Directorate of Airspace Policy

Civil Aviation Authority

CAP 736

Operation of Directed Light, Fireworks, Toy Balloons and Sky Lanterns within UK Airspace

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Chapter 1 Introduction

1 Aim

Individuals or organisations wishing to direct light sources, pyrotechnics or fireworks into the air are to do so in a safe and sensible manner, as mandated by legislation contained within the United Kingdom Air Navigation Order 2009, so that their activities may safely co-exist with aircraft operations. The Civil Aviation Authority (CAA) is responsible for policy regarding light displays, permanent laser sites, other light source installations, fireworks, helium-filled toy balloon and sky lantern releases and their effects on aviation. Consequently, the aim of this CAP is to state existing policy and to provide individuals/organisations wishing to conduct directed light, firework, helium-filled toy balloon or sky lanterns operations in the United Kingdom with a means of notifying their activities to the CAA. This will enable the aviation community to properly assess the impact of any such proposed activity and take appropriate measures to mitigate any dangers to flight safety.

2 Structure

This document should be read in its entirety in order to appreciate the relevance of the issues to aviation. Following the introduction, Chapter 2 gives a general overview of the issues surrounding the impact of light and fireworks displays, and helium-filled toy balloon and sky lantern releases, on the safety of flight operations and also gives supporting legislative background to the subject. Chapter 3 describes the light display guidelines and indicates areas within which the UK considers it especially necessary to protect flight operations from the dangers presented by temporary light displays. This chapter also makes reference to firework displays, and to helium-filled toy balloon and sky lantern releases. Chapter 4 describes the issues surrounding the establishment of permanent laser or searchlight sites. The Annexes provide an example of the form to be used by organisers to notify the CAA of their activities, together with a graphical illustration of the safety zones considered necessary to exist in the vicinity of aerodromes. Finally a list of reference documents is provided.

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Chapter 2 General

1 The Threat to Aircraft Safety

1.1 The use of lasers, searchlights, fireworks, helium-filled toy balloons and sky lanterns is now widespread throughout the UK, and their use has the potential to impact upon aviation activity. Lasers and searchlights make use of a generated light source to produce intense and directional beams of light, which can dazzle pilots and have the potential to cause damage to the human eye, and which can be exacerbated should a pilot be wearing night-vision goggles or similar devices. Unexpected fireworks could distract and confuse pilots and cause damage to aircraft in flight. Helium-filled toy balloons and sky lanterns have the potential of causing damage to engines through ingestion. Additionally, debris from sky lanterns dropping to the ground could produce Foreign Object Debris (FOD), which could cause damage to aircraft should any remnants land on the manoeuvring areas of an airfield. The risk to aviation is increased when such activities take place in the vicinity of aerodromes, particularly during those critical phases of flight associated with taking off and landing.

2 Light Displays and Legislation

2.1 Adequate lighting is necessary for all visual tasks. An excess of light, however, can detrimentally affect vision to the extent of rendering it ineffective. In aviation, a pilot may experience high levels of lighting when flying into the sun or looking at very bright artificial light sources such as searchlights. Sudden and intense bursts of light can also cause distraction and confusion, especially if the occurrences are unexpected, and instances such as light displays, lasers or firework shows can be the cause of this.

2.2 Ideally, pre-event analysis and discussion with aviation authorities should safely deconflict flying and light-display activities. Failure to take suitable or adequate measures to prevent a risk to aircraft may result in prosecution under the Air Navigation Order 2009, and in particular, but not in totality, the following articles: Article 137 that refers to endangering the safety of an aircraft, or under Articles 221 and 222 that refer to lights liable to endanger and lights which dazzle or distract.

3 Lasers

3.1 Lasers used in the vicinity of aerodromes add to the known aviation-related problems associated with high intensity lights and can have a physiological impact upon pilots which could threaten aircraft safety, particularly at critical stages of flight such as final approach. Such physiological effects can include: glare, temporary flash blindness, after-image, and, possibly, eye injury. In addition, there is the potential for laser activity to dazzle and distract pilots of aircraft, and any planned laser activity must be organised to avoid this eventuality.

