly until the problem has been solved.

4.6 BRAKE OPERATING LIMITATIONS

If the brake is needed during landing, exercise great care and remember the following procedures:

1. Apply the brake very gently once the aircraft is stabilised after landing.
2. If the rear wheels lock and the aircraft starts to slide, release the lever immediately and re-apply more gently once the aircraft is stable once more.

⚠ WARNING

If the brake is used as an emergency landing brake in wet and icy conditions, extreme care must be exercised. If the aircraft veers, or the wheels lock, release the brake pedal immediately and steer towards the direction of the veer.

4.7. OTHER LIMITATIONS

- The following limitations must be strictly respected:
- The CTSW / CTSL is a non-aerobatic aeroplane. Spins, loops, bunts, tailslides, rolls and flick manoeuvres are all prohibited.
- The CTSW / CTSL is a daytime VFR only aeroplane.
- Operation in very gusty winds exceeding 30kt is not recommended.

5. PREPARATION FOR FLIGHT

5.1. RIGGING & DE-RIGGING THE CTSW / CTSL

It is easiest to rig the aircraft with a minimum of 2 helpers. Take care not to damage the wings and control surfaces by careless handling. Do not force components to line up. Lightly lubricate the wing spar pins and root rib pins and inspect all parts for wear, abrasion and distortion before assembly.

⚠ WARNING

Rigging and de-rigging the aircraft is a simple and safe operation when carried out correctly. However, if you do not use the correct procedures or technique it is possible to injure yourself, and may result in an incorrectly rigged aircraft that could cause injury or death if operated in this condition. It is therefore essential that you receive formal instruction on how to rig and de-rig the aircraft by an instructor, or other competent person before attempting the operation on your own.

CAUTION

For the first few times that you de-rig your aircraft, ensure that the weather is calm or you have an experienced helper to take charge if the wind starts to take control from you. It is also much better to be set up on grass than hard standing, both to avoid damage to the wing and scraped knuckles as you lower the wing to the ground. Clear the area of clutter, tools, twigs and inspect the ground for holes or any other obstacles that may trip you.

5.1.1. Wings

1. Insert either wing into the fuselage slot and prop up the wing tip on a padded trestle of the appropriate height. Slide in till the pitot tube, strobe cables etc can be connected.
2. Do the same with the second wing, ensuring that you connect the fuel lines before the wings are fully inserted. Check that the fuel lines are not trapped in any way.
3. Fully insert the wings until the fore and aft root rib shear connections engage. Line up and engage the flap torque tubes.
4. When the main spar pin holes line up, insert the main spar pins, with the handles positioned about 10 degrees upwards on the front side of the spar.
5. Attach the caps and bolts to the main spar pins, tighten using an Allen key.
6. Connect the aileron push rods to the wing root bell cranks.
7. Check for security and alignment of all components, and for full and free operation of ailerons and flaps.

To de-rig the CTSW / CTSL, firstly drain off all the fuel, using the gascolator drain. De-rigging is then the reverse of the above procedure.

5.1.2 Stabilator

1. Inspect all parts closely for wear, abrasion and distortion before assembly.
2. Ensure the two long 6mm vertical bolts and nuts are to hand.
3. Offer the stabilator up to the mounting fitting.
4. Connect the duplicated tab operating pushrod.
5. Line up the mounting boltholes, insert the mounting bolts from the top (head upwards).
6. Tighten the mounting bolt nuts.

De-rigging is the reverse of the above procedure.

5.2. PRE-FLIGHT INSPECTION

⚠ WARNING

You should never, under any circumstances, consider flying the aircraft before you have completed a thorough pre-flight check!

Even when the aircraft is in frequent use, it is necessary to inspect it thoroughly before the first flight of the day. Ensure the aircraft is parked safely, the throttle is closed, choke off, ignition switches are OFF and the key is out before commencing checks. When checking the gascolator, enough fuel must be drawn off to empty the gascolator bowl and clear the wing tank feed lines. Use a jam jar or similar, kept for the purpose. Before the first flight of the day, remove the cowl top section to enable a more complete inspection of the power plant.

Do not remove coolant header tank cap when engine is hot. Boiling water and/or steam could be emitted under high pressure causing scalding.

5.2.1 Powerplant daily inspection checklist

- Remove cowl top section and have a good look around for loose or broken items.
- With cool engine check Coolant quantity and top up if necessary. The coolant is 100% ethylene glycol (anti-freeze) or Evans NPG. Alternatively water/ethylene glycol mix can be used, but in

this case the coolant temperature must be monitored. The header tank on top of the engine should be full. Coolant type is placarded on the header tank. When replacing the cap, ensure both sealing washers are in position and in good condition. The plastic coolant expansion bottle should have 25-50mm of coolant in when the engine is cold. Enter coolant top-ups and type in the technical log.

- Check oil by rotating the engine slowly by hand till the oil tank gurgles, which indicates the crankcase is purged of oil. Top up the tank if necessary. The level should lie between the max/min markings and must never sink below the minimum mark. Before a long flight, the oil level should lie above the middle of the two markings. Enter oil top-ups in the technical log.
- Examine the oil, coolant and fuel systems for leaks, chafing, cracks or splits.
- Check all fasteners for security.
- Check oil and coolant radiators for damage; check mounts for security and cracks.
- Check exhaust system for security of muffs, springs, clips. Check for cracks and signs of blowing.
- Check carburettors, filters and manifold rubber mounts for security, and carburettors for signs of flooding.
- Check wiring, HT leads and spark plug caps for security and condition.
- Replace the cowl securely, checking the condition of the cowl and propeller for damage.

