

## LEAFLET 19

**GASEOUS TRITIUM LIGHT SOURCES (GTLs) AND  
GASEOUS TRITIUM LIGHT DEVICES (GTLDs)**

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**SCOPE**

1 A gaseous tritium light source (GTLs) is a sealed glass container filled with radioactive tritium gas. GTLSs may be referred to as betalights, trilux or nuclear lamps and are used to provide illumination.

2 A gaseous tritium light device (GTLd) is equipment containing one or more GTLS. There are many types of GTLDs in service use, including prismatic compasses, defile markers and SUSAT weapon sights.

3 This Leaflet describes the radiological requirements for keeping, using and disposing of such equipments. Summaries of the radiation risk and regulatory requirements for examples of GTLSs and GTLDs are provided at the Annexes to this leaflet. Summary risk assessments for a comprehensive range of GTLSs and GTLDs are available from the RPA who may also be consulted for further advice regarding the hazards and requirements for these items.

## WHAT IS A GTLS?

4 A GTLS is a glass capsule coated internally with a phosphor and filled with tritium gas, a radioactive isotope of hydrogen. Low energy beta particles, which are emitted during the radioactive decay of tritium, react with the phosphor to produce a continuous emission of light. If a capsule is broken, the escape of tritium could result in a health risk, particularly if the breakage occurs in a confined space. When a GTLS is broken, provided that the area is reasonably well ventilated, the tritium gas will disperse relatively quickly, however some activity will remain bonded to the phosphor and shards. The sources also contain small quantities of tritiated water, which also tend to remain associated with the phosphor and fragments of glass for a considerable time following breakage.

## STATUTORY REQUIREMENTS AND PARALLEL ARRANGEMENTS

5 In addition to the general requirements of the Health and Safety at Work etc Act 1974 and the Management of Health and Safety at Work Regulations 1999, the following specific legislation applies directly or is applied indirectly through parallel arrangements designed to achieve equivalent standards:

- Ionising Radiations Regulations 1999 (IRR99) (apply directly);
- Radioactive Substances Act 1993 (RSA93) (parallel arrangements);
- Radioactive Substances (Gaseous Tritium Light Devices) Exemption Order 1985 (parallel arrangements);
- Carriage of Dangerous Goods and Transportable Pressure Equipment Regulations 2007 (apply directly).

## DUTIES

### Commanding Officer and Head of Establishment (CO/HoE)

6 The CO/HoE has a duty to the Secretary of State, and a personal responsibility, to protect the environment and secure the health, safety and welfare of their staff at work. The CO/HoE is also required to protect persons not in MOD employment (e.g. members of the public) against risks to their health and safety arising from the MOD work activities. This includes radiation safety. The CO/HoE's authority (but not responsibility) for radiation safety management arrangements may be delegated to appropriate personnel, such as a Radiation Safety Officer (RSO).

### Radiation Safety Officer (RSO)

7 The Radiation Safety Officer (RSO) is to ensure that:

- They are familiar with the specific radiation hazards at their unit or establishment and that an appropriate risk assessment has been carried out;
- Local orders include the requirements for keeping, using and disposing of GTLSs or GTLDs containing radioactive material as detailed in this Leaflet;
- Staff are appointed, instructed and trained in their duties relating to this Leaflet;
- The requirements stemming from this Leaflet are subject to audit.

### Radiation Protection Supervisor (RPS)

8 Where an RPS is appointed, they are to ensure that work is carried out in accordance with the local orders for radiation safety which are to include the requirements of this Leaflet. Further information on the requirements for appointment of an RPS is given in Table 2.

**Workplace Supervisor (Radioactive Materials) (WPS) (RAM)**

9 In units holding GTLSs or GTLDs but where it is unnecessary to appoint an RPS, a WPS (RAM) is to be appointed with duties to ensure that work is carried out in accordance with the local orders for radiation safety which are to include the requirements of this Leaflet.

**Employees**

10 It is the responsibility of all employees to ensure that they are familiar with the relevant parts of local orders to ensure that these items are handled safely and correctly. Any incidents are to be reported to the appropriate supervisor or line manager.

**CLASSIFICATION OF GTLSs OR GTLDs**

11 In accordance with the Radioactive Substances (Gaseous Tritium Light Devices) Exemption Order 1985, certain GTLSs or GTLDs may be classified as Class A, Class B or Class C articles. The classification dictates the conditions under which holdings of such articles, and the arrangements for accumulation and disposal of such articles as waste are exempt from specific requirements of the RSA93.

