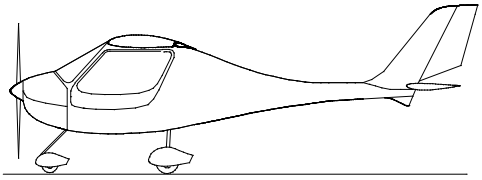
P&M Aviation

FLIGHT DESIGN



CT

Operators Manual – Issue 2.1

SERIAL NO:

P&M Aviation, Unit B, Crawford St, Rochdale, Lancs OL165NU
Telephone: +44 (0)1706 655134
email: flying@pmaviation.co.uk www.pmaviation.co.uk

CONTENTS

NOTICE

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 formal certificate or license following successful completion and assessment of the syllabus detailed in Appendix A. In addition, it is your personal responsibility to ensure that you are qualified to fly in the state/country where you intend to operate the aircraft.

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 instructor for clarification.

If you have just acquired this aircraft then it is important that you register as the new owner/operator with your nearest P&M Aviation Aviation Distributor, or with P&M Aviation Aviation direct at the following address:

P&M Aviation
Unit B
Crawford st
Rochdale
Lancs
UK.

Or online at www.pmaviation.co.uk

WARNIN

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 shown 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.

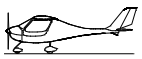
NOTE: *This NOTE symbol indicates points of particular interest for more efficient and convenient operation.*

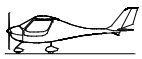
⚠ WARNING

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 CT Microlight aircraft 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 P&M aviation / Flight Design aircraft.

Read this Operator's Manual before flying your aircraft so you will be thoroughly familiar with the proper operation of your CT's 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 this aircraft safely. All operators of this aircraft must qualify in a pilot training programme, to the minimum standard of the syllabus detailed in Appendix A, to attain awareness of the mental and physical requirements necessary for aircraft operation.

To ensure a long and trouble free life from your CT, 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.

Issue 2
Introduces the Warp Drive 66" parallel chord 3 blade ground adjustable propeller option modification Modification M107.

Issue 2.1 Ammended to show interconnected tanks and unusable fuel 4L total IAW Service Bulletins 125 and 134 (modification M186)

1. PREPARATION FOR SAFE OPERATION.

⚠ 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 CT 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 P&M Aviation Microlight, you must be fully trained at least to the syllabus detailed in Appendix A. This syllabus is based upon the UK Civil Aviation Authorities minimum standard of training for Microlight flying in its jurisdiction. It may be that in your country or state, the regulations will dictate a different training syllabus or even that no formal training is necessary; however, this does not mean that you can operate the aircraft in safety without having carried out training with an instructor, to the syllabus. Most of the subjects studied by students qualifying for a Private Pilot Licence or Airman's Certificate are as valid for microlights as for light aircraft, and it is absolutely essential that these subjects are not bypassed before attempting to fly the CT, with the exception of some of the technical subjects dealing with the airframe, engine, controls and effects of controls. Following training you must satisfy your instructor that you are qualified to fly the CT before attempting to operate the aircraft. This may be by tests and examinations required in the country or state or by tests and examinations set by your training establishment.

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 satisfying the relevant authority or instructor/examiner following a type conversion training programme containing at least the exercises in the syllabus in Appendix A.

If you have not flown within the previous 3 months, take a refresher lesson with a Qualified Instructor before flying as Pilot in Command, and 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 pilot's map. Ensure that your planned route remains within the operational Air Laws of your state/country. 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 CT 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 F 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 kilograms.

WARNING

It is extremly dangerous to exceed the 450kg 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 a small quantity of fuel via the drain valve before each flight 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
Before flying, check the Human Factors detailed in Appendix A, Human Performance Limitations. Never fly with a cold, under the influence of drink or drugs, 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 5.2, 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 PICKETING.
In transit, the CT2K should be parked nose into the wind, parking brake on, tied down to the aileron brackets. The maximum safe load each aileron bracket can take is 57kg (i.e. a maximum of 50litres water container).
If the aircraft is to be left overnight or longer, the mainwheels should be chocked rather than to keep the hydraulic system under pressure. The aircraft should be tied down to each aileron & flap bracket and also at the engine mounting frame under the cowl opening. The structure and controls must be carefully inspected 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 climb out. 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.

⚠ WARNING

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

⚠ WARNING

THE OIL SYSTEM: engine oil is stored in the reservoir underneath 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.

⚠ WARNING

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.

⚠ 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. Failure to follow these instructions could result in injury or death.

⚠ WARNING

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 CT, 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 CT has a wide speed range requiring some in-flight familiarization with an experienced CT pilot, especially for those used to flying simpler aircraft of limited performance.

The CT 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 CT, deteriorating weather can be encountered quickly. Flight into Instrument Meteorological Conditions (IMC) without a fully IMC equipped aircraft and current instrument rated pilot is generally fatal. The CT is a daytime VFR aeroplane only. The speed range available from 45 – 120 kt enables the pilot to slow down, make a precautionary landing or divert as appropriate.

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 disk brakes.

Aircraft Dimensions

Span	9.31m
Length	6.22m
Wing area	10.80 m^2

Powerplant

ROTAX 912 ULS	Horizonally opposed 4 cylinder 4 stroke engine
Power	74.5 KW / 100 HPS @ 5.800 rpm
Carburation	Twin Bing CD carburettors
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 plug leads connected.

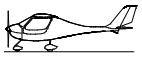
Propeller

Type	Neuform Novaprop TXR2-65 two bladed 1.65m dia ground adjustable composite
Pitch	20° 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

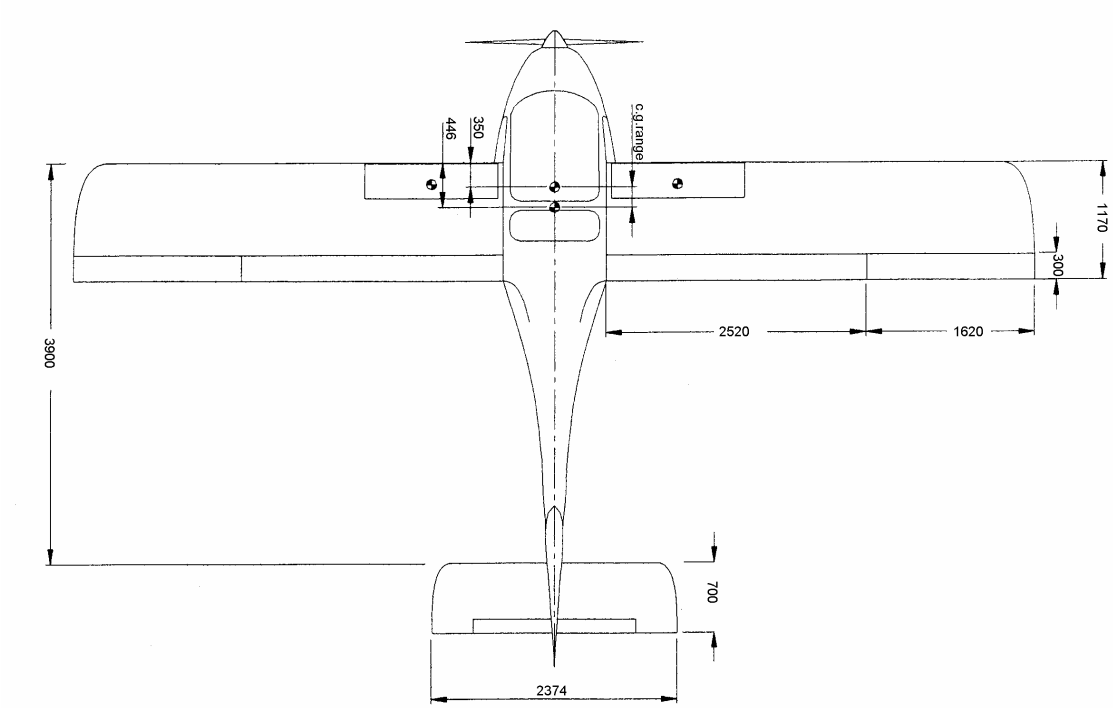
NOTE: *changing the propeller pitch invalidates the Permit to Fly and the Noise Certification.*

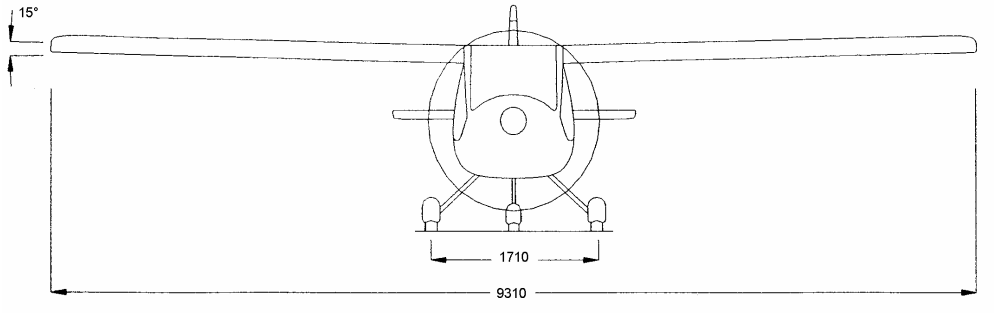
Minimum equipment required to operate the CT

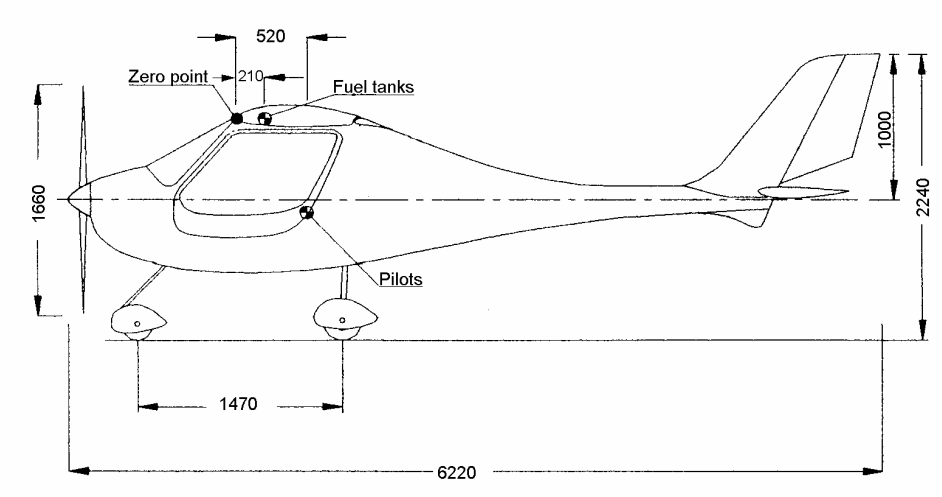
1 AlphaMFD combined flight/engine instrument
1 Four-point Harness for each seat
1 Magnet compass with Deviation placard
1 Slip indicator
1 Flap position indicator
1 Current CT checklist



2.1. GENERAL ARRANGEMENT DRAWING







2.2. 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 CT2K must keep to a white colour scheme. The structure of the CT 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 CT is not recommended and paint stripper must NEVER be used! Where it is absolutely necessary to repaint the aircraft, you must contact P&M Aviation for a repair scheme and the aircraft weight must not be increased.

