

# FLYLIGHT

## Skyranger Operators Manual



**G\_\_\_\_\_ Serial No.: BMAA/HB/\_ \_ \_**

Approving Authority

British Microlight Aircraft Association  
The Bullring, Deddington, Banbury  
Oxon, OX15 0TT, United Kingdom

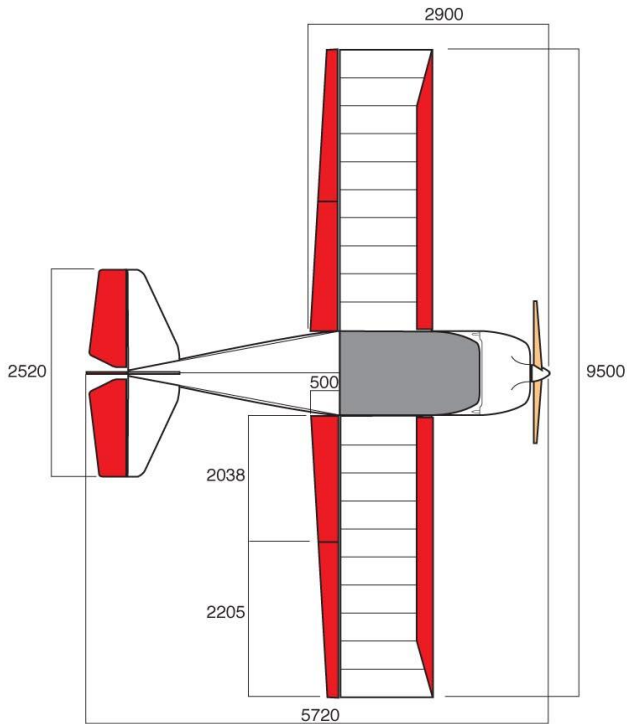
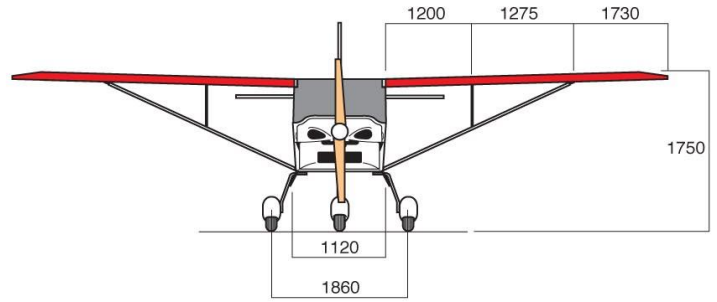
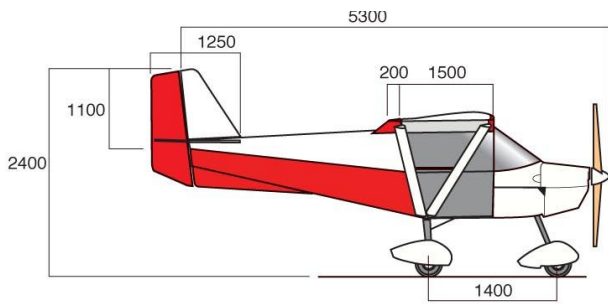
by delegation from the United Kingdom Civil Aviation Authority

**Manufacturer**

Flylight Airsports Ltd, Sywell Aerodrome, Sywell Northants NN6 0BT

This manual is approved for use with Sky Ranger aircraft issued with a United Kingdom type accepted (amateur-built) Permit to Fly. It must remain with the aircraft, and not be amended or altered without authority from the manufacturer in conjunction with the BMAA or UK CAA.

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



Not to scale.  
 All dimensions in millimeters.  
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## **1. Introduction**

- 1.1 The Skyranger is a three-axis aeroplane, it was certified in the United Kingdom to the requirements of British Civil Airworthiness Requirements (BCAR) Section S.
- 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 flying instructor experienced on the type. A separate build manual exists to instruct you in building the Skyranger 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 an instructor, CRI, Coach, familiar with the type is strongly 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. All modifications to a British Skyranger must be approved by the British Microlight Aircraft Association.
- 1.4 The license required to fly the Skyranger in the UK are either a EASA PPL / LAPL, UK PPL (A) with SEP or Microlight ratings, UK NPPL with microlight rating or NPPL SSEA with differences training for microlight aircraft. Pilots with licenses and experience confined to heavier GA aircraft must carry out differences training to fly the Skyranger. Pilots with microlight ratings trained for Flexwing aircraft should carry out differences training for 3 Axis control systems before attempting to fly the Skyranger.
- 1.5 This aircraft must be operated using airframe and engine log books. Entries must be made in the logbooks in ink and within 7 days.

## **2. Description of the Aircraft**

### **2.1 Ancestry**

The Skyranger was conceived by Philippe Prevot in 1991. The first 200 examples were manufactured under licence by Synairgie between 1994 and 1998. The manufacture of the Skyranger was moved to Aeros in the Ukraine in 1998, incorporating many developments in the design. The Skyranger was then certified to BCARS in 2001, during which many small changes were made. In 2003 there was further facelift of cowling design and tail shape. The design continued to evolve with the introduction of Swift and Nynja versions. Many of the features of which can be incorporated in the Skyranger.

### **2.2 Construction**

The Skyranger is predominately constructed of pin-jointed straight aluminium tubes with wings and tail covered with pre-sewn polyester or optional laminate fabric. The fuselage is covered in non structural glassfibre panels.

### **2.3 Flying Controls**

2.3.1 Pitch control is by fore-aft movement of the control stick, with movement transmitted to a conventional elevator through cables.

2.3.2 Pitch trimming is by a hand-operated lever mounted in the central console between the seats, with movement transmitted through a cable to a trim-tab on the starboard elevator, reacted with springs.

2.3.3 Roll control is by sideward movement of the control stick, with movement transmitted through cables to part-span, differential-movement ailerons.

2.3.4 Yaw control is by dual-control foot pedals, with movement to the rudder transmitted through cables.

2.3.5 Braking is by hand lever operated hydraulic disc brakes.

2.3.6 The undercarriage is of tricycle arrangement, with nose wheel steering mechanically linked to the dual-control rudder pedals.

2.3.7 Flaps are lowered in two stages by lifting a hand-operated lever located between the seats whilst gripping an integral latching lever.

## 2.4 **Fuel system**

- 2.4.1 The standard fuel system consists of two polyethelene tanks linked together with a balance pipe. As such they work as one single tank for fuel management purposes.
- 2.4.2 Fuel is drawn from a single outlet through a single fuel tap which isolates all supply.
- 2.4.3 Fuel is pumped by an engine driven mechanical fuel pump, and an (optional) electrical back-up fuel pump. An anti vapour-lock restricted return allows fuel flow back from the engine compartment to the fuel tanks.
- 2.4.4 The tank outlet has a strainer, and an additional fuel filter is used in the supply line.

### 3. **Limitations**

#### 3.1 **Introduction**

This section includes the basic operating limitations for the Skyranger. The full limitations are contained in Homebuilt Aircraft Data Sheet (HADS) HM4, 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.

IAS Calibration Card for Skyranger G-\_\_\_\_\_.