5.2.2 Airframe daily inspection checklist

- Check windscreen and windows are clean and undamaged and that doors and latches operate properly. Doors can be held up by engaging the latch pin on the wing loop. Be careful not to cut your head on the latch pin or wing trailing edges.
- Check that you have enough fuel and that the tank fillers are secure.
- Ensure the tank vents are clear.
- Fuel cock ON, check gascolator for water.
- Check cockpit for foreign objects.
- For single seat flight, secure passenger harness.
- Check stick and rudder pedals for full and free movement.
- Check main wing spar pins are secured in position with screws.
- Put master switch ON, lower flaps, check symmetrical operation of flaps and flap indicator, put master off.
- Inside baggage bay, check flap mechanism and aileron drive mechanism for security.
- Check aileron-centering springs.
- Check that luggage is stowed correctly in luggage container and secured and that it is within weight limits.
- Check the condition and pressure of the tires.
- Test the brakes, check reservoir hydraulic fluid level.
- Ensure that the undercarriage legs are straight and that the fairings and spats are secure.
- Check flaps for condition and security of hinges.
- Check ailerons for condition and free movement. Observe bell crank through wing inspection window.
- Check that the Pitot tube is clean.
- Check stabilator bolts and linkages are secure.
- Check the stabilator for free movement and the movement of the anti-balance tab.
- Check trim tab, linkage and hinge.
- Operate trim system and check for correct operation.
- Check rudder for free movement, check also rudder hinge and cables.

5.2.3 Powerplant pre-flight checklist.

- Check oil level and top up if necessary.
- Check coolant expansion reservoir for level within limits.
- Ensure that the propeller is clean, undamaged, and that the spinner is secure and clear of the cowl.
- Ensure that the cowl intakes are clear.

5.2.4 Airframe pre-flight checklist

- Check windscreen clean and undamaged and that doors and latches operate properly.
- Check that you have enough fuel and that the tank fillers are secure.
- Check cockpit for foreign objects.
- For single seat flight, secure passenger harness.
- Check stick and rudder pedals for full and free movement.
- Check main wing spar pins are secured in position with screws.
- Operate trim tab lever through its operating range.
- Put master switch ON, lower flaps, check symmetrical operation of flaps and flap indicator, put master off.
- Inside baggage bay, check flap mechanism and aileron drive mechanism for security.
- Check aileron-centering springs.
- Check that luggage is stowed correctly in luggage container and secured and that it is within weight limits.
- Check luggage compartment doors are closed with pins located and latches fully home.
- Check the condition and pressure of the tires.
- Test the brakes.
- Ensure that the undercarriage legs are straight and that the fairings and spats are secure.
- Check flaps for condition and security of hinges.
- Check ailerons for condition and free movement. Observe bell crank through wing inspection window.
- Check that the Pitot tube is clean.
- Check stabilator bolts and linkages are secure.
- Check the stabilator for free movement and the movement of the anti-balance tab.
- Check trim tab, linkage and hinge.
- Check rudder hinges and cables and rudder for free movement.

5.3. PASSENGER BRIEFING

⚠ WARNING

An inexperienced or panic-stricken passenger could jeopardise the safety of the aircraft and crew. Ensure that you give all passengers a proper brief. Before offering to take a passenger, ensure that you have ascertained that they do not suffer from any physical or mental condition that would make the flight hazardous either for the passenger or for the safety of the aircraft. Your first task before starting the engine is to seat your passenger (if applicable) in the aircraft, to check his/her harness, and then to give the following briefing:

Do not touch the ignition switches.
Do not touch the hand throttle.
Describe take-off, landing and intention of flight.
Demonstrate harness release and door release.

⚠ WARNING

Engine start-up is always a potentially dangerous time. Before starting ensure doors and hatches are closed and that baggage is properly stowed. Make sure that you have done all your checks, that you are not disturbed while doing them, and that you are entirely happy that the aircraft is in a fit state to be started-up. Finally, before start-up, ensure that the aircraft is pointing away from people/vehicles/buildings etc, and that there are no pets or other animals which could panic after start-up. Double check that the propeller is clear and that the throttle is set (no more than 5mm open) before starting the engine.

Note that rotating propellers (which are very difficult to see), hot coolant, hot and moving engine parts can all be very dangerous if not treated with due care and respect.

Fuel cock	ON
(With a cold engine) Choke pull back	ON
Throttle - open no more than 5mm	SET
Master Switch	ON
Brakes - Pull back & lock	ON
CLEAR PROP	CHECK

Turn key clockwise to switch both magnetos on, turn further to start.

NOTE: *Operate starter for a maximum of 10 seconds before a cooling period is required*.

- Check oil pressure rises within 10 seconds.
- Allow engine to warm until it will run steadily without choke.
- Warm up at 2000 to 2500 rpm until oil temperature reaches 50°C.
- Switch on any additional instruments, for example radio, strobe light, GPS. Apply the brake and open throttle slowly to 3850 rpm. Switch off immediately if brakes do not hold.
- Check magnetos at 3850 rpm, max rpm drop 300 rpm, max difference in rpm drop 115 rpm. Engine must run smoothly.

NOTE: in very cold conditions, a ground power boost may be necessary. A 12v electrical connection is provided below the cowl on the RH side, Earth is NEGATIVE. Ensure that the propeller cannot touch personnel or cables when connecting and disconnecting ground power.

⚠ WARNING

Before touching the propeller, double check that Ignition keys are set to the OFF position, failure to do so could result in injury or death.

Although unlikely, it is possible that an electrical circuit fault will allow the ignition circuit to remain live with the key switch in the off position, it is therefore essential that before attempting to clear a flooded engine with the throttle set to OPEN, you ensure that the aircraft has adequate clear space forward for the operator to react to an inadvertent engine start up and to close the throttle. If in any doubt, then chock the aircraft before carrying out this procedure.

When starting an aircraft engine or during warm-up it is essential to keep all spectators/children/pets well clear of the propeller and the propeller arc and ensure that they are all totally under the control of a responsible adult. On certain surfaces stones can bounce into the propeller blades and can then become projectiles. Do not start an engine if any loose stones are in the vicinity of the aircraft with any spectators present at all. A stone picked up by a propeller can travel at high speed for hundreds of metres.