12 A GTLS or GTLD, the activity of which does not exceed 20 GBq, is a Class A article.

13 A GTLS or GTLD is a class B article where each GTLS comprising the article has an activity not exceeding 80 GBq and the total activity of the article does not exceed 1 TBq.

14 A GTLS or GTLD is a Class C article when installed, or awaiting installation, in:

- A vessel or aircraft;
- A vehicle or equipment used or intended for use by the armed forces of the Crown.

15 The majority of GTLSs and GTLDs held at MOD establishments are Class A articles, exempt from registration from Section 1 of the RSA93 provided the total activity of all such articles on the premises does not exceed 5 TBq. Where an establishment holds GTLSs and GTLDs which are not Class A articles, RPA advice is to be sought regarding the classification adopted and the requirements for registration under RSA93. Additionally, RPA advice is to be sought prior to disposal of any GTLS or GTLD, whether of Class A, B or C.

**MARKINGS OF GTLSs OR GTLDs**

16 The following markings may be found on GTLSs or GTLDs.

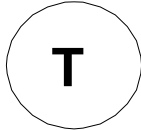


Figure 1 Tritium marking.

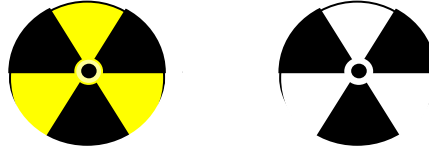


Figure 2 Standard radiation trefoil radioactive valves. Colour of symbol: black on yellow or white background.

17 Where possible GTLSs and GTLDs in storage are to be kept in their original containers or packaging and are to be marked with the following information:

- NATO stock number;
- Number of GTLSs/GTLDs in package;
- Total activity of GTLSs/GTLDs in package;
- The word 'radioactive' and the trefoil symbol.

**HAZARDS**

Table 1 Hazards associated with GTLSs and GTLDs

Radiation type		Emitted	Comments
Alpha		✘	
Beta	Direct	✓	Low energy beta radiation is emitted from GTLSs and GTLDs, but the energy of the beta is insufficient to penetrate beyond the casing. Tritium can present a hazard internal to the body if taken in by ingestion, inhalation, or absorption through the skin or through cuts in the skin. Of the two forms of tritium, tritiated water presents the far greater health hazard due to its more significant ability to enter the body both by inhalation and by rapid absorption through the skin.
	Bremsstrahlung	✓	Low levels of Bremsstrahlung radiation (X-rays) are emitted from valves containing beta emitters.
Gamma		✘	
X-rays		✘	
Neutrons		✘	

**TRITIUM MONITORING AND DETECTION**

18 Monitoring the radiation dose rate from a GTLS or GTLD is very difficult due to the very low energy beta radiation emitted and will therefore record a level significantly less than  $1 \mu\text{Sv h}^{-1}$ . Similarly, it is very difficult to detect tritium contamination without the use of specialised monitoring instrumentation. Tritium surveys are therefore generally carried out by indirect means involving the taking and analysis of smears of the surfaces to be monitored.

19 It is also difficult to monitor for tritium in the air and thus assess the internal hazard following a release of tritium into the atmosphere. Therefore, for workers who have potentially been exposed to tritium, it may be necessary to carry out tritium-in-urine monitoring to assess the amount of tritium taken into the body and the resulting radiation dose.

### RISK ASSESSMENTS FOR GTLSs AND GTLDs

20 The number of GTLSs and GTLDs in service within MOD is too large to list in this publication. Similarly, it is not possible to include risk data for all items. However, summary risk assessments for an example are reproduced at Annexes A to C of this Leaflet. These summary risk assessments may be used to scope the hazard and control requirements for a wider range of GTLSs and GTLDs and may be used, where appropriate, as input to the risk assessments and local orders required in accordance with Leaflets 2 and 16 respectively. Specific risk assessments would be required where large quantities (> 5000 GBq) of GTLSs and GTLDs are stored. Advice on further detail and assessments may be sought from the RPA.

### HANDLING OF GTLSs AND GTLDs

21 No protective clothing is required for the routine handling of GTLSs and GTLDs. Specific advice for those involved in repairing GTLSs or GTLDs is given in Annex D.

### BREAKAGE OF GTLSs AND GTLDs

22 All reasonable practical steps are to be taken to prevent any GTLS or GTLD being damaged, lost or stolen. Wherever there are reasonable grounds for believing that such an item is damaged, lost or stolen the incident is to be reported in accordance with the procedures detailed in Leaflet 14 and further actions, as detailed below, should be followed.