Kn CAS (Calibrated)	33 Vso	36 VS1	40	50 min sink	53 climb	55 approach speed	60 Best Glide	65	66 Vfe	72 Va	80	90	100	108 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.



### 3.3 Operational Limitations

- 3.3.1 The Skyranger must only be flown in day VMC conditions
- 3.3.2 The Skyranger is certified to a "permit to fly" standard. This prohibits commercial operation.
- 3.3.3 UK Skyrangers are approved to a UK 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 The minimum instrumentation required will depend on the engine fitted. Details for each is specified in the type Homebuilt Aircraft Data Sheet (HADS) HM4. Latest issues of which are available on the BMAA website.
- 3.3.5 It is recommended that the Skyranger 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.
- 3.3.7 Do not fly if any ice is present on the airframe. Performance, stability and handling will all be degraded with dangerous consequences. Do not fly the aircraft into known icing conditions.

### 3.4 Flight Limitations and key performance speeds

		Skyranger	
Never exceed speed,	Vne	108 kn CAS [	IAS]
Manoeuvring speed,	Va	72 kn CAS [	IAS]
Flap limiting speed,	Vfe	66 kn CAS [	IAS]
Door open limit speed		72 kn CAS [	IAS]
Speed for best rate of climb Vy		53kn CAS [	IAS]
Speed for best climb angle Vx		45 kn CAS [	IAS]

- 3.4.2 Maximum Bank angles are 60° either way.
- 3.4.3 Maximum Pitch attitudes are 45° nose up and down from the horizontal.

- 3.4.4 Normal acceleration limits are +4g / -2g.
- 3.4.5 At least 55kg (121lb / 8 stone 9lb) must be in the cockpit for flight, no more than 120kg (264lb / 18stone 12lb) may be carried in each seat.
- 3.4.6 Maximum Take-off weight: 450kg – or 472.5Kg if fitted with an airframe mounted total recovery parachute system.
- 3.4.7 Aerobatics and deliberate spinning are prohibited.

### 3.5 Engine Limitations

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

## 4. ***Flying the Skyranger***

### 4.1 Pre-Flight Inspection

Pre flight inspection – Check A, is detailed in the maintenance section.

### 4.2 Starting

- 4.2.1 Before starting the engine ensure that the max takeoff weight will not be exceeded (from fuel/weight placard).
- 4.2.2 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 :-

<b>Security</b>	aircraft, crew, equipment, secure, brakes ON.
<b>Throttles</b>	full and free, and closed, choke set as required.
<b>Area</b>	all around and behind aircraft clear.
<b>Ignition</b>	mags ON.
<b>Prop</b>	Shout ‘clear prop’, pause then start the engine.

Once the engine is running set the recommended warm up RPM and slowly remove the choke.

### 4.3 Taxiing

- 4.3.1 Before Taxiing ensure that the engine has run for at least 2 minutes from cold. Do not use high RPM until the engine has reached its minimum flight operating temps.

4.3.2 Taxi at no more than a brisk walking pace, somewhat less if the surface is rough. Steering is effected through the rudder pedals which are linked directly to the nosewheel. The turning circle normally is around 20 feet in diameter (at the aircraft centreline).

4.3.3 Relatively light weight aircraft like the Skyranger can be blown over in winds over 25knots. It is imperative that when taxiing in strong winds that the correct control placements are used. When the wind is from the forward quarters hold the stick into wind and the elevator neutral. When the wind is from the rear quarters the stick should be positioned away from the wind and the elevator held down.

#### 4.3.4 Taxi checks

When taxiing check:

- Brakes functioning
- Compass moving when aircraft turned
- Slip ball moving when aircraft turned
- Engine temps warming, no limits exceeded

#### 4.4 Pre take-off checks (vital actions)

Prior to take-off, it is recommended that the following pre takeoff check is used. This check is a derivation of the mnemonic CHIFTWA as used in many BMAA schools.

#### C – Controls

- Position into wind – Check controls for full and free movement
- Check visually that the controls are moving in the correct sense

#### H – Harness and Hatches

- Check harnesses and hatches (doors) are secure, no loose objects

#### I – Instruments and engine

- Check flight instruments are set and serviceable
- Check engine instruments are serviceable, minimum operating temps
- Check choke is OFF
- Set 3000 RPM and check each ignition in turn – max RPM drop 150
- Check for smooth idle around 1500–1700 RPM
- Increase power to max brakes will hold for at least 10 seconds
- Check engine indications normal. Reset RPM to 2000

#### F – Fuel and Flaps

- Check fuel tap is ON
- Check contents sufficient for flight
- Cycle flaps and check symmetrical operation, detent operation
- Set flap as required

#### T – Trim

- Check trim set for takeoff (mid position)

#### W – Wind (and eventualities)

- Check wind speed and direction / crosswind component
- Consider emergency actions – abort point EFATO options etc

#### A – All clear

- Confirm all clear on approach
- R/T call if required and line up on runway

#### 4.5 Normal takeoff

- 4.5.1 For a non performance takeoff, into wind, flaps can either be left in the fully up –CR (cruise) position, or with the first stage – TO (takeoff) position.
- 4.5.2 When lined up and rolling straight smoothly apply full power. Keep straight with rudder, ailerons neutral and with the elevator slightly up to reduce the weight on the nosewheel.
- 4.5.3 When the airspeed rises to 45 knots CAS [ IAS] rotate and lift off and adopt a shallow climb attitude. Allow the airspeed to rise to 60 knots CAS [ IAS] and adopt a climbing attitude to hold this airspeed.
- 4.5.4 When above 200 feet AGL the airspeed can be reduced to 53 knots CAS [ IAS] if a greater climb rate is required, and the flaps selected to CR. The power can also be reduced a little for noise abatement if required. When the flaps are retracted there will be a slight tendency for the aircraft to pitch up, which will require a gentle push on the stick to maintain a constant airspeed. Therefore after the flap change re trimming may be required.
- 4.5.5 When in the climb, due to the excellent climb rate, the nose is high and may obscure forwards view. Therefore it is recommended to periodically weave or lower the nose to clear the blind spot. For prolonged ascents a cruise climb at reduced power setting and slightly higher airspeed is recommended and will increase forwards field of view.

#### 4.6 Short takeoff

- 4.6.1 For a short takeoff select first stage, (TO), flap. Start from as close to the beginning of the field as possible. Hold on the brakes as power is increased to full. When power is full or if the aircraft starts to ‘creep’ forwards, release the brakes. Elevator position should be neutral (smooth surfaces only) or slightly up.
- 4.6.2 When the airspeed rises to 40 – 45 knots CAS [ IAS] rotate and lift off. When airborne allow the aircraft to accelerate to 45 knots CAS [ IAS] for best obstacle clearance. Be aware that at this speed prompt action will be needed to lower the nose and obtain glide speed in the event of power loss.

4.6.3 When clear of obstacles allow the aircraft to accelerate to 53 knots CAS [ IAS], and at 200 feet AGL select CR flap.

4.6.4 It is important to always pick an abort point before attempting to take off from a short field. If the aircraft approaches the abort point before lifting, the takeoff should be aborted by fully closing the throttle and braking firmly.