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/Rohacell/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.

2.3. FUEL SYSTEM

The CT is equipped with one integral baffled fuel tank in each wing. Each tank has a capacity of 65 litres. A sealing plate is fitted at the wing root, which is removable for inspection of the feed strainer and tank interior. The fuel tanks are vented from the filler caps in each wing.

Fuel lines run from each tank to a fuel selector valve close behind the firewall. The selector has right tank, off and left tank positions and is driven by a torque tube with a detent spring for the “off” position. The fuel feed runs from the selector, 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 flowmeter and then to the two metal pipes leading to the carburettors. Just before the flowmeter is a metering tee junction, which 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.
When the fuel tanks are full, the CT must be parked on reasonably level ground to avoid fuel spillage from the vent tube.

The fuel tank has a of capacity 65L, and the fuel type must be a minimum of RON 95, EN228 PREMIUM PLUS or AVGAS 100LL. Use of Avgas 100LL should be kept to an absolute minimum, unleaded to EN228 is recommended. The Fuel type and quantity is placarded near each filler neck. SUPER leaded, DIN 51600.

Before you place any reliance on your fuel gauge, you will need to calibrate the 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 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.

⚠ WARNING

Filtered fuel only should be added to the fuel tank. Contaminated fuel may cause engine failure.

⚠ 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.

⚠ WARNING

- 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.

2.4. ELECTRICAL SYSTEM

Flywheel alternator with Rotax regulator giving 13.5 – 14.2 V dc, 250 W, about 18 A.
Battery 12 V 5ah Cyclon type.
Electric flap actuator.
Rotax electric starter.
Ducati dual electronic ignition system.

⚠ 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.

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.

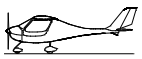
⚠ WARNING

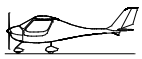
The battery gives off explosive gases; keep sparks, flames and cigarettes away. Provide adequate ventilation when charging or using batteries in an enclosed space. The battery contains sulphuric acid (electrolyte). Contact with skin or eyes may cause severe burns, wear protective clothing and a face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

2.5. **UNDERCARRIAGE**

Tricycle undercarriage with steerable nose-wheel and cantilever sprung light alloy main legs.





2.6. BRAKES

Hydraulic disc brakes, on each main wheel, activated by a single brake lever, with a parking brake system engaged by a detent. 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.

2.7. 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.

⚠ WARNING

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.

⚠ WARNING

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

2.8. 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.

2.9. 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. Ensure that the pins are properly located in matching holes before flight.

2.10. FLIGHT CONTROL SYSTEMS

NOTE: *Any connection or adjustment of a primary control system not intended for regular rigging/de-rigging must have a duplicate inspection for security and for full and free movement in the correct sense.*

Rudder
The rudder control system comprises two 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 centring system provides 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 may be necessary to do this.

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

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 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. The trim control lever has a detent plate, requiring the lever to be pushed across to the left before it can be adjusted. The trim lever 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.

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 4kg 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 bellcrank via a nut and bolt. The nut and bolt is disconnected when removing the wing. The wing root bellcrank drives a long pushrod inside the wing. The pushrod motion is turned through 90^{o} by a bellcrank inside the wing, which drives the aileron. The wing bellcrank is visible through a transparent inspection window in the wing lower surface.

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 at the centre to synchronise the flaps.

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.

Control Surface Deflections

Control Surface	Datum	Deflection measured at trailing edge +ve = surface downwards
Ailerons	Neutral, measure from flap T.E ,flaps up	Up -110mm ±10, Down 50mm ±5
Flaps	Fuselage fairing trailing edge	Flaps fully up = - 60mm +-5 (-12^{o}) Flaps 0 (takeoff) = 0 mm (0^{0}) Flaps fully down = 175mm +-10 (40^{0})
Stabilator	Measure top surface of ventral fin to Lower trailing edge of stabilator.	Up -185mm ±10, Down - 30mm ±5
Trim tab	With stabilator neutral (aligned with fuselage fairing)	Trim full nose up 7mm +-3 Trim full nose down - 25mm +-5
Rudder	Rudder horn aligned with fin	Left 218mm ±10, Right 218mm±10

3. GENERAL INFORMATION

3.1. WEIGHT & CENTRE OF GRAVITY (CG)

Weight

The CT is designed for maximum capability within the UK definition of a small light aeroplane (SLA). The weight is close to the applicable limits with no room for even the lightest extra equipment. The empty weight of 265kg must not be exceeded. 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.

Centre of Gravity (CG)

The CT 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	.257 - .410 M aft of datum (22% - 35% Mac)
CG Datum	Wing leading edge at any point (there is no leading edge sweep)
CG Attitude	Cockpit tunnel top surface must be horizontal

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. Using the table below, from the 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.

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		-.87		
MAINWHEELS		.57		
TOTAL WT & CG				
Date:		**Modification State:**		

PART	WEIGHT KG	ARM M	MOMENT	CG POSN
NOSEWHEEL		-.87		
MAINWHEELS		.57		
TOTAL WT & CG				
Date:		**Modification State:**		

Ammendment 1 24/8/01 correction to aeroplane example arm, arms in metres.

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:

Example:

PART		WEIGHT KG	ARM M	MOMENT	CG POSN
AEROPLANE		265	.257	68.1	
PILOTS		147	.52	76.4	
FUEL	18 LTR	12.924	.3	3.9	
LUGGAGE		25	1.2	30.0	
CG AOD		449.924		178.43	.396

3.2. PERFORMANCE & ENGINE DATA

Parameter	Condition	Warp Drive Propeller	Neuform propeller
Stall speed Vs1	Flaps -12°	43 kts	43 kts
Stall speed Vs2	Flaps 0°	40 kts	40 kts
Stall speed Vs0	Flaps 40°	34 kts	34 kts
Cruise, smooth air, flaps –12°	Yellow arc	115-150 kts	115-150 kts
Cruising speed range, flaps –12°	Green arc	40-115 kts	40-115 kts
Manoeuvre speed Va		86 kts	86 kts
Vne	red line	150 kts	150 kts
Max crosswind component		13 kts	13 kts
Take off distance to 15m		252m	236m
Landing distance from 15m		275m	275m
Best climb rate @ MAUW		925 fpm	1054 fpm
Best climb speed		55kt	55kt
Cruise @ 75% power		120kt at 5280 rpm	120kt at 5280 rpm
Fuel consumption @ 100% power		24 L/hr	24 L/hr
Fuel consumption @ 75% power		18 L/hr	18 L/hr
Cruising fuel consumption range		10 – 18 L/hr	10 – 18 L/hr
Max range		1070nm at 90kt, no reserve	1070nm at 90kt, no reserve
Max power	Max 5 minutes	100 bhp	100 bhp
Max continuous RPM		5280	5280
Cruising RPM range		3100 – 5280 rpm	3100 – 5280 rpm
Idle RPM		1500-1650	1500-1650

⚠ WARNING

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.

⚠ WARNING

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

⚠ WARNING

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 studen pilots. Cross wind take-offs & landings should only b undertaken
by well-trained pilots in good current practice. The higher the crosswind component, the more important good current

3.3. PLACARDS

The following placards must be displayed on the aeroplane:

Main Limitations Placard

On instrument Panel, in clear view of pilot

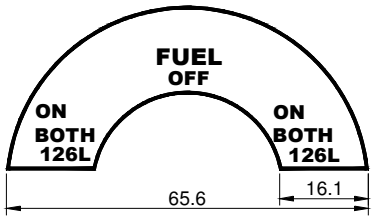
LIMITATIONS CT2K

MAX AUW 450KG
EMPTY WEIGHT
(MAX EMPTY WEIGHT 265KG)
NON-AEROBATIC, LIMITS
+3.8G, -1.5G

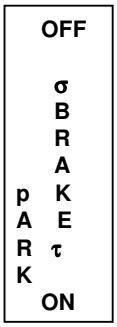
TOTAL LOAD	FUEL
55-92KG	130L(FULL)
130KG	76L
160KG	35L
172KG	18L

Vso FLAPS 40° 34KT
VS1 FLAPS 0° 40KT
VS2 FLAPS –12° 43KT
VF MAX FLAPS 64KT
Va MANOEUVRE 86KT
Vc CRUISE 115KT
Vne 150KT
MAX CONTIN RPM 5280
OIL PRESS 1.5-5BAR
OIL TEMP MAX 140°C
COOLANT MAX 150°C

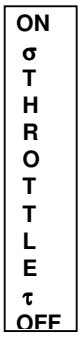
Fuel Selector Placard – NOTE post S.B.125 and 131
(fuel tanks interconnected, 2L unusable fuel in each tank)