23 A broken GTLS or GTLD is potentially hazardous because loose radioactive material can enter the body by a variety of means including inhalation of gaseous material (if present), inhalation of radioactive dust and absorption through cuts or scratches in the skin.

24 Because GTLSs and GTLDs contain gaseous tritium (H-3), it is important that the room or compartment where the breakage has occurred is vacated for 1 hour to ventilate before dealing with the broken fragments wearing suitable personal protective equipment. Detailed guidance on the procedure for dealing with a broken GTLS or GTLD can be found in Leaflet 40.

### LEGAL AND MOD MANDATORY REQUIREMENTS

25 Table 2 below summarises the legal and MOD mandatory requirements for GTLSs and GTLDs. In cases of doubt, the RPA is to be consulted for advice.

Table 2 Legal and MOD mandatory requirements for GTLSs and GTLDs

Requirement	Applicable	Comments	Related Leaflet*
HSE authorisation	✗		
HSE notification	✓	The HSE is to be notified in accordance with Leaflet 3, if there are any GTLSs or GTLDs on the site having a cumulative activity of greater than 1GBq.	3
EA notification**	✗	Holdings of any number of Class C articles are exempt from notification to the Environment Agency under the Radioactive Substances (Gaseous Tritium Light Devices) Exemption Order 1985.	

Requirement	Applicable	Comments	Related Leaflet*
Risk assessment	✓	See summaries at annexes to this leaflet. Further specific risk assessments or prior risk assessments may be required, especially where large quantities (> 5000 GBq) are stored. (see Leaflet 2).	2
Restriction of exposure	✓	Observe manufacturer's instruction and guidance. Also, see Leaflet 4.	4
PPE	✗	Not required except when dealing with a breakage (see Leaflet 40).	
Maintenance of radiation engineering controls	✗ (but see comment)	For very large quantities (> 5000 GBq) of GTLSs or GTLDs it may be appropriate to ventilate the storage areas, depending on the outcome of the risk assessment. These ventilation systems are to be maintained on a regular basis in accordance with manufacturer's instructions.	
Contingency plans	✓	See Leaflet 40 breakage and fire	40
Designated areas	✗ (but see comment)	The presence of GTLSs and GTLDs in equipment does not usually, lead to a requirement for area designation. Stores holding quantities of electronic GTLSs or GTLDs may require designation if they meet the criteria detailed in Leaflet 4. Note: small stores which people cannot enter (e.g. drawers or cupboards) do not require designation but must be appropriately marked.	
Monitoring	✗ (but see comment)	Indirect monitoring may be required in areas where maintenance or repair on GTLSs or GTLDs is carried out.	
Training for users	✓	Information and instruction only.	15
Local orders	✓	See Leaflet 16 for guidance.	16
Appointed person	✓	RPS not required except for storage areas required to be designated as controlled or supervised. Where an RPS is not required, a WPS (RAM) needs to be appointed in accordance with Leaflet 15.	15
Storage	✓	In a segregated secure store/container/cupboard marked with radiation trefoil warning sign and stored in accordance with Leaflet 9. May require ventilation for large quantities (> 5000 GBq) depending on outcome of risk assessment. GTLSs and GTLDs are not to be removed from their cartons until required.	9
Accounting	✓	Recorded on a source list (retained for 2 years) and mustered in accordance with Leaflet 9. Recorded on Dstl Annual Holdings Return, copy retained for 1 year.	9
Leak testing	✗	Leak testing is not appropriate for GTLSs or GTLDs.	
Personal dosimetry	✗		

Table 2 Legal and MOD mandatory requirements for GTLSs and GTLDs (continued)

