

Raj Hamsa X'Air (UK)

Operators Manual

This manual applies to aircraft

G- _ _ _ _ Serial No.: BMAA/HB/ _ _ _ _

Approving Authority

British Microlight Aircraft Association
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by delegation from the United Kingdom Civil Aviation Authority

Importer

Aircraft Kits and Spares are imported by:
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This manual is a legal document which is approved for use with Raj-Hamsa X'Air microlight aircraft issued with a United Kingdom Type Accepted /Homebuilt Permit to Fly. It must remain with the aircraft, and not be amended or altered without authority from either the BMAA or UK CAA.

All pilots should read this manual before flying as pilot in command of the aircraft to which it refers.

Approved for issue:-

G B Gratton
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TABLE OF AMENDMENTS

<u>Amendment No.</u>	<u>Date incorporated</u>	<u>Signed</u>
Initial Issue	May 1999	-
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1 Introduction

- 1.1 The Raj Hamsa X'Air is a conventional 3-axis controlled microlight aeroplane, it was certified in the United Kingdom to the requirements of British Civil Airworthiness Requirements (BCAR) Section S issue 2; which at the time of writing is arguably the highest airworthiness standard in the world which is applied to microlight aircraft.
- 1.2 This manual is not intended to teach you to fly the aircraft, or to build it. Learning to fly should be accomplished under the supervision of a light aircraft or microlight flying instructor experienced on the type; at time of writing it is legal to learn to fly on an X'Air so long as you are the sole owner of the aircraft (or spouse). A separate build manual exists to instruct you in building an X'Air from a kit.
- 1.3 What this manual will do, is provide the information which a qualified pilot requires to safely fly this aircraft (although a conversion by a QFI familiar with the type is recommended), and to carry out routine maintenance and minor repairs. Manuals exist for this aircraft for use overseas which also include guidance on fitting modifications to the X'Air; all modifications to a British X'Air must be approved by either the British Microlight Aircraft Association, or the UK Civil Aviation Authority. In general, the BMAA offers the cheapest and most straightforward route for approving modifications.
- 1.4 The licenses which would be required to fly this aircraft are a UK PPL(Aeroplanes)-Microlights, with or without operating restrictions. A UK or JAA PPL(Aeroplanes), BCPL(Aeroplanes), CPL(Aeroplanes) or ATPL(Aeroplanes). Pilots used to larger types are particularly recommended to obtain conversion from a microlight QFI since microlight aircraft have flying characteristics which although not unsafe, can bite the unfamiliar.
- 1.5 This aircraft must be operated using two separate logbooks, for the airframe and the engine (or the BMAA combined logbook, reference BMAA/AW/036). All entries must be made in the logbook in ink and within 7 days. If the aircraft is fitted with an in-flight adjustable propeller, a separate logbook must also be held for that; it recommended that CAP400, which is issued by the CAA and available from most pilot shops is used for this purpose.

2 Description of the Aircraft

- 2.1 Ancestry. The X'Air was developed by Raj Hamsa in India, based upon the French designed AX3 microlight. The AX3 itself was derived from an American 2-axis controlled ultralight aircraft, the "Weedhopper".
- 2.2 Construction. The X'Air is of bolted tubular construction, with aerodynamic surfaces and the fuselage covered with 185 g/m² Dacron polyester fabric. The pod is made from a glass-fibre composite and the transparent windows and doors from "Lexan". Techniques used are conventional for 3-axis microlights. Most aluminium components are coated with white epoxy paint.
- 2.3 Flying Controls.
- 2.3.1 Pitch control is through a conventional elevator controlled by twin control columns in the cockpit. The linkage between them consists of a series of levers and push rods.
- 2.3.2 Pitch trimming is through a trim tab fitted to one side of the elevator. This is controlled by a lever between the two seats, in the sense forward=nose-down, aft=nose-up. The lever and trim tab are linked by cables under tension through a series of pulleys and runners.
- 2.3.3 Roll control is through conventional ²/₃ span ailerons, controlled by twin control columns in the cockpit. The two ailerons and two sticks are linked by a series of levers, cables and pulleys.
- 2.3.4 Yaw control is through a conventional rudder (note: this is unlike the AX3 which uses an all-flying fin), controlled by two sets of rudder pedals. Connection is by a series of levers, cables and pulleys. The rudder self centres, aerodynamically for large deflections, and for small deflections using a spring and cable mechanism connected to the nosewheel.
- 2.3.5 Braking is effected by twin drum brakes, which provide both stopping and differential steering. These are operated by toe pedals from the left hand seat only. Connection between the brakes and the toe pedals is by Bowden cable.
- 2.3.6 The nosewheel is steerable and connected to the rudder mechanism in the same sense (push right, yaw right, turn right). A self centring spring mechanism is fitted, however this is primarily to provide rudder self centring in flight, the nosewheel will naturally self-centre whilst taxiing even without this. Tyres are 4 ply 3.50" x 8" pneumatic.
- 2.3.7 No flaps are fitted to the aircraft.