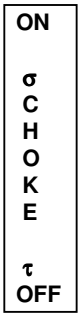
Brakes Placard
By lever



Throttle Placard
By lever



Choke Placard
By lever



Trim Placard
By lever

Down
σ
T
R
I
M
τ
UP

Lubricant/coolant
Placard, on cowling
hatch

ENGINE OIL
SEMI-SYNTHETIC
SAE 10-40

COOLANT 100%
ANTI-FREEZE

Baggage placard, on baggage bay door

MAX BAGGAGE
25KG TOTAL

Mag switch placard

MAGNETOS
OFF L R BOTH
START

Circuit breakers placard
by circuit breakers

CIRCUIT BREAKERS
MASTER <> CHARGE
PULL FOR OFF

Flaps Placard
by flap switch

FLAPS UP
FLAPS DOWN ↕

Door Placards
Above left hand door handle

CLOSE < DOOR > OPEN

Above right hand door handle

OPEN < DOOR >

Heating Placard
Above heating controls

CABIN<>CARB
PULL FOR HEAT

Auxiliary Power Placard
by aux. power lead on cowling

AUX POWER
12V NEGATIVE
EARTH

Fuel Filler Placard
by each fuel tank filler

CAPACITY 65L
FUEL TYPE:
Min. RON 95
EN228 PREMIUM PLUS
AVGAS 100LL (SEE MANUAL)

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°	43 kts
Stall Speed Vs 2	Flaps 0°	40 kts
Stall speed Vs 0, flaps full down	Flaps 40°	34 kts
Caution range – for smooth air with small control movements	yellow arc	115–150 kts
Cruising speed range	green arc	40–115 kts
Manoeuvre speed	Va	86 kts
Vne (red line)		150 kts
Flaps down speed	White arc	64kts
Max crosswind component		13 kts

4.2. MAXIMUM LIMIT MANOEUVRING LOAD FACTORS

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

NOTE:

1. *Up to 86kt (Va) full control deflections may be made without exceeding the positive load factor.*
2. *Between 86kt (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 (86kt).*

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	172kg total on two seats
Maximum empty weight	265kg
Maximum all up weight – MAUW	450 kg
Maximum fuel at maximum cockpit load	13kg (18 litres) (1 hour at max continuous power)
Maximum Baggage	25kg
CG range, loaded for flight	.257 - .410 M aft of datum, (22% - 35% 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 a PPL group M.

4.5. POWERPLANT LIMITATIONS

ROTAX 912 –S engine:

Takeoff performance	100 HP @ 5800 rpm (max 5 min)
Max continuous rpm	5280 rpm
Static max rpm	4600 – 4750 rpm
Idle rpm	1500-1650
Oil pressure in normal service	1.5 – 5 bar
Minimum oil temperature	50°C
Maximum oil temperature	140°C
Optimum oil temperature	100 -110°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)	150°C
Coolant type	100% anti-freeze (ethylene glycol based)
Fuel capacity	2 x 65L wing tanks, 130ltr total
Unusable fuel	4L total
Fuel type	SUPER leaded, DIN 51600 EURO SUPER RON 95 unleaded SUPER PLUS RON 98 unleaded AVGAS= 100 LL (not recommended)

* **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 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 CT is a non-aerobatic aeroplane. Spins, loops, bunts, tailslides, rolls and flick manoeuvres are all prohibited.
- The CT 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 CT

It is easiest to rig the CT 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 before assembly. Inspect all parts closely 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.

Wings

1. Insert one wing into the fuselage slot and prop up the wing tip on a padded trestle of the appropriate height.
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. Connect the aileron push rods to the wing root bellcranks.
4. Fully insert the wings until the fore and aft root rib shear connections engage. Line up and engage the flap torque tubes.
5. 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.
6. Attach the caps and bolts to the main spar pins, tighten using an allen key.
7. Check for security and alignment of all components, and for full and free operation of ailerons and flaps.

To de-rigg the CT, firstly drain off all the fuel, using the gascolator drain. De-rigging is then the reverse of the above procedure.

Stabilator

Inspect all parts closely for wear, abrasion and distortion before assembly.

1. Ensure the two long 6mm vertical bolts and nuts are to hand.
2. Offer the stabilator up to the mounting fitting.
3. Connect the duplicated tab operating pushrod.
4. Line up the mounting bolt holes, insert the mounting bolts from the top (head upwards).
5. 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 CT is in frequent use, it is necessary to inspect the aeroplane 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 powerplant.

WARNING

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

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). Do not use water. The header tank on top of the engine should be full. 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 in the technical log.
- Check oil and top up 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.

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 “LEFT” tank, check gascolator for water.
- Fuel cock on “RIGHT” tank, 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-centring 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 tyres.
- 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 bellcrank 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.

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.

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-centring 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 tyres.
- 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 bellcrank 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 the following briefing.

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 and 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 takeoff, landing and intention of flight.

5.4. STARTING PROCEDURE

⚠ 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 20 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.
- Operate brake lever 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. In an emergency the engine can be hand swung, however, a disciplined hand starting procedure must be used with 2 people, one in the cockpit. Gloves and chocks are necessary. The composite propeller has little inertia and may kick back. Damage to the propeller trailing edge is also possible.*

⚠ WARNING

Before touching the propeller, double check that both contact switches are set to the OFF (forward) position, failure to do so could result in injury or death.

⚠ WARNING

Although unlikely, it is possible that an electrical circuit fault will allow the 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 inadvertant engine start up and to close the throttle. If in any doubt, then chock the aircraft before carrying out this procedure.

⚠ WARNING

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 (yards).

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 912, 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. Failure to follow these instructions could result in injury or death.

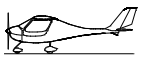
⚠ WARNING

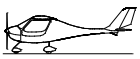
The brakes/parking brake are not designed to hold the aircraft against a full power run-up. Exercise extreme caution when ground running the engine.

5.5. BEFORE TAKE-OFF VITAL ACTIONS

- Daily and pre-flight checks complete and engine running.
- Check that your passenger has been briefed.
- Check the doors are closed and bolted.
- Check the radio and intercom connections.
- Check that harnesses are securely fastened.
- Check fuel load is at least 7L in EACH sight gauge and is sufficient for the intended flight plus reserves.
- Check fuel selector is set to ON.
- Check that the charge light goes out at low throttle setting.
- Check trim is set to take-off.
- Check that flaps are symmetrical and set to take off position.
- Check for full and free movement of controls.
- Check the oil temperature is a minimum of 50°C.
- Check that flight and engine instruments are reading OK, set altimeter.
- Check that the choke is off
- Check both ignition/mag switch positions for mag drop and then on both mags.
- Check wind direction and that the runway is clear and long enough.
- Check that the runway approach is clear and that you have ATC (air traffic control) clearance.

Ammended 31/03/11 fuel levels at least 7L in EACH sight gauge.





8. FLIGHT

⚠ WARNING

The CT 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 CT are trained to a minimum standard of the syllabus in Appendix A, 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 CT conversion course before attempting to fly the CT.

⚠ WARNING

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

8.1. TAKE-OFF PROCEDURE

- For normal take off select 0 to 15° depending on surface (grass use 15°), release brakes and smoothly open throttle until full power is achieved.
- For short take-off, select 15° flap. Hold against the brakes until full throttle is applied or the aeroplane starts to slide, then release brakes and apply full power (4500 – 4900 rpm).
- On soft surfaces especially, use the elevator to keep weight off the nosewheel; the idea being to keep the aircraft balanced on the main undercarriage until it lifts off at around 40kt.
- Climb away straight ahead, accelerating to 60kt, select flaps up at 200ft. As the flaps progressively retract, let the speed build to 65-70kt which is the best rate of climb (flaps up).
- On hard surfaces, neutral elevator may be used, rotating the aircraft at around 40kt.
- On longer runways, -12° (flaps fully up) may be used, rotate at 45kt.
- Let the speed build to 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.

⚠ WARNING

Exercise great care in strong crosswinds and turbulent conditions.

⚠ WARNING

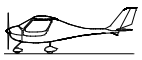
If the wing is wet, take off distance can be up to twice as long.

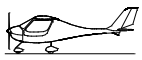
⚠ WARNING

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.

⚠ WARNING

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.





8.2. CLIMB

- At 200ft, select flaps fully up. Trim speed will be found to rise automatically as the flaps retract.
- Re-trim at 70kt.
- You may climb at full throttle, not exceeding 5280rpm.
- 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.

8.3. EN-ROUTE

- Re-trim the aircraft in level flight using the order Attitude, Power (5280 max), Trim (APT).
- Every 15 minutes or so, in humid conditions, select carb heat ON.
- Do a standard FREDA (fuel, radio, engine, direction indicator, altimeter) check.
- Select carb heat OFF.
- Use the fuel selector to regulate the fuel level in each tank to be equal to within $^1/_2$ of full tank capacity.
- Cruising fuel consumption is approximately 18 l/h at 110kt, 10 l/h at 80kt.

⚠ WARNING

Every 10 minutes check fuel, engine temperatures, altitude & position.

⚠ WARNING

Applying or removing power suddenly when near the ground can be dangerous.

⚠ WARNING

Ensure fuel is showing on **BOTH** sight gauges. It may be possible to correct feed imbalance by flying with sideslip for a period.

8.4. TURNS

The aeroplane has conventional light aircraft control handling, except that the response, particularly in pitch, is more rapid 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° should not be flown at less than 55kt, and never close to the ground.

Ammended 31/03/11 Fuel must be showing in BOTH sight gauges.

⚠ WARNING

Never pitch nose up or nose down more than 45° from the horizontal.

⚠ WARNING

Do not exceed more than 60° of bank.

8.5. STALLS

⚠ WARNING

It is dangerous to stall the aircraft close to the ground. Never intentionally stall the aircraft below 3000 ft 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 3000 ft 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.

Power off Stall

With full flap, power off, 450kg AUW, the aeroplane stalls at 33-34kt. It will take some time to slow the aircraft from cruise at 100-120kt, to the flap speed 64kt, then down to the stall. As the stall is approached there is little aerodynamic buffet, though there may be some wallowing in yaw as the stall is approached. 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 120ft. The stall attitude is more nose-up with flaps up than with flaps down. With flaps fully up, the stall handling is similar except that the stall occurs at 43kt at 450kg AUW.

Stall in the turn

- Turning flight stalls should only be practiced in banks up to 30°.
- Maintain balanced flight approaching a turning stall, using rudder as necessary.
- Stall speed is around 36kt flaps down, 45kt flaps up, at 450kg AUW.
- The aeroplane tends to roll out of the bank as the stall occurs.