3.2 Protection of the pilot against deliberate or accidental laser beam strikes has been of interest to military aviation medicine specialists for many years and is an aim of the CAA. The proliferation of laser light displays for entertainment or commercial purposes has increased the risk of accidental illumination of aircraft from such displays, and therefore it is increasingly important to manage and mitigate those risks.

3.3 Lasers used in outdoor light displays can produce an intense, coherent, directional beam of light with wavelengths covering the visible spectrum of 400-700 nanometres. In view of the increasing risk to flight safety posed by the more widespread use of laser emitters around airports, the International Civil Aviation Organisation (ICAO) formed a study group in 1999 to evaluate the laser risk. During 1999 and 2000, the Aviation Medicine Section of the ICAO Secretariat developed the laser-related Standards or Recommended Practices (SARPs) which are now included in Annexes 11 and 14 to the Convention on International Civil Aviation.

These standards, to which the UK subscribes, require states to take adequate steps to prevent laser beams from adversely affecting flight operations and recommends establishing zones around aerodromes within which the use of lasers should be restricted.

3.4 Safety regulations for laser displays are already taken into consideration by Local Government Authorities when carrying out risk assessments for associated planning applications or entertainment licences. Aviation risk assessments are carried out along similar lines to establish Hazard Zones. ICAO Recommended Practices suggest the establishment of Laser Beam Free Flight Zones, Laser Beam Critical Flight Zones and Laser Beam Sensitive Flight Zones. The UK approach, which has been established for several years, does not prescribe precise dimensions for such zones around each UK airport, but considers that a Notification Zone exists around every UK aerodrome within which laser emissions must be controlled. Additionally, in making an assessment of any Laser Notification the CAA takes into consideration that airspace in the vicinity of an aerodrome which supports the management of aircraft operating into and out of airfields. Sponsors of Laser Notifications may be directed to Air Traffic Control (ATC) organisations, such that the appropriate Air Navigation Service provider can consider any Aerodrome Safeguarding concerns as part of the consultation process.

3.5 A Nominal Ocular Hazard Zone is considered to exist around any laser within which visible and invisible laser beams can pose a potential threat to safety by exceeding the Maximum Permissible Exposure. Assessment of lasers producing visible beams will also take into account the additional risks from dazzle and distraction in order to calculate a Sensitive Level and Visual Interference Level that determine whether the installation can safely co-exist with aircraft operations and, if appropriate, what restrictions or limitations should be applied. This assessment will depend on the range and bearing of the installation from any nearby aerodrome. If the proposed display or installation is particularly complex or contentious, a Local Laser Working Group may be convened to assess the implications of the proposal and produce a final assessment.

3.6 Protection of the pilot against deliberate or accidental laser beam strikes is of significant concern to the CAA. The risk of accidental laser illumination of aircraft from a commercial activity is reduced through applicants following the process detailed within this publication. The deliberate and malicious laser targeting of airborne aircraft has the potential to impact upon aircraft safety and could lead to civil prosecution. The CAA works in concert with the appropriate authorities in an effort to reduce the number of incidents.

4 Searchlights

4.1 Searchlights are frequently used to provide spectacular backdrops to individual events. They are also used to provide lighting displays for structures or special events over periods of weeks or even months. Apart from the potential to distract aircrew,

they may also appear similar in appearance and position to airfield lighting, hence their position and operation must be considered with care.

5 Fireworks

5.1 Firework displays can vary from the small-scale garden event to a major commercial or ceremonial occasion; they have the potential to distract and confuse aircrews or damage aircraft during flight operations. A feature of fireworks displays is that solid objects are physically launched into the air to create the full visual effect. Many fireworks associated with large-scale events can dispense canisters several hundred feet into the air. Whilst the risk of collision with aircraft is small, the existence of such projectiles needs to be borne in mind when carrying out an assessment for firework displays in the vicinity of aerodromes.