ROTATING PROPELLERS ARE ALMOST INVISIBLE AND CAN CAUSE INJURY OR DEATH! Extreme care must be exercised during engine warm-up.

⚠ WARNING

Taking off without completing the proper warm up procedure may result in premature mechanical wear in your engine, extreme rough running on the Rotax 912S, and possibly engine failure on take off. Always warm your engine thoroughly before take off.

⚠ WARNING

The pilot must always be in the aircraft, harness properly fitted and hatches closed, during run-up. Be ready to turn off at the ignition switch. Have a clear area ahead. Failure to follow these instructions could result in injury or death. The brakes/parking brake are not designed to hold the aircraft against a full power run-up. Exercise extreme caution when ground running the engine.

5.5 BEFORE TAKE-OFF VITAL ACTIONS

- Daily and pre-flight checks complete and engine running, brakes on.
- Choke off
- Intercom and radio working.
- Check that your passenger has been briefed.
- Trim & Controls - trim set to takeoff, Controls full, free and in correct sense.
- Mags – check both ON.
- Check fuel load is at least 7L in BOTH sight gauges and is sufficient for the intended flight plus reserves.
- Check fuel selector is set to fully ON.
- Flaps – symmetrical, set to +15° (standard) or +30° (Short or soft field)
- Instruments – Check oil temp 50°C +, Oil pressure 2 – 5 bar, Check QFE, QNH, charge light out.
- Cabin – seat adjustment, map, kneeboard, plan for flight.
- Harness and Hatches – check harnesses secure and adjusted, doors closed, baggage doors closed.
- Check all clear on approach and takeoff, ATC clearance if required.
- Deflect aileron into crosswind, apply up elevator for soft ground.
- Release brakes, parking brake OFF, smoothly apply full power, check 4500 – 4900 rpm on takeoff run.

Where the Dynon Autopilot is fitted, carry out the following preflight checks:

- Select Autopilot ON on the control panel;
- Ensure Autopilot is shown selected on the Dynon screen;
- Select a heading different from the current aircraft heading and check that the stick moves laterally from its static position.
- Select an altitude above ground level and check that the stick moves longitudinally from its static position;
- Check the correct function of the cancel buttons, then turn off the autopilot until required in flight.

6. FLIGHT

⚠ WARNING

The CTSW / CTSL does not have a certified aircraft engine. The pilot must be prepared for the engine to stop at any time and he/she must fly the aircraft accordingly. He must also be trained and in current practice for forced landing procedures. This means the pilot should only overfly terrain where a safe landing is possible at all times. He should avoid overflying towns, forests, mountainous zones etc., and always fly with sufficient altitude to glide to the nearest safe landing area. Failure to do so could result in injury or death.

⚠ WARNING

It is essential that persons wishing to fly the CTSW /CTSL are trained to a minimum standard of the NPPL (M) and are checked out to fly it by a recognised training school for the type of aircraft. It is absolutely essential that all persons with only experience of flexwing aircraft, or 3 axis aircraft having simple systems and limited speed range, undertake a conversion course before attempting to fly the aircraft.

⚠ WARNING

Airframe icing can affect handling markedly. At the first sign, you should land or fly out of icing conditions.

6.1. TAKE-OFF PROCEDURE

- For normal take off select +15° flap, release brakes and smoothly open throttle until full power is achieved.
- For short or soft field take-off, select +30° flap. Hold against the brakes until full throttle is applied (4500 – 4900 rpm) or the aeroplane starts to slide, then release brakes.
- On soft surfaces especially, use the elevator to keep weight off the nose wheel; the idea being to keep the aircraft balanced on the main undercarriage until it lifts off at around 40kt.
- On hard surfaces, neutral elevator may be used, rotating the aircraft at around 40kt.
- Let the speed build to 55-60kt and trim for the climb.
- All take-offs should be as close to directly into wind as possible.
- Maximum crosswind component 13 kts (see Section 4 - Operating Limitations).
- Use aileron down into wind at the beginning of the takeoff roll.
- Climb away straight ahead, accelerating to 60kt.

⚠ WARNINGS

- Exercise great care in strong crosswinds and turbulent conditions.
- Before take-off or landing at altitude, in hot conditions, on a short strip and particularly in the case of a combinaton of all three, do your density altitude calculations.
- If the wing is wet, take off distance can be up to twice as long.
- It is dangerous to perform unnecessary steep initial climbs or banks because of the danger of a low altitude stall/spin. In the case of engine failure soon after take-off, lower the nose and land as straight as possible ahead. DO NOT TURN BACK.

- Exercise great care in strong crosswinds and turbulent conditions.

- Before take-off or landing at altitude, in hot conditions, on a short strip and particularly in the case of a combination of all three, do your density altitude calculations.

6.2. CLIMB

- Accelerating to 60kt, at 300 ft select flaps up in stages, allowing the aircraft to accelerate at each stage. The best rate of climb is at 60kt with flaps 0°. Some Right rudder may be required to keep the slip ball centered.
- At 500ft, select flaps fully up in stages, allowing the aircraft to accelerate at each stage. Do not retract flaps fully below 60kt.
- Re-trim at 60kt for best rate of climb 0° flap, or 70-80kt for cruise climb, -12 ° flap. You may climb at full throttle, not exceeding 5280rpm for 5 minutes.
- Use rudder as necessary to maintain balanced flight.
- Roll/yaw or dip the nose occasionally to see ahead.

⚠ WARNING

DO NOT PERFORM STEEP CLIMB-OUTS. Allowing a steep climb to develop at a slow airspeed immediately after take-off is dangerous. If the engine fails, the aircraft will pitch nose down through a large angle before taking up a glide. Roll control is also impaired at low airspeed. If at low level, there may not be enough time for recovery to landing mode, which could result in injury or death.