#### 4.7 **Soft field takeoff**

4.7.1 Select first stage (TO) flap. Avoid stopping the aircraft whilst entering the runway and roll into the takeoff run. Hold full up elevator until the nosewheel lifts and then try to balance the aircraft in the rotated attitude whilst speed is increased. This will help reduce rolling resistance and keep overall drag to a minimum.

4.7.2 Allow the aircraft to lift off at around 40 knots CAS[ IAS] , and then carefully allow the aircraft to accelerate to 53 knots CAS [ IAS] in ground effect before adopting the climbing attitude. At 200 feet AGL select CR flap.

4.7.2 It is important to always pick an abort point before attempting to take off from a soft field. If the aircraft approaches the abort point before lifting, the takeoff should be aborted by fully closing the throttle and braking firmly.

#### 4.8 **Crosswind takeoff**

4.8.1 The maximum demonstrated takeoff crosswind is a component of 15knots. Pilots are advised to avoid crosswind components of greater than 10 knots until very experienced on type.

4.8.2 Select O (CR) flap. Start the takeoff roll with the stick held fully into wind and the elevator neutral. Pressure may be required on the rudder pedals to steer straight.

4.8.3 Allow the aircraft to accelerate. The amount of aileron can be reduced if there is a tendency to lift the downwind wheel. Keep the elevator neutral until the speed reaches 50–55knots CAS[ IAS], then cleanly rotate and lift off.

4.8.4 As the aircraft lifts off, adopt a shallow climb attitude. Gently yaw the aircraft into wind to set up the required drift angle, and centralise the ailerons and balance ball.

## 4.9 Normal landing

- 4.9.1 Generally the Skyranger should be landed from an approach speed of about 55 knots CAS [ IAS], although in turbulent conditions handling can be improved by increasing this by 5–10 knots. Full flap (LD) position is the standard landing setting. As flap is selected a gentle pull on the stick will be required to maintain constant airspeed. Therefore re trimming will be required.
- 4.9.2 Maintain the approach speed until roundout, which should be initiated around 15–20 ft ,and then hold-off initially 2–3 ft above the runway and allow to settle gently when the speed decays. Aim to land on the main wheels with the nose wheel well off the ground.
- 4.9.3 Pilots transitioning from more traditional lower performance microlight aircraft should be aware that if the airspeed is allowed to increase on the approach then the aircraft may exhibit considerable float during the hold off period and this may cause a tendency to ‘balloon’ and will cause more runway than expected to be used.

## 4.10 Short field landing

- 4.10.1 Select full flap (LD) position, and set up a powered approach at around 45 – 50 knots CAS[ IAS]. Use power adjustments to control the flight path and rate of descent whilst accurately maintaining airspeed with elevator. If tall obstacles are present on the approach, then transition into a glide approach once clear past them. Take care however to maintain airspeed during this phase. 50 knots CAS [ IAS] is recommended as the minimum for a full glide approach at max takeoff weight and full flap.
- 4.10.2 When round out height is reached close the throttle fully and round out. Perform a brief hold off and land. Brakes can be used to shorten the landing roll if required. Take care not to brake too sharply on rough or soft surfaces. Braking efficiency is at its greatest if the elevator is applied fully up after touchdown once below flying speed.
- 4.10.3 Accurate airspeed control is the key to short field performance and pilots new to the Skyranger must practice until this is achieved, to be able to land in the published distance.

#### 4.11 Soft field landing

4.11.1 Fly the approach as in 4.10 above.

4.11.2 Fully hold off and try to touch down gently, and as slow as possible.

During the ground roll avoid braking and progressively apply full up elevator to keep the nose wheel up for as long as possible. Continue to hold up elevator when the nose wheel is on the ground.

#### 4.12 Cross wind landing

4.12.1 The Skyranger has a maximum demonstrated crosswind component of 15 knots. Cross wind components above 10 knots should not be attempted other than by experienced pilots fully familiar with the type.

4.12.2 Either O (CR) or first stage (TO) flap can be selected. Fly a powered approach at a little higher airspeed than normal – around 55 – 60 knots CAS[ IAS]. Initially crab the approach to remain in balance and on centreline.

4.12.3 During the final stages of the approach lower the into wind wing a little and apply rudder pressure as required to align the fuselage with the runway. Round out and hold off like this, and touchdown into wind wheel first. Try to land after a short hold off without allowing the airspeed to decay too much. This will assist in maintaining good control response.

4.12.4 As with all crosswind landings the aircraft must still be accurately 'flown' whilst on the ground. Initially the aircraft will touchdown on the upwind main wheel first. Progressive aileron deflection should applied into wind as the speed decays during the ground roll to keep the aircraft on one wheel and gently lower the downwind wheel as airspeed reduces and aileron authority diminishes. The aircraft will need to be accurately steered straight down the runway with rudder during this process. The nose gear should be held off initially and gently lowered before rudder authority reduces too far and aerodynamic directional control is lost. As the nose wheel touches down rudder will have to be straightened to avoid a steering snatch due to the rudder deflection applied against the crosswind.

4.12.5 When the nose wheel is down, aileron will still need to be applied against the crosswind and neutral or light forwards elevator pressure



should be applied to ensure adequate steering from the nose wheel and to avoid yawing into wind.

#### 4.13 Cruise

The Skyranger has a large range of cruise speed. At the higher values fuel consumption will be correspondingly higher. Cruise is set up in the normal way by selecting the required attitude and power and trimming off any residual pitch forces.

#### 4.14 Turning

4.14.1 Turning is accomplished in the standard manner. In common with many light aircraft the Skyranger requires some rudder co-ordination to maintain balance when rolling into and out of a turn.

4.14.2 As with any other aircraft, the stall speed will increase with bank angle. The stalling speed at 60° bank with no flap will rise to 51 knots CAS [ IAS], at 450Kg takeoff weight.

#### 4.15 Flight in Turbulence

The Skyranger has powerful controls and handles turbulence well. However in strong turbulence, do not fly above the manoeuvre speed of 72 knots CAS [ IAS]

#### 4.16 Stalling

During test flying of the UK prototype the following stalling speeds were recorded:

VS1 - Stalling speed at max takeoff weight, forward CG and flaps up: 36kn CAS

VSO - Stalling speed at max takeoff weight, forward CG, full flap: 33kn CAS

These speeds should represent the worse case in normal service. Lower takeoff weights and more rearward CG will lower the stalling speed - but not by much! Pilots should also remember that stalling speed increases during turns and manoeuvres. Any ice on the aircraft will also increase stalling speeds - **never takeoff with ice present on the aircraft.**

#### 4.16.1 Slow flight characteristics

Slow flight indications include:

- Lightening of controls accompanied by reduced effectiveness
- Reduced airflow noise (most noticeable at low power settings)
- High nose attitude (most noticeable at high power settings)
- Rearwards position of control stick and back pressure
- Strong pitch buffet as the incipient stall is entered
- A tendency to roll or wing rock accompanying the buffet

To recover normal operating airspeed at the slow flight stage, simply move the stick forwards and apply power.

#### 4.16.2 Wings Level, Power Off

The aircraft can safely be stalled at a deceleration rate of up to 3kn/s. Max pitch attitude is 45°, and stall warning is given about 2 knots above the stall by buffet. Stall is normally marked by a mushing descent in heavy buffet or nose drop.

