



## SkyRanger Family (kit) : Skyranger Classic, Swift and Nynja Operators & Maintenance Manual



**G - \_ \_ \_ \_ Serial No.: \_ \_ \_ \_ \_**

**Approving Authority**

British Microlight Aircraft Association

The Bullring, Deddington, Banbury Oxon, OX15 0TT, United Kingdom

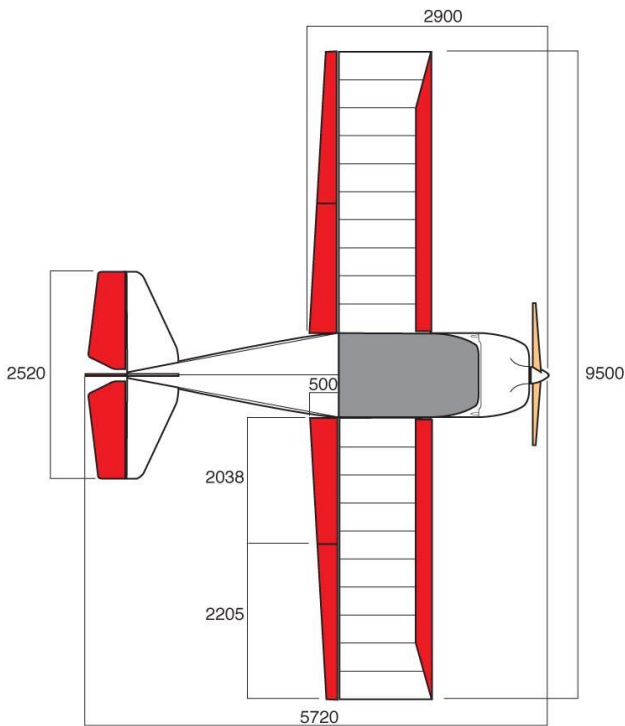
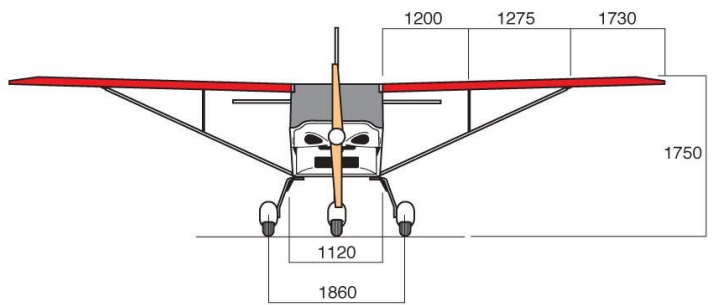
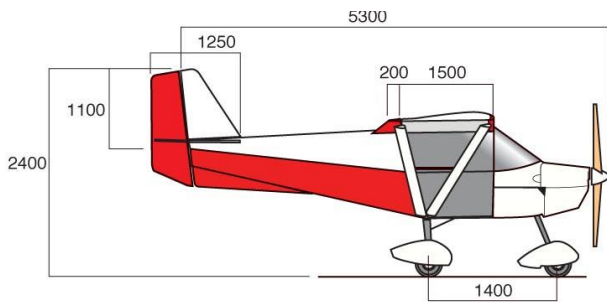
by delegation from the United Kingdom Civil Aviation Authority