Power on stalls

Stall speed is reduced by 2-3kt from 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 will 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 centred, especially at low speeds.

Close to the ground, at least 50kt (flaps down) and 55kt (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.

⚠ WARNING

It is important to understand that the data recorded during stall tests were ascertained using the the CAA requirement of a reduction of airspeed of not more than 1 mph per second. If accelerated and therefore unauthorised stalls are undertaken, the aircraft may then lose significant height before recovery is made, or, in extreme cases, may become unstable to the extent of being unrecoverable.

⚠ WARNING

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

8.6. DESCENT

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. It is better to periodically warm the engine in a long descent.

8.7. APPROACH AND LANDING

Due to the wide speed range of the CT, 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 if the speed is correct over the runway threshold. Speed in excess of 50kt at the threshold results in a very long float. The CT climbs at around 350fpm with full flaps, so it is far better to go around and make practice approaches until the approach path and speed are just right.

⚠ WARNING

Never approach at less than 50kts even lightly loaded in smooth conditions.

Downwind checks

Brakes	OFF
Fuel	SUFFICIENT? set to tank with fuel
Altimeter	SET QFE if known
Carb heat	HOT
Harnesses	SECURE? cockpit clear of maps etc.

During the downwind leg, close the throttle and let the aeroplane progressively slow to 64kt and then select flaps down. 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. 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.

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.

⚠ WARNING

Correct airspeed on finals is of great importance for engine-off landings. The approach speed must not be allowed to decay below 50 kts, and there must be a margin to permit rotation before touchdown.

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. The crosswind limit, with a pilot in good practice, is 13kt. Maintain the into-wind aileron up during the ground roll. It must not be allowed to lift.

In common with other high wing aircraft, the CT has a tendency, which is controllable, to lower the nose when maximum sideslip is applied with full flap. Therefore practice maximum slip/maximum flap combination, maintaining 45-50kt, at altitude.

8.8. 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.

8.9. EMERGENCY PROCEDURES

⚠ WARNING

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

Spins

The CT 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 a second
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

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 field 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.

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

- Fuel selected to a tank containing fuel
- 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 around 20 degrees, increasing to 40 degrees on the later stages of the approach. 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.

⚠ 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.

Landing on Corn or Other Crops
If in the event of a forced landing you have to choose crops, maintain the lowest speed you can 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.

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.
- 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.

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

8.10. 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, tyres & wheels
- Oil and coolant levels

9. MAINTENANCE, SERVICE, & REPAIRS

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

details of which are given in section 9.2.

Undercarriage:
Every 1500 hours or after any heavy landing, the main undercarriage legs should be removed and dye penetrant tested for cracks/distortion at the mounting holes. Legs must be replaced in the same orientation that they were removed in.

NOTE: *since the CT is a relatively complex aircraft compared to most microlights, it is highly recommended to return it to the factory for its Annual or 100 hour Check (whichever comes first).*

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 Engine must be maintained according to the outline schedule in sections 9.3. For more details on servicing the Rotax 912S, please refer Rotax Engine Operator's Manual.

The TBO for the Rotax 912S is 1200 hours. It is highly recommended that the overhaul be carried out by a Rotax Approved Service Agent since specialised tools & facilities are required.

Propeller

⚠ 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 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	3	
	Check all the airframe fasteners for damage, corrosion and wear	3	
	Clean the aircraft (it's much easier to see any damage on a clean aircraft)	3	
	Check the airframe carefully for damage, dents, gouges & deep scratches	3	
	Check the control stick for free movement (all directions); check control system pushrods, cables and fittings for damage, corrosion and wear	3	
	Check the aileron hinges for damage, corrosion and wear. Lubricate with one drop of oil	3	
	Check the elevator hinges for damage, corrosion and wear. Lubricate with one drop of oil	3	
	Check the adjustment of the rudder pedals & check the entire rudder system for damage, corrosion and wear	3	
	Check the rudder hinges for damage, corrosion and wear. Lubricate with one drop of acid-free silicone oil	3	
	Check the trim system for adjustment, damage, corrosion and wear	3	
	Check the front undercarriage oleos	3	
	Check the front undercarriage leg for damage, corrosion and wear	3	
	Check the main undercarriage & fairings for damage, corrosion and wear	3	
	Check the adjustment of the brakes	3	
	Check the tyre pressures and the tyres for damage & wear	3	
	Polish the paintwork with auto wax		3
	Remove wings to inspect all the following components (normally hidden):		3
	Check condition of the 2 wing spar retaining pins for corrosion and general condition		3
	Inspect the forward and rear spherical bush sockets for condition, freedom of movement and security of mounting		3
	Inspect all visible moving parts of the aileron control system for adjustment, damage, corrosion and wear		3
	Inspect all visible moving parts of the flap control system for adjustment, damage, corrosion and wear		3
	Put a drop of oil on all moving parts of the control system inside the wing		3
	Check the condition of the fuel system, hoses, clips etc		3
	Remove the cover plate of tank wing root. Check condition of strainer. Check the fuel tanks are clean and have no water in them		3
Electrical System	Check battery terminals for oxidation, grease with Vasolene and re-tighten as necessary	3	
	Check condition of battery leads	3	
	Visually check condition of all cable terminations	3	
Fuel System	Check gascolators for water and flow rate, flow must be 0.5L/45 secs minimum	3	
	Check fuel filter condition and cleanliness, replace if necessary	3	
	Check condition of all fuel pipes	3	
	Check all fuel pipe clips are tight & adjust as necessary	3	
Propeller	Check propeller blades for damage and balance	3	
	Check condition of propeller hub	3	
	Check torque of prop bolts	3	
	Inspect the propeller blades for damage, clean with auto polish		3

9.3. ROTAX 912S ENGINE MAINTENANCE SCHEDULE

	25	100	200
Clean the engine and visually inspect it	3		
Check for leakage of coolant or oil	3		
Check oil level, change oil and oil filter -1st 25 hrs and every 50 hrs if run on Avgas		3	
Check the carburettors for synchronisation. Rebalance as necessary	3		
Check throttle and choke cables for adjustment & wear	3		
Check the fuel filter for contamination and change if necessary		3	
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. Once the engine has ground run for 5 minutes, re-check the level	3		
Drain the radiator system completely, flush out with fresh water, refill with 100% coolant			3
Check gearbox	3		
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	3		
Remove and clean the air-filter		3	
Check the condition of the spark plugs, clean/replace as necessary		3	
Change the spark plugs and check that spark plug connectors are secure			3
Check the condition of all oil, fuel & water pipes for abrasion and crazing. Check all hose clips are tight		3	
Check condition of all electric cables & terminals		3	
Check the cylinder pressures using a compression gauge			3
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	3		

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 1200 hours (or 10 years). 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 CT's Airframe and Wings are divided into 2 categories:

- Minor repairs to the fuelage 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 composite 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 P&M Aviation Aviation or P&M Aviation Aviation nominated repair agents. No replacement parts should be fitted unless they are factory supplied and identified. All replacements & 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.

10. APPENDIX A: PPLA MICROLIGHT TRAINING SYLLABUS

INTRODUCTION

After many years experience and consultation with experienced microlight instructors and examiners, this syllabus has been formulated by the Microlight Panel of Examiners on behalf of the BMAA and approved by the CAA.

All microlight instructions must be conducted in accordance to this, and no other syllabus - unless any alternative syllabus has been submitted to and approved by the CAA.

The syllabus is in two main parts - 1 Flying, 2 Ground - subjects.

The flying syllabus is broken down into **phases** and **exercises.** Individual exercises are further sub-divided into different elements, each of which must be fully understood by the student. Within each phase, each exercise has a specific stated aim. To ensure that these aims are achieved each phase has a specific stated standard of skill which must be achieved.

Elements pertinent to both weight-shift and 3-axis types of aircraft are included in the syllabus. Where an aspect is not relevant to a type it should be ignored. For example, in exercise 6 - "Use of yaw control to maintain balance flight" is not pertinent to a weight-shift aircraft, as no primary control for yaw in current designs.

Use of the syllabus
Every student should be in possession of a copy of the syllabus, as an aid to ensuring that no element is omitted, each can be ticked off as it is completed.

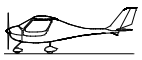
An exercise or group of exercises of the flying syllabus is taken as a session, and the pattern of each flying session should be run as follows:-
(1) Pre -flight briefing (2) Flight training session (3) Post flight briefing

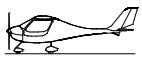
The flight exercises as listed reflect a progression through the basic handling skills to more complex manoeuvring and procedural flying. It is not however mandatory for a student to complete the exercises in strict number order if an instructor feels that the student will benefit from an earlier introduction to a later exercise.

All flight exercises should be completed to a satisfactory standard prior to course completion.

There is no laid down format for the ground subjects training, but it should be closely aligned to the knowledge required for the flight training exercises in order to produce an integrated course of training.

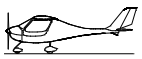
Every school is required to keep an up to date progress report for each student pilot on a student records sheet.