#### 4.16.3 Recovery

Recovery should be made in the standard manner by moving the stick forwards to reduce angle of attack, whilst simultaneously applying full power to aid acceleration and minimise height loss. The nose can then be raised as soon as the airspeed is building past 45 – 50 knots CAS [IAS]. Height loss between stall and recovery, if well executed, is around 50 – 80 feet ft if power is used, or around 100 – 150 feet to establish a steady glide if power is not used.

#### 4.16.4 Wings Level, Power On

Characteristics are similar to the power off case. An additional warning of the approaching stall is the attitude of the aircraft. With full power set the aircraft stalls at a very high nose attitude.

Because of the increased slipstream and torque effect at high power settings considerable rudder deflection may be required to keep in balance as the stall is approached. Stalling out of balance can result in considerable wing drop.

#### 4.16.5 Recovery

Recovery is simply made by moving the stick forwards to reduce angle of attack. Any tendency to wing drop should be countered by application of opposite rudder sufficient to prevent further yaw towards the dropping wing. These two actions should be performed simultaneously.

#### 4.16.6 In Turning Flight.

Stalling speeds are increased with bank angle, in the manner normally expected. The Skyranger often has the characteristic of rolling towards wings level as the stall occurs. Recovery is standard. Move the stick forwards to reduce angle of attack and apply power. Simultaneous opposite rudder should be applied against any rolling tendency. Once the aircraft is safely above the stalling speed co-ordinated aileron and rudder can be used to level the wings.

#### 4.17 Aerobatics

Aerobatics are not permitted in this aircraft.

#### 4.18 Departures from Controlled Flight.

##### 4.18.1 The Spin

Deliberate spinning is prohibited. However, it is possible through gross mishandling of the aircraft to inadvertently enter a spin. Should this happen, the spin can be seen by a steep nose-down pitch attitude (about 45° nose down) and the aircraft rapidly yawing in one direction. Some higher than normal 'g' forces may also be experienced. Should this occur, close the throttle move the stick and rudder pedals to their central positions immediately. The aircraft should stop turning almost immediately and be established in a steep nose down attitude with the airspeed rising rapidly. At this point, retract flaps if extended, and gently ease out of the dive. Normal flight can then be resumed.

##### 4.18.2 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.

#### 4.19 Flight with doors open or removed

If fitted with the two-piece door option flight is permitted with the top half of the door open. The maximum speed for flight with the doors open is 72kn CAS [ IAS].

4.19.1 When the doors are opened in flight they must be latched on the wing mounted hooks. Failure to do this can result in the door unexpectedly slamming shut during flight out of balance (sideslips).

4.19.2 Pilots should be aware that as the doors are opened the aircraft will experience a tendency to pitch up slightly and re establish trim some 5kn or so slower.

4.19.3 The Skyranger can also be flown with either the one or two-piece doors removed entirely.

4.19.4 The Skyranger exhibits greater directional stability when flown with the doors open / removed. This then requires slightly more rudder input to maintain balance with the engine running at full power in the climb.

4.19.5 Climb and glide performance is slightly reduced when flying with the doors open / removed. Stall and spin characteristics remain unchanged.

## **5. Performance**

### **5.1 Introduction**

The following data was obtained in the original UK prototype. 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 7C (aircraft performance), part of which is reproduced here by kind permission of the CAA.

### **5.2 Climb**

Speed for best rate of climb is 53kn CAS [            IAS]. Best angle of climb speed (V<sub>x</sub>) is 45kn CAS [            IAS] 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 speeds should not vary significantly. Specific performance figures for your aircraft will be in Annex A.

### **5.3 Glide**

Speed for best glide angle is 60kn CAS [            IAS], at which a glide ratio of around 9 to 1 may be expected. Flying a little slower at 50kn CAS [            IAS] will give the minimum descent rate (min sink) of around 550FPM.

### **5.4 Cruise**

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 Skyranger. The pilot is encouraged to plan very conservatively until sufficient experience is gained of the fuel consumption and cruising speeds at the conditions in which the aircraft is normally flown.

## 5.5 Takeoff performance

Take-off performance for short dry grass for your aircraft is contained in Annex A. Using those figures, the following additional safety factors should be applied to the distance to clear a 15metre obstacle (taken from CAA GA Safety Sense leaflet 7C).

Per 1000 ft runway height above Sea Level	Multiply by 1.1
Per 10°C increase in temperature above 15°C	Multiply by 1.1
Per 2% uphill slope	Multiply by 1.1
Soft ground or snow or wet grass	Multiply by 1.25+
If you have to take-off with a tailwind	Multiply by 1.2 for every 4 knots of wind
Now to be sure, multiply by 1.33, to take into account that you may not fly the aeroplane as well as the company test pilot did when he worked out the values in the manual.	

## 5.6 Landing performance

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 7C

For every 1000ft you are above sea level	multiply by 1.05
For every 10°C above 15°C air temperature	multiply by 1.05
For every 2% of downslope	multiply by 1.1
If the ground is soft, or there is snow or wet grass	multiply by 1.25+ (very short grass may be more slippery - up to 1.6)
If you have to land with a tailwind	multiply by 1.2 for every 4 knots of wind
Now to be sure, multiply by 1.43, to take into account that you may not fly the aeroplane as well as the company test pilot did when he worked out the values in the manual.	

## **6. Emergencies**

### **6.1 Engine Failure Before Take-Off (aborted takeoff)**

Close throttle, apply brake, switch off.

### **6.2 Engine Failure After Take-Off (EFATO)**

Lower nose, to establish an approach speed of at least 52 kn CAS [ IAS] land straight ahead or near to straight ahead, DO NOT ATTEMPT TO TURN BACK from below 500ft.

### **6.3 Engine Failure In Flight**

Lower nose, maintain 47 kn CAS [ IAS] the minimum sinking speed. If it is required to glide a distance to the nearest suitable field then 57 kn CAS [ IAS] will give the best glide speed, fly a little faster in a head wind to maximise distance and a little slower with a tail wind. 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. Use brakes as appropriate.

### **6.4 Engine Fire in Flight**

Close fuel cock, Switch off electric fuel pump , open throttle fully, make emergency call if time permits, when engine stops turn off mag switches and master, treat as engine failure in flight. Vacate aircraft as soon as possible after landing.

### **6.5 Fire in the cockpit**

Switch off electric fuel pump, all other electrical devices (not the ignition unless there is an engine fire also), close heater vent, open fresh air vents, land immediately and vacate the aircraft.

### **6.6 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.

## 6.7 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.

## 6.8 Inadvertent Flight in Hail or heavy rain

Reduce power to avoid propeller damage, fly out of the weather as soon as possible.

## 6.9 Inadvertent Flight in Icing Conditions

Fly out of conditions as soon as possible, land as soon as possible.

## 6.10 Use of Airframe Mounted Total Recovery Parachute System (if fitted)

Switch off engine (both ignitions off). Pull activation handle firmly.

After deployment: – tighten harnesses, fuel cock OFF, make emergency radio call if radio carried.