**Manufacturer**

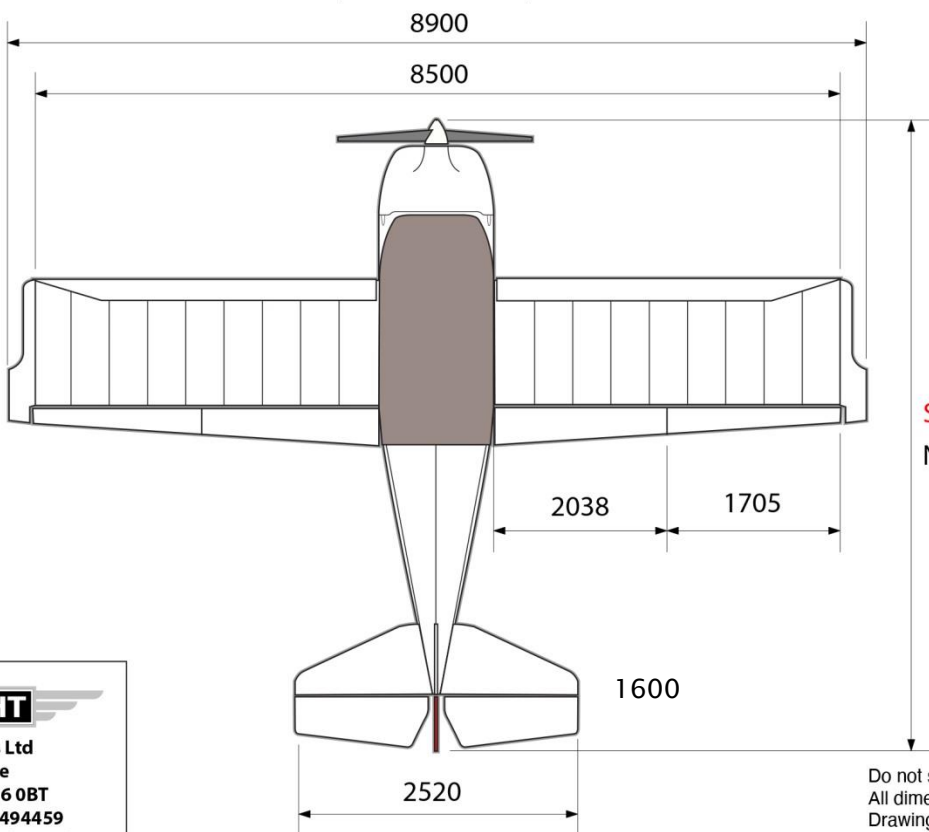
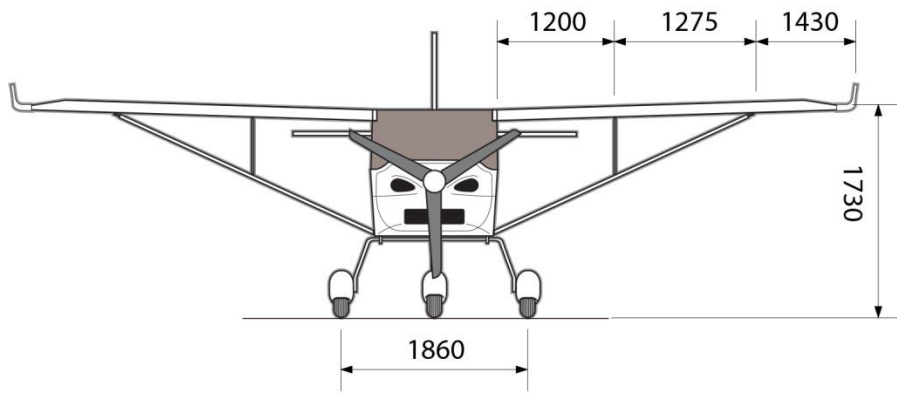
Flylight Airsports Ltd, Sywell Aerodrome, Sywell, Northants, NN6 0BT United Kingdom

This manual is approved for use with Skyranger series 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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Swift3 5720  
Nynja 5900

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## **Contents**

1. Introduction .....	6
2. Description of the Aircraft .....	7
3. Limitations .....	9
4. Flying the Aircraft.....	13
5. Performance .....	23
6. Emergencies .....	26
7. Rigging and De-rigging.....	28
8. Weight and Balance .....	30
9. Maintenance .....	32
10. Repairs .....	46
11. Trim and tuning .....	49
12. Vital Statistics.....	51

Annex A The BMAA Airworthiness Approval Note recommending issue of a permit to fly

Annex B Engine Manual

Annex C Weight and balance report for this aircraft (form BMAA/AW/028).

Annex D Modifications fitted to this aircraft (MinMods)

Annex E Instructions and Manuals for other devices fitted to this aircraft

Annex D service bulletins and MPD's relevant to this aircraft

## **TABLE OF AMENDMENTS**

Reference	Changes incorporated	Approved, date
Issue 1	Initial issue for SkyRanger Family combined manual	07.03.2024

