BRITISH MICROLIGHT AIRCRAFT ASSOCIATION
TECHNICAL INFORMATION LEAFLET

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ANTI-COLLISION BEACONS (STROBES)

1. Introduction.

1.1 Anti-collision beacons, commonly known as strobes, offer a significant safety benefit. Various systems are available and this document covers those areas of the installation of any strobe system which affect airworthiness when fitted to microlight aircraft. All such systems should comply with the requirements of this TIL, but must also be approved through the BMAA, CAA or manufacturers' modification approval systems.

1.2 The strobe light may be a traditional Xenon flash tube or an LED Type.

1.3 In order that a strobe is effective it needs to be visible in twilight several (often as many as ten) miles away.

1.4 A flashing unit must flash at a rate between 40 and 100 flashes per minute.

1.5 For simple flex wing strobe installations follow the approval procedure for Standard Minor Modification TIL 106, see 3.3 below for the definition of a simple flex wing strobe installation.

1.6 For 3-axis control, powered-parachute aircraft and for non standard strobe light installations on weight-shift control aircraft, an application should be made using form BMAA/AW/002c **DO NOT INSTALL THE STROBES UNTIL AFTER AUTHORISATION FROM THE BMAA.**

2. Safety Precautions.

2.1 In order to prevent undesirable medical effects (such as vertigo or epileptic attacks), the light(s) must be located such that they are not in, or could be reflected off the aircraft into the normal or peripheral vision of the pilot or passenger.

2.2 Instructions must be inserted in the aircraft handbook describing this hazard, and requiring strobe systems to be turned OFF should reflection from cloud or other features bring the flashing into view.

2.3 An ON/OFF switch must be easily accessible to the pilot in flight.

2.4 The ON/OFF switch must be placarded giving its function and sense of operation (S779 requires that switches to be 'down for off').

2.5 The installation must meet all requirements of this document, along with any requirements for installation or operation of the supplier or manufacturer.

2.6 The system must be tested and shown not to interfere with onboard intercom systems and radios if fitted.

3. Mounting Considerations

3.1 The wing tips are a poor choice of location for bulky, Xenon, external 'after-market' strobe lights, as they can adversely affect the stall and spin-recovery characteristics of the aircraft. However, with the advent of low profile LED type strobes this problem is reduced. If this location is chosen then some flight-testing may be required as part of the modification approval process.

3.2 A good location for anti-collision lamps is on the centre-line of the aircraft:

(a) Outside of the normal and peripheral vision of the pilot and passenger;
(b) Such that light is not reflected off the airframe into the vision of the pilot or passenger;
(c) Clearly visible by other aircraft with as few 'blind-spots' as possible.

3.3 Finding a suitable location for anti-collision lamps on the exterior of an aircraft is not always an easy task.

Below is some general guidance for different types of aircraft.

(a) Flex-wing aircraft – Experience has shown that the best locations are on the king post and the underside of the trike. If made from round-section tube, a jubilee clip can be used to clamp the lamp to the king post. With the adoption of airfoil-section tube becoming more widespread, more ingenuity in designing a mount may be required. Note that the king post must not be drilled or cut. TIL106 may be used for simple flexwing strobe installations.
When there is no kingpost other positions must be considered, although the options are limited. The wheel spats or wingtip fairings are possible candidates if the lights are compact and lightweight.

(b) Fabric covered aircraft – The only acceptable mounting methods for a lamp are by fitting a bracket to an existing bolt, or by clamping to a *substantial* tube (typically using jubilee clips, but make sure the tube is protected with plastic tape first). Under no circumstance should the tube be drilled or cut. It may be acceptable to cut a slit in the fabric covering to allow a unit to be mounted to underlying structure, but contact the BMAA first.

(c) Metal, stressed-skin aircraft – Under no circumstance should a load-bearing panel be drilled or cut to mount a lamp. Unfortunately, in the case of a metal stressed-skin aircraft, most of the airframe is load-bearing primary structure. The most acceptable mounting methods are by fitting a bracket to an existing bolt or by mounting the lamp onto a non load-bearing panel such as a cowling, hatch, inspection panel or composite fairing. If you are unsure as to whether a panel is stressed or not, consult the BMAA and do not drill or cut it until you are!

(d) Composite, stressed-skin aircraft – Under no circumstance should load-bearing skin be drilled or cut to mount a lamp. Unfortunately, in the case of a composite stressed-skin aircraft, most of the airframe is load-bearing primary structure. The most acceptable mounting method is to mount the lamp onto a non load-bearing panel such as a cowling, hatch, inspection panel or fairing. If you are unsure as to whether a panel is stressed or not, consult the BMAA and do not drill or cut it until you are!

3.4 The power unit, when separate from the lamp(s), should be mounted to a *substantial* structure. Note that under no circumstance should primary structure be drilled or cut.

3.5 In addition to the load testing in section 5.3 below, some consideration should be given to the load path into the aircraft. This is particularly important when the lamp or power unit makes a significant percentage change to the mass of the structural element to which it is attached. For example, if attaching a lamp to a lightweight cowling, not only should the lamp be load tested to ensure that it will not come away from the cowling in case of a crash landing, but the cowling should be re-tested at its new, increased weight, to ensure that it (the cowling plus lamp) does not come away from the aircraft.

3.6 When installing strobes as navigation lights, the beacons should be installed such that the red beacon emits light on the port side of the aircraft, green on the starboard side of the aircraft, and white aft of the aircraft. This is outlined in figure 1 below. Figure 1 also indicates the radial field of luminance that each beacon should emit respectively. The angles presented in figure 1 are for illustrative purposes only and are not considered mandatory.