3 Limitations

3.1 Introduction. This section includes the basic operating limitations for the X'Air. The full limitations are contained in Type Acceptance Data Sheet (TADS) BMO63, which is used by the Inspector at Annual Permit renewal to ensure, amongst other things, that the correct limitations are placarded in the cockpit.

3.2 Units. When noting limitations, it is important to ensure that the limitations which you are using use the same units and calibrations as the instruments in the cockpit. The limitations shown below use knots CAS (Calibrated Airspeed); your aircraft may have an instrument in mph, and in any case will read IAS (Indicated Airspeed). The difference between IAS and CAS is basically the accuracy of your pitot-static system. The IAS limits for your aircraft were determined when the aircraft was test flown, and are shown in Annex A to this manual. There will also be a placard in the cockpit, however space is allowed below for you to insert the IAS limitations and calibration details for your aircraft.

3.3 Operational Limitations

3.3.1 The X'Air must only be flown in day VMC conditions, with sight of the surface. It may not be flown over built up areas.

3.3.2 The X'Air is certified to a "permit to fly" standard. This prohibits aerial work, other than flying instruction of the owner.

3.3.3 This aircraft is certified to a UK only standard, this means that permission is required from the host country to fly it overseas. However a reciprocal agreement for homebuilt aircraft means that no permission is required for flights to other ECAC (European Civil Aviation Conference) member states.

3.3.4 For flight the following instruments must be fitted and serviceable: ASI, Altimeter, Engine RPM, Compass, fuel pressure gauge. A slip-ball is recommended but not essential.

3.3.5 It is recommended that the X'Air is not flown where a crosswind component above 15 knots is predicted.

3.3.6 Do not fly above 10,000ft standard pressure altitude without the use of personal oxygen.

3.4 Flight Limitations

3.4.1 Never exceed speed, Vne, is 83 kn CAS [IAS]

3.4.2 Manoeuvring Speed, Va is 65 kn CAS [IAS]

3.4.3 Maximum Bank angles are 60° either way.

- 3.4.4 Maximum Pitch attitudes are 45° nose-up, 30° nose-down.
- 3.4.5 Normal acceleration limits are +4 / -2g.
- 3.4.6 At least 55kg (121lb / 8 stone 9lb) must be in the cockpit for flight, no more than 90kg (198 lb / 14 stone 2 lb) may be carried in each seat.
- 3.4.7 Maximum Take-off weight is 450 kg.
- 3.4.8 Aerobatics and deliberate spinning are prohibited.

3.5 Engine Limitations

- 3.5.1 The limitations for the engine are contained in Annex B, they are also placarded in the cockpit.

IAS Calibration Card for X'Air G-_____.

Kn CAS (calibrated)	30	33 (Vs)	40	43 (best glide)	50 approac h	60	65 (Va)	70	80	83 (Vne)
IAS (indicated)										

Unless all errors are less than 2 knots, a copy of this calibration card must be displayed in the cockpit near to the ASI.

1 Flying the X'Air

1.1 General.

1.2 Pre-Flight Inspection.

1.2.1 Engine. Carry out an engine pre-flight inspection following the instructions contained in the Engine Manual at Annex B.

1.2.2 Aircraft. The following is a brief summary of the minimum pre-flight inspection, if you are unsure, it does no harm to increase the number of items on your inspection.

Inside the Cockpit

- Ignition switches OFF
- Parking brake (if fitted) ON
- Condition of choke and choke cable
- Condition and security of all flying controls.
- Check condition of all instruments
- Check harnesses are properly fitted and not frayed.
- Check seats are secure.
- Check sufficient fuel for the planned flight.