## **1. Introduction**

- 1.1 The Skyranger family of aircraft include the Skyranger 'Classic', Swift, and Nynja models. They are three-axis 'Light Sport Microlight' aircraft, Approved in the United Kingdom using BCAR Section S, and CS-VLA as a basis for approval to the Air Navigation (Amendment) Order 2021/879 art.10(c) (August 19, 2021) microlight definition up to 600kg. Depending on model and modification state they range from 472.5Kg to 600kg maximum takeoff mass (MTOM)
- 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.
- 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 familiar with the type is strongly recommended), and to carry out routine maintenance and minor repairs.
- 1.4 The license required to fly a Skyranger in the UK is an NPPL with a microlight rating – and, where applicable, with differences training for microlight aircraft above 475Kg. Pilots with licenses and experience confined to heavier GA aircraft should check the validity of those licenses to fly UK microlight aircraft and will normally be required to carry out differences training to fly microlight aircraft such as the Skyranger. Pilots with microlight ratings trained for Flexwing aircraft must carry out differences training for 3 Axis control systems before attempting to fly a Skyranger. Type familiarity training is strongly recommended for pilots new to either of the Skyranger models.
- 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. After a production run of 200, in 1998 the design was updated – known in the UK as the SkyRanger ‘Classic’. A shorter wing model – The SkyRanger Swift then followed in 2005. The SkyRanger Nynja was a further development from the SkyRanger design introduced in the UK in 2010, featuring a redesigned fuselage with fibreglass body fairings, and detail aerodynamic, improvements, along with a reworked interior. In 2015 an LS variant was introduced to allow UK operation at 500kg MTOW – outside of the Microlight category. In late 2021 the UK adopted an increased weight definition allowing up to 600kg takeoff weight. The Swift and Nynja 600 models include modifications to allow operation up to the full 600kg MTOM.

### **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 either covered in Fabric (Classic and Swift models) or covered in non-structural glass fibre panels (Nynja).

### **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 polyethylene 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.

## 2.5 **Electrical system**

2.5.1 The electrical system is based on a 12V battery which is charged via the engine generator system producing a maximum output of 250watts / 21A. Please consult Rotax engine manuals, and the wiring section of the Skyranger specific model build manual for more details.

2.5.2 A fusebox is positioned on the left side of the instrument binnacle below the side pockets. Blade type fuses are used and a placard shows details of fuse rating and the consumer that it supplies. Alternatively builders may use other positions or circuit breakers.

2.5.3 The voltmeter shows the state of the battery voltage. Voltage should be greater when engine is running – indicating the charging system is working.



### 3. **Limitations**

#### 3.1 **Introduction**

This section includes the basic operating limitations. The full limitations are contained in the BMAA HADS for the type and specific model 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.

**Example IAS Calibration Card** (in this case a Nynja 600 – the correct one for your aircraft is specified in the approval MAAN issued by BMAA for your specific aircraft)

Kn CAS (Calibrated)	37 Vso	41 VS1	47 min sink	54 Best climb angle	54 Appro ach	55 Best glide angle	61 best climb rate	70 Vfe	72 Max doors open	82 Va	100 Vno	117 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 aircraft must only be flown in day VMC conditions.
- 3.3.2 The aircraft is certified to a "permit to fly" standard. This prohibits commercial operation.
- 3.3.3 This aircraft is approved to a UK only standard, this means that permission is required from the host country to fly it overseas. Several reciprocal agreements exist with other countries to allow access. The pilot should research agreements and requirements as part of any planning for flights outside of the UK.
- 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) for type. Latest issues of which are available on the BMAA website.
- 3.3.5 It is recommended that the aircraft 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

Please write in your IAS values from flight test.

		<b>Nynja 600</b>	<b>Swift 600</b>
Never exceed speed,	$V_{NE}$	117 kn CAS [ IAS]	111 kn CAS [ IAS]
Max speed rough air,	$V_{NO}$	100 kn CAS [ IAS]	100 kn CAS [ IAS]
Manoeuvring speed,	$V_A$	82 kn CAS [ IAS]	82 kn CAS [ IAS]
Flap limiting speed,	$V_{FE}$	70 kn CAS [ IAS]	70 kn CAS [ IAS]
Door open limit speed		72 kn CAS [ IAS]	72 kn CAS [ IAS]
Speed for best rate of climb $V_Y$		61 kn CAS [ IAS]	61 kn CAS [ IAS]
Speed for best climb angle $V_X$		54 kn CAS [ IAS]	54 kn CAS [ IAS]
Speed for best glide angle		55 kn CAS [ IAS]	55 kn CAS [ IAS]
Speed for minimum sink		47 kn CAS [ IAS]	47 kn CAS [ IAS]