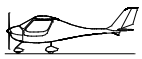




SUMMARY OF THE SYLLABUS FOR THE MICROLIGHT P.P.L. COURSE FLIGHT TRAINING

PHASE	MIN TIMES/PHASE	EX NO	EXERCISE DESCRIPTION
PART 1			
1	2 HRS	1	AIRCRAFT FAMILIARISATION
		2	PREPARATION FOR FLIGHT AND ACTION AFTER
		3	AIR EXPERIENCE
		4	EFFECTS OF CONTROL
		5	TAXIING
		6	STRAIGHT & LEVEL
		7	CLIMBING
		8	DESCENDING
		9a	MEDIUM LEVEL-TURNS (up to 30° bank)
		9b	CLIMBING AND DESCENDING TURNS
2	1 HR	10a	SLOW FLIGHT
		10b	STALLING
		11	SPIN AWARENESS
3	3 HRS	12	TAKEOFF AND CLIMB TO DOWN WIND
		13	THE CIRCUIT, APPROACH, AND LANDING/OVERSHOOT
4	1HR	14	ADVANCED TURNING(UP TO 60°BANK ANGLE)
		15	UNUSUAL AND DANGEROUS ATTITUDES/CONDITIONS
5	1HR	16a	FORCED LANDINGS, WITH /WITHOUT POWER
		16b	OPERATION AT MINIMUM LEVEL
6	7HRS	17a	FIRST SOLO
		17b	SOLO CIRCUIT, LOCAL AREA, AND GENERAL FLYING CONSOLIDATION TO GFT FOR MICROLIGHT PPL. -LOCAL FLYING NOT FURTHER THAN 8 NM FROM TAKE-OFF SITE - HOURS AS REQUIRED TO COMPLETE MINIMUM OF 15 hrs TOTAL FLYING EXPERIENCE (EXCLUDING GFT) AND INCLUDING A MINIMUM OF 7 HRS SOLO.
		17c	DUAL REVISION FOR GFT
PART 2			
7	5 HRS	18	PILOT NAVIGATION
- Navigation training (at least 3 hrs of which MUST be solo). To include two 40nm total distance each, solo cross country flights, during each of which, the student landed at least at one other site. - One site must be at least 15nm away from the take-off site at which the flight began. - The two solo cross-country flights must be flown over different routes and to different sites. Note :- Before full licence can be issued, or remove of limitations from 'restricted' licence, 25 hrs total flying experience must be gained (Excluding GFT).			



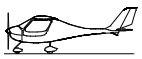


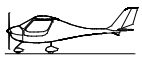
MICROLIGHT P.P.L. COURSE FLIGHT TRAINING SYLLABUS

PART 1 - PHASE 1

EX 1: AIRCRAFT FAMILIARISATION	
Aim:	To become familiar with the component parts, controls, and systems of the aircraft.
Explanation of the aircraft:	Component parts of the aircraft Main flight controls Engine controls
Explanation of the cockpit layout and systems:	Operation of flying controls Operation of engine controls Flight instruments/Engine instruments Electrical systems Fuel systems Operation of safety equipment
Check lists and drills:	Use of check lists and drills suitable for aircraft type Instinctive knowledge of position of controls
Emergency drills:	Action in the event of fire; in the air and on the ground Failure of equipment or systems Escape drills

EX2: PREPARATION FOR FLIGHT AND ACTION AFTER FLIGHT	
Aim:	To understand how to prepare the aircraft and pilot for flight, and how to leave the aircraft after flight.
Airfield Rules/Procedures/Safety:	Standing orders Booking out/in Windsock Signal square Fuel storage Fire extinguisher/s Smoking
Student Comfort:	Seating position Suitable clothing for conditions expected
Flight Authorisation and aircraft acceptance:	Pre-flight planning Aircraft documentation Air traffic control information Personal equipment
Pre-flight checks:	Use of manufacturer's check list or mnemonic Explanation of extra items to check if aircraft just rigged
External checks:	Position of aircraft suitable for starting Fire extinguisher is available Taxi path is unobstructed
Starting and warming up engine:	Pre- start checks Stages and controls involved Signals that may be used
Pre-flight Takeoff checks:	Use of manufacturer's check list or mnemonic Importance of this check(vital actions)
Running down and switching off:	Stages and controls involved
Leaving the aircraft	Suitably parked / picketed Controls locked or restrained Brief external check
Completion of post-flight documentation:	Booking in Reporting of defects Entries in personal flight log Entries in Airframe/Engine log





Ex3: AIR EXPERIENCE	
Aim:	To introduce and become accustomed to the aircraft, the sensation of flying and to sample the aspect of the ground from the air.
Detailed instruction is not normally undertaken on this flight. It can, however, be a valuable lesson. It is an opportunity for the instructor to become acquainted with the student and decide upon the most suitable approach for subsequent instruction. During the flight all actions performed by the instructor should be accompanied by an explanation. Any sudden manoeuvring or expected turbulence should be discussed before it is encountered. The student should inform the instructor of any discomfort, in order to allow a rapid return to the airfield. During the latter part of the flight, the student should have the opportunity to handle the controls to provide a foundation for the next exercise. If the student has some previous flying experience, then this exercise can be combined with effects and controls.	

EX4: EFFECTS OF CONTROLS	
Aim:	To understand how each control affects the aircraft in flight
Airmanship:	The importance of maintaining a good look out
Methods of assessing aircraft attitude	The horizon Hands-off trim 'Feel of wind on face'
Primary effects of controls:	
Further effects of controls:	
Effects of airspeed. Slipstream and torque on control response:	
Effects of trim	Hands-off trim In flight adjustable trim (where applicable)
Effects of Flap (where applicable)	Effect at different positions Change in pitch attitude with flap Remaining within flap operational limiting speed
Use of other controls for increasing Rate of Descent (where applicable)	Airbrakes Spoilers Tip draggers
Use of other controls as applicable to type	Mixture control Carburettor heat Cabin heat and ventilation

EX5: TAXIING	
Aim:	To safely control the aircraft while manoeuvring on the ground, in different wind conditions and on different surfaces.
Airmanship	Lookout Suitable taxi speed Service ability checks of instruments (compass, ASI, etc.)
Use of controls during taxiing:	Headwind Tailwind Crosswind
Tailwind considerations: (where applicable)	
Emergencies	

EX6: STRAIGHT & LEVEL FLIGHT	
Aim:	To attain and maintain flight in a straight line and constant altitude
Airmanship:	Lookout Regular checks - Fuel state/ consumption rate/engine instruments/etc.
Straight flight	Visual reference point Regaining and maintaining visual reference point Use of yaw control to maintain balanced flight
Level flight: (Normal cruise power)	Power required dependant on load carried Attitude appreciation and control Use of in-flight trim control (if applicable) Hands-off trim Inherent stability Use of altimeter to check level
Level Flight: (Varying power settings and IAS)	Power provides height Angle of attack provides speed Power and angle of attack combine to give performance
Attitude control:	Use of pitch control to maintain constant attitude to achieve constant I.A.S
Differences between 3-axis aircraft and weightshift aircraft:	Normal input to the pitch control will change we the attitude on both 3-axis and weight-shift aircraft. But:- With 3-axis aircraft to change airspeed, aircraft noise must be raised or lowered, because wing is fixed to the fuselage so nose attitude change with deliberate airspeed change. With weight-shift aircraft to change airspeed wing is moved independently of fuselage so nose attitude remains almost with deliberate airspeed change (provided that the Angle of Attack is changed slowly)

EX 7: CLIMBING	
Aim:	To enter and maintain a steady full-power-climb and then return to level flight at a predetermined altitude. Also to enter and maintain a steady cruise-climb.
Airmanship:	Lookout Altimeter setting procedure Position of aircraft in relation to Airways etc. Awareness of any blind spots Monitoring engine temperature
Entry to climb:	Power first, then attitude adjustment (PAHT) Combining power and attitude for performance Establishing and holding correct speed for climb
Levelling off:	Attitude first, then power adjustment AHPT) Maintenance of selected altitude
Effect of flaps on climb: (if applicable)	
Maximum Angle of climb:	Speed to achieve performance required Practical uses
Maximum Rate of climb:	Speed to achieve performance required Practical uses
Cruise Climb:	Practical uses

EX 8: DESCENDING.	
Aim:	To enter and maintain a steady glide-descent, then at a predetermined altitude to return to level flight or climb. Also to enter and maintain a steady cruise- descent.
Airmanship	Lookout Selection of clear airspace Altimeter setting procedure Regular application of power to ensure warm engine and clear plugs Awareness of blindspots
Glide descent:	control of airspeed Speed for maximum glide range Speed for minimum sink Rate of descent/Angle of descent Use of flaps (if applicable) Use of airbrakes (if applicable) Use of spoilers(if applicable) Use of tip draggers(if applicable)
Entry to the descent	Attitude first, then power reduction (AHPT)
Levelling off	Power and attitude together
Effect of flap (where applicable):	Effect on attitude and airspeed Control of angle of descent with constant airspeed Descent-to-climb-on full-flap procedure
Powered descent	Relationship between power and airspeed Control of rate of descent Control of angle of descent using visual reference point (as on final approach)
Cruise descent	Uses
Sideslipping	Method of losing height

EX 9A MEDIUM LEVEL-TURNS UP TO 30° BANK ANGLES EX 9B CLIMBING AND DESCENDING TURNS.	
Aim:	To enter and maintain a medium (up to approx. 30°bank) turn whilst maintaining level flight , then to return to straight and level flight on a new heading. Also to enter and maintain a climb or descent whilst turning or to enter and maintain a turn from a straight climb or a descent
Airmanship	Instinctive lookout before turns Allowance for wind and maintaining knowledge of position
Use of controls	Co-ordination and interaction during turns Accurate speed control
Use of power:	To control height Slipstream and torque effect relative to direction of turn
Maintenance of attitude and balance:	Co-ordination and balance through the turn Using structure of aircraft to provide datum during the turn Awareness of heading during the turn Use of visual reference points to ensure accurate rolling of turns Use of low bank angles during climbing turns, to maintain rate of climb

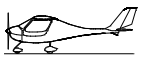
STANDARD REQUIRED AT END OF PHASE 1

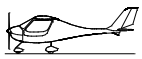
A reasonable level of competence in all general-flying skills

PHASE 2

EX 10A: SLOW FLIGHT (Vs + 2mph and Vs = 5 mph	
Aim:	To become familiar with the feel of the aircraft in slow flight just above the stall speed and to recognise the symptoms of the incipient and to restore aircraft to safe flight before the stall occurs
Airmanship	Lookout Checks to ensure safe operation through exercise i.e.: height/location etc.
Characteristics of slow speed flight:	Control response Effect of slipstream and torque (where applicable) Angle of attack (high nose attitude for 3-Axis aircraft) Angle of attack (control bar well forward of hands-off position for weight-shift aircraft) Wing dropping tendencies and difficulty in maintaining wing level Extra emphasis on need to keep 3-axis aircraft in balance with use of rudder Extra emphasis on need for careful use of roll control Need for extra care when turning i.e.: shallow angles of bank