6 Helium-Filled Toy Balloons

6.1 The release of helium-filled toy balloons is viewed as a valuable source of publicity and/or fundraising at many events. However, the conduct of such activities in the vicinity of aerodromes could present a risk to aviation. Discussions between Rolls Royce Engineering and the CAA Safety Regulation Group's Propulsion Department have determined that the ingestion of balloons would not have a detrimental effect on a gas turbine engine's performance, regardless of its passage through the engine. However, regardless of any assurances with regard to the nil effect of ingestion, pilots will tend to manoeuvre to avoid large concentrations of balloons. Therefore, to increase awareness and to minimise the potential risk, CAA guidelines are laid down[1] for the benefit of balloon operators, Air Traffic Control and aerodrome managers.

7 Sky Lanterns

7.1 Sky lanterns[2] vary in size and performance and when released can travel a considerable distance from the release point at unpredictable heights on prevailing winds. This unpredictability of flight could cause sky lanterns to become a risk to aviation through airborne engine ingestion, or on the ground as sky lantern debris has the potential to produce FOD which can cause damage to aircraft. The level of risk associated with the release of sky lanterns is proportionate to the number and size of units released at any one time, and to the point of release. Whilst the risk of collision with an aircraft is small, aviation activity within the airspace of intended release needs to be considered when carrying out an assessment for the releasing of any sky lanterns, in particular when within the vicinity of an aerodrome. Therefore, to increase awareness and to minimise the potential risk, CAA guidelines are laid down for the benefit of those planning to release sky lanterns, and for Air Traffic Control and aerodrome managers.

1. *CAP 393 Air Navigation: The Order and the Regulations*, Article 163 refers.
2. For the purposes of this CAP Fireworks and Firework Displays, and the releasing of sky lanterns, both involve the launching of one or more solid combustible objects into the air, with the risk of either impacting against an aircraft or causing a distraction to aircrew.

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Chapter 3 Light[1] (Temporary) and Firework Displays, and Helium-Filled Toy Balloons and Sky Lanterns Release Guidelines

1 Action by Organisers of Light (Temporary) and Firework Displays, and Helium-Filled Toy Balloons and Sky Lantern Releases

1.1 This chapter refers to procedures concerned with Light (temporary) and Firework displays, and the release of helium-filled toy balloons and sky lanterns. Refer to Chapter 4 if the Light (temporary) display is to be designed as a permanent (longer than 30 days) installation.

1.2 For Light (temporary) and Fireworks displays, and helium-filled toy balloon or sky lantern releases, organisers should notify the CAA of their proposed activity by completing the notification form DAP 1918 (see example in Annex A to this document) giving 28 days' advance notification of the event. Upon notification the CAA will look to deconflict or co-ordinate the activity, as well as promulgate warnings to the aviation community and establish any control measures considered necessary.

1.3 The CAA will examine the proposal based on the guidelines detailed within this document. If no further information is required then the appropriate warnings will be promulgated. While the Event Organiser (EO) will not routinely receive written confirmation of this, if further information or action is required the CAA may contact the originator of the proposal to discuss suitable future courses of action.

2 Guidelines for Light (Temporary) and Firework Displays

2.1 It is of prime importance that Light (temporary) and Fireworks displays are never directed at or towards aircraft or aerodromes. The EO should nominate a single point of contact, known as a Display Operator (DO), who will be directly responsible for the conduct of the actual event. EOs should be aware of the geographical zone illustrated at Annex B of this document, within which the CAA considers it necessary to impose restrictions in order to protect flight operations, specifically:

a) within three nautical miles of an aerodrome's notified Aerodrome Reference Point (ARP) or similar; or

b) within ten nautical miles of the notified ARP along the track of the extended runway centreline and 500 metres either side of said centreline.

3 Additional Guidelines for Light (Temporary) Displays

3.1 Ideally, measures should be in place to prevent any illumination from a Light (temporary) display escaping towards the aerodrome, or along the extended runway centreline out to ten nautical miles from the ARP.