		<b>Nynja 472.5Kg</b>	<b>Nyna LS 500kg</b>
Never exceed speed,	$V_{ne}$	117 kn CAS [ IAS]	117 kn CAS [ IAS]
Max speed rough air,	$V_{no}$	N/A	96 kn CAS [ IAS]
Manoeuvring speed,	$V_a$	74 kn CAS [ IAS]	85 kn CAS [ IAS]
Flap limiting speed,	$V_{fe}$	70 kn CAS [ IAS]	70 kn CAS [ IAS]
Door open limit speed		72 kn CAS [ IAS]	72 kn CAS [ IAS]
Speed for best rate of climb $V_y$		58 kn CAS [ IAS]	58 kn CAS [ IAS]
Speed for best climb angle $V_x$		45 kn CAS [ IAS]	45 kn CAS [ IAS]

		<b>Skyranger Swift 472.5Kg</b>	<b>Skyranger Classic 472.5Kg</b>
Never exceed speed,	$V_{ne}$	111 kn CAS [ IAS]	108 kn CAS [ IAS]
Manoeuvring speed,	$V_a$	74 kn CAS [ IAS]	72 kn CAS [ IAS]
Flap limiting speed,	$V_{fe}$	70 kn CAS [ IAS]	66 kn CAS [ IAS]
Door open limit speed		72 kn CAS [ IAS]	72 kn CAS [ IAS]
Speed for best rate of climb $V_y$		57kn CAS [ IAS]	53kn CAS [ IAS]
Speed for best climb angle $V_x$		48 kn CAS [ IAS]	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: 472.5–600KG as applicable to variant.
- 3.4.7 Aerobatics and deliberate spinning are prohibited.

### 3.5 Engine Limitations

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

## **4. Flying the Aircraft**

### **4.1 Pre-Flight Inspection and ground handling**

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

4.1.2 Ground handling – the aircraft can easily be moved by one or more persons pushing / pulling on substantial parts of the structure. When moving forwards the root of a propeller blade close to the hub can be pulled on. The front wing lift struts can also be pulled on. When moving backwards the leading edge of the tailplane can be used to push down on (so nosewheel is lifted and aircraft easily manoeuvred) and pushed against. Take care not to push on fairings or directly on fabric areas. Ground towing should not be done without using a system approved by the manufacturer.

### **4.2 Starting**

4.2.1 Before starting the engine with the intention of flight ensure that the max take-off weight will not be exceeded and balance is within limits.

4.2.2 Start Procedure (Rotax 9 series engines, for others consult specific engine manuals for variations):

- Brakes ON, facing safe direction – all clear in front and behind (prop wash)
- Flaps up (CR setting)
- All Switches OFF, radio and transponder OFF
- Master Switch ON
- Fuel tap check ON
- Electric fuel pump (if fitted) On for 5 secs when cold then OFF
- Throttle CLOSED
- Choke ON if cold
- Ignitions (mags) both ON
- Check clear all around and shout 'CLEAR PROP!'
- Start engine

(For first start of the day leave ignitions off and crank for 5 secs to bring up oil pressure, then stop, put Ignitions on and start)

#### 4.2.3 After start:

- Set approximately 2000 RPM (Rotax 9 series engines) and ease choke fully OFF (note that the ignition advance will occur shortly after start changing engine note and RPM – unless older engines without this feature are used). **If engine inadvertently goes to high RPM – ignitions off immediately.**
- Check oil pressure is rising and within limits within 10 seconds.
- Check charging (if charge switch fitted select ON at this stage and observe Voltage rise)
- Radio and Transponder (if fitted) ON.

#### 4.3 Taxying

4.3.1 Before Taxying 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 these 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 Taxy 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
- Check parachute system unlocked (if fitted)

#### 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, oil above min temp of 50°C
- 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 (s) 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 take-off

- 4.5.1 For a non performance take-off, 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 nose wheel.
- 4.5.3 When the airspeed rises to around 45 kn CAS [ IAS] rotate and lift off and adopt a shallow climb attitude. Allow the airspeed to rise to at least that corresponding for your models best rate of climb (Vy) and adopt a climbing attitude to hold this airspeed.
- 4.5.4 When above 200 feet AGL the flaps can be 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 At the speed for best rate of climb at this speed the nose is high and may obscure forwards view (especially if flown at light weight). Therefore it is recommended to periodically weave or lower the nose to clear the blind spot. If a max rate of climb is not required a cruise climb at reduced power setting and/ or higher airspeed is recommended and will increase forwards field of view.