Requirement	Applicable	Comments	Related Leaflet*
Reporting procedures	✓	All losses and certain other incidents require to be reported to MOD authorities. Reporting to external regulatory authorities may also be required. See Leaflet 14 for details.	14
Transport	✓	Items and bulk quantities may generally be transported as Excepted Packages provided that the activity per GTLS does not exceed 800 GBq and the total activity per package does not exceed 8000 GBq as detailed in JSP 800 Vol. 4b (road, rail, sea) or JSP 800 Vol. 4a (air).	JSP 800 Vol. 4a & 4b
Marking	✓	All GTLSs, GTLDs, equipment stores and containers are to be marked appropriately in accordance with this leaflet.	-
Sale/transfer	✓	See Leaflet 11	11
Disposal of redundant items	✓	<p>Unbroken GTLSs and GTLDs should be returned via stores.</p> <p>Broken GTLSs should be placed in a suitable container (e.g. a paint tin) following the approved cleanup procedure. In the UK the disposal of the tin, GTLS fragments, cloths, gloves etc, is into a normal refuse route, provided the activity of the item is not greater than 20 GBq and not more than 1 item is disposed of in any 0.1m<sup>3</sup> of non-radioactive waste. The disposal container should have all markings that indicate the presence of radioactive material removed. Disposal must not be to a tip on the establishment site. Overseas, broken GTLSs are to be returned via stores.</p> <p>Where surplus MOD stocks are sold at auction, it is particularly important that sales items are checked for the presence of radioactive materials, including GTLSs.</p> <p>Further advice may be sought from the RPA as necessary.</p> <p>Records following a stores return are to be kept for 2 years and following a disposal indefinitely. Leaflets 11 and 12 also refer.</p>	12

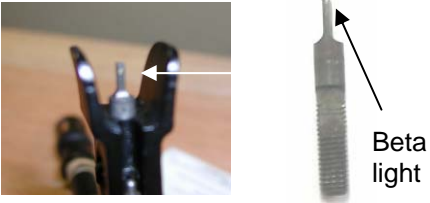
\*JSP 392, unless otherwise stated

\*\*Environment Agency (EA) for England and Wales, Scottish Environment Protection Agency (SEPA) for Scotland and Environment and Heritage Service for Northern Ireland (EHSNI).

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## LEAFLET 19 ANNEX A




## SA80 BLADE SIGHT ASSEMBLY – EXAMPLE OF A SUMMARY RADIATION RISK ASSESSMENT

<b>SA80 Blade Sight Assembly B4</b>	
<b>Description</b>	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>The GTLS aperture is about the size of a pinhead seen at the rear of the blade near the top. The whole sight containing the Blade 1005-99-967-0508 is 1005-99-967-0506 * Note Cadet Version 1005-99-967-4839 does not contain GTLS.</p> </div> </div> <p>Equipment carries no manufacturer "T" or trefoil warning symbol</p>
<b>Use</b>	Sight illumination (Gaseous Tritium Light Source).
<b>Supplier</b>	British Aerospace.
<b>NSN</b>	1005-99-967-0508.
<b>IPT Details</b>	Combat Support.
<b>Radionuclide</b>	Tritium (H-3)
<b>Ionising Radiation</b>	Beta (0.019 MeV).
<b>Half Life</b>	12.3 years.
<b>Original Activity</b>	259 MBq.
<b>Classification</b>	This component is Class C under the GTLD Exemption Order 1985 SI 1047 – Installed/awaiting installation in armed forces vessels, aircraft, vehicles or equipment. This has implications for the legal licensing of the holder of the source in terms of use, storage and disposal, which are briefly outlined below. Your RPA is to be contacted if further information is required.
<b>Hazard</b>	Tritium is a form of Hydrogen and in GTLSs and GTLDs in the form of gas. If destroyed in a fire, the tritium is rapidly converted to tritiated water. The escape of tritium could result in a health risk particularly in a confined space. Of the two forms of tritium, tritiated water presents the greater hazard due to its ability to enter the body both by inhalation and rapid absorption through the skin. Radiation levels on contact $<0.1 \mu\text{Sv h}^{-1}$ .
<b>Risk Assessment</b>	All components with tritium in them leak. The degree of risk from tritium leaking out of this component is negligible. The likelihood of accidental damage to this component to such a degree that tritium escapes is low. A more severe accident, for example, crushing, could possibly result in the release of tritium. Internal dose will be dependent on the duration of exposure and concentration of tritium. An adult in a $30\text{m}^3$ room breathing an atmosphere with 259 MBq of tritium dispersed in it for an hour could receive an internal dose of around $7 \mu\text{Sv}$ . (DRPS Report 289/2004 dated 10/12/04).

<b>Local orders</b>	Details of the control measures taken from this leaflet are to be included in the local orders for radiation safety (Leaflet 16 refers).
<b>Control measures during use</b>	No protective clothing or special precautions required.
<b>Inspection</b>	Annually as well as during routine maintenance. Check to be made for signs of damage.
<b>Leak Testing</b>	Leak testing is not required for this component.
<b>Accounting</b>	This item is to be accounted for on a Radioactive Source List. Leaflet 9 refers. All radioactive material is to be mustered monthly. Any change of location is to be entered in the Source Movement Log together with any change in custodian.
<b>Radioactive Substances Act 1993</b