EX 10B: STALLING	
Aim:	To recognise and enter a fully developed stall from various modes of flight both straight and turning and then to recover with minimum height-loss to a safe flight mode. Also to recover To a safe flight mode at the incipient stall stage.
Airmanship:	Special attention to lookout - clearing turn to check rear Checks to ensure safe operation through exercise i.e.: height /location etc.
Principles and characteristics at the stall:	Effectiveness of controls Inherent stability of aircraft at stall e.g. Washout Buffet and other indications e.g. Severe rearward bar pressure on weigh-shift aircraft Wing dropping tendencies and correct handling of controls i.e. Dangers of using roll control to level wings at the point of stall.
Factors affecting the stall speed:	Flaps (if applicable) Power Weight Load factor i.e. centrifugal force in steep turns
Full Stall and recovery:(from straight flight-level climbing and descending)	Use of controls Use of power
Full Stall and recovery:(from Turing flight-30° angle of bank -level, climbing and descending)	Use of controls Use of power (recovery with and without the use of power)
Stall and recovery at the incipient stage:	Recovery during various attitude and configurations Recovery during changing configurations
Stalling at higher speed	Secondary stall 'g' stall





EX 11: SPIN AWARENESS (IF APPLICABLE)	
Aim:	To understanding recognise the onset of situations which may lead to an inadvertent spin, and to learn how to instinctively take the necessary control actions to effect a recovery back to normal flight conditions before a spin occurs i.e.: to recover at the incipient stage
Airmanship:	Special attention to lookout - clearing to check rear Checks to ensure safe operation through exercise i.e.: height /location etc.
Causes of spin:	
Recognition of Incipient spin:	
Recovery from the Incipient spin:	Use of controls Danger of using ailerons at the incipient stage Effect of power and flap (flap restriction as applicable to type) Effect of centre of gravity on spin Recovery at the incipient stage from various attitudes and configurations

STANDARDS REQUIRED AT THE END OF STAGE 2.

Prior to circuit training ability to control aircraft safely in slow flight just above the stall (Vs + 2 mph)and able to recover to normal flight at incipient stall stage. Prior to solo flight a very high standard of competence at recovering safely from fully developed stall and demonstrable ability to prevent aircraft getting into dangerous attitudes from all stall/spin-and-recovery manoeuvres.

PHASE 3

EX 12: TAKE OFF AND CLIMB TO DOWNWIND POSITION	
Aim:	To safely take off and climb the air craft to position on the downwind leg at circuit height. Also to land safely in the event of an engine failure after take off or at any time in the circuit and to decide against and take appropriate action, if for some reason continuation of the take off would be unsafe.
Airmanship	Pre take-off checks Planning for power failure on every take off Planning takeoff with regard to wake turbulence from other aircraft Planning takeoff with regard to areas of low level rotor/turbulence Drills during and after take off i.e.: constant planning for an aborted takeoff or a forced landing due to power failure on take off in the circuit and monitoring engine temperature during the climb.
Factors affecting the length of the takeoff roll and the initial climb:	Use of power Correct lift-off speed Use of flight controls and techniques Wind: Nil-wind, Head wind, Cross-wind Ground surface: Concrete, grass (Long/short soft/hard/dry/wet) Ground gradient Weight- Altitude-Temperature-Humidity Maximum angle of climb Maximum rate of climb
Undulating (rough field)	Premature lift off and subsequent control
Short and soft field considerations:	
Tailwind considerations (if applicable)	
Effects of flap (if applicable)	Decision to use Effects of use
Emergencies:	Abandoned takeoff Engine failure after takeoff Engine failure in the circuit

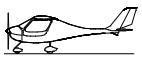
EX 13: THE CIRCUIT FINAL APPROACH AND LANDING	
Aim:	To fly an accurate circuit and carry out a safe approach and landing
Airmanship	Importance of constant lookout during circuit and prior to Turing to leg
Downwind checks	Planning approach and landing with regards to wake turbulence from aircraft landing ahead
The downwind leg, base leg, final approach positioning and drills:	
Factors affecting the final approach (and landing run):	Nil-wind, Head-wind, Cross-wind Correct approach speed Use of power Weight Flaps/ spoilers (if applicable)
Types of approach (and landing):	Powered approach and landing Glide approach and landing Crosswind approach and landing Short field approach and landing Soft field approach and landing Flawless approach and landing (if applicable) Use of airbrakes and spoilers (if applicable) Missed approach and go-around Correct positioning Missed landing and go-around
Effect of ground surface and gradient on the landing run:	Tailwheel considerations (if applicable) Use of elevators Safeguarding the nosewheel
Use of brakes (if applicable)	The Complete Take-off circuit and Landing Circuit joining and leaving procedures.
The Hold off period and Touchdown:	Ability to control height and pitch control, and airspeed with power Ability to control direction Ability to control and correct ballooning Ability to control with crosswinds Ground manoeuvring after landing

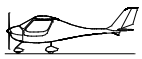
STANDARD REQUIRED AT THE END OF PHASE 3

Ability to take off safely and maintain the climbout safely given a variety of different circumstances. Ability to cope with emergencies at any point in the take-off, circuit or landing phases of the flight. Ability to approach and land safely given a variety of different circumstances. Demonstration of a high degree of airmanship and knowledge of airfield and circuit procedures and disciplines.

PHASE 4

EX 14: ADVANCED TURNING (UP TO 60° BANK ANGLES)	
Aim:	To carry out a co-ordinate level turn at steep angles of bank and to recognise and recover from a spiral dive. Also entry and recover from and uses of a side slipping turn.
Airmanship:	Impotence of lookout Importance of maintaining orientation Cockpit checks
360° turns up to 45° bank angle	Level climbing Descending Wake turbulence
Steep level-turns (up to 60° bank angle)	Co ordination Use of power Weight-shift aircraft- 270° turns only, to avoid own wake turbulence and possible student disorientation due to being forced into an unusual or dangerous attitude
The spiral dive	If power applied - reduce Recovery by use of roll and then pitch
The side slipping turn	Uses of





EX 15: UNUSUAL AND DANGEROUS ATTITUDES/CONDITIONS	
Aim:	To recognise potentially dangerous conditions of flight and to recover safely from unusual attitudes.
From inadvertent mishandling of controls at high speeds From inadvertent mishandling of controls in stall recovery in various configurations From inadvertent mishandling of controls in a steep turn From inadvertent mishandling of controls following hitting own wake turbulence in a 360° steep turn at 45° to 60° bank angles.	
NOTE: THIS EXERCISE MUST NOT BE PRACTISED BY THE STUDENT	

Standard required at the end of phase 4

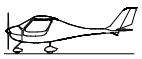
Ability to control aircraft safely in steeper than normal angles of bank, with correctly co-ordinated roll, pitch and power, also has ability to avoid the spiral dive and wake turbulence. Ability to use sides slipping usefully and safely. Also, a very high degree of understanding the reasons why, and of ability to recognise the onset of dangerous attitudes, together with instinctive and immediate prevention of the aircraft from continuing into potentially dangerous conditions of flight.

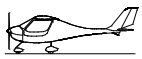
PHASE 5

EX 16A: FORCED LANDINGS-WITH/WITHOUT POWER	
Aim:	To carry out a safe descent approach and landing in the event of the engine failing during flight and to carry out a safe unplanned precautionary landing in an unfamiliar field
Airmanship	Use of correct drills Correct handling and highly accurate speed control
Forced landing procedure:	
Choice of landing area	Provision for change of plan
Gliding distance considerations	The descent plan Key position Engine failure check
The base leg:	
The final approach:	Methods of controlling glide angle S turns
Precautionary landing with power:	Inspection procedures
Actions after landing	Aircraft security

EX16B: OPERATION AT MINIMUM LEVEL	
Aim:	To safely operate the aircraft at heights lower than those normally used.
Airmanship:	Assessment of weather conditions /turbulence Assessment of height above terrain Compliance with low flying rules High levels of awareness Low level military aircraft
Low level familiarisation	Actions prior to descending Visual impressions and height control at low altitudes Effect of wind, speed and inertia during turns Effect of wind and turbulence
Low level operation:	Weather considerations Avoidance of precipitation Obstacle considerations
Effects of precipitation	As applicable to type
Joining circuit in poor weather and bad weather circuit:	

STANDARD REQUIRED AT END OF PHASE 5





Ability to choose a suitable safe area and to set up a good approach to land following any unexpected power loss simulation.
Ability to choose a suitable safe landing area and to carry out a low pass to check suitability of surface prior to a simulated precautionary landing.
Ability to fly safely just above ground level, demonstrating a high degree of understanding of lo-level turbulence and awareness of obstacles, together with ability to co-ordinate turns correctly with regard to wind direction.
Acute awareness of dangers and rules associated with low flying, and consideration for noise, animals etc.

PHASE 6

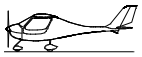
EX 17A: FIRST SOLO	
Aim:	To carry out a safe and accurate solo circuit, approach and landing.
Airmanship	Constant look out Faultless checks Ability to deal with all emergency drills
First solo, short briefing required:	Pilot should not hesitate to overshoot if in any doubt Differences in handling and performance when flown solo Use of ballast

EX 17B: SOLO CIRCUIT, LOCAL AREA, GENERAL FLYING CONSOLIDATION	
Aim:	To practise and refine all the skills learned during the dual training and to prepare for the General Flying Test.
Airmanship:	Review and application of all different aspect of airmanship.
General flying consolidation	Review and application of all different aspect of the general handling skills
Circuit consolidation	Review and application of all different aspect of the take off circuit approach and landing
Local area consolidation:	Airfield departure procedure Map reading and identification of local features Turning onto and maintaining heading by use of compass Circuit rejoining procedure

EX 17 C: DUAL REVISION FOR GFT	
Aim:	To correct any errors or bad habits which may have developed during 17b and to check that no aspect of the training has been overlooked.
Review of:	All aspects of required standards of airmanship, general flying skills, knowledge of and practical application of ground subjects/procedures etc. prior to application for General Flying Test

STANDARD REQUIRED AT THE END OF PHASE 6

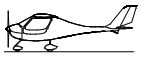
All general flying skills and airmanship to be up to GFT standard. Also an adequate knowledge of aviation law, general meteorology, local weather and ability to predict if conditions will remain suitable for continued flight. Also reasonable standard of map reading ability.