Underside

- If the aircraft has not flown within 24 hrs, drain a small amount of fuel from each drain tap using a standard tool and check for water.

Starting from the port side, inspect :-

- The fuel hoses from the engine, and the fuel filter.
- Condition of door and hinges (if fitted)
- Fastenings of the leading edge tube between the two plates.
- All of the tubes converging on the foot-rest.
- The stainless steel wing-strut straps
- Both wing-strut clevis pins and rings.
- The port wing struts and jury struts.
- The port wing leading edge
- The port wing wingtip fairing

Walk around to the port wing trailing edge, inspect:-

- The upper rear compression strut fitting
- Compression tube fitting
- Through the lower surface inspection panel, check the forward fittings of the compression tube and drag wires.
- Trailing edge attachment clevis pins.
- All aileron hinges (nylon bushes should not be greased)
- All clevis pins and wings, aileron pushrod fastening.
- Move the aileron, confirm there is no freeplay between it and the other wing aileron.
- Look over the upper and lower wing surfaces for any distortion or damage.

- Check the security of the velcro “tail” on the wing centre panel.
- Condition of the tyre, undercarriage leg, drag strut and suspension spring.

Walking back to the tail, check

- All elevator linkages and the pushrod
- Condition of all cables (carefully, a broken strand can be very sharp!) - note that the rudder cables must cross
- All clevis pins and rings.
- Tension on the fuselage fabric.
- Elevator attachment fittings.
- Elevator and rudder hinges
- Condition and attachment of the elevator trim tab.
- Tension and condition of the tailplane fabric.
- Rudder cable shackles
- Rear fuselage section fastenings
- Aileron and elevator pulley support plate.
- Look forward from behind the tail, any airframe distortion should be visible as an asymmetry.

Walk to the starboard side and check:-

- Starboard elevator hinge
- Upper elevator wire fastenings

Moving forward along the fuselage

- Fuel filler cap is secure, vents clear, tanks securely attached.
- Check the security of the velcro “tail” on the wing centre panel.
- Condition of the tyre, undercarriage leg, drag strut and suspension spring.
- Look over the upper and lower wing surfaces for any distortion or damage.
- Move the aileron, confirm there is no freeplay between it and the other wing aileron.
- All clevis pins and wings, aileron pushrod fastening.
- All aileron hinges (nylon bushes should not be greased)
- Trailing edge attachment clevis pins.
- Through the lower surface inspection panel, check the forward fittings of the compression tube and drag wires.
- Compression tube fitting
- The upper rear compression strut fitting
- Condition of door and hinges (if fitted)

Walk around to the front of the wing, inspect

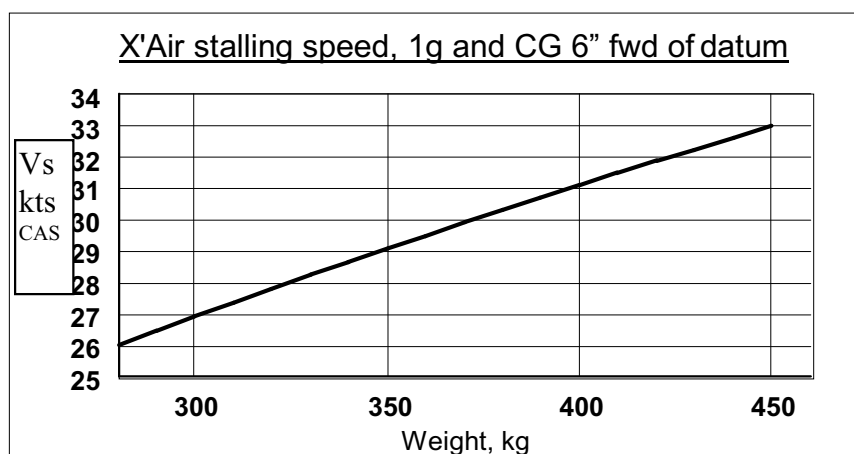
- The starboard wing wingtip fairing
- The starboard wing leading edge
- Fastenings of the leading edge tube between the two plates.
- All of the tubes converging on the foot-rest.
- The stainless steel wing-strut straps
- Both wing-strut clevis pins and rings.
- The wing struts and jury struts.