6.3. EN-ROUTE

- Re-trim the aircraft in level flight using the order Attitude, Power (4800 max), Trim (APT).
- Do a standard FREDA (fuel, radio, engine, direction indicator, altimeter) check.
- Check both fuel level gauges.
- Cruising fuel consumption is approximately 14 l/h at 110kt, 10 l/h at 80kt.
- Every 10 minutes check fuel, engine temperatures, altitude & position.

⚠ WARNINGS

- Do not open either door in flight.
- Ensure fuel is showing on **BOTH** sight gauges. It may be possible to correct feed imbalance by flying with sideslip for a period.

6.4. TURNS

⚠ WARNINGS

- Never pitch nose up or nose down more than 45° from the horizontal
- Do not exceed more than 60° of bank.

The aeroplane has conventional light aircraft control handling, except that the response is more rapid in all axes due to the low inertia.

Use stick and rudder together to maintain balanced flight in turns. Steeper turns up to the limit 60° require progressively more up elevator deflection and pressure.

In tight turns, power off at low speed, the aeroplane loses height rapidly. Turns steeper that 30^{o} should not be flown at less than 55kt, and never close to the ground.

6.5 STALLS

⚠ WARNING

It is dangerous to stall the aircraft close to the ground. Never intentionally stall the aircraft below 3000ft above the ground. A stall close to the ground could result in injury or death.

Before practicing stalls climb to at least 3000 ft AGL and carry out **HASELL** checks.
Height – at least 3000ft AGL
Airframe – windows and doors latched and flaps set.
Security - Harnesses secure, loose objects stowed.
Engine – Ts (temperatures) and Ps (pressures).
Location – open country.
Lookout – check for other aircraft.

6.5.1 Power off Stall

It will take some time to slow the aircraft from cruise at 100-120kt, down to the stall at approximately 40kt (flaps up). As the stall is approached there is a little aerodynamic buffet. As the stall is approached, the controls become progressively softer in feel and more sluggish in response. Use the rudder to keep the aircraft straight.

The stall should be straight, with aileron response available in the correct sense. The stall itself is an indistinct mushing; the nose dropping gently. The height loss due to the stall is approximately 50ft. The stall attitude is more nose-up with flaps up than with flaps down. With flaps down, the stall is at approximately 34kt at 472.5kg AUW and is a little sharper and less nose-up.

6.5.2 Stall in the turn

Turning flight stalls should only be practiced in banks up to 30^{o}.
Maintain balanced flight approaching a turning stall, using rudder as necessary.
Stall speed is approximately 35kt flaps down, 42kt flaps up, at 472.5kg AUW.
The aeroplane tends to roll out of the bank as the stall occurs.

6.5.3 Power on stalls

Stall speed is reduced by a few knots compared to the power off condition. The stall attitude under power is steeper with flaps up than with flaps down.

Flaps up, aileron control is still available at the stall. Flaps down, there is a tendency to yaw left with power. If unchecked, this may allow the left wing to drop at the stall. Then, if right aileron is given, the left wing may continue to drop. Hence rudder should be used to keep the slip ball centered, especially at low speeds.

Close to the ground, at least 45kt (flaps down) and 50kt (flaps up) must be maintained. Tight turns must be avoided. If a wing drops in a turn at too low a speed (incipient spin) it must be recovered immediately using full opposite ***rudder***, holding the other controls neutral. Use the elevator smoothly on the recovery to avoid repeating the stall.

It is important to understand that the data recorded during stall testing were ascertained using the CAA requirement of a reduction in airspeed of not more than 1 knot per second. If accelerated and therefore unauthorised stalls are undertaken, the aircraft may then lose significant height before recovery is made.

Whip stalls and accelerated stalls are very dangerous and absolutely forbidden. These manoeuvres can lead to loss of control and/or in-flight structural failure that could result in injury or death.

6.6 DESCENT

Warm the engine periodically during a long descent, otherwise the engine may fail to pick up if a go-around is required. If during a long descent and approach, the engine has cooled and fails to respond, apply choke until the engine picks up, then select choke off again.

6.7 APPROACH AND LANDING

Due to the wide speed range, it takes much longer than most microlight aircraft to slow down and change to the landing configuration. The approach angle, even with full flaps, is flatter and requires more space. In this respect it is much more like a light aeroplane.

Very short landings can be achieved using full flap if the speed is correct over the runway threshold. Speed in excess of 50kt at the threshold results in a very long float. The aircraft climbs at around 350 fpm with full flaps, so it is far better to go around and make practice approaches until the approach path and speed are just right.

6.7.1 Downwind check

Brakes	OFF, PARKING VALVE OFF
Fuel	SUFFICIENT?
Altimeter	SET QFE if known
Harnesses	SECURE? cockpit clear of maps etc.

During the downwind leg, close the throttle and let the aeroplane progressively slow to no more than the flap limiting speeds detailed in section 4.1 and then select flaps down in progressive stages, re-trim. Allow the aeroplane to slow to 55-60kt. Select about 10% power to ensure engine can pick up again at any time.

Descend to 500ft AGL during the base leg, check the approach is clear, and enter final approach. Allow speed to drop to 50kt aiming to slow to 45kt over the threshold (use 50kt in gusty weather). Use elevator to control speed and power to control height. Do not hesitate to go around if necessary, the CTSW / CTSL will climb quite well with full flap. Close throttle and fly parallel to the ground at about 1m as the speed decays. Flare to prevent the aeroplane sinking until it settles on the main wheels. Maintain up elevator until the nose-wheel settles down. Apply some up elevator to keep weight off the nose-wheel when taxiing into wind especially on soft ground. Use brakes with caution – on wet grass a skid and ground loop may develop. In gusty conditions, neutral elevator is preferable to prevent the aeroplane lifting off again.

⚠ WARNING

Correct airspeed on finals is of great importance for engine-off landings. The approach speed must not be allowed to decay below 45 kts, and there must be a margin to permit rotation before touchdown.

CAUTION

Locking the brakes can cause tyre damage on tarmac and snaking on wet grass. If they do lock, release the brake lever immediately and apply more gently.