EX 18: PILOT NAVIGATION	
Aim:	To fly accurately and safely in VMC and under VFR a predetermined route without infringing the rules governing regulated airspace.
Airmanship:	Pre-flight planning Planned cockpit management Adequate security of loose items
Flight planning	Notams Weather forecasts and actual(s) for planned route Map selection and preparation Choice of route Tie down equipment
Calculations	Magnetic heading and times on route Fuel consumption Weight, balance and performance
Airfield procedure on departure:	Organisation of cockpit Altimeter setting Setting of heading Setting of time and noting ETAs
En-Route	Maintenance of altitudes and headings Revisions to ETA and heading Minimum weather conditions for flight to continue at any point 'In flight' decisions Navigation at minimum level Uncertain of position procedure Lost procedure
Arrival at destination procedure:	Altimeter setting (QNH to airfield QFE) Airfield circuit and circuit joining procedure
Parking procedure	
Security of aircraft	
Note: The above navigation exercises would typically be spread over the following sessions, though it is not mandatory for any dual tuition for this part of the syllabus:- 1. Dual cross country. (Inc. Away landing) 2. Dual cross country. (Inc. navigation at min. level and lost procedure) 3. Solo cross country. (1st qualifying cross country) Solo cross country. (2nd qualifying cross country)	

STANDARD REQUIRED AT THE END OF STAGE 7.

Good navigation ability to predict weather. High standards of airmanship.



SUMMARY OF THE SYLLABUS FOR THE MICROLIGHT PPL COURSE - GROUND SCHOOL TRAINING

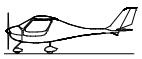
- **Principles of flight**
- **Aviation Law**
- **Aviation Navigation**
- **Aviation Meteorology**
- **Airframes and Engines**
- **Aircraft Instruments**
- **Fire, First Aid and Safety Equipment**
- **Human Performance Limitations**

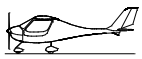
MICROLIGHT PPL COURSE GROUND-SCHOOL TRAINING SYLLABUS

PRINCIPLES OF FLIGHT	
PHYSICS AND MECHANICS	Speed, Velocity, Force Pressure-Bernoullis Principle Motion of a body along a curved path
AEROFOILS. LIFT AND DRAG	Air Resistance and air density Aerofoil shapes Lift and drag - Angle of attack and airspeed Distribution of lift, centre of pressure Drag - Induced, parasite- Form, Skin Interference Lift/Drag Ratio and aspect ratio
FLYING CONTROLS	The three Axes - Vertical, Lateral, Longitudinal Yaw, Pitch, Roll Operation and Function of elevators, ailerons, rudder Principles and purpose of mass, and Aerodynamic Balance Operation and function of Trimming controls Operation and function of flaps Operation and function of spoiler, spoilerons, tip rudder Operation and function of canard configuration Principles and operation weight-shift control systems Operation and function of billow shift
EQUILIBRIUM	The Four Forces - Lift, Weight, Thrust, Drag Moments and Couples The balance of the Four Forces - Straight and Level, Climbing, Descending
STABILITY	Positive, Neutral, Negative Lateral and Directional Stability -3 Axis/Weight-shift Longitudinal Stability -3 Axis/Weight-shift Relationship of C of G to Control in Pitch -3 Axis/Weight-shift Luff lines on weight-shift aircraft Washout
THE STALL	Airflow separation Stalling Angle - Relationship to Airspeed Wing Loading Wing Loading increase with bank angle increase High Speed Stall
THE SPIN	Causes of a spin Autorotation Effect of the C of G on spinning characteristics
TURNING FLIGHT	The Forces in the Turn
LOAD FACTORS AND MANOEUVRES	Definition of load factor - VN envelope Effect on Stalling Speed In-Flight Precautions

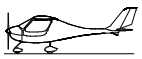
PRINCIPLES OF FLIGHT - CONTINUED	
AIRCRAFT PERFORMANCE	Power Curves, Effect of temperature and density, Range and Endurance Climbing Performance, Rate of Climb, Angle of Climb Take-off and Landing Performance, Take-off run available, Take-off Distance available The Take-off and Initial Climb - Performance Effect of: Wind, Wind Gradient, Wind Shear, Weight, Pressure, Altitude, Temperature and Density, Ground Surface and Gradient, Uses of flaps The Approach and Landing - Performance Effect of: Wind, Wind Gradient, Wind Shear, Use of Flaps, Ground Effect
WEIGHT AND BALANCE	Limitations on Aircraft Weight Limitations in relation to aircraft balance Weight and centre of gravity calculations
THE PROPELLER	Construction and shape Maintenance and checks Balancing

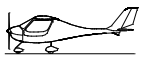
AVIATION LAW	
	The ANO Classification of aircraft
AIRCRAFT DOCUMENTATION	Certificate of Registration Permit to fly/exemption certificate Noise Certificate Flight manual/maintenance schedules/ pilots operating handbook Airframe and Engine log book and pilots responsibility to maintain and record: Aircraft hours, inspections, defects, repairs, maintenance, and modifications (mandatory and otherwise)
PERMITS TO FLY AND EXEMPTIONS	BMAA, 'Guide to Airwothiness' Documentation Non-expiring Permit to Fly and Certificate of Validity Non-expiring Exemption and Certificate of Validity Limitations applying to Permit to Fly and Exemption Certificate Aircraft Failure to comply with the Requirements or Conditions of the Permit to Fly or Exemption Certificate Application of Flight/Owner's Manual and Pilot's Operating Handbooks to the Permit to Fly Requirements for Maintenance and Inspections Overhaul, Repair, Replacement and Modifications to Aircraft or Equipment
AIRCRAFT EQUIPMENT	AN Schedule 4 Equipment Required in Relation to the Circumstances of Flight
AIRCRAFT RADIO EQUIPMENT	AN Schedule 5 Certificate of Approval of Aircraft Radio Installation Flight Radio Operators Licence
AIRCRAFT WEIGHT SCHEDULE	Legal Requirements in Relation to the Permit To Fly/ Exemption
GRANT AND RENEWAL OF LICENCES TO MEMBERS OF FLIGHT CREW	Conditions of issue
PRIVILEGES OF THE PRIVATE PILOT'S LICENCE	Student Pilot Privileges Medical Certificates The Private Pilot's Licence Ground Examinations and Flight Test Medical Certificate-Renewal Private Pilot Privileges (' Restricted' 'and un restricted') Specified Minimum Weather Provisions
RATINGS- CONDITIONS OF ISSUE	Privileges of the Aircraft Rating Additional Ratings





AVIATION LAW - CONTINUED	
LICENCES AND RATINGS-RENEWAL	Certificate of Test Certificate of Experience Period of Validity Flying Hour Requirements
PERSONAL FLYING LOG BOOK	Requirements to Maintain Personal Details Particulars of flight Recording of Dual, Solo, Cross Country Flight Times Recording of Flight Tests Instructor's Endorsements of Flight Times
INSTRUCTION IN FLYING	Definition of Flying Instruction Requirements for flying Instruction to be given
PRE FLIGHT ACTION BY COMMANDER OF AIRCRAFT	
DROPPING OF PERSONS OR ARTICLES	
CARRIAGE OF MUNITIONS	
CARRIAGE OF DANGEROUS GOODS	
ENDANGERING SAFETY OF AIRCRAFT	
ENDANGERING SAFETY OF PERSONS OR PROPERTY	By Intent By neglect
DRUNKENNESS IN AIRCRAFT	Application to Passengers Application to Flight Crew
SMOKING IN AIRCRAFT	Authority of Commander Notices in aircraft
AUTHORITY OF COMMANDER OF AIRCRAFT	Legal Requirements to obey all Lawful Commands
EXHIBITION OF FLYING	Public Displays BMAA Events
DOCUMENTS TO BE CARRIED	On Domestic Flights On International Flights
PRODUCTION OF DOCUMENTATION AND RECORDS	Requirements of Commander Requirements of Operator Requirements of Flight Crew Personal Flying Log Books
REVOCATION, SUSPENSION OR VARIATION OF CERTIFICATES, LICENCES, OR OTHER DOCUMENTS	Whilst pending enquiry or after enquiry Surrender of Documents or Records Invalidation of Documents due to Breach of Conditions
OFFENCES IN RELATION TO DOCUMENTS AND RECORDS	Unauthorised use of Documents Alteration, Mutilation or Destruction of Documents or Records Entries in Log Books or Records Incorrect Entries - Wilfully or Negligently Unauthorised Issue of Certificates
AERODROMES- INSTRUCTION IN FLYING	The Requirements for Basic minima as laid down by the BMAA Permission and Purpose of Use
POWER TO PREVENT AIRCRAFT FLYING	
AIR TRAFFIC RULES AND SERVICES	
DIVISION OF AIRSPACE IN THE UK	Controlled Airspace Control Zones Control Areas Terminal Control Areas Airways Advisory Airspace Military Aerodrome Traffic Zones Civil Aerodrome Traffic Zones
CLASSIFICATION OF AIRSPACE	The seven classes of airspace
VMC,IMC AND NOTIFICATION	Conditions for VFR flight (VMC) Conditions for IFR (IMC) Quadrant Rule Semi-Circular Rule Special VFR Flight