- Condition of the pod, windscreen, nosewheel. Confirm that both nosewheel centring springs and cables are secure and undamaged.
- 1.3 Starting. The BMAA standard manual pre-start checks [**STAIP**] are recommended. The actual starting procedures for a particular engine are contained in Annex B to this manual. The STAIP checks are :-
- 1.3.1 Aircraft, Crew, Equipment, **Secure**.
 - 1.3.2 **Throttles** full and free, and closed.
 - 1.3.3 **Area** around and behind aircraft clear.
 - 1.3.4 **Ignition** as required.
 - 1.3.5 **Pull**, start the engine.
- 1.4 Taxiing. The aircraft will taxi on whatever course you wish without difficulty using a combination of throttle, toe-brakes and nosewheel steering. In strong winds, keep the stick slightly forward (to keep the nose down) and into wind. It is easiest to turn using the nosewheel steering (rudder pedals), but this can be supplemented for a very tight turn by using the toe brake on the side to which you are turning. The turning circle normally is around 20ft in diameter (at the aircraft centreline).
- 1.5 Take-off. Prior to take-off, it is recommended that the BMAA standard pre-take-off checks [**CHIFTWAP**, see below] are used, including a check to ensure that the parking brake (if fitted) is off. The pitch trimmer should be vertical. The pilot must ensure that the engine has been run successfully at take-off power prior to take-off, and has in any case run for several minutes and the choke is off.
- 1.5.1 **Controls** full and free, **Choke** off
 - 1.5.2 **Harnesses** and **Helmets** (if worn), secure.
 - 1.5.3 **Instruments** all serviceable, reading correctly. **Ignition** checked for mag drop and selected to both.
 - 1.5.4 **Fuel** on, sufficient for the flight, filter clear of debris, pressure in limits.
 - 1.5.5 **Trim** set to take-off position.
 - 1.5.6 **Wind** speed and direction checked, and suitable for safe take-off on selected runway.
 - 1.5.7 **Approach** to the selected runway clear of aircraft.
 - 1.5.8 **Power** checked, and the pilot is satisfied that the aircraft can sustain take-off power.
- 1.6 Take-off is conventional, hold the aircraft straight using the rudder pedals, rotate at 35-40kn CAS [IAS] and the aircraft should fly-off at around 45 knots. It is not advisable to allow the speed below the best climb speed of 43 kn CAS [IAS] during the climb-out. In crosswinds, the aircraft will feather into wind immediately it is airborne.

- 1.7 Landing. Generally the X'Air should be landed from an approach speed of about 50 kn CAS [IAS] with the pitch trimmer set vertical, although in turbulent conditions, handling can be improved by increasing this by 5-10 knots. Roundout should be initiated around 8-10 ft and hold-off 1-2ft above the runway. Until more detailed operating experience on the aircraft has been gained by the pilot, the pitch trimmer should be set in the vertical position during the pre-landing checks.
- 1.8 Landing in a Crosswind. Landing with even a small crosswind component can create a significant amount of drift on approach. However by using the **crabbed approach** technique, with an approach speed of around 55 kn CAS [IAS], crosswind components of up to 15 knots may be handled without significant difficulty, although the pilot should expect to have to apply considerable concentration and should brief any passenger accordingly. About 20ft above the ground, the rudder should be used to straighten the aircraft, which will cause the into-wind wing to drop, although this may be resisted to some degree with the ailerons, a single wheel landing is inevitable on the into wind wheel. Crosswind components above 15 knots should not be attempted other than by experienced pilots fully familiar with the type.
- 1.9 During flight testing of the X'Air, the **wing-down approach** technique was also investigated. It was concluded that this technique is difficult and unpleasant to fly in the X'Air and is not recommended.
- 1.10 Cruise. If setup correctly, the X'Air should be able to trim at a desired cruise speed ± 2 knots, by use of the pitch trimmer, with power set as required. Pilots used to open-cockpit microlights are reminded that the doors (if fitted) may allow the aircraft to be flown slightly out of balance and occasional checks on the slip-ball are worthwhile for efficient flight.
- 1.11 Turning. Turning is conventional for this class of aircraft, with a moderate amount of rudder co-ordination required. The maximum permitted bank angle is 60° , for which quite high back-stick forces, and slightly increased power will be required to maintain a balanced turn. As with any other aircraft, the stall speed will increase with bank angle. However, the nearly full back stick required to stall the X'Air gives a good warning of the impending stall.
- 1.12 Flight in Turbulence. The X'Air has a higher wing-loading than most microlights and hence flies well in turbulence. In turbulence it is best to maintain a reasonably fast cruising speed, which will reduce the effects of gusts and crosswind components; however, do not fly above the manoeuvre speed of 65kn CAS [IAS] in turbulence. Below this speed the worst thing a gust can do to you is stall the wing or one of the control surfaces. Above that speed, it is possible for strong gusts to overstress the aircraft.