3.2 If this proves impractical, other precautions are to be taken to ensure that Light (temporary) displays do not impinge on safe flight operations, such as arranging for a direct telephone or radio communications link between the DO and appropriate Air Traffic Control authority at the relevant aerodrome, through which the Light

1. Within this chapter the word 'Light' is used in the text to group Lasers and Searchlights.

(temporary) display can be terminated immediately on request from either an aircraft or the affected aerodrome.

NOTE: If this is not possible, then the Light (temporary) display may represent a threat to flight safety and should not proceed.

3.3 Outside of the area defined in paragraphs 2.1a) and b) above any Light (temporary) display is unlikely to affect aerodrome flight operations. However, the EO should notify the CAA to ascertain if there are any other aviation activities that may be affected by the display.

4 Additional Guidelines for Firework Displays

4.1 Aerial fireworks displays should be limited to a height of 1,500 ft above ground level. Any firework conforming to BS7114/BS EN 14035-36 will not exceed this height.

4.2 Displays within a ten nautical mile radius of an active aerodrome or within an Aerodrome Traffic Zone (ATZ)[1] may require notification and co-ordination action and must be notified by the EO to the CAA for consideration.

4.3 If the fireworks display is planned to take place near the coast, the organisers should pass all the relevant details to HM Coastguard.

5 Guidelines for Helium-Filled Toy Balloon and Sky Lantern Releases

5.1 While the geographical zone described in paragraph 2.1a) and b) above does not apply for helium-filled toy balloon or sky lantern releases, the CAA will usually consider placing restrictions upon the request for such releases as follows:

a) within five nautical miles of an aerodrome for helium-filled toy balloons; and

b) ten nautical miles or less from an aerodrome for sky lanterns.

NOTE: All applications are considered on their individual merit.

6 Additional Guidelines for Helium-Filled Toy Balloons

6.1 Balloons should be made of latex, not metallic foil, and must not have a metallic finish. It is strongly recommended that plastic inserts are not used to close the balloons, nor lengths of string, streamers or ribbons; the balloons are not to be tied together. Where the balloons are restrained prior to release, the restraining medium must be attached to the ground or a fixed structure to prevent any inadvertent release of the restraining medium with the balloons.

6.2 The application procedure for helium-filled toy balloon mass releases[2] varies as the number of balloons to be released changes. Details are as follows:

1. An ATZ is airspace established in the vicinity of an aerodrome with the purpose of providing protection to aircraft landing, taking off and flying in the visual circuit. An ATZ extends to a height of 2,000 ft above aerodrome elevation within a circle centred on the notified mid-point of the longest runway and a radius of two nautical miles if the longest runway is notified as 1,850 metres or less, or a radius of two and a half nautical miles if the length of the longest runway is notified as greater than 1,850 metres.
2. Balloon releases that do not meet the definition of mass release are less likely to cause a hazard to aircraft. However, organisers are encouraged to seek advice on the safe conduct of such releases from Airspace Utilisation, Directorate of Airspace Policy, K6 G2, CAA House, Kingsway, London, WC2B 6TE (tel: 0207 453 6599; fax: 0207 453 6593; email: ausops@caa.co.uk).

Number of Balloons	Procedure
Between 1,000 and 5,000	The Event Organiser (EO) should contact Airspace Utilisation (AU), email: ausops@caa.co.uk (full contact details are given in Footnote 2 on the previous page) to ascertain which ATC Units may be affected by the release. AU will instruct the EO to contact the appropriate ATC Unit before the date of the release and again on the day of release. The organiser should also inform the local police of the planned release.
Between 5,001 and 20,000	The organiser must apply in writing to AU, giving at least 28 days' notice. AU will co-ordinate with any ATC Units affected by the release. Deconfliction process will be taken by AU from other notified unusual aerial activities. For sites outside controlled or notified airspace, AU will issue an approval letter to the organiser and copy this to the affected ATC Units, aerodromes, Police Air Support and Air Ambulance Units. For sites within controlled or notified airspace, AU will issue a Permission to the organiser and copy it to the affected ATC Units, aerodromes, Police Air Support and Air Ambulance Units. AU will promulgate the release by means of a NOTAM[1].
20,001 or more	The organiser must apply in writing to AU, giving at least 28 days' notice. AU will co-ordinate with any ATC Units affected by the release. Deconfliction process will be taken by AU from other notified unusual aerial activities. AU will issue a Permission to the organiser and copy it to the affected ATC Units, aerodromes, Police Air Support and Air Ambulance Units. AU will promulgate the release by means of a NOTAM.