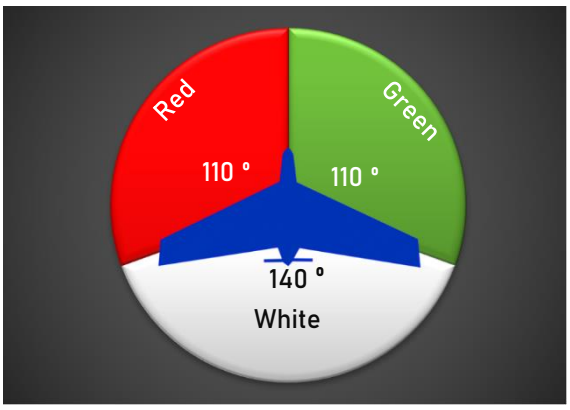

Figure 1: Navigation light arrangement for microlight aircraft.

4. General Considerations.

4.1 Strobe lights covered by this note are electrically operated, either directly powered from the engine generator or via a battery. Some units are supplied as 2-part assemblies, with electrical interconnection; the major components being a strobe-driver power unit, and a strobe-lamp unit. Where these items are separate, high voltages are carried to the strobe lamp via a suitable electrical cable; it is essential that such a cable is properly insulated for high voltage protection. The current rating of the primary supply to the driver unit is generally in the region of 4 to 5 amps.

4.2 All safety requirements must be checked on each individual aircraft installation, since often the cable routings, connections or positioning of components vary between aircraft.

5. Testing.

5.1 Flight testing is not required, unless specified by the BMAA for a particular installation. However, a visual check must be made to ensure that the installed system complies with the requirements of paragraph 1.3 and 1.4.

5.2 The installation must be inspected to ensure that it complies with all of the suppliers' or manufacturer's instructions.

5.3 With the exception of lightweight components (such as cabling) all parts must be load tested to show compliance with BCAR S597, to ensure that they will not come away from the aircraft and cause injury in the case of crash or hard landing. The individual part (such as the battery or lamp) must be weighed. The item must be pushed or pulled to the loads listed below (using scales or a spring balance) without causing damage or coming away from the aircraft:-

(a) Forwards; 9 x weight (9g).
(b) Downwards; 6 x weight (6g).
(c) Upwards; 4½ x weight (4.5g).
(d) Towards both port and starboard; 3 x weight (3g).

6. Manuals, Placards and Information.

6.1 There must be clearly displayed placards for the aircraft on-off switch as required by 2.4 above.

6.2 Information required by 2.2 above must be included in the aircraft operating manual.

7. Onboard Intercom/Radio Interference.

7.1 Interference with onboard intercom systems and radios must be checked. This should be carried out with and without the engine running and at all engine powers, ensure safety procedures are in place.

7.2 Carry out a listening check at radio frequencies of 7MHz intervals. The squelch may be set before testing begins to eliminate any ambient static.

7.3 Any interference heard should not be loud enough to cause undue discomfort to the pilot.

8. Weight and Balance.

8.1 For all microlight aircraft, it must be confirmed that the installation of the strobe system, with power supply,

must not cause the aircraft to exceed its maximum empty weight.

8.2 For 3-axis microlight aircraft, especially when the system is installed away from the longitudinal centre of gravity, it must be confirmed that the aircraft CG will remain within required limits.

8.3 The BMAA microlight aircraft weight and CG form BMAA/AW/028 can be used, if required, to determine both of the above points.

9. Inspection.

9.1 Before signing for the installation of strobes, the aircraft inspector must satisfy him or herself that the installation meets all of the following requirements:

(a) The pilot must not be able to see the light (direct or reflected) from the strobe.
(b) The pilot must be able to easily reach the ON / OFF switch in flight.
(c) The switches must have an appropriate electrical rating (Note 1) and in correct sense.
(d) All cables and insulation must have an appropriate electrical rating. (Note 2)
(e) There must be protection for the primary power supply. (Note 3)
(f) Radio interference must be checked.
(g) Component operating temperatures. (Note 4)
(h) The aircraft manual has sufficient information.
(i) All electrical circuitry is unlikely to create a fire hazard. (Note 5)

9.2 For a standard flex wing installations (defined in para3.3above) TIL106 should be completed.

9.3 For all other strobe applications form BMAA/AW/002c requires completing prior to installation of the strobe lights. Provided the proposed installation does not affect primary structure then in most cases a BMAA Minor Modification will be granted and Form BMAA/AW/004a will be issued for the installation, and the inspector should complete this form. For all other installations the BMAA will issue more specific instructions.

Note 1: Account must be taken of information provided by the component supplier or manufacturer, especially with regard to the electrical rating of components and wiring. The switch rating should normally be at least 5A at 250V (to allow for the generator open circuit case).

Note 2: Inspectors should not take responsibility for inadequate information; if further information is required, it is the applicant's responsibility to obtain this.

Note 3: The primary supply must be protected, close to its source, by a fuse or contact breaker rated in accordance with the equipment supplier's instructions (normally about 5 amps).

Note 4: Some components, especially Xenon lamps, operate at high operating temperatures. "Hot" equipment must not be within 450mm of any fuel pipe or tank, or within 150mm of temperature sensitive materials (such as wing fabrics, or electronic circuits). "Hot" should be regarded as anything too hot to leave a hand on comfortably. Exceptions can be made if sufficient precautions are taken (e.g. use of fire/heat retardant materials)

Note 5: Electrical cables in strobe systems can carry very high voltages, so must have suitable quality insulation and cable security.

Note 6: No part of the equipment must interfere with aircraft flying controls.

Note 7: Mechanical attachment should not normally involve drilling or altering any part of the aircraft structure. If this is required, full details must be included as part of the modification approval request.