1.13 Stalling.

1.13.1 The graph below shows the aircraft stalling speed at standard conditions (1kn/s deceleration, wings level, idle power) at various weights. However, note that this is in knots CAS, and the ASI may under-read considerably at low speeds (see Annex A) giving a much lower apparent stalling speed. Stalling speed may increase slightly with forward CG.



1.13.2 Wings Level, Power Off. The aircraft can safely be stalled at a deceleration rate of up to 5 kn/s. The pitch attitude does not change much up to the stall, and stall warning is given about 5 knots above the stall by stick position - about 10-12" back from normal cruising flight. There is little or no pre-stall buffet. Stall is normally marked by full back stick and the aircraft will descend at 500fpm or more (what is commonly referred to as "mush"). There is normally no stall-break, although a gentle pitch break can be seen with the combination of aft CG and a rapid deceleration rate, the more rapid deceleration rate will also normally cause a slightly higher nose-up attitude at the stall. Recovery is immediate upon centralising the stick and applying power. Height loss between stall and recovery, if well executed, is around 50ft if power is used, or around 100ft to establish a steady glide if power is not used. Do not try to recover with power alone, which will drive the nose up into a deeper stall and can cause undemanded wing rocking.

1.13.3 Wings Level, Power On. Characteristics are similar to the power-off stall, however increased power gives a higher nose-up pitch attitude and associated greater pitch break at the stall. Up 20° wing drop may occur. Recovery is the same.

1.13.4 In Turning Flight. Stalling speeds are increased with bank angle, in the manner normally expected. The aircraft will normally roll wings level or slightly into a turn the other way at the point of stall, and pitch down gently.

1.14 Aerobatics. Aerobatics are not permitted in this aircraft.

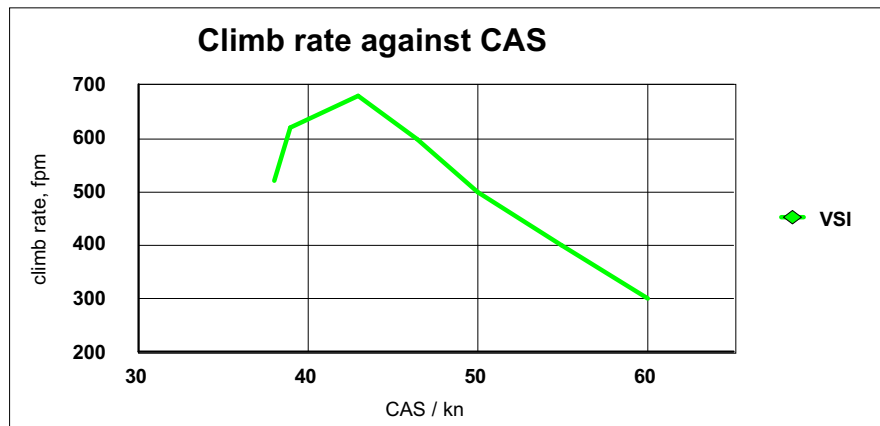
1.15 Departures from Controlled Flight.

1.15.1 The Spin. Deliberate spinning of the X'Air is prohibited. However, it is possible through mishandling of the aircraft to inadvertently enter a spin, either through stalling the aircraft in a turn, or by failing to keep the rudder pedals straight at the point of stall. Should this happen, the spin can be seen by a steep nose-down pitch attitude (about 45° nose down) and the aircraft yawing to one side or the other, some higher than normal 'g' forces may also be experienced. Should this occur, close the throttle and centralise the stick and rudder pedals immediately. The aircraft will stop turning almost immediately and return over about 5 seconds to a normal glide attitude, from which normal flight may be resumed.