1. A NOTAM (Notice To Airmen) is created and transmitted by government agencies to alert aircraft pilots of any hazards en route or at a specific location.

It is acknowledged that the above procedures differ from those detailed in the ANO 2009 (Section 1, paragraph 163). However, the CAA is currently seeking to have the ANO amended to reflect what it believes to be best practice.

7 Additional Guidelines for Sky Lanterns

7.1 The following guidelines are to be observed for the release of sky lanterns:

a) Any individual or group releasing more than ten sky lanterns should contact the CAA prior to release.

b) Any individual or group releasing ten sky lanterns or less at a release site ten nautical miles or less from an airfield – the EO should contact the ATC organisation of that airfield.

c) Any individual or group releasing ten sky lanterns or less at a release site more than ten nautical miles from the nearest airfield – contact with the CAA/ATC is not required.

d) Sky lanterns are not to be tied together.

7.2 If the sky lantern release is planned to take place on or near the coast, the EO should pass all the relevant details to their local HM Coastguard prior to the event.

NOTE: On contacting the airspace specialist within the CAA he/she will offer details of ATC Units likely to be affected by any notified sky lantern event. The provision of such

details does not absolve any EO from identifying any local airfields affected by the proposed event and is not to be taken as a complete list.

8 Further Advice

8.1 Further advice on the use of lasers and fireworks for display purposes can be obtained from the following Health and Safety Executive publications:

HS(G)95 – The Radiation Safety of Lasers Used for Display Purposes. (ISBN 0-7176-0691-0)

HS(G)123 – Working Together on Firework Displays: Guide to Safety for Firework Display Organisers and Operators. (ISBN 071-7608352)

8.2 Laser safety guidance can be obtained from the Health Protection Agency as follows: tel: 01235 831600; fax: 01235 833891; email: laser@hpa.org.uk.

Chapter 4 Permanently Sited Lasers and Searchlights

1 Permanent Laser and Searchlight Sites

1.1 Any laser or searchlight site that is likely to remain in position for more than 30 days is considered a permanent site and will therefore be subject to existing Local Planning Authority consultation arrangements. Not every site will be significant to aviation, but the CAA should be consulted during the initial planning process for any such installation.

1.2 An initial approach should be made to the Off-Route Airspace Section in the Directorate of Airspace Policy at the CAA. The Section will examine the proposal and advise the originator of whether it is likely to affect aircraft operations and, if so, what measures to take to mitigate its effect. The guidelines given in Chapter 3 and Annex B will be utilised to make an initial assessment of the likely risk to aircraft operations. Further advice may be sought from the Health Protection Agency and the Air Traffic Standards Division of the Safety Regulation Group at the CAA.

2 Lasers, Searchlights and Other Lights Used for Air Traffic Control Purposes

2.1 Several types of lasers, searchlights and other lights are used on or near airfields for ATC meteorological purposes or as a bird hazard control – these include cloud and visibility measurement, communications, and navigation aid calibration tasks. It is the responsibility of both the Aerodrome Licence Holder and the Air Navigation Service Provider to ensure that equipment used for such purposes, both on- or off-aerodrome, is operated in accordance with the manufacturer's instructions, international, national and local ATC procedures, and in a manner that will neither endanger any aircraft nor prejudice flight safety.

3 Use of Lasers by Military Units

3.1 The use of lasers by military units is widespread across all three Services. Lasers are commonly used for range finding, target designation and weapon guidance. This document does not cover the use of lasers, searchlights or other light sources by the military, because the MOD and their subordinate organisations produce separate regulations concerning the safe use of lasers by the military. However, such regulations do not absolve any person from using best judgement to ensure the safety of aircraft and aircrew while operating equipment employing lasers, searchlights or other light sources.