6.10.1 Activation handle securing pin should be removed immediately prior to flight and reinserted immediately after flight – add this to your pre and post flight checklist.

6.10.2 If an AMTRPS is fitted to this aircraft, the manual should be annexed to this manual.

6.10.3 Servicing of the rocket system in accordance with the manufacturer's instructions is mandatory. Details of maintenance carried out must be recorded in the aircraft log book.

6.10.4 An AMTRPS installation is approved by the BMAA on the basis that, whilst not deployed, it will not hazard the aeroplane, its occupant(s) or ground personnel. In addition, the BMAA has not approved the system itself or considered in what circumstances, if any, it might be deployed. The approval does not require the system to demonstrate to be effective in safely recovering the aeroplane and its occupant(s).



## **7. Rigging and De-rigging**

### **7.1 To attach the wings:**

- With the wing tip raised to approximately the rigged height, slide the wing root into place to engage in the root brackets
- Insert the wing root fixing bolts
- Attach the lift struts and jury struts
- Tighten all attachment bolts and insert safety rings
- Connect flap pushrod
- Connect Pitot line
- Connect aileron cables
- Ensure aileron cables are crossed as per placard in cockpit on central upright.
- Final inspection of all nuts and bolts, cable routing and attachments

### **7.2 To remove the wings:**

- Disconnect aileron cables
- Disconnect pitot line
- Disconnect flap pushrods
- Remove safety rings from lift strut bolts (if fitted)
- Remove nuts from lift strut bolts and spar bolts
- Support wing tip
- Remove lift struts
- Remove spar bolts (wing root)
- Slide wing outwards until spar is clear of cabin.

### **7.3 Tail**

The tail plane is not designed to be a regular de-rig item, however it may be removed for long distance trailering, as may the rudder. When re assembling these parts replace all Nyloc nuts that were removed for disassembly.

#### 7.4 Use of wing fold mechanism

Use of the optional wing fold mechanism is detailed in the wing fold instructions which should be put in Annex F

### **8. *Weight and Balance***

#### 8.1 Introduction

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 Skyranger 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 heavy crew and full fuel) and heavier with forward CG (typically low fuel, light pilot only). Also at aft Cg, the hands off stability will be reduced. Flying outside of the permitted CG limits at either extreme is potentially extremely dangerous and should not be attempted in any circumstance.

#### 8.2 CG Datum

The CG datum and limits are contained in the HADS HM4

#### 8.3 CG moment arms

The moment arms of the seats, fuel tank(s) and other items are shown in the HADS HM4 and in the Weight and CG report at Annex C.

#### 8.4 Weighing

The aircraft will have been weighed when first built, and must be re-weighed at intervals as laid down by the BMAA and CAA. Weighing should be carried out by a BMAA 3-axis inspector. 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 specific details for the Skyranger in the HADS.

## **9. Maintenance**

### **9.1 Introduction**

This manual details recommended maintenance. However maintenance requirements will depend upon conditions of storage and type of use. Examples of harsh use may include:

Storage outside

Use near salt water

Regular use from unprepared rough fields

Regular transport by trailer

Learning to fly

In such cases more regular inspections and component replacement may be required in order to keep the aircraft in an airworthy condition.

### **9.2 Who may carry out maintenance, and who's responsibility is it?**

9.2.1 The Skyranger has been designed and conceived to be maintained by a person without specific training in mechanics. However some mechanical experience is desirable and persons with limited mechanical capability should limit themselves to the simple maintenance actions and engage suitably skilled persons to undertake the more complex tasks. No specific qualifications are legally required for persons carrying out maintenance work on UK Microlight Aircraft.

9.2.2 The Owner is essentially the 'maintenance manager' and must assume responsibility for ensuring the maintenance actions are carried out as and when required in order that the aircraft may remain in an airworthy condition. As such the owner must be thoroughly familiar with this maintenance manual, and not hesitate to take advice from their local BMAA inspector, professional maintainer, and / or the aircraft manufacturer on any points that are not immediately clear.

### **9.3 Recording and certifying maintenance**

9.3.1 All maintenance actions should be recorded in the aircraft airframe and engine log book(s). Separate worksheets and invoices for parts / work, should be kept in a file that can be referenced in conjunction with the logbook entries.

9.3.2 Each logbook entry detailing maintenance should be accompanied by a signature of the person or persons that have carried out the work.

Any work that is 'flight critical' must have a second signature (in addition to the person that has carried out the work) to certify that correct reassembly has been carried out. This must be done by a 'qualified person' – the definition of such a person is anyone that the owner deems qualified for the task. Another pilot familiar with the type or similar type, a BMAA or LAA inspector, or a professional maintainer, are examples of persons that could be considered 'qualified' for this task.

Examples of tasks that are considered 'flight critical' are:

Dis/ reassembly of control systems or primary structure (outside of normal re/de-rigging).

Maintenance by replacement of primary structure

Maintenance by replacement of control systems

#### 9.4 **Sourcing parts**

9.4.1 Unique airframe parts must be purchased from the manufacturer, or another organization approved by the BMAA for manufacturing such parts (usually if the manufacturer has ceased trading). Some parts may be unique to the UK approved model, so this must be verified.

9.4.2 Non unique parts may be sourced from other suppliers. However they should be equivalent in terms of specification and dimension. If there is doubt, then there is no doubt – they should not be used.

#### 9.5 **Engine maintenance**

This should be carried out in accordance with the engine manufacturer's specific maintenance schedule for the type and model of engine.

#### 9.6 **Inspections and when to carry them out**

9.6.1 There are four types of routine inspections:

1. Check A – this is a daily inspection. A sub version of this is a subsequent preflight inspection, which may be slightly less detailed.
2. Check B – 50 hour / 6 month inspection (whichever comes sooner). This inspection may be also be extended by 10% (5 hours).

3. Check C - Once per year timed to co-incide with the annual permit inspection or 100 hours (whichever comes sooner) This inspection may be also be extended by 10% (10 hours) if required.

9.6.2 These hours are airframe hours - which are flight hours. If the aircraft is operated from a rough surface then it is recommended airframe hours are recorded from start of taxiing, to finishing taxiing at the end of the flight. For convenience owners may choose to base times on engine hours.

## 9.7 Check A

9.7.1 Engine – carry out an engine pre-flight inspection following the instructions contained in the engine manual.

9.7.2 Aircraft – The following is a brief summary of the minimum daily Inspection. If you are unsure, it does no harm to increase the number of items on your inspection.