1.15.2 Other Departures. Other departures from controlled flight are likely either to be due to damage to the aircraft, or hazardous flying conditions. In either case, land as soon as possible and examine the aircraft, particularly the flying controls, for any damage.

2 Performance.

- 2.1 The following data were obtained in the original UK prototype, G-BYCL fitted with a 65hp Rotax 582 engine and 68inch Brolga 3-blade propeller. Changes from this data for your particular aircraft will be at Annex A. When using the data for planning purposes, apply sensible safety factors, such as are contained in CAA Safety Sense leaflet 7B (aircraft performance), part of which is reproduced here by kind permission of the CAA.
- 2.2 The best climb speed is 43 kn CAS [IAS]. The graph below shows climb performance against CAS for the test aircraft at approximately 420 kg and 1500 ft. When selecting a climb speed, always remember that should anything go wrong, more speed gives you more time to sort your problems out. Although climb performance may change between aircraft, the best climb speed should not. Specific performance figures for your aircraft will be in Annex A.



- 2.3 The best glide speed is 43 kn CAS [IAS], at which a glide ratio of between 6:1 and 7:1 may be expected.
- 2.4 Because microlight aircraft are very strongly affected by weight, engine condition, propeller matching, wind and air temperature, it is very hard to give any reliable information concerning the cruise performance of the X'Air. The captain is encouraged to plan very conservatively until sufficient experience is gained of the fuel consumption and cruising speeds at the conditions in which he or she normally fly the aircraft.
- 2.5 Take-off performance for short dry grass for your aircraft is contained in Annex A.

Using the figures above, the following additional safety factors should be applied to the distance to clear a 15metre obstacle (taken from CAA GA Safety Sense leaflet 7B). If unsure, always use these factors to ensure you have sufficient take-off distance available.

10% increase in weight	Multiply take-off distance by 1.2
Per 1000 ft runway height above Sea Level	Multiply take-off distance by 1.1
Per 10°C increase in temperature above 15°C	Multiply take-off distance by 1.1
Wet grass	Multiply take-off distance by 1.1
Dry Tarmac or concrete	Divide take-off distance by 1.1
Per 2% uphill slope	Multiply take-off distance by 1.1
Per 5 knot tailwind component	Multiply take-off distance by 1.2
Soft ground or snow	Multiply take-off distance by 1.25

- 5.6 Landing performance for short dry grass for your aircraft are contained in Annex A.

Using the figures above, the following additional safety factors should be applied to the distance to clear a 15metre obstacle on the approach (taken from CAA GA Safety Sense leaflet 7B). If unsure, always use these factors to ensure you have sufficient runway to avoid using the considerably provided hedge at the far end of the runway..

10% increase in weight	Multiply landing distance by 1.1
Per 1000 ft runway height above Sea Level	Multiply landing distance by 1.05
Per 10°C increase in temperature above 15°C	Multiply landing distance by 1.05
Wet grass	Multiply landing distance by 1.1
Dry Tarmac or concrete	Divide landing distance by 1.1
Per 2% downhill slope	Multiply landing distance by 1.1
Per 5 knot tailwind component	Multiply landing distance by 1.2
Soft ground or snow	Multiply landing distance by 1.25