4 Further Contacts and Advice

4.1 Initial guidance and advice on the impact of light sources on aviation can be obtained from:

Off-Route Airspace Section
Directorate of Airspace Policy
CAA House
45-59 Kingsway
London
WC2B 6TE

Tel: 020 7453 6542
Fax: 020 7453 6565

4.2 Any questions concerning the military use of lasers, searchlights or other light sources should be addressed to:

Secretary, Military Laser Safety Committee
Defence Ordnance Safety Group
DE&S MOD
Abbey Wood
Birch 3a #4304
Bristol
BS34 8JH

Tel: 0117 91 35515

5 Laser Safety Guidance

Laser safety guidance can be obtained from the Health Protection Agency as follows: tel: 01235 831600; fax: 01235 833891; email: laser@hpa.org.uk.

Annex A Form DAP 1918 – Example

NOTIFICATION OF OUTDOOR LASER, SEARCHLIGHT, FIREWORK, HELIUM-FILLED TOY BALLOON OR SKY LANTERN EVENTS

Civil Aviation Authority

Please fill in the form on-line and submit it using the button at the foot of the page (on submission a copy of the form will be e-mailed to you).

Note: Fields marked with an * are mandatory. **CAA use only**

SECTION 1: APPLICANT DETAILS

*Name: ..... Job Title/Organisation: .....

*Address: .....

..... *Postcode: .....

*Tel. Number: ..... *E-mail: .....

SECTION 2: EVENT DETAILS (Note: 28 days' notice MUST be given of the event)

*Brief Description of Event: .....

*Date of Event: ..... Daily Period (in local time) *From: ..... *To: .....

If there are multiple events or testing prior to the event please give details below:

SECTION 3: LOCATION DETAILS

URL Link to Location on Webpage:

Ordinance Survey Grid Ref: ..... or, WGS84 Co-ord: Lat: ..... Long: .....

*Contact Telephone Number at Site: .....

*Site Address: .....

..... *Postcode: .....

Maximum Display Height: ..... AGL ft
(Fireworks only)
(For Toy Balloons and Sky Lanterns enter 'Unlimited'

SECTION 4: RELEASE DETAILS – TOY BALLOONS or SKY LANTERNS ONLY

(Note: Balloons must be made of Latex/Rubber, NOT metallic or with a metallic finish)

Quantity to be Released: ..... Method of Release: Batch ☐ Mass ☐ Individual ☐

If Batch selected, please indicate the number of occurrences: .....

SECTION 5: DECLARATION

By clicking Submit Form I, as the event organiser, declare that I have checked the above information and that to the best of my knowledge it is correct, and that I am aware of my obligations under the Air Navigation Order 2009.

Name: ..... Date: .....

Submit Form

Form DAP 1918 Issue 01 Page 1 of 1

Click here to access the on-line version of the form.