### **Inside the Cockpit:**

- Ignition switches OFF
- 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 fuel filter is clean.
- Check sufficient fuel for the planned flight.
- Check wing leading and trailing edge bolts secure

### **Underside**

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

### **Engine bay**

- Remove cowling
- Check all items as in engine manual at Annex B
- Check security of all electrical connections
- Check prop bolts protruding from securing nuts
- Generally look for any fluid leaks or loose fastenings
- Check condition of engine mounting rubbers and bolts
- Check firewall security – not chafing any structure, secure and sealed to cowlings.
- Replace the cowling and all securing screws

### **Starting from the nose, inspect**

- Condition of the propeller: no nicks or cracks
- Condition and security of the spinner, if fitted
- Condition and inflation of the nose wheel tyre
- Condition of noseleg
- Security of the nose wheel spat and fairing
- Security of the engine cowling

### **Moving down the starboard side of the aircraft and along the starboard wing, inspect**

- Static vent is clear of obstructions
- Condition of door, hinges and latches

- Starboard undercarriage leg undistorted
- Undercarriage drag strut and shoes secure
- Tyre condition and pressure
- Security of wheel spat
- Check for evidence of hydraulic leaks
- Security of wing strut lower attachment bolt
- Jury strut brackets
- Wing struts and jury struts straight
- Security of upper wing strut attachments
- Through the inspection panel in the lower surface, check the condition of the aileron pulleys and cables and internal wing structure.
- General condition of leading edge, wing tip area and covering
- Aileron movement and hinges, attachment of cables and control horn condition
- Flap, hinges, and security of actuating rod attachment
- Condition of wing covering and security of battens

#### **Moving towards the tail, inspect**

- Condition of covering on tail cone.
- Security of horizontal tail mounting bolts and covering lacing
- Elevator and hinges, horns and cables
- Trim-tab, horn and cables
- Rudder and hinges, horns and cables
- Condition of tail surface coverings
- General alignment of vertical and horizontal tail surfaces
- Condition of bracing wires and their terminations

#### **Moving forwards to the port wing, inspect**

- Port undercarriage leg undistorted
- Undercarriage drag strut and shoes secure
- Tyre condition and pressure
- Security of wheel spat
- Check for evidence of hydraulic leaks
- Security of wing strut lower attachment bolt
- Jury strut brackets
- Wing struts and jury struts straight
- Condition of wing covering and security of battens
- Flap, hinges, and security of actuating rod attachment
- Aileron movement and hinges, attachment of cables and control horn condition
- General condition of leading edge, wing tip area and covering
- Security of upper wing strut attachments
- Through the inspection panel in the lower surface, check condition of the aileron pulleys and cables and internal wing structure.
- Condition of door, hinges and latches
- Static vent (if fitted) is clear of obstructions
- Finally stand back and take an overall view looking for general symmetry.

## 9.8 Routine maintenance worksheet

<b>Skyranger</b>		
Aircraft serial no / Reg:..... Airframe hours at check.....		
<b>Fuselage</b>	required	tick
Check all pressure instruments for cracks, leaks and stiction	50hrs	
Check all fuselage tubes for cracks, dents, corrosion or deformation	50hrs	
Check all fasteners for security, condition and fretting	50hrs	
Check all bracing cables, for tension, security, fretting, and corrosion.	50hrs	
Check all plastic saddle washers for cracking.	50hrs	
Check operation of flying controls – friction, control cable tension and condition.	50hrs	
Rotate control cable pulleys ¼ turn	50hrs	
Check harnesses for security, condition and operation of buckles	50hrs	
Check Seats, for security and condition, wear on support pegs.	50hrs	
Check fuselage coverings and cowlings for security and condition	50hrs	
Check doors for security and condition, cracks in lexan, operation of latches.	50hrs	
Check windscreen for security and condition – cracks in lexan.	50hrs	
<b>Undercarriage</b>	required	tick
Check main gear legs for distortion, security and condition.	50hrs	
Check noseleg for distortion security and condition, free rotation	50hrs	
Regrease nose leg (undo top bolt, and steering bar and slide down to do this)	200hrs	
Check wheels for general condition, security of rims to hub, and rims for distortion.	50hrs	
Check Tyres for tread, cuts, scores, perishing, correct inflation (26PSI)	50hrs	
Spin wheels to check bearings	50hrs	
Check brake discs and callipers for security, pads for wear levels.	50hrs	
Check operation of brake system, fluid levels and leaks.	50hrs	
Check condition and security of wheel spats (if fitted)	50hrs	
<b>Propeller</b>	required	tick
Inspect blades for nicks and splits	50hrs	
Remove spinner and check hub and spacer for security and condition	50hrs	
Check securing bolts torque	50hrs	
Check blade pitch setting	50hrs	



Check spinner and back plate for security and condition	50hrs	
<b>Fuel system</b>	required	tick
Inspect inside tanks for dirt / contamination – clean if required	50hrs	
Check tanks for security and condition	50hrs	
Check fittings for perishing rubber bungs / leaks	50hrs	
Inspect all fuel pipes for perishing, abrasion and security of connections	50hrs	
Fuel filter – check for contamination and change if necessary	50hrs	
Inspect system for leaks	50hrs	
Check operation of fuel tap	50hrs	
<b>Electrical</b>	required	tick
Check electrolyte level of battery (if applicable)	50hrs	
Check security of battery mounting, leaks, connections security	50hrs	
Check all wiring for condition and security	50hrs	
Check condition of all switches	50hrs	
<b>Wings</b>	required	tick
Check spar tubes for straightness, dents, corrosion and fretting	50hrs	
Check all cables and thimbles for tension, corrosion, fretting, fraying, kinking.	50hrs	
Check all fasteners for condition and security	50hrs	
Check lift struts for straightness, dents, corrosion and fretting, security and condition of fasteners	50hrs	
Check jury struts for straightness, dents, corrosion and fretting, security and condition of fasteners	50hrs	
Check aileron structure, and condition and security of hinges, operation and control cable runs and pulleys.	50hrs	
Rotate aileron cable pulleys in wing ¼ turn	50hrs	
Check flap structure, and condition and security of hinges. Operation. Check the return spring on detent lever.	50hrs	
Lubricate aileron and flap hinges	50hrs	
Check coverings and stitching for condition, abrasion, damage	50hrs	
<b>Tailplane and Elevators</b>	required	tick
Check structure of tailplane and elevators, for straightness, dents, corrosion.	50hrs	
Check tailplane halves attached securely to fuselage – condition and securing of fasteners and mountings	50hrs	
Check elevator joiner for condition, and security/ integrity between elevator halves (grasp each elevator and apply some torque pressure in opposition – there should be no movement)	50hrs	
Check operation of elevator	50hrs	

Check hinges - condition and security	50hrs	
Lubricate hinges	50hrs	
Check fabric and stitching condition	50hrs	
Grease turnbuckles exterior for corrosion protection.	50hrs	
Check condition and tension of bracing cables.	50hrs	
Check condition and tension of Elevator cables	50hrs	
Check security and condition of trim tab	50hrs	
Check operation of trim tab and hinge, lever friction	50hrs	
Check trim tab springs for condition and security	50hrs	
Lubricate trim tab hinge	50hrs	
Check trim tab control cable for condition	50hrs	
<b>Fin and Rudder</b>	required	tick
Check structure of fin and rudder for straightness, dents, corrosion	50hrs	
Check forward attachment of fin - condition and security	50hrs	
Check condition and tension of rudder cables	50hrs	
Check condition and tension of centering bungee	50hrs	
Check condition of hinges	50hrs	
Lubricate hinges	50hrs	
Check rudder operation (push tail down to free nosewheel), no excessive friction, and centering on release	50hrs	
Check condition and security of fin extension (Skyranger2)	50hrs	
Check fabric and stitching condition	50hrs	
<b>Engine bay</b>	required	tick
Carry out maintenance actions as per Rotax manuals	50hrs	
Check fuel system - condition of fuel lines, security of connections. Carburettor rubbers for bulges or splits. Air filters - security and condition	50hrs	
Check oil system - condition of oil lines, security of oil cooler, Oil tank, oil filter, level and leaks	50hrs	
Check water system - condition of hard and flexible water hoses, water radiator, header tank, overflow bottle level and leaks, Water carb heat (if fitted)	50hrs	
Check exhaust system - security, springs, check for cracks, dents, blowing. Proximity to cowlings, fluid pipes.	50hrs	
Lubricate exhaust ball joints	100hrs	
Check heater components - security of heater wrap, ducting, valves and operation.	50hrs	
Check electrical system - engine connections, security and condition. Spark plug connections, CDI unit security.	50hrs	

