North Essex Astronomical Society

Laser Pointer Safety Policy

V1.0 5th November 2018

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Introduction & Purpose

When used safely, green laser pointers are an extremely useful tool for guiding an audience around the night sky and to point out objects. They are also useful as aiming devices for telescopes and cameras. When misused, laser pointers present serious risks of injury to the operator, other people, aircraft and vehicles. Individuals who misuse laser pointers face prosecution and personal injury claims.

North Essex Astronomical Society (hereafter referred to as “NEAS”) requires all members wishing to user laser devices (including green laser pointers) to read and abide by this policy at the Observatory, private events organised by NEAS and public events organised by or attended by NEAS (hereafter referred to as “NEAS Events”).

Misuse of laser pointers, either through dangerous behaviour or acting in a manner likely to bring the society in to disrepute will result in removal of your membership of NEAS as set out in the society’s constitution.

Laser Devices & The Law

Laser Misuse Act

The **Laser Misuse (Vehicles) Act 2018**[1] came into force on 10th May 2018, and makes it an offence for a person to shine a laser beam at a "mechanically propelled vehicle" which is moving or ready to move where the laser beam dazzles or distracts the person in control of the vehicle, or is likely to do so.

A vehicle may be an aircraft, a road vehicle, a train, a ship, a hovercraft, etc. It is also an offence to shine a laser beam at an air traffic facility, which may be a building or other structure used for air traffic services.

On conviction of an offence under the act, the person may be liable to imprisonment for up to five years, an unlimited fine or both. It is a defence to show that the person did not intend to shine the laser beam at the vehicle or facility and exercised all due diligence and took all reasonable precautions to avoid doing so.

Note that previously under the Air Navigation Order, similar provisions applied to when shining a laser beam at an aircraft, but this was on the basis of "strict liability", i.e. there was no defence even if the incident was not deliberate.

Personal Injury Law

The basic principle of personal injury law is that you should take all reasonable precautions to avoid causing foreseeable injury or harm to others. If you are found to have acted in a negligent manner, you may be liable to pay damages (compensation) to the injured party. As set out below, misuse of a laser device can cause injury to yourself and to others.

Whilst NEAS has public liability insurance to cover injury or harm caused to our members to the public and to other members, you are required to abide by this policy at all times. **Note that our insurance does not cover harm that you may cause to yourself, and therefore you acknowledge that your own use of laser devices is undertaken at your own risk.**

Criminal Law

If you deliberately or recklessly cause harm to others using a laser device, you may be subject to prosecution under criminal law.

If you abide by the requirements of this policy, you will be better placed to demonstrate that you did exercise due diligence, took all reasonable precautions and did not behave in a criminal or reckless manner.

[1] http://www.legislation.gov.uk/ukpga/2018/9/contents/enacted/data.htm

Potential Hazards To Yourself and To Others

Personal Injury Hazards

The most likely cause of personal injury due to improper use of a laser device is damage to the retina at the rear of the eye due to heating through absorption of the laser energy, though other hazards also exist for more powerful devices. Depending on the type, power output and duration of exposure to the laser beam, an individual may experience:

- Temporary flash blindness lasting seconds, minutes or hours with full recovery of affected vision. Clearly whilst the individual is affected by flash blindness, they are at risk of further injury through tripping, falling or loss of control of a vehicle.

- Partial or complete sight loss with an eventual recovery of some or all of the lost vision. Recovery may take weeks or months and there may be long-term ill-effects.

- Partial or complete sight loss from which no recovery is possible.

- Burns to the skin caused by exposure to the laser beam.

- Injuries from fires or explosions caused by the laser beam or malfunction/misuse of the laser device itself.

Note that exposure to the laser beam may be directly, by reflection from a surface such as a mirror or window or, in the case of the most powerful laser devices, by viewing the laser dot on a non-reflective surface. As there are no pain receptors in the retina, permanent damage can occur before the individual becomes aware of it.

In order to control these risks, laser devices are divided in to a number of classes as described below. It is important to realise that there is no such thing as an inherently “safe” laser device regardless of its classification:

- Class 1 laser devices may either be low powered, or they may be high powered but enclosed in order to prevent viewing of the laser beam. For example, a laser printer is a Class 1 device, but viewing the beam is often hazardous.

