



# RPA Information Sheet

Reference: RPA/INF/032  
Date of Issue: 26 April 2002

The University of Leeds  
Leeds LS2 9JT  
Telephone: 0113 34 43203

[www.leeds.ac.uk/rps](http://www.leeds.ac.uk/rps)

## RADIO-LUMINESCENT CLOCKS AND DIALS HISTORICAL AEROPLANE EXHIBITS

---

### INTRODUCTION

Until the early 1960's it used to be common practice for aeroplane manufacturers to fit radio-luminescent clocks and dials to aircraft to enable crucial instruments to be clearly visible in darkness and under adverse weather conditions. Typically, it is the alpha-numericals, indicator points and the hands of the radio-luminescent dials that are painted with the radioactive material thorium.

The practice of painting dials with radioactive thorium diminished as a result of the realisation that painting the dials gave rise to amongst radio-luminising<sup>1</sup> industry workers. Latterly the development of new luminising techniques and the evolution of health, safety and environmental legislation brought the use of radioactive materials in clocks and dials to a close.

### RADIO-LUMINISING DIALS IN PUBLIC EXHIBITS

It is a concern to organisations that display or permit access to historical exhibits such as aeroplanes and military vehicles that custodians and members of the public do not become exposed to harmful doses of radiation.

However, although there are measurable radiation dose rates in close proximity (a few centimetres) to the dial faces, then providing a few simple health and safety precautions are followed then there should be no health and safety concerns for custodians or members of the

---

<sup>1</sup> It was the practice amongst 'radio-luminising painters' to lick their paint brushes to a fine point prior to dipping into the radium paint and painting the material onto the dials. This caused the radioactive radium to build up in the mouth and throat of the painters who then succumbed to fatal cancers.



public. The level of risk (or danger) arising from the radio-luminescent dials is determined by a process called **risk assessment**, and the safety precautions that should be followed are called **local rules**.

## RISK ASSESSMENT

### Radiation Exposure

The maximum levels of radiation emitted by the types of radio-luminescent dials<sup>2</sup> commonly fitted to historical aircraft are unlikely to be greater than 50 microsieverts per hour, and these levels would only be found at the surface of the dial. At a distance of 0.5 metres, which is the closest a visitor is likely to get, the radiation will have spread out<sup>3</sup> and the levels will be less than 10 microsieverts per hour.

If a visitor stood for two or three hours at a distance of 0.5 metres from a radioactive dial, they would receive the same radiation dose they would get by flying to Spain on holiday<sup>4</sup>. Or, to look at this another way: the average **natural background**<sup>5</sup> radiation dose received by members of the public in the United Kingdom is 2000 microsieverts each year - therefore the radiation dose received as a result of standing next to a radioactive dial for two hours is 1% of the natural background dose.

### Assessment of Risk

In normal use, providing that

- the radio-luminescent dial remains encased within the manufacturers casing,
- the manufacturers casing is intact and in good condition, and,
- the dial is fixed to the instrument panel,

there is **no risk** of exposure to dangerous levels of radiation.

If the dial 'glass' or casing becomes broken or damaged in any way, or stolen, then there is the

---

<sup>2</sup> Not all dials contain luminescent radioactive materials. It is usually the plane compasses, fuel, oxygen, pressure and engine temperature gauges that are radio-luminescent.

<sup>3</sup> The technical term by which radiation (and light) spreads out is the 'inverse square law'.

<sup>4</sup> This radiation exposure is due to cosmic radiation falling onto Earth from space.

<sup>5</sup> Natural background radiation comes from cosmic radiation, radioactive fallout from the burning of fossil fuels, natural radioactivity in food, natural radiation from the sea, and the occasional x-ray (averaged over a number of years).



possibility that radioactive contents may leak and present a serious radiation hazard.

## LOCAL RULES

The local rules are basic safety instructions prepared in compliance with the requirements of the Ionising Radiations Regulations 1999. Employees, custodians, visitors and members of the public must comply with the requirements of these local rules at all times.

### ***Safety Contact***

In the event of any emergency, accident or incident involving the radio-luminising dials the following persons must be contacted immediately.

Contact	Title/responsibility	Telephone number

### ***Radiation Protection Adviser***

In the event of a radiation incident the safety contact should contact the organisations appointed Radiation Protection Adviser.

**Radiation Protection Adviser (RPA)**

**Dr Ian K Haslam**

**Mobile: 07939 032915**

**e-mail: [i.k.haslam@leeds.ac.uk](mailto:i.k.haslam@leeds.ac.uk)**



### ***Safety Instructions***

- Custodians and members of the public should avoid touching the dials.
- The radio-luminescent dials should not be interfered or tampered with in such a way that would cause them to sustain damage.
- The dials must remain in their proper place in the exhibit unless they need to be removed for repair or other safety reasons. In this event the dials must be stored in a safe and secure place; the advice of the RPA should be sought in advance.
- If any dial becomes damaged or loosened from its mounting the plane should be closed and the advice of the safety contact and the RPA sought.
- The owners of the aircraft (and thereby of the dials) should ensure that the dials are checked at regular intervals to ensure that they are present and in good condition. Regular intervals should be taken to mean daily when the public have access and monthly at other times. The results of the monthly checks should be entered into a logbook that must be kept in an appropriate location (preferably on site).
- The dials must not be disposed, sold or passed on to a third party without prior consultation with the safety contacts and the RPA.
- Should any dial become lost, the safety contacts, the RPA and the police must be informed immediately.