6.7.2 Crosswind landings

Landings should be made into wind whenever possible. Crosswind approaches can be made with the crabbing or wing down technique, or a combination. Refer to the crosswind limits in section 4. These are only for pilots in good practice. Maintain the into-wind aileron up during the ground roll. The wing must not be allowed to lift.

In common with other high wing aircraft, the aircraft has a tendency, which is controllable, to lower the nose when maximum sideslip is applied with full flap. This is due to the way the flap downwash affects the tail. Therefore practice slip/flap combination, maintaining 45-50kt, at altitude. This characteristic is much less evident with the CTSL which has a 35^{o} max flap angle as opposed to the CTSW 40o.

6.8 SHUTTING DOWN THE ENGINE

The engine should be cooled down by a period of running at idle rpm. During the cooling down period, check both magnetos work independently, ensure flaps are up and then turn off any electrical equipment. Turn off the ignition and remove the key. Headsets may be hung up on the wing main spar-pin handles.

7. EMERGENCY PROCEDURES

⚠ WARNING

Spinning is not permitted in the CT and can be dangerous and could result in injury or death

7.1 Spins

The aircraft is not designed or certificated for intentional spinning. However, it is possible for the aeroplane to spin in all configurations of flaps, power and CG. It is reluctant to enter a spin power off, CG forward position. An inadvertent spin might be caused, for example, if the aeroplane is turned sharply at a high angle of attack following a partial engine failure. At the incipient stage, neutralise the ailerons, pick the dropping wing up with full opposite ***rudder*** and apply down elevator.

If a full spin should inadvertently develop, use the standard spin recovery procedure:

1. Throttle: CLOSED
2. Ailerons: NEUTRAL
3. Check with airspeed indicator that you are in a spin, not a spiral dive, and check direction.
4. Stick: Back
5. Rudder: FULL against spin direction
6. Pause for 1-3 seconds
7. Progressively move stick FORWARD until spin stops

8. Recovery will be within 3/4 turn, rate of rotation may *increase* before it stops spinning
9. Neutralise rudder, level the wings and ease out of the ensuing dive as smoothly as possible.

7.2 Engine Failure & Forced Landings.

⚠ WARNING

All engines are fallible. Microlight engines are uncertificated. For this reason never forget that an engine failure can occur at any time. Always be prepared for the engine to fail when it is least convenient and therefore always ensure that you are within gliding distance of a suitable emergency landing field. Regular practice of glide approaches on engine idle will pay dividends. Warm the engine periodically when doing this.

- ALWAYS keep in practice at forced landings with engine out.
- ALWAYS maintain sufficient altitude to give you the choice of a safe emergency landing field.
- ALWAYS assume that every road and every building WILL have a power line near it.
- ALWAYS plan and update your emergency landing fields on a cross-country flight.
- NEVER rely on the electric starter when carrying out forced landing practice, the engine will cool significantly with airspeed and will probably require choke to restart.
- NEVER fly over a wood or water without climbing high enough to permit a safe landing outside the dangerous area.

For engine failure after take-off, if below 300ft, land as straight as possible ahead, avoid turning more than 30^{o} off track.

If there is time, and the reason for engine stoppage is unknown, check:

- Fuel selected ON, contents check.
- Choke off
- Ignition ON both magnetos, try to restart.

If the engine fails to restart:

- Fuel OFF
- Ignition OFF
- Mayday or Pan call.

Slow the aeroplane to 55-60kt for best glide performance. Once the forced landing area is within reach, lower the flaps to 15 degrees, increasing to full flap on the later stages of the approach if it is certain the aeroplane will get into the field. Use the “constant aspect” approach or circuit with a long base leg, as found works best in practice. Sideslipping is preferable to tight S turns in controlling approach angle. Running into the far hedge at 10mph is better than stalling before the field boundary is reached.

⚠ WARNING

Do not attempt to take off again without positively identifying the problem, solving it and running the engine at take-off power for at least seven minutes. Pace out the field and DO NOT attempt takeoff if it is too small or rough.

7.2.1 Landing on Corn or Other Crops

If in the event of a forced landing where you have to choose crops, maintain the lowest speed you can, into wind and stall the aircraft when the wheels touch the tops of the crop. The main hazard here is that of heavy retardation from the drag of the crop, with the possibility of nosing over onto the aircraft's back.

7.2.2 Ditching on Water

- Take great care estimating your height over water, since it is easy to be misled. Proceed as follows:
- If you have a radio, call a MAYDAY, glide towards shipping.
- Direct the aircraft into wind if the wind is significant, if not, consider landing along the swell.
- Tighten your safety harness and cover the release button with your free hand.
- Unfasten the door.
- Clear away any articles which could impede your exit, e.g. radio, map board, intercom.
- Prepare mentally for your landing, ie. have a clear idea about how you will exit the aircraft, try to determine the best direction to swim away - normally rearwards. Be prepared to swim downwards, if necessary, before surfacing. If you are carrying a passenger, make the plan clear to him too.
- Touch the water as slowly as you can, slightly nose up.
- Once in the water, don't panic, leave the aircraft and do not try to take anything with you.
- Inflate lifejacket and turn on PLB as soon as possible.

7.3 Engine fire

- In the event of an engine fire, use the following procedure:
- Turn fuel selector OFF
- Apply full power till engine stops, then
- Ignition OFF
- Descend quickly, sideslip to keep flame & smoke away from cockpit
- Forced landing as described above
- Evacuate cockpit quickly, passenger first

8. POST FLIGHT INSPECTION

After flight, and particularly if you have had a heavy landing or suspect damage may have occurred through ground handling or cross wind landings, you must inspect the aircraft thoroughly. Check the Maintenance and Repair section in this Manual.