#### 4.6 Short take-off

- 4.6.1 For a short take-off 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 kn CAS [ IAS] rotate and lift off. When airborne allow the aircraft to accelerate in ground effect to a minimum of the best angle of climb speed (VX) for your model, for best obstacle clearance before adopting the climbing attitude. 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 best rate of climb airspeed ( $V_y$ ), 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 take-off should be aborted by fully closing the throttle and braking firmly.

#### 4.7 **Soft field take-off**

4.7.1 Select first stage (TO) flap. Avoid stopping the aircraft whilst entering the runway and roll into the take-off run. Hold full up elevator until the nose wheel 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 40–45 kn CAS [ IAS], and then carefully allow the aircraft to accelerate to  $V_y$  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 take-off should be aborted by fully closing the throttle and braking firmly.

#### 4.8 **Crosswind take-off**

4.8.1 The maximum demonstrated take-off crosswind is a component of 15 knots. 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 take-off 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 – 55 kn 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 aircraft should be landed from an approach speed of about 50 (472.5kg and below) to 54 (600kg) kn 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 round-out, 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 kn 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. Around 5knots higher airspeed is recommended as the minimum for a full glide approach at max takeoff weight and full flap in calm conditions and should be maintained until round out height.
- 4.10.2 When round out height is reached round out and close the throttle fully. 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 aircraft 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 aircraft 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 for a standard approach. 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 be 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 steerage from the nose wheel and to avoid yawing into wind.

#### 4.13 Cruise

The Skyranger family of aircraft 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 the aircraft is accomplished in the standard manner. In common with many light aircraft it requires some rudder coordination 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 by a factor of 1.4 (up to 57 kn CAS [IAS] for the 600 models flown at 600kg)

#### 4.15 Flight in Turbulence

The aircraft has powerful controls and handles turbulence well. However in turbulence, do not fly above the  $V_{NO}$  speed (as applicable) If very turbulent consider reducing to below the manoeuvring speed

#### 4.16 Stalling

The individual indicated stalling speeds of your aircraft ( $V_{S1}$  – without flap, and  $V_{S0}$  – with full flap) are derived during test flying and will be shown in your individual approval MAAN. Pilots should remember that stalling speed increases during turns and manoeuvres. Any ice on the aircraft will also increase stalling speeds – **never take-off 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

Vs0 and VS1 as in 4.16 above, are values to expect at a deceleration rate of 1kn / second. At 1kn/sec deceleration stall warning is given around 2 knots above the stall by buffet. Stall is normally marked by a mushing descent in heavy buffet or nose drop.

The aircraft can safely be stalled at higher deceleration rates of up to a maximum of 3kn/sec and within a max pitch up attitude of 45°. At these higher deceleration rates / higher pitch attitudes, expect more abrupt nose drop and reduced stall warning.

#### 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 50 kn / 58 mph. Height loss between stall and recovery, if well executed, is around 80 – 100 feet if power is used, or around 150 – 200 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 aircraft 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 and apply full opposite rudder. If the spin does not stop following application of rudder, with ailerons neutral, progressively apply nose down elevator (forward stick) until the spin stops. Then centralise the rudder and ease out of the dive. Retract flaps if the limiting speed is being rapidly approached and is likely to be exceeded. 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 the aircraft may be flown with the top half of the door open (one or both). The maximum speed for flight with the doors open is 72 kn CAS [ IAS]

4.19.1 If not fitted with the optional gas struts, 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 aircraft can also be flown with either the one or two-piece doors removed entirely (one or both).
- 4.19.4 The aircraft 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**

When using the data for planning purposes, apply sensible safety factors, such as are contained in CAA GA Safety advice (see section 5.5 below)

### **5.2 Climb**

Speed for best rate of climb ( $V_Y$ ), and Best angle of climb speed ( $V_X$ ) are as shown in the tables at 3.4 above, and will be expressed as IAS in the placards for your aircraft. 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.

### **5.3 Glide**

At speed for best glide angle a glide ratio of around 8.5 to 1 may be expected. Flying a little slower at minimum sinking speed will give the minimum descent rate (min sink) of around 580FPM.