Check engine mounting structure for condition and security.	50hrs	
Check engine mount rubbers for excessive movement (see specific check advice below)	50hrs	
Check engine mount bolts wire-locking.	50hrs	
Check engine cowlings for condition, security of mounting fasteners, check fire resistant paint isn't worn off areas.	50hrs	
<b>General</b>	required	tick
Clean all accessible aluminium structure and treat with ACF50 or equivalent	50hrs	
Symmetry check – stand 5M in front and view for general symmetry – fin and tailplane alignment with wing, wing twist etc.	50hrs	
<b>Lifed items</b>		
Replace Lower (2) Lift strut Bolts	500hrs	
Replace upper Lift strut bolts (8)	1000 hrs	
Replace leading and Trailing edge to fuselage attachment bolts	1000hrs	
Replace wing fold spar attachment pins	500hrs	
Replace control stick pivot bolt	1000hrs	
Replace control stick torque tube forward hinge bolt	1000hrs	
Replace all Control cables (elevator, aileron, rudder)	1000hrs	
Work carried out by.....on.....Date		
Signed.....		
Comments:		

## 9.9 Lifed components

Some components have specific life based on fatigue calculations and assumptions about use. These components should be changed at the time intervals in the table above at 9.8.

## 9.10 Fabric

9.10.1 The Skyranger can be fitted with either Dacron or Xlam coverings. It should be noted that Dacron degrades more rapidly than Xlam when exposed to UV light, and therefore requires more care to ensure a long service life.

9.10.2 Prolonged outside uncovered storage is not recommended.

9.10.3 Covering fabric and its stitching can be tested with the BMAA approved 'Bettsometer'. This will be done annually during its UK Permit to Fly renewal inspection. In addition it should also be done after each 100 hours of flight or after each 20 days of accumulated outside storage (such as resulting from touring use) – whichever accumulates the sooner.

9.10.4 The minimum Bettsometer test values are:

Dacron	1000g
Xlam	1360g
All stitching	1360g

## 9.11 Damage to fabric

9.11.1 Small tears in the fabric up to 30mm long, or abraded holes up to 15mm diameter, that are more than 50mm from a seam line, or can be repaired using a self adhesive patch, if possible to both sides of the fabric – warmed gently with a hairdryer to melt the adhesive.

9.11.2 Single broken stitches can result in 'running', where a large area loses tension. Securing the broken end with a drop or two of glue will prevent this.

9.11.3 Any greater damage must be repaired using approved processes. These are detailed in BMAA TIL 015.

## 9.12 Cleaning lubricating and protecting the structure

9.12.1 Aluminium and steel airframe components and fasteners can corrode rapidly in certain adverse conditions. These include:

Operation in a 'marine' environment (near the coast where salt can be in the air).

Dust or dirt left on the structure for prolonged periods.

Dampness for prolonged periods – especially dampness coupled with dirt or dust.

- 9.12.2 Always keep the aircraft clean. It pays to clean the aircraft after use before storage. But avoid putting the aircraft away wet in a closed hangar with reduced ventilation.
- 9.12.3 Proprietary car 'wash wax' cleaning products are generally suitable for washing. Pay particular attention to rinsing to ensure all traces of detergent are removed.
- 9.12.4 Particular care should be exercised cleaning Dacron fabric. We recommend 'Starbrite Sail and Canvas Cleaner'.
- 9.12.5 For corrosion protection we recommend 'ACF50' ant corrosion fluid be liberally applied periodically to the airframe components. This can be applied to a cloth and rubbed on – much like a polishing operation. Use the aerosol directly to get in tight areas and exposed tube ends. Wiping away any dribbles and excess.
- 9.12.6 Exposed steel parts like wing strut ends, tailplane turnbuckles etc are recommended to be coated with a thin layer of grease.
- 9.12.7 Control surface hinges should be regularly lubricated – either with grease or oil.
- 9.12.8 Glassfibre parts can be polished after washing with wax polishes.
- 9.12.9 Lexan glazing is sensitive to product in order to remain clear and streak free. Use a suitable cleaner / polish. Warning – Fuel spillage or contact with Loctite will cause almost instant cracking of Lexan.

### 9.13 **Engine mount rubbers**

- 9.13.1 Engine mount rubbers slowly wear out over time. They should be changed 'On Condition':
- 9.13.2 They should be changed if external signs of cracking / perishing are present.
- 9.13.3 They should be changed if excessive movement is present. Check this in the following way:

Remove the engine bonnet

Grasp the propeller near the hub

Lift up and down, side to side, and diagonally.

Observe the rubbers and movement relative to the mounting structure. Movement confined to rubber flexing is fine. Clear movement of the whole rubber parts relative to the hole in the mounting structure indicates that the rubber should be replaced.

#### 9.14 **Fuel tanks**

9.14.1 The fuel tanks are clear polyethylene. Taking off the tank caps results in the ability to look directly inside. Any dirt / water or other contamination is easy to see. Using the drain valve will remove most of this, but inevitably some is left in the corners and over the front of the 'saddle' of the tanks.

9.14.2 A useful technique to clean these areas is to make up a siphon tube using a length of small diameter aluminium tube connected to a length of flexible pipe. This can be directed and used as a very effective 'Hoover' to clean all small remaining particles.

9.14.2 The fuel tanks will yellow over time and should be changed on condition. The rubber type fuel tank fittings may degrade over time, and we recommend that those submerged in fuel are changed every five years.

#### 9.15 Checks following a heavy landing

9.15.1 Main Undercarriage – The main gear legs will splay outwards if overloaded. Usually a heavy landing will be slightly wing down and one leg will distort more than the other. So initially observe from the front and check for symmetry. Check also the angle of the wheel to the vertical. When new the wheel angle unloaded will be vertical or very slightly 'towed in' at the bottom. A wheel sitting splayed outwards at the bottom indicates the gear leg (or axle) has been bent, and is no longer serviceable. If landed heavily with brakes on, or on a rough surface, significant drag loads may be applied. Check for play in the connections of the steel drag brace to the main gear leg and where it attaches to SKR.15. Lock the brakes on and rock the aircraft backwards and forwards to assess this. Check also the main cross beam SKR.9 for straightness.