Even after a flight without incident you should still carry out a thorough Post-Flight Inspection, paying particular attention to:

- The propeller
- The undercarriage, engine / nose leg mount, tyres & wheels
- Oil and coolant levels

9. MAINTENANCE, SERVICE, & REPAIRS

Routine maintenance information is presented. Further information is available from the factory of Airmasters for heavy maintenance including a procedure for setting up and diagnosing faults in the flap system.

9.1. GENERAL

Airframe

The airframe, electrical and fuel systems and propeller need to be checked according to the following schedule:
50 Hour check every 50 hours
100 Hour check: every 100 hours or annually whichever comes first
details of these are given in section 9.2.

Undercarriage, CTSW (metal legs):

Every 300 hours or after any heavy landing, the main undercarriage leg main bolt rear plate must be removed and the leg dye penetrant tested for cracks/distortion at the mounting holes. If removed, legs must be replaced in the same orientation that they were removed in.

CTSL:

Check the mounting bolts, clamps and undercarriage beam for distortion or cracking after any heavy landing.

Please also note the following:
Do not use any solvents to clean the airframe as they may damage the aircraft's paint.

Plexiglass windows should be polished with a soft clean cloth.

All mechanically moving parts MUST be properly lubricated within the given time period. See the Schedules in section 9.2 on the following page.

⚠ WARNING

Never fly an aircraft with dented or damaged components.

⚠ WARNING

Never use spirits, alcohol, thinners or any strong detergents when cleaning the airframe. These may damage the paint or lead to failure of the composite structure which could result in injury or death.

Engine

The power plant must be maintained according to the schedule 9.3 below and the current Rotax 912S Engine Operator's Manual.

Propeller

The Propeller should be inspected for nicks, cracks, crazing, delamination and corrosion at the hub.

⚠ WARNING

Never fly with a damaged propeller. At best the propeller could be seriously out of balance, at worst it could be about to suffer from structural failure. Damage to a composite propeller could be structural with little external sign. If a propeller blade "lets go" at cruise power settings, you could have less than 2 seconds before the engine tears itself off its mountings. Shut the engine down immediately if the propeller gets damaged in flight or on take-off.

9.2. AIRCRAFT MAINTENANCE SCHEDULE

Area	Check	Every 50 hrs	Every 100 hrs
Airframe	Check all points in the Preflight Check, see section 5.2	x	
	Check all the airframe fasteners for damage, corrosion and wear	x	
	Clean the aircraft (it's much easier to see any damage on a clean aircraft)	x	
	Check the airframe carefully for damage, dents, gouges & deep scratches	x	
	Check the control stick for free movement (all directions); check control system pushrods, cables and fittings for damage, corrosion and wear	x	
	Check the aileron hinges for damage, corrosion and wear.	x	
	Check the elevator and trim tab hinges for damage, corrosion and wear. Lubricate with one drop of oil.	x	
	Check the adjustment of the rudder pedals & check the entire rudder system for damage, corrosion and wear	x	
	Check the rudder hinges for damage, corrosion and wear.	x	
	Check the trim system for adjustment, damage, corrosion and wear. Move trim wheel through full travel, inspect cable for broken strands.	x	
	Check the front undercarriage strut operation. Lubricate if necessary.	x	
	Check the front undercarriage leg for damage, corrosion and wear	x	
	Check the main undercarriage, mounts & fairings for security, damage, corrosion and wear	x	
	Check the adjustment of the brakes	x	
	Check the tyre pressures and the tires for damage & wear	x	
	Polish the paintwork with silicone free auto wax (e.g. Autoglym 01B)		x
	Remove wings to inspect all the following components (normally hidden):		x
	Check condition of the 2 wing spar retaining pins for corrosion and general condition		x
	Inspect the forward and rear spherical bush sockets for condition, freedom of movement and security of mounting		x
	Inspect all visible moving parts of the aileron control system for adjustment, damage, corrosion and wear		x
	Inspect all visible moving parts of the flap control system for adjustment, damage, corrosion and wear		x
	Put a drop of oil on all moving parts of the control system inside the wing		x
	Check the condition of the fuel system, hoses, clips etc		x
	Remove the cover plate of tank wing root. Check condition of strainer. Check the fuel tanks are clean and have no water in them		x
Electrical System	Check battery terminals for oxidation, grease with Vasolene and re-tighten as necessary	x	
	Check condition of battery leads, ensure ground power lead is away from the carbon cowl.	x	
	Visually check condition of all cable terminations	x	
Fuel System	Check gascolator for water and flow rate, flow must be 0.5L/45 secs minimum	x	
	Check fuel filter condition and cleanliness, replace if necessary	x	
	Check condition of all fuel pipes	x	
	Check all fuel pipe clips are tight & adjust as necessary	x	
Propeller	Check propeller blades for damage and balance	x	
	Check condition of propeller hub	x	
	Check torque of prop bolts	x	
	Inspect the propeller blades for damage, clean with auto polish		x

9.3. ROTAX 912S POWERPLANT MAINTENANCE SCHEDULE

	25	100	200
Clean the engine and visually inspect it	x		
Check for leakage of coolant or oil	x		
Check oil level, change oil and oil filter -1st 25 hrs and every 50 hrs if run on Avgas		x	
Check the carburettors for synchronisation. Rebalance as necessary	x		
Check throttle and choke cables for adjustment & wear	x		
Check the fuel filter for contamination and change if necessary		x	
Check coolant level. If coolant appears to be black, drain down the radiator, flush it out with tap water and refill with 100% anti-freeze or Evans NPG. Once the engine has ground run for 5 minutes, re-check the level	x		
Drain the radiator system completely, flush out with fresh water, refill with 100% coolant			x
Check gearbox	x		
Check the condition of the engine mounting system. Check the rubber mounts for crazing, check the torque of all engine mounting bolts, and check for corrosion on the engine mounting subframe	x		
Remove and clean the air-filter		x	
Check the condition of the spark plugs, clean/replace as necessary		x	
Change the spark plugs and check that spark plug connectors are secure			x
Check the condition of all oil, fuel & water pipes for abrasion and crazing. Check all hose clips are tight		x	
Check condition of all electric cables & terminals		x	
Check the cylinder pressures using a compression gauge			x
Ground run the engine for at least 10 minutes after the service has been completed. Switch off, check oil & water levels, check all hoses for leaks	x		

In addition to the above maintenance, the coolant should be renewed every 2 years and all rubber parts should be renewed every 5 years.