#### 5.4 **Cruise**

The aircraft can cruise at a large range of airspeeds. The best theoretical still air range will be at a low airspeed around the same speed as for  $V_y$ . Depending on engine type and weight it could be 10lph or less. Consumption rises as airspeed and RPM are increased. At maximum continuous RPM the fuel burn will be more than 25lph – i.e. a lot more fuel consumption for a diminishing airspeed increase.

Exact fuel burn will vary with take-off weight and density altitude. 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 and landing performance

Take-off performance for short dry grass for your aircraft is contained in Annex A.

The following additional safety factors should be applied to the take-off distance to clear a 15metre obstacle (taken from CAA GA Safety information):

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.	

The following additional safety factors should be applied to the landing distance to clear a 15metre obstacle on the approach (taken from CAA GA safety information):

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 that you would normally use for a full glide approach. Land straight ahead or near to straight ahead, DO NOT ATTEMPT TO TURN BACK from below 500ft.

Maintaining full control is key for survival and that can only be done if a safe airspeed is maintained – DO NOT BE TEMPTED TO STRETCH THE GLIDE BY FLYING SLOWER.

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

Lower nose, and establish the minimum sinking speed. If it is required to glide a distance to the nearest suitable field then increase airspeed to the best glide angle 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, switch on electric pump), 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. Note also that all required placarding must be present and legible and this is considered part of the required maintenance. Details of maintenance carried out must be recorded in the aircraft log book.

6.10.4 An AMTRPS installation is approved by the CAA on the basis that, whilst not deployed, it will not hazard the aeroplane, its occupant(s) or ground personnel. In addition, the CAA 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). Therefore use the parachute as a last resort in situations where major injury / death is otherwise likely.

## **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

Note that whilst fitting the wing it must be held up at the tip until the wing root fittings and lift struts are attached. Lowering the wing tip during this process can damage the structure.

Although it may be possible to devise supports to enable one person rigging / derigging, a minimum of two people are normally required.

### **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 **Inspection**

Following rigging a thorough inspection must be made that the aircraft has been rigged correctly, controls correctly connected and functioning, and all fasteners are correctly inserted and tightened. A duplicate inspection should be carried out by a qualified person, and recorded in the airframe log book with signatures from both parties. See 9.3.2 for more information.

### 7.5 **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 D. In this case a good post unfolding inspection should be carried out by the pilot, but a second duplicate inspection and log book entry is not required.

### 7.6 **Ground transport**

If transported dismantled great care must be taken to protect the structure against Damage caused by relative movement, chafing and stresses. A dedicated trailer is recommended with suitable supports, brackets and securing systems.

## **8. Weight and Balance**

### **8.1 Introduction**

Consult the specific weight and balance report for your individual aircraft. It may be possible with some combinations of crew, fuel and baggage weight to go outside of CG limits. The pilot must familiarise themselves with the typical load cases of their aircraft to establish when such a case can occur, and be able to carry out a weight and balance check.

In addition, 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, arms and limits**

See the HADS for your specific model.

### **8.3 Weighing**

Your 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 weight and balance report must be retained in this manual at Annex B.

Any modification added or removed from the aircraft must be accounted for either as a calculation amendment in the report or by a fresh weighing. Only an approved inspector can perform these tasks.

Also at each weighing or amendment, details of the results must be entered in the aircraft logbook.

Once you have the empty weight and moment for your specific aircraft from the weight and balance report (\*\* in the example below), you can use this to calculate Centre of gravity position for a specific flight using a simple table. See example below for a Nynja 600 with 2 x 100Kg crew flying with 30Kg of fuel and 10 kg of baggage:

Item	weight	arm	Moment (weight x arm)
Empty weight	288 **	+0.353 **	102 **
Crew	200	+0.15 / +0.22	30
Fuel	30	-0.35	-10.5
Baggage	10	-0.35	-3.5
Other			
<b>Total weight</b>	<b>528</b>	<b>Total moment</b>	<b>118</b>

The units used do not matter, as long as the same units are used in all cases. It is recommended to use kg and m for consistency.

Note the plus / minus signs do matter. Plus is forward of datum, minus is aft of datum.

Centre of Gravity position = Total moment / Total empty weight

In this example,

CG position =  $118 / 528 = +0.223M$  (forward of datum)

Alternatively, several apps can be used for this calculation, and some are features in GPS navigation systems such as SkyDemon.

BMAA also produce a pilot information leaflet (Pil 001) about the importance of Weight and Balance - which is essential reading.