4 Emergencies

- 4.1 Engine Failure Before Take-Off. Close throttle, apply brake, switch off.
- 4.2 Engine Failure After Take-Off (EFATO). Lower nose, to establish an approach speed of at least 50 kn CAS [IAS] land straight ahead or near to straight ahead, DO NOT ATTEMPT TO TURN BACK from below 500ft.
- 4.3 Engine Failure In Flight. Lower nose, maintain 43 kn CAS [IAS] best glide speed, select a landing site, make emergency radio call if time permits, as time permits check for possible reasons for engine failure and attempt re-start (e.g. ignition switches, fuel cock, lack of fuel pressure), if field is flat land into wind, otherwise uphill. Apply braking only if it is essential to stop within the distance available, and never before all 3 wheels are on the ground.
- 4.4 Engine Fire in Flight. Close fuel cock, open throttle fully, make emergency call if time permits, treat as engine failure in flight. Vacate aircraft asap after landing.
- 4.5 Fire in the cockpit. Close all ventilation, switch off all electrical devices (not the ignition unless there is an engine fire also), land immediately and vacate the aircraft.
- 4.6 Emergency Landing on Water. Try to land into wind with as high a nose-up attitude as possible. Before impact, pilot and passenger must be prepared to release their harnesses, it may also be beneficial to release the doors before impact. If wearing lifejackets, do not inflate them until outside the aircraft. Note that it is very hard to judge height above water.
- 4.7 Emergency Landing in Trees. Ensure harness(es) tight, try for low bushy trees as far as possible. Try to impact with as steep a nose-up attitude as possible.
- 4.8 Inadvertent Flight in Hail or heavy rain. Turn carb heat on (if fitted), reduce power to avoid propeller damage, fly out of the weather as soon as possible.
- 4.9 Inadvertent Flight in Icing Conditions. Turn carb heat on (if fitted), fly out of conditions as soon as possible, land as soon as possible.
- 4.10 Use of Ballistic Parachute (if fitted). Tighten harnesses, fuel cock OFF, ignition OFF, pull handle, make emergency radio call if radio carried. [Note, if a BRS is fitted to this aircraft, the BRS manual will be annexed to this manual.]

5 Weight and Balance.

- 5.1 So long as it is kept within the placarded operating limits, and no unapproved modifications have been made since construction (including the alteration of ballast), the X'Air can be flown with any permitted fuel, pilot and passenger weights without falling outside of its permitted CG limits. However, pilots should be aware that stick forces and displacements will become lighter with aft CG (typically a lightweight pilot and full fuel) and heavier with forward CG (typically low fuel, pilot and passenger). Flying outside of the permitted CG limits at either extreme is potentially dangerous.
- 5.2 The X'Air CG datum is at the mainwheel axle centreline. Measurements are in inches and kg.
- 5.3 The moment arms of the seats, fuel tank(s) and other items are shown in the Weight and CG report at Annex C.
- 5.4 The X'Air will have been weighed when first built, and must be reweighed at intervals as laid down by the BMAA and CAA (typically every 5 years or when it is modified or repaired).
- 5.5 Weighing should be carried out by a BMAA 3-axis inspector or Technical Team member. A copy of the W&CG report must be retained in this manual at Annex C. Also at each weighing, details of the weighing must be entered in the aircraft logbook. Full instructions on how to weigh a microlight aircraft are contained in BMAA technical information leaflet TIL 012, and specifically for the X'Air in TADS BM063.
- 5.6 If a BRS is fitted according to the instructions contained within TADS BM063, it will have a moment arm of 23" aft of datum.

6 Routine Maintenance.

6.1 Below are the service intervals to be followed for the airframe, for engine maintenance see Annex B.

6.2 It is also permitted for the pilot to adjust the stick position (using the locating holes in front of the seat) and small aileron adjustments may be made at the aileron wire turnbuckles if the aircraft has a natural turn. However, the 7½° reflex at the ailerons must be retained.

L = Lubricate, V = Inspect and replace / repair as required, R = Replace.

Item	monthly / 50hrs	6 monthly / 150 hrs	annually / 300 hrs	every 3yrs / 900 hrs
Fabric tension, tighten on lacing as required ¹	V	V	V	V
Fabric condition			V	V
Tyre Pressure (22 psi)	V	V	V	V
Tyre wear	V	V	V	V
Brake wear	V	V	V	V
Front shocks	V	V	V	V
Main gear shocks	V	V	V	V
Aileron cables and pulleys	L	L	V L	V L
Throttle and choke cables	L	L	V L	V L
All cockpit control joints	L	L	V L	V L
Elevator push rod joints	L	L	V L	V L
All wiring and hoses		V	V	V
Primer bulb		V	V	V
Fuel tank		V	V	V
Rudder hinges and linkages	L	V L	V L	V L
Trim tab hinges and linkages	L	V L	V L	V L
All primary structure and fastenings			V	V

¹ It is vital that under-wing tensioning straps on the wing undersurface are not-overtightened. This can cause the sail to tear. If through mishandling the sail is overtightened and damage results, refer to chapter 9.