The compass should be swung every 2 years or after any modification liable to affect the compass. If the deviation is more than 5 degrees on any heading, a deviation placard is required.

For full details of the 100 hour and 200 hour engine services, please refer Rotax Engine Operator's Manual.

The TBO for the Rotax 912S is 2000 hours. It is highly recommended that the overhaul be carried out by a Rotax Approved Service Agent since specialised tools & facilities are required.

9.4. REPAIRS

Repairs to the CTSW's Airframe and Wings are divided into 2 categories:

Minor repairs to the fuselage and wings may be carried out by any suitably qualified person, following consultation with the factory as to the nature and seriousness of the repair.

Major repairs, following any type of accidental damage, for example, can only be carried out by the factory or a factory-approved repair specialist.

NOTE: *Only genuine spare parts should be used to replace worn, damaged or corroded components*.

⚠ WARNING

Like all aircraft, the CT requires skilled and qualified attention. We do not recommend self-repair or re-assembly by other than Airmasters or Airmasters' nominated repair agents. No replacement parts should be fitted unless they are factory supplied and identified. All replacements and servicing should be entered into the aircraft technical log book supplied and signed off by a qualified inspector.

Incorrect servicing, maintenance or fitting of parts could result in injury or death.

Appendix 1 - Parachute Equipped Aircraft

FOREWORD

The CTSL is only available for the UK market with parachute system fitted as standard.

The CTSW has parachute fitment as an optional modification M213. The modification reference for the CTSW to be operated at 472.5 kg AUW is M211.

Two systems are used:-

- Junkers Magnum Lightspeed Softpack 89m^2 fitted as standard to the CTSW and
- BRS-6-1050 fitted as standard to the CTSL.

The two installations are similar and the aircraft suspension webbing strops are identical.

For the BRS-6 system, please read the BRS parachute owner's manual as supplied with each new CTSL.

⚠ WARNING

The parachute recovery system installation has been approved by CAA on the basis that , as far as it is practicable to demonstrate, it will create no hazard to the aeroplane, its occupant(s) or ground personnel whilst the system is not deployed; and that when properly maintained, the risk of malfunction, deterioration or inadvertent deployment is minimised. The CAA has not approved the system itself or considered the circumstances, if any, in which it might be deployed. The effectiveness of the system for the safe recovery of the aeroplane has not been demonstrated.

The parachute and rocket system must be maintained and serviced according to the following instructions.

Parachute Installation

1.0 General

The parachute system installation drawing is KB7010000. The parachute and rocket are mounted on a frame which is Flight Design part no. KB7010010.

The parachute system is attached to the aircraft by 3 strops. 2 strops run from the front engine mounting, up each cabin pillar and over the wing spar. A third balancing strop runs from the main undercarriage fitting. The strops are connected together in the cabin roof behind the main bulkhead by a shackle which also connects to the main canopy bridle. The strops are arranged to lower the aircraft at a 20 degree nose-down angle. This attitude has been selected for occupant restraint, energy absorption and may also (depending on other damage) allow some directional control by rudder during the descent.

The actuating handle is mounted above the fuselage tunnel on the main bulkhead, between the seats. It is coloured red and provided with a ground padlock which must be removed before flight. Restraint of the occupants by use of the existing shoulder and lap harnesses is essential.

2.0 Preflight checklist

- Check expiry dates on equipment.
- Check security of airframe connections
- Check bridles held neatly by tywraps, no loose loops
- Check security of rocket and canister connections
- Check security of shackles
- Bridle routing
- Egress cover security
- Security of handle housing
- REMOVAL OF SAFETY PIN BEFORE FLIGHT
- Passenger briefing

3.0 Deployment situations

The parachute should only be used for situations where the pilot believes that a successful forced landing is unlikely.

These include mid air collision, structural failure, control failure, pilot disorientation e.g. in cloud, medical emergency, engine failure over inhospitable terrain, weather emergency (e.g. extensive unforecast fog).

It may not help in the case of an engine fire, as the parachute descent may simply prolong exposure to it. The two front strops are of nylon and could fail under engine fire conditions. Fuel should be turned off and the engine run until it is starved of fuel, before considering parachute deployment.

4.0 Deployment sequence

If the aircraft is uncontrollable or at low altitude, **the ignition should be cut** and the parachute deployed immediately. If the aircraft is still under control, tighten harness straps, slow to below 90kt in straight and level flight to reduce opening g load and to promote a clean deployment. See technical data for deployment speed/altitude/load limitations.

1. Turn off the ignition to prevent the possibility of propeller entanglement.

2. Pull the release handle fully out, forcibly

3. Prepare for the deployment deceleration by keeping limbs close and protecting the face. The canopy should deploy in under 5 seconds. Repeat the handle pull if nothing happens, check the ground lock is removed.

During descent, some directional control may be available with coarse rudder inputs. If so, head into wind before impact. Ensure ignition, fuel and master switch OFF before impact.

5.0 Recovery

If the parachute is inflated on the ground, pull one of the shroud lines till the canopy deflates.

The release mechanism is well protected in the structure. If the aircraft has an accident where the parachute is not deployed, rescue personnel should be instructed to keep clear of the rocket panel (which is placarded) in the top of the fuselage. As soon as possible the ground lock should be replaced in the parachute handle.

6.0 Repair

Apart from ground impact damage and any in-flight damage, parachute deployment will split the cabin roof where the suspension strops pull out. A Factory repair scheme will be necessary by a Factory approved repair organization. The parachute and rocket should be replaced or returned to the Factory for servicing.