BMAA also produce a specific technical information leaflet (TIL12) about weighing rules and procedures, which is well worth a read.

## **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 family of aircraft 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 must 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 the date, name and signature of the person or persons that have carried out the work.

Any work that is 'flight critical' must have a duplicate inspection and 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 CAA or BMAA for manufacturing such parts (usually only 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 and/or part number. 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 three types of routine inspections:

1. Check A – this is a daily inspection. It is recommended to repeat this in the case of multiple flights on the same day as a subsequent preflight inspection, which should consider the same items but 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). This check should include all 50 hour items form the worksheet below)
3. Check C – Once per year timed to coincide with the annual permit inspection or 100 hours (whichever comes sooner) This inspection may be also be extended by 10% (10 hours) if required. This check should include all the 50 hour and 100 items, and higher life items when they become due.

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.

9.6.3 Maintenance of the parachute system, bridles, and parachute, should be carried out in accordance with the parachute manufacturer's specific maintenance schedule. For the rocket system, maintenance / renewal **must** be carried out in accordance with the manufacturer's specific maintenance schedule

## 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
- Movement of all flying controls –friction, correct movement sense, connections
- Throttle control – action smooth and friction adequate.
- 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
- Check inside rear fuselage area internal structure and cables

### **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 A
- 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**

- Condition of door, hinges and latches
- Starboard side of undercarriage leg undistorted and clamps 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 composite covering on rear fuselage.
- Security of horizontal tail mounting bolts and covering lacing
- Elevator and hinges, horns and cables
- Trim-tab, horn, cables and springs
- Rudder and hinges, horns and cables
- Condition of tail surface coverings and fin composite fairings
- General alignment of vertical and horizontal tail surfaces
- Condition of bracing wires and their terminations

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

- Port side of undercarriage leg undistorted and clamps 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
- Finally stand back and take an overall view looking for general symmetry.

## 9.8 Routine maintenance worksheet (Checks B and C)

SkyRanger ..... 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 cables 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 fairings and cowlings for security and condition. (for SKR / Swift also check rear fuselage fabric condition and stitching)	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 leg for distortion, and clamping assembly security and condition of rubber pads.	50hrs	
Check nose leg for distortion security and condition, free rotation	50hrs	
Regrease nose leg (undo top bolt, and steering bar and slide down to do this, use multi –purpose or silicon grease)	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	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, fluid condition (change every 2–3 years or check with tester for water ingress)	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 and split pins, 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 and split pins. Operation. Check the return spring on detent lever.	50hrs	
Lubricate aileron and flap hinges (multi- purpose or silicon grease, or small drop of light oil)	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 condition and security of hinges, and split pins	50hrs	
Lubricate hinges (multi- purpose or silicon grease, or small drop of light oil)	50hrs	
Check fabric and stitching condition	50hrs	
Grease turnbuckles exterior for corrosion protection. (multi- purpose or silicon grease), check lock-wire	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 (multi- purpose or silicon grease, or small drop of light oil)	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 centring bungee	50hrs	
Check condition and security of hinges, and split pins	50hrs	
Lubricate hinges (multi- purpose or silicon grease, or small drop of light oil)	50hrs	
Check rudder operation (push tail down to free nosewheel), no excessive friction, and centring on release	50hrs	
Check condition and security of fin extension	50hrs	
Check fabric and stitching condition	50hrs	
<b>Engine bay</b>	required	tick
Carry out maintenance actions as per engine manufacturers manuals - intervals as advised in documentation	As manual	
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 (copper grease)	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	50hrs	

security.		
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	
<b>Documentation review</b>		
Latest worksheet and maintenance manual used?	50hrs	
Any service letters / service bulletins / mandatory permit directives (MPD's) applicable?	50hrs	
All modifications and repairs approved and documented	50hrs	
Weight and balance report up to date	50hrs	
All placards present, correct and serviceable (i.e legible)	50hrs	
All required instruments serviceable	50hrs	
All control deflections within limits (including flaps and trim tab) - values contained in the TADS.	100hrs	
All ancillary controls are serviceable	50hrs	
Log book hours up to date and entry completed for this maintenance event.	50hrs	
Work carried out by.....on.....Date Signed..... Comments and deferred defects (continue on additional sheet if required):		



## 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. Control cables may have extended life based on a specific inspection – see the applicable Flylight Service bulletin for details.