9.15.2 Nose landing gear – If the aircraft is heavily landed on the nose landing gear the leg itself may become bent. This may not be readily apparent from an external inspection. The weakest part is where the leg wastes down in size to accept the suspension rubbers. If it bends here it will usually result in increased friction in the rudder / ground steering circuit. Press down the tail to lift the nosewheel and push the rudder side to side. If increased friction is found, this indicates a bent noseleg. Removing the noseleg will confirm this. It may also be possible if overloaded to bend the large washer under the suspension rubbers, or even drive the rubbers over the washer.

9.15.3 Wheel rims – If the aircraft is heavy landed it is possible for the tyre to deflect to the point where the wheel rim comes in contact with the ground, and will dent / distort. Check this visually and by spinning the wheels. Underinflated tyres will cause this damage following slightly less firm arrivals

9.15.4 Tube 27's – These are the diagonal cabin brace tubes behind the pilot and passenger seats, extending to the top corners of the cabin. These brace the cabin and stop parallelograming of the structure sideways. If the aircraft is landed heavily on one wheel these can be damaged – the fittings become stretched in the tube ends and relative movement develops. This can be checked by:

Stand just outside the cockpit with doors open Hold the wing lift struts feel each end of the SKR.27's for movement – where the insert goes into the tube, and where the insert attaches to the airframe. If noticeable movement exists then there is damage, and the damaged part must be replaced.

*The above points are the common areas where damage is first witnessed. However it is possible that other areas may damage first, or may also be damaged. Following any heavy landing a very thorough inspection of all the airframe should be made.*

## 9.16 Major strip down

9.16.1 It is recommended that the Skyranger receive a major strip down inspection after a substantial period of use / time. In average conditions this is recommended at 1000hours / 5 years. Aircraft

stored/ used in particularly good conditions may not require this for 10 years, and those stored / used in poor conditions may require it substantially sooner.

9.16.2 Essentially then it will be 'on condition', but don't extend this simply for financial reasons. Seek guidance from your local inspector / maintenance professional/ the importer.

9.16.3 Such a strip down will involve removal of fabric coverings. This permits full detailed inspection of airframe components and the opportunity to replace all fasteners showing signs of corrosion.

9.16.4 The simple design and construction permits such a detailed and comprehensive task to be relatively simply accomplished.

## **9.17 General maintenance tips**

9.17.1 Use the UK build manual for reference to airframe assembly sequences and processes.

9.17.2 Only use a Nyloc nut once – repeated use will reduce its locking ability. Also it is recommended that Loctite thread locker is used as standard practice on every fastener using a Nyloc nut. At least one thread must protrude.

9.17.3 Split pins should not be used more than once.

9.17.4 Unless otherwise specified airframe bolts should be tightened to remove free-play, without causing distortion of the parts/ ovalising of tubes.

## **10. *Repairs***

10.1 If the aircraft is damaged, it is imperative that the full extent of the damage is quantified by an appropriate person. In the case of flying accident damage this MUST involve a BMAA inspector.

10.2 Damage can often extend well beyond the immediately obvious.

10.3 Careful strip inspection of components will often be prudent. Check for bent fasteners, distortion of tubes, elongated holes and stress marks in the anodizing of aluminium tubes.

10.4 Repair by replacement is the usual course of action, and as such requires no special additional approval. However repair of a particular



part by rework/ reinforcement/ welding etc is classified as a repair and requires specific approval of the repair process. On a simple aircraft like the Skyranger it is normally far simpler and cheaper to replace the damaged component.

#### 10.5 **Repairs to the Engine.**

These should be carried out in accordance with the maintenance manual for the engine fitted.

#### 10.6 **Repairs to Instruments.**

Microlight aircraft instruments are not usually repairable and should be replaced.

#### 10.7 **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) reinforced rubber fuel hose. Fuel hose forward of firewall must be fire-resistant. 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.

#### 10.8 **Damaged Wiring.**

Replace with fireproof or fire resistant wiring of the same or higher current rating, secured in the original manner.

#### 10.9 **Repairs to Batteries.**

A damaged battery must be replaced and all surrounding structure thoroughly inspected for acid damage.

#### 10.10 **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.

#### 10.11 **Damage to the Fuel Tank.**

The fuel tank should be drained and removed from the aircraft. The fuel tank should be replaced.

## 11. Trim and tuning

11.1 **WARNING:** Any sudden change in Pitch, Roll or Yaw trim characteristics may indicate airframe damage has occurred. If trim characteristics change following maintenance then it may indicate incorrect assembly. The following paragraphs are a guide to small in service adjustments.

### 11.2 Pitch

Pitch trim is effected by a trim tab on the starboard elevator. Check the current HADS for deflection angles. The pitch trimmer should be powerful enough to trim the aircraft for normal flight throughout the Cg range. Pitch trim is also influenced by the neutral settings of the flaps and ailerons. If they are set trailing edge up then it has the effect of trimming nose up, and vice versa. The neutral setting and tolerance range of Flaps and ailerons are contained in the current HADS.

### 11.3 Roll.

The aircraft will experience changes in lateral (roll) trim due to variation in lateral Cg ( for instance when flown solo Vs dual). Different power settings can also affect lateral trim due to torque effects. Roll trim should therefore be assessed in straight and level flight at typical cruise power setting / airspeed, and in balance (slip ball central). If the aircraft has a persistent tendency to roll then the following adjustments can be made:

11.3.1 **Small rolling tendency:** this can be tuned out by adjusting the relative angles of the flaps. This works in the same sense as an aileron deflection – i.e if aircraft wants to roll left raise the right flap and lower the left flap. Keep adjustments within the tolerance range specified in the current HADS.

11.3.2 **Larger rolling tendency:** This can be tuned out by use of different length wing strut ends. +5 and +10mm ends are available for this use. Adjustments must always be made so that washout is increased – i.e longer strut ends must only ever be used in the rear wing struts. They fit in the outer ends of the wing struts. If aircraft is rolling left fit the longer strut end to the right wing, and vice versa.

#### 11.4 Yaw.

Yaw trim is effected by a bungee system that springs the rudder to a central position. This position can be adjusted by moving the bungee laterally where it attaches to the framework cross member mid way down the fuselage. The aircraft will want to yaw in response to power setting. Trim should be assessed in straight and level flight at typical cruise power setting / airspeed. If the aircraft has a tendency to yaw nose left then the rudder can be set with a right bias to counter this by moving the bungee attachment position to port, and vice versa. The bungee has a tendency to lose its effectiveness over time and should be replaced periodically. Details of how to fit the bungee are in the build manual.

## 12. Vital Statistics

Weight values for this Skyranger are at Annex D and a description of the aircraft is at Section 2. See also the 3 view at the beginning of this handbook

The following describes the basic dimensions of the aircraft:-

Length	5.9m
Height	2.4m
Span	9.5m
Mean chord	1.5m
Wing area	12.8m <sup>2</sup>
Dihedral angle	1.2°
Sweepback angle	0°
Washout	0 – 1°
Fin area	0.4m <sup>2</sup>
Rudder area	0.46m <sup>2</sup>
Horizontal tailplane area	1.08m <sup>2</sup>
Elevator area	0.92m <sup>2</sup>
Aspect ratio	5.7:1
Undercarriage track width	1.6m
Undercarriage wheelbase	1.4m
Fuel capacity	60l
Tyre Pressure	26psi

## **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.