7.0 Maintenance

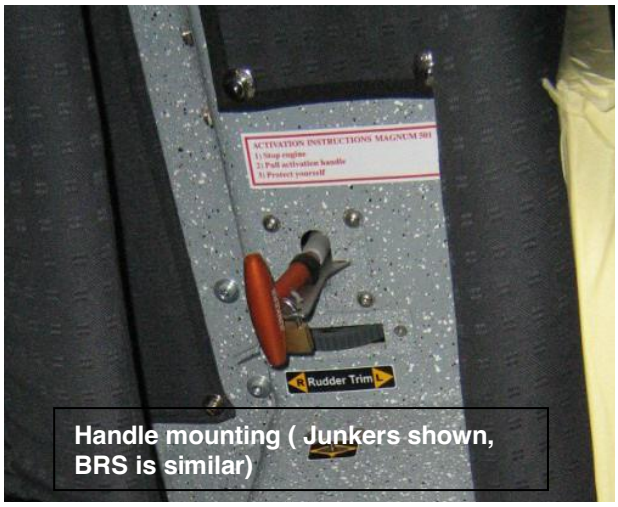
Additional Maintenance for parachute equipped aircraft. Check A is the daily inspection before flight.

Area	Check	Check A	Annual	6 years	13 years	24 years
Canopy	Repack			X		
Canopy	Replace					X
Rocket	Replace				X	
Operating handle	Ground lock OFF	X				
Operating handle	Secure, stowed	X				
Fasteners	Inspect for security		X			
Corrosion	Inspect		X			
Strops, Shackles, Operating cable	Inspect for condition		X			
Placards	Present, Legible		X			

Note :- A record of the maintenance required above MUST be recorded in the aeroplane log book.

8.0 Removal of the rocket assembly:

1) Ensure the aircraft is in an area where accidental rocket deployment would not be hazardous, preferably outside.
2) Disconnect the shackle connecting the rocket to the parachute pack assembly.
3) Remove the parachute deployment handle ground lock.
4) Remove the parachute handle Allen bolt which secures the handle to the cable assembly.
5) Carefully withdraw the deployment handle from the operating cable.



Handle mounting (Junkers shown, BRS is similar)

6) Undo the bottom two mounting bolts and nuts which secure the operating cable bracket to the bulkhead.

7) Withdraw the operating cable assembly rearwards from the aeroplane bulkhead.
8) Replace the rocket deployment handle and ground lock on the operating cable assembly.
9) Undo the rocket mounting nuts and bolts from the parachute mounting frame.

Rocket mounting.

10) Withdraw the rocket and operating handle assembly complete from the aeroplane.
11) Store the rocket and cable assembly, packed and padded in a clearly labelled box. Transport according to the applicable dangerous goods regulations.

Re-fit the rocket assembly using the reverse sequence.

9.0 Removal of parachute assembly

1) Ensure the parachute rocket handle-ground lock is in place.
2) Detach the rocket shackle from the parachute pack.
3) Detach the parachute main strop shackle from the parachute pack.
4) Remove the parachute attachment straps.
5) Remove the parachute through one of the baggage doors.
6) The parachute itself is non-hazardous. Store in a dry area out of direct sunlight.

Re-fit using the reverse sequence, ensuring the rocket and main parachute strops are connected correctly, folded and secured so that the rocket can tow the parachute out cleanly and that the main parachute strop can unfurl without snagging. Ensure there is no possibility of fouling the flap or aileron linkages under all operating conditions.

On fitting the rocket assembly or parachute modification, the system MUST must have an independent, second inspection by a suitably qualified person for security and correct routing of bridles and actuation cable. Airmasters recommends using a factory Inspector, BMAA Inspector (3-axis), or similarly qualified person.

Parachute system technical data - Junkers

Type

Junkers Magnum Lightspeed Softpack

Manufacturer

Stratos 07 s.r.o
Na Folimance 13
Czechoslovakia 120000

Responsible organisation, servicing

Junkers Profly GMBH
Am Flugplatz 1
D 95326 Kulmbach Germany
Tel +9221-879312

Weight and CG, complete CT2k/CTSW installation with strops, mounting frame

12kg at 1.25m AOD

Technical information

Canopy Planform type	Round with no centre line
Opening system	Slider
Reference diameter	7m
Area	86 m^2
Deployment	Pyrotechnic rocket with mechanical firing

Limitations

Maximum deployment speed	163kt	300 km/h
Maximum load	475kg	
Minimum load	270kg	
Minimum deployment altitude	> 262 ft	80m

Performance

Deployment time	3.9sec@ 87kt 100km/h
Sink rate at 3,300ft AMSL ISA	7.33 m/sec
Maximum deployment load	25.6KN

Type : BRS-6-1050-DAeC

Manufacturer:

BRS inc, 380 Airport rd,
S St Paul
MN 55075
USA
001-651-457-7491
www.brsaerospace.com

European service:
BRS VERTREIB
Hauptstrasse 7
D-14806 Loctow
Germany
0049-33843-41818
www.brs-vertreib.de

Weight and CG, complete CT2k/CTSW installation with strops, mounting frame

12kg at 1.25m AOD

Technical Information

Canopy Planform type	Round with no centre line
Opening system	Slider
Reference type	30 gores
Deployment	Pyrotechnic rocket with mechanical firing
Canopy repack cycle	6 years
Canopy life	24 years
Rocket life	13 years

Limitations

Maximum deployment speed	150kt	276 km/h
Maximum load	475kg	

Performance

Deployment time	3.9sec@ 87kt 159km/h
Sink rate at 3,300ft AMSL ISA	7.33 m/sec
Maximum deployment load	25.6KN

Appendix 2 - Autopilot

The Dynon autopilot is an optional fit on the CT2K, CTSW and the CTSL. Full details on the setting up, operation and troubleshooting of the autopilot can be found at:

https://dynonavionics.com/includes/guides/SkyView_Autopilot_In-Flight_Tuning_Guide-Rev_D.pdf