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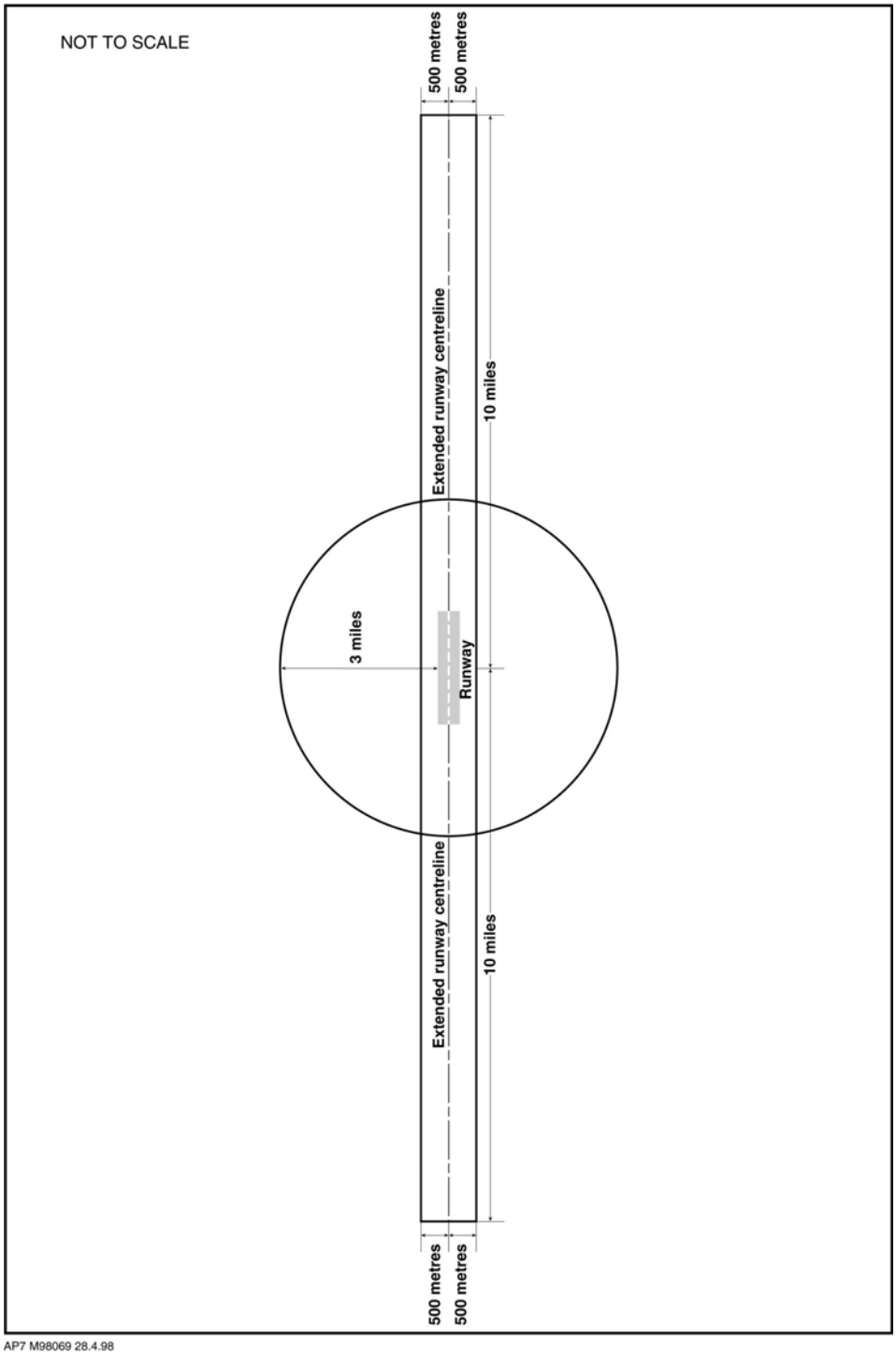
Annex B Notification Zones for Light and Firework Displays (Diagram)



(Note: miles = nautical miles)

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Annex C Reference Documents

The following documents contain further specific guidance on the risks, notification and conduct of Light Displays:

CAP 168 – Licensing of Aerodromes.

UKAIP ENR 5-3-2 Permanently Sited Lasers (available from www.ais.org.uk).

Eurocontrol Safety Regulation Commission Document – SRCDOC 7 (Outdoor Lasers in the Navigable Airspace) 2001 (available from www.eurocontrol.int).

ICAO Annex 11, Chapter 2 and Annex 14, Chapter 5.

ICAO document "Laser Protection at Aerodromes" (AN5/19.3-01/56).

ICAO document "Manual on Laser Emitters and Flight Safety" (Doc 9815).

UK HSE: HS(G)95 – "The Radiation Safety of Lasers Used for Display Purposes". (ISBN 0-7176-0691-0).

UK HSE: HS(G)123 – "Working Together on Firework Displays: Guide to Safety for Firework Display Organisers and Operators". (ISBN 071-7608352).

DIRECTIVE 2006/25/EC on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation).

PD IEC/TR 60825-3: 2008 "Safety of laser products – Part 3: Guidance for laser displays and shows" (available from BSI).

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