AVIATION LAW - CONTINUED	
TYPES OF AIR TRAFFIC SERVICE UNITS	Notams The UK Air Pilot Air Traffic Centres Zone Control Units Aerodrome Control Units Radar Facilities
ALTIMETER SETTING PROCEDURES	Terrain Clearance Flight Separation Flight Levels Transition Levels Transition Layer Transition Altitude
FLIGHT AT AERODROMES	Aerodrome Traffic Zone Lights and Pyrotechnic Signals Ground Signals Used at Civil Aerodromes Marshalling Signals
FLIGHT PLANS	
FLIGHT INFORMATION	
FLIGHT IN CONTROL ZONES, CONTROL AREAS AND TERMINAL CONTROL AREAS	
FLIGHT ON ADVISORY ROUTES/SERVICE AREAS	
AIRMISS REPORTING PROCEDURES	
AIRSPACE RESTRICTIONS AND HAZARDS	Danger Areas Prohibited and restricted areas Military flight training areas Bird Sanctuaries High Intensity Radio Transmission Areas Additional Hazards to Aircraft in flight Gliding Sites/Hang Gliding Sites Free Fall Parachute Areas Military Air Exercises Flying Displays, Air Races, etc. Navigation Obstructions
ROYAL FLIGHTS	
AERODROMES, AGA SECTION OF THE AIR PILOT	Civil Aerodromes Military Aerodromes Aerodrome Ground Lights Identification Beacons Aerodrome Beacons Times of operation
METEOROLOGY	Sources of information Requests for Route Forecasts
FACILITATION - CUSTOMS AND PUBLIC HEALTH	Arrival, departures and transit of Civil aircraft on International Flights Customs Aerodromes Private flights - Documentary Requirements Customs Requirements Public Health Requirements
SEARCH AND RESCUE	Responsibility and Organisation Aircraft not equipped with radio Visual Distress and Urgency Signals Procedure and signals employed by rescue Aircraft Search and rescue regions and facilities
WARNING SIGNALS TO AIRCRAFT IN FLIGHT	

AVIATION LAW - CONTINUED	
EXTRACTS FROM THE RULES OF THE AIR TRAFFIC CONTROL REGULATIONS	Interpretation Application of Rules to Aircraft Reporting Hazardous Conditions Low Flying Simulated Instrument Flight Practise Instrument approaches Lights or other signals to be shown or made by Aircraft Display of lights by Aircraft Flying machines in Flight Flying machines on the ground Failure of navigation lights Gliders Free Balloons Captive Balloons and kites Airships
GENERAL FLIGHT RULES	Weather reports and forecasts Rules for avoiding aerial collisions Aerobatics Manoeuvres Right Hand Traffic Rule Notification of arrival Flight in notified airspace Choice of VFR or IFR
AERODROME TRAFFIC RULES	Application Visual Signals Access to and Movement on the manoeuvring area Right of way on the ground Dropping of Tow Ropes Aerodromes not having ATC units Special rules for certain Aerodromes Wake Turbulence separation
FLIGHT SAFETY AND ACCIDENT REPORTING	Extracts from The Civil Aviation (Investigation of Air Accidents) Regulations 1989 The Air Navigation (Investigation of Air Accidents involving civil and military aircraft or installations) Regulations 1986 Authorities requiring immediate notification by telephone Confimation in writing and use of correct written form only BMAA Safety and Accident Investigation Handbook Flight Safety Bulletin issued quarterly by the general aviation Safety commiteee (GASCO) Accidents to aircraft on the British Register (Published annually by the CAA) A.I.B Bulletins Pink Aeronautical Information Circulars

AIR NAVIGATION	
FORM OF THE EARTH	Meridians of Longitude Parallels of Latitude Rhumb Lines
MAGNETIC VARIATION	
COMPASS DEVIATION	
PRINCIPLES OF NAVIGATION	IAS Wind, Heading, Groundspeed The triangle of Velocities
MAPS AND CHARTS	Practical use of 1:500,000 and 1:250,000 Series Impotence of using Current Charts Chart Scale Measurements of distance and heights Units of distance Units of height Measurement of angles tracks and bearings Relationship to true magnetic and compass north

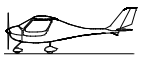
AIR NAVIGATION - CONTINUED	
MAP REFERENCE INFORMATION	Latitudes and Longitude Isogonals Topography Relief Hydrographic features Cultural features Aeronautical Symbols Aeronautical information Conversion of units (Distance and Height)
MAP READING	Map Analysis Permanent Features Relief Line Features Spot Features Unique or special features Features subject to change Water Other Effects of season
PREPARATION	Checkpoint features and selection; Folding the map for use
METHOD OF MAP READING	Map orientation Anticipation of checkpoints With continuous visual contact When uncertain of position
FLIGHT PLANNING	Selection of charts Plotting the route Selection of Altitude/s and Safety Altitude Use of the chart of UK Airspace Restrictions Danger areas Prohibited/Restricted areas Military flight training areas Bird sanctuaries High intensity radio transmission areas Addition hazards to aircraft in flight Notams and Aeronautical information circulars Local time and GMT
WEATHER FORECASTS AND REPORTS	Minimum weather conditions acceptable to safety General aviation visual flight forecast service Aerodrome forecasts and reports Local telephone general weather forecast Local Radio/TV general weather forecast
PRACTICAL NAVIGATION	Compilation of the flight log Measurements of track Determining safety altitude Calculating heading, true and magnetic, groundspeed, distance Time, fuel consumption, fuel required Departure procedures Booking out Estimated time of arrival Setting heading procedures Altimeter setting procedures Maintenance of altitude and heading Establishing position Revisions to heading The “1:60” and “close angle” methods of heading correction The use of drift lines En route checks Uncertainty of position procedure Lost procedures Arrival procedures Altimeter setting procedures Booking in

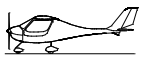
AVIATION METEOROLOGY	
THE ATMOSPHERE	Composition and structure The troposphere Air density
PRESSURE	Air has weight Effect of altitude Effect of density Measurement: Barometer, Aneroid, Mercurial Mean seal level (MSL)-Conversion for height Isobars Pressure systems - Depression - Trough-Col-Anticyclone-Ridge
THE ALTIMETER	Principle Pressure settings (QNH, QFE, Regional QNH, Standard)
WIND	Horizontal motion of the atmosphere Effect of earth's rotation Relation of wind to isobars Surface friction Geostrophic Local winds Sea breeze effect Thermal winds Katabatic/Anabatic Effect of terrain Surface geography Surface objects Rotor Standing waves Wind gradient Wind shear
TEMPERATURE	Source of Earth's heat Effect on density Adiabatic cooling/heating Lapse rates Environmental Adiabatic-dry and wet (saturated) Effect of height on saturated adiabatic lapse rate
HUMIDITY	Water vapour Moisture content Relative Humidity Effect of temperature Dew point temperature Effect on density
AIR MASSES	Sources and types Transformation Fronts: Warm, Cold, Occlusion
CLOUDS	Classification of clouds: High/Medium/Low Types of clouds: Stratiform/Cumiliform/Name of clouds
FORMATION OF CLOUD	Air cooling to Dew Point Mixing - vertical motion of atmosphere Convection - stability and instability Orographic Frontal
PRECIPITATION	Rain/drizzle/hail/sleet/snow
DEPRESSIONS	Origin Development Frontal Depression
VISIBILITY	Measurement Haze Mist Fog - Radiation/Advection

AVIATION METEROLOGY - CONTINUED	
ICE ACCRETION ON AIRCRAFT	Conditions required for ice formation Types of airframe icing Hoar frost Rime ice/Clear ice Effects of icing on aircraft performance Carburettor icing
EFFECTS OF WEATHER ON FLIGHT	Effect on altimeter en route in proximity to a depression Effects of turbulence - low level - under cumulus Hazards of flight through depressions and fronts Hazards of flight in reduced visibility - haze - precipitation Effects on visibility related to the sun's position ahead or behind Flight in proximity of large Cu and Cb cloud - line squalls Effect on surface wind direction of large Cu and Cb cloud Potential hazard of a snow/ice coating on a parked aeroplane Potential hazard of a clear evening sky in autumn/winter - fog, frost

AIRFRAMES AND ENGINES	
AIRCRAFT STRUCTURE	Airframe Wing the controls The Trimming System Tuning Aircraft Tyres: Wear, bulges, cuts, scores Aircraft seats Baggage: Stowage position, Maximum weights allowed
ENGINE	Principles of two stroke cycle Principles of four stroke cycle
ENGINE IGNITION SYSTEMS	Principles The Ignition Switch/es Use of correct plugs Spark gap Replacement intervals Plug security
CARBURATON	Principles Setting for the correct mixture Recognising the wrong mixture
EXHAUST SYSTEMS	Difference between Two-stroke and Four-stroke systems Check for security, cracks and internal integrity
DECOKING	Intervals
OIL SYSTEM	Correct mixing of Two-stroke oil/petrol Four stroke oil systems
FUEL SYSTEMS	Fuel Pump Fuel filters Fuel grade Water in fuel
ELECTRICAL SYSTEMS	Generators Batteries
PROPELLER	Defects Balancing
REDUCTION DRIVE	Belt tension Alignment Defects Maintenance procedures

AIRCRAFT INSTRUMENTS	
AIRSPEED INDICATOR	Position errors
ALTIMETER	
MAGNETIC COMPASS	Precautions when carrying Ferrous objects Turning, acceleration, deceleration errors
ENGINE INSTRUMENTS	Temperature gauges -CHT-EGT-Water RPM Counter





FIRE, FIRST AID AND SAFETY EQUIPMENT	
FIRE DANGERS AND PRECAUTIONS	Fire Extinguishers Fire in flight Fire on the ground Fuel storage, fuel mixing, refuelling Smoking
FIRST AID	Procedures following an accident Fractured or broken limbs Severe bleeding Head Injuries Severe shock Burns First Aid Kits - Stowage

HUMAN PERFORMANCE LIMITATIONS	
INTRODUCTION	Reasons for knowledge of HPL
OXYGEN	Relation - to the atmosphere, height, effect
HYPOXIA	Location Timing Effects and acceleration of same
HYPERVETILATION	Causes and effects Avoidance
BAROTRAUMA	Causes and effects Avoidance
COMMON AILMENTS	Effects Medication
DECOMPRESSION	Underwater effects Relationship to flying
AIR SICKNESS	Causes, Medication, Enviroment
HEARING	Noise limits Effects Precautions
SIGHT	Correction of defects
TOXIC HAZARDS	Sources Effects Smoking
BLOOD PRESSURE	Control
EPILEPSY	Why a bar to fly
ALCOHOL/DRUGS	Problems Effects Control
KNOWLEDGE AND THE SENSES	Knowledge Perception Action Environment
DISORIENTATION	Causes Effect Result
AVOIDING THE AIRMISS	Assessment Relative speeds 'Look-out' Actions Problems
STRESS	Forms The individual Outside influences
MANAGEMENT OF STRESS	Danger of drugs Mutual discussion Experience
SOCIAL PSYCHOLOGY	The ego factor Potential reactions Control