- Some classes of laser device are low risk when viewed with the naked eye, but become hazardous when viewed through an optical device such as a magnifier or a telescope which concentrates the energy in the eye.

- Some laser devices may not emit visible light and thus present a hazard which you cannot see.

Class 2, as well as some *Class IIIa* devices designed for use as consumer laser pointers, are considered low risk as the blink reflex means that anyone accidentally exposed to the laser beam will usually close their eye and look away within a quarter of a second before any permanent eye injury occurs.

Note that temporary flash blindness is still possible and that deliberately staring at the beam of a device Class 2 or Class IIIa device can cause injury to the retina, so these devices are only "safe" if used with care as set out below.

Flash Blindness, Distraction and Dazzle Hazards for Vehicles

Laser devices also present hazards to individuals in control of vehicles, e.g. pilots, drivers, air traffic controllers, etc.:

- Flash blindness may cause the individual to lose control of the vehicle by being unable to see where the vehicle is going or to see the instruments.
- Dazzle or glare reflecting off the windscreen may partially or completely block the individual's view, preventing them from seeing where the vehicle is going.
- Distraction may cause the individual to lose control of the vehicle at a critical moment by being much brighter than surrounding lights, e.g. when landing an aircraft.

The typical maximum distances at which these hazards occur will depend on the colour, power, and spread of the laser beam and weather conditions. For the classes of device permitted by NEAS the following are conservative estimates:

Hazard	**Estimated Maximum Distance for Class 2 / IIIa Green Laser Pointer**
Flash blindness	70 metres / 220 feet
Dazzle / Glare	300 metres / 1,000 feet
Distraction	3,000 metres / 10,000 feet

Note, these figures are provided for guidance when assessing risks at an observing location. There is no "safe" distance at which it is acceptable to aim a laser pointer at a vehicle.

Laser Classification by Risk of Personal Injury

Lasers devices should be marked using the IEC 60825 class labelling system shown in the left column. Some devices may still be marked with the older class labelling system, shown *in italics*.

Class	Permitted by NEAS	Safety Notes
Class 1 *Class I*	No	Not suitable as a laser pointer.
Class 1C	No	Not suitable as a laser pointer.
Class 1M	No	No consumer devices available. Not suitable as a laser pointer.
Class 2 *Class II*	Yes	Low risk for brief unintentional exposure to direct or reflected beam. **Caution: Do not intentionally stare into the beam.**
Class IIIa *Class 3a* *Aperture <= 7mm*	Yes	Low risk for brief unintentional exposure to direct or reflected beam. **Caution: Do not intentionally stare into the beam.** **Caution: Eye hazard for accidental exposure using optical devices such as loupes and magnifiers at less than 100mm from beam aperture for diverging beam type.**
Class IIIa *Class 3a* *Collimated Type with Aperture > 7mm*	No	No consumer devices available. Not suitable as a laser pointer. **Caution: Do not intentionally stare into the beam.** **Caution: Eye hazard for accidental exposure using optical devices such as binoculars and telescopes for collimated beam type with apertures greater than 7mm.**
Class 2M	No	No consumer devices available. Not suitable as a laser pointer.
Class 3R	No	Low risk for brief unintentional exposure to direct or reflected beam. **Caution: Do not intentionally stare into the beam.** **Caution: Eye hazard for prolonged intentional exposure to direct or reflected beam.**
Class 3B *Class IIIb* *Class 3b*	No	**Danger: Severe eye hazard for accidental exposure to direct or reflected beam**. **Caution: Eye hazard for prolonged viewing of laser dot on surface.** **Caution: Beam can burn skin and materials if exposed at close range for a short period**.
Class 4 *Class IV*	No	**Danger: Extreme eye hazard for accidental exposure to direct beam, reflected beam and laser dot on surface.** **Danger: Beam and scattered light can instantly burn skin and materials.**

Permitted Devices

All classes of laser device present a risk of personal injury if misused, including Class 2 and *Class IIIa / 3a* devices if an individual stares directly into the beam for an extended period by deliberately overcoming the blink reflex.

Class 2 (*Class II*) devices present a low risk of personal injury in normal use, even if a person directly views the beam briefly by accident. NEAS members are therefore permitted to use Class 2 laser pointers at NEAS Events.

Class IIIa / 3a devices designed for consumer use present a low risk of personal injury in normal use, even if a person directly views the beam by accident. NEAS members are therefore permitted to use *Class III / 3a* laser pointers at NEAS Events.

Note that collimated beam-type *Class IIIa / 3a* devices with apertures greater than 7mm are not permitted at NEAS events as some types will present an eye hazard if viewed through telescopes or binoculars. These are not intended to be used as consumer laser pointers in any event.

If you have a Class IIIa / 3a device, you must check its suitability with a committee member before using it at NEAS Events.

Prohibited Devices

No classes of device other than Class 2 (*Class II)* or *Class IIIa / 3a* devices designed for consumer use as laser pointers may be used at NEAS Events.

This prohibition includes devices which are not marked with a classification, devices where a member of the committee reasonably suspects the device is of a higher classification than marked and devices not intended for consumer use. This prohibition also includes devices which have been modified and those which have been salvaged or otherwise repurposed from their intended use.

Members should be aware that devices may be mis-labelled intentionally to evade import restrictions or due to poor quality control during manufacture. This is particularly the case for laser pointers bought online or overseas.

Members are expected to abide by the safe usage requirements set out in this document due to the risk of devices being mis-labelled and thus more hazardous than expected.

Permitted Users

Only adult members (18+) of the society are permitted to use laser devices at NEAS Events. Members will be asked to read this document and confirm their willingness to abide by it upon joining the society,

Prohibited Users

Where a member fails to abide by the requirements set out in this document, permission to use all laser devices may be withdrawn until the individual satisfies a designated member of the committee that they understand this document and will abide by its requirements.

In serious or repeated cases of misuse, permission to use laser devices may be withdrawn permanently, or the member may be removed from the society as per the constitution and the incident(s) may be reported to the police.

Record Keeping

The committee will keep a record of members who currently have permission to use laser devices withdrawn. This will be made available to committee members and other members responsible for organising and running events as required to enforce this policy.

Using Laser Pointers Safely

Assess the Location - Airports and Air Traffic

NEAS events are conducted in an area surrounded by busy airspace which greatly increases the risk of inadvertently shining a laser pointer at an aircraft:

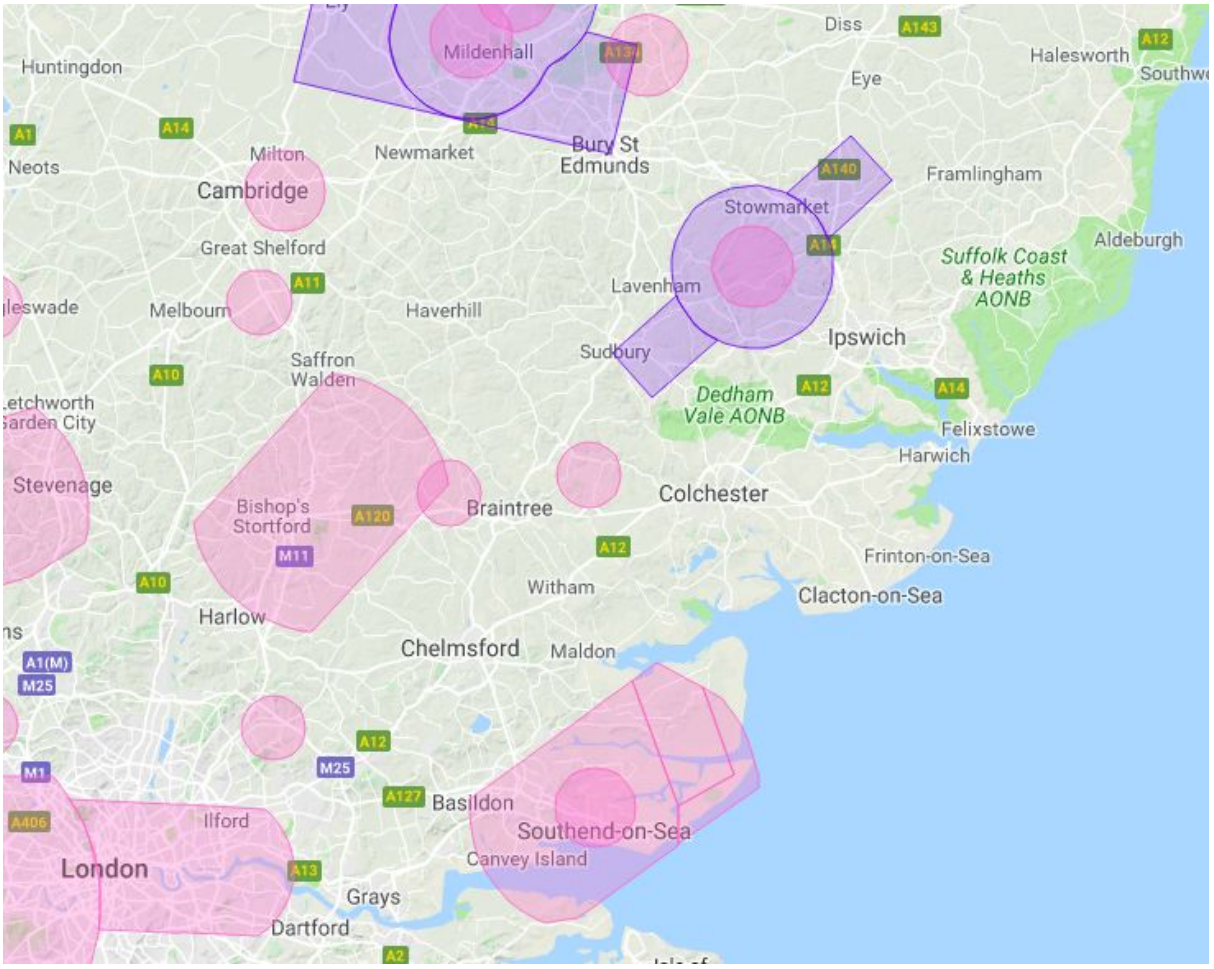
- You should consider the location of any nearby airports and aerodromes which may be active after dark.

- Both the Observatory and outreach events held at Great Notley Country Park are frequently overflown or within easy sight of aircraft taking off and landing at Stansted Airport. Members and the public frequently mistake landing lights for low lying planets or the International Space Station, so an abundance of caution is required.

- Outreach events held at Abberton Reservoir are within a popular “free flight” zone used by low flying light aircraft including night flying. It is also close to military firing ranges with frequent overflights by low-flying military helicopters at night. A number of busy flight paths also pass directly overhead.

- Any location within Essex and the surrounds may be overflown by civilian, emergency services and military helicopters, often at low altitude.

It is a specific offence to aim a laser pointer in to the sky within an Airport Notification Zone unless the Civil Aviation Authority has been notified. Therefore, no laser pointers may be used at NEAS events which are held within the coloured areas marked on the map below. For an interactive map covering the whole UK, see https://notaminfo.com/ukmap (ensure that "ATZ", "CTR/CTZ" and "MATZ" are all ticked under the "Airspace Details" section).



Prohibited Laser Pointer Zones

For the avoidance of doubt, the Observatory, Great Notley Country Park and Abberton Reservoir are outside the prohibited zones.

Assess the Location - Roads, Railways and Ground Traffic

NEAS events are conducted in areas surrounded by roads and to lesser extent railways and the open sea. Members and the public will usually arrive at NEAS events by car:

- You should consider the location of all nearby sources of ground traffic, including public car parks. This is particularly important for locations which are close to hills or other high ground due to the risk of inadvertently shining a laser at a vehicle on the hill.

- Outreach events at Great Notley Country Park have a limited view of the A131 nearby to the West and on slightly higher ground than the observing location. Care should be taken when shining laser pointers in this direction.

- Outreach events at Abberton Reservoir have an extensive view of the B1026 to the West and South. Particular care should be taken to the South due to vehicles cresting the hill before coming on to the reservoir causeway.

- At the Observatory, there are limited views of the minor roads across fields to the West.

