

STAR 012

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**The effects of laser attacks on
aircraft**

Introduction

The deliberate targeting of pilots with a laser to distract their safe operation of the aircraft is of escalating concern to the aviation industry and law enforcement agencies worldwide. From negligible numbers of incidents in the years 2001-2004 (<5 reported per country per annum), 2010 saw 2,836 reported by the FAA and 1,494 by the UK CAA with France, Australia, Canada and the Middle East also reporting numerous incidents. The problem has become more pronounced, despite national restrictions of availability of more powerful classes, with the relatively easy ability to obtain them via the Internet. Currently no State has classified laser devices as offensive weapons, therefore possession is not an offence, although the UK has provisions in the Air Navigation Order (Articles 222 and 137) which make it possible for the Police to make charges against anyone caught shining a laser at an aircraft in flight.

Effects of Lasers

Aircraft are particularly vulnerable during critical phases of flight, such as take-off and landing, when pilots apply maximum concentration. Any distraction to a pilot's attention during these phases is dangerous, introducing an intense light into a darkened flight deck is extremely hazardous. A laser beam can refract through tiny abrasions on the exterior of the cockpit windscreen and thereby illuminate the entire flight deck. Temporary loss of vision is one of the commonest effects of lasers but they can also impair sight by glare, flash blindness, blind spots or after-images. An aircraft on final approach at 1,000ft has about one minute before it reaches the runway threshold and touches down. A laser attack can blind a pilot for up to 10 seconds followed by over one minute of impaired vision. Glare, a temporary disruption in vision caused by a bright light within the field of vision, lasts as long as the light exposure. In flash blindness, the temporary loss of vision persists after the source of illumination has been removed. Blind spots effect only part of the visual field. After-image is an image that remains in the visual field after exposure to a bright light.

Lasers can be classified in five different classes according to their ability to damage eye or skin:

- Class I: Power level <0.39mW. No capability for eye or skin damage (usually red, uses – CD Players, Laser printers).
- Class II: Power level <1mW. Safe for momentary exposure but more than 10 seconds may cause eye damage. No skin damage. Usually red, used in some laser pointers.
- Class IIIa: Power level <5mW. Safe for momentary exposure but more than 10 seconds may cause eye damage. No skin damage. Generally emit a green light, used in most laser pointers.
- Class IIIb: Power level <500mW. Momentary exposure can cause eye damage. No skin damage. Usually green and used in astronomy.
- Class IV: Power level >500nW. May cause eye and skin damage even from reflected laser beams. Most outdoor, military and industrial lasers belong in this category. Not easy to obtain.

A 5mW laser pointer can easily cause glare and distract pilots up to 3700ft and a safe distance is considered to be 11,700ft, under 250ft can cause flash blindness.



Recommended actions in the event of laser illumination

- Look away from laser beam and shield your eyes if possible.
- Determine if other crew members are also exposed, If not, consider handing over control of the aircraft to the non-exposed crewmember.
- If appropriate, engage the autopilot.
- Turn up the cockpit lights to minimize any further illumination effects.
- Inform ATC.
- Avoid rubbing the eyes (risk of corneal abrasion).
- Fill in an Air Safety Report (ASR) and Mandatory Occurrence Report (MoR), as required.
- If any visual symptoms persist after landing, get an ophthalmologic examination.

Conclusions

Most of the lasers used in illumination seem to have been ordinary handheld laser pointers. Because it is very hard for the perpetrator to acquire to and maintain steady illumination of a moving target, in the cockpit the illumination will appear as a series of flashes. Fortunately, the risk of permanent damage to the eye is very small, however, when it occurs at low altitude it can be extremely dangerous because of the glare, flash blindness and after-images. Crews should therefore be aware of the threat and consider how they will react in the event that they are targeted.

References

UK CAA Laser attacks on aircraft; a short briefing January 2011.

IFALPA Medical Briefing Leaflet 'The effects of laser illumination of aircraft' February 2009.

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