## 9.10 Fabric

9.10.1 The aircraft 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 Dacron fabric and the stitching for both types of fabric 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

All stitching            1360g

Xlam – no Bettsometer test required, but should be assessed for delamination and embrittlement.

## 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 processes approved by the manufacturer or the BMAA / CAA.

## 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' anti 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 multi-purpose or silicon grease.

9.12.7 Control surface hinges should be regularly lubricated – either with grease (multi-purpose or silicon grease) or a drop of light oil.

9.12.8 Glass-fibre parts can be polished after washing with wax polishes.

9.12.9 Lexan glazing is sensitive to cleaning product in order to remain clear and streak free. It can embrittle and crack if exposed to most cleaning chemicals. In general, clean with water only. Very small concentrations of wash wax type cleaners in the water may be used

with low risk. Insects will need a good soaking to remove – avoid rubbing them aggressively as the Lexan can easily scratch. A soft sponge or microfiber cloth works best. Dry with a microfiber cloth and then a suitable plastic cleaner like Plexus can be used sparingly to remove streaks. Avoid such a product from soaking in behind rivets – where it can collect, and cracks may propagate over time. 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.

9.14.3 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 spring leg will splay outwards if overloaded. Usually a heavy landing will be slightly wing down and one side may 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 have negative camber (bottom of the wheel bent inwards). 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 heavily 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 parallelogramming 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 Aircraft receives a major strip down inspection after a substantial period of use / time. In average conditions this is recommended at 1000hours / 10 years (whichever comes sooner). Aircraft stored / used in poor conditions may require it substantially sooner and should be closely monitored for signs of corrosion or other distress that will indicate a strip is required.

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 Manufacturer.

9.16.3 Such a strip down will involve removal of fabric coverings and fuselage fairings. 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 model specific build manual for reference to airframe assembly sequences and processes and general electrical schematic.

9.17.2 Only use a Nyloc nut once – repeated use will reduce its locking ability. Also, it is recommended that Loctite thread locker (243 or

equivalent in another brand) 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/oval-ising of tubes. Beware of the nut becoming 'thread-bound' at the end of the thread. Additional washers may be required in such a case.

## **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 or the manufacturer. Accidents must be reported to the AAIB and BMAA.

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 from the manufacturer, BMAA or CAA. On a simple aircraft like these 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 **Main Battery repairs,charging, jump starting.**

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

Check battery type and suitability of charger to be used (note that if the LIFEP04 battery option is fitted a specific charger will be required)

Take care not to short the battery to the rudder cables with the charger clamps. Replace the protective boots over the battery terminals once charging is complete.

Jump starting is not recommended as a standard technique – consider waiting whilst battery is recharged instead. Dangers include shorting the battery to rudder cables or other structure with the leads, and difficulty of safely disconnecting and removing jump leads and jumper battery with engine running and prop turning!

#### 10.10 **Puncture repairs / repairs to Tyres.**

An inner tube puncture may be repaired. If there is damage to the tyres which shows the inner canvas or there is a soft or distorted area, replace the tyre in question.

Consult the build manual for information of removing the wheel spats, how the wheel is constructed and how to dismantle to repair a puncture / change inner tube and / or tyre.

**Mainwheel jacking:** – use a jack under the end of the gear leg using a wooden pad to protect the end of the gear leg. Only jack high enough to facilitate removal / refitting and ensure the aircraft is stable on the jack and the other wheel chocked to prevent ‘roll off’

**Nosewheel jacking:** – push the tail down to lift the nose wheel clear of the ground. Use a patient helper to hold the tail down, or hold it down with straps to a stout ground anchor.

#### 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 TADS 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 TADS.

### 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 TADS.

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 the aircraft are at Annex A 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 /8.5m***
Mean chord	1.5m
Wing area	14.1m <sup>2</sup> /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 up to 500kg	26psi
Tyre Pressure 500– 600kg	26–32psi nose, 32psi mains

\*\*\* = *Swift and Nynja*

## **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**

MODIFICATIONS FITTED TO THIS AIRCRAFT SINCE INITIAL PERMIT ISSUE

Note optional modification reference as recorded in TADS, or note MAAN or AAN number and attach approval document following this page

Modification Reference	Description	Sign and date incorporated





**ANNEX D**

SERVICE BULLETINS AND MPD'S RELEVANT TO THIS AIRCRAFT - LIST HERE AND APPEND EACH.

REFERENCE	Description	Issue or date