Assess the Location - Other Hazards

You should consider any other location-specific hazards prior to using a laser pointer at a NEAS event:

- Is there any risk of inadvertently shining a laser pointer at the public or another member? Consider pathways, the direction of approach of other people and your proximity to others. E.g. At busy outreach events, people may unexpectedly wander in front of you. At Great Notley, there is a high bank close to the observing site which people often climb.

- Are there any buildings nearby? Laser beams reflect readily off windows and other shiny surfaces with unpredictable results, and the occupants will not be pleased if lasers enter the property or illuminate the windows.

- Are there any domesticated or wild animals nearby, including birds in trees? Animals can have their vision affected by lasers in the same way as people. E.g. The Observatory frequently has cows in the adjacent field and these might be spooked by a laser aimed at them.

Aiming the Laser Pointer Safely

1. Look and listen for aircraft every time you use the laser pointer. Never aim the laser pointer within 45 degrees of any aircraft. If an aircraft is heard but not seen, wait until you have located it visually before using a laser pointer.

2. Always hold the switched-off laser pointer with your outstretched arm above head height to minimise the risk of hitting a person with the beam.

3. If presenting to a group, point the laser away from the group and any telescopes. Move to a different position to achieve this if necessary.

4. Before switching on, look along your arm to see where you are aiming and check for any hazards, including people, windows, vehicles and other aircraft.

5. Switch on the laser pointer whilst close to the intended target. Switch off before moving on to the next target or putting the laser pointer away. Do not sweep the laser across the sky and do not become distracted by questions from others.

6. Do not aim a laser pointer below 20 degrees above the horizon.

7. Do not aim a laser pointer at a moving object such as the ISS or a satellite. Be sure that you have identified your target before pointing and do not do so if in any doubt. Slowly sweep the laser in a circle around the object rather than pointing at it.

8. If using a laser pointer to aim a telescope or camera, look along the laser pointer to check where it is aiming before switching on. Switch off the laser pointer before looking through the telescope.

9. Aim high and move the telescope downwards slowly to the target. Do not sweep the telescope horizontally at low elevations.

Other Dos and Don’ts

- Store laser pointers securely where they cannot be accessed by children. Remove the batteries when not using the pointer.

- Use a laser pointer with a momentary switch whenever possible, i.e. one that switches off immediately the switch is released.

- Never point a laser beam at any person, animal, vehicle or building.

- Never look directly into the laser beam or allow others to do so.

- Do not allow children to use laser pointers even if under the supervision of an adult.

- Do not use laser pointers as toys, including ‘sword fighting’ or other games.

- If you observe another member using a laser pointer inappropriately at a NEAS event, you should report it to the event organiser or a member of the committee immediately.

Public Events & Outreach

Whilst green laser pointers are extremely useful at public events, extra care is required:

- All members attending public events are expected to set a good example and demonstrate the highest standards of behaviour, including the responsible use of laser pointers.

- Do not permit members of the public (adults or children) to use your laser pointer or one belonging to NEAS under any circumstances.

- Members of the public are not permitted to bring their own laser pointers or use them at NEAS events. This will be stated on all event information.

- If a member of the public is seen using a laser pointer, you must report it to the event organiser or a member of the committee immediately.

- If you observe another member using a laser pointer inappropriately at a public event, you should report it to the event organiser or a member of the committee immediately.

- Where a member of the public alleges that a member of NEAS or another member of the public is using a laser pointer inappropriately, you must report it to the event organiser or a member of the committee immediately.

- The event organiser or committee member will ensure that any unauthorised device is returned to the owner's vehicle or that the individual misusing a device is ejected from the event as necessary. Where reckless or criminal behaviour is seen, this should be reported to the police if appropriate.

- Do not leave laser pointer unattended. Keep them on your person at all times or locked securely in a vehicle or equipment box when not in use.

- Where a laser pointer is attached to a telescope or camera, do not leave it unattended unless you have removed the batteries.

- Children will find green lasers particularly exciting. Do not allow a child to put their hand in the laser beam and impress upon them (and their parents) that it is not a toy.

- You may be asked where to obtain a laser pointer by a member of the public. State that you do not know and do not engage in further discussion on the matter.