6 Repairs

- 6.1 General. Repairs should either be carried out as described below, or to a scheme approved by the BMAA. After repairs, you should always obtain a “second inspection” from a qualified pilot or (preferably) BMAA inspector after making any repair, who should sign in the logbook that they have inspected the repair and consider it safe. Where this is not possible, draw the repair to the attention of your inspector at the next permit renewal who should oversee your own entry.
- 6.2 Sail Repairs. Sail (flexible surface) repairs must be carried out in accordance with BMAA Technical Information Leaflet TIL 015.
- 6.3 Repairs to tubular structure, springs, pulleys, cables, bolts, nuts, etc. Any damaged such parts must not be repaired and the aircraft must not be flown once the damage has been identified. Identical replacement parts must be fitted before any further flight, and their installation inspected and signed-off in the logbook by a BMAA inspector. The invoice (legally referred to as the certificate of conformity) for the parts fitted must be kept with the aircraft logbook. If it is not possible to obtain replacement parts, consult the BMAA Technical Office for advice.
- 6.4 Repairs to the Engine. These should be carried out in accordance with the maintenance manual for the engine fitted.
- 6.5 Repairs to Instruments. Microlight aircraft instruments are not usually repairable and should be replaced.
- 6.6 Repairs to Fuel Hose. Any fuel hose which is found to be cracked or damaged must not be repaired. Replace it with at least automotive quality (preferably aircraft or fire-retardant boat use) re-enforced rubber fuel hose. It is not advised that transparent fuel hose is used, and PVC hose must not be used with fuel under any circumstances. Take care not to over-tighten cable ties used to secure hose, since this can cause a flow restriction.
- 6.7 Damaged Wiring. Replace with fireproof or fire resistant wiring of the same or higher current rating, secured in the original manner.
- 6.8 Repairs to Batteries. (If fitted), a damaged battery must be replaced and all surrounding structure thoroughly inspected for acid damage.
- 6.9 Repairs to Tyres. An inner tube puncture may be repaired. If there is damage to the tyres which shows the inner canvas, replace the tyre in question.
- 6.10 Damage to the Fuel Tank. The fuel tank should be drained and removed from the aircraft. If the tank is judged to be repairable, a layered glass-fibre repair may be made and then inspected by a BMAA Inspector qualified for composites, who must also conduct a 1.5psi pressure test to

ensure that the tank does not leak. If the tanks become impossible to see the fuel level through, either the starboard tank must be replaced with a new item, or a separate fuel gauge may be fitted (which must be approved by BMAA modification).

7 Vital Statistics

Weight values for this X'Air are at Annex C and a description of the aircraft is at section 2. However the following describes the basic dimensions of the aircraft:-

Length	5.70m
Height	2.55m
Span	9.80m
Mean chord	1.63m
Wing area	16m ²
Dihedral angle	1.2°
Sweepback angle	8°
Washout	4°
Fin area	0.73m ²
Rudder area	0.63m ²
Horizontal tailplane area	0.51m ²
Elevator area	0.88m ²
Aspect ratio	6
Undercarriage track width	1.6m
Undercarriage wheelbase	1.46m
Fuel capacity	63 litres (45 kg)
Tyre Pressure	22 psi

ANNEX A

MAAN RECOMMENDING ISSUE OF A PERMIT TO FLY

The approval MAAN for this aircraft is to follow this page.

ANNEX B

ENGINE MANUAL

The operators and maintenance manual for the engine fitted to this aircraft is to follow this page.

ANNEX C

WEIGHT AND BALANCE REPORT

Forms BMAA/AW/028 completed for this aircraft are to follow this page.

ANNEX D

MINOR MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL
PERMIT ISSUE

Minor modification approval sheets are to follow this page

Minmod No.	Description	Sign and date incorporated

ANNEX E

MAJOR MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL
PERMIT ISSUE

BMAA MAANs and CAA AANs (other than the original approval MAAN) are to follow this page.

MAAN / AAN No.	Issue	Description	Sign and date incorporated

ANNEX F

INSTRUCTIONS AND MANUALS FOR OTHER DEVICES FITTED TO THIS
AIRCRAFT

No.	Description	Issue or date	Approval Mod No., or original equipment
F1			
F2			
F3			
F4			
F5			
F6			
F7			
F8			
F9			
F10			
F11			
F12			
F13			
F14			
F15			
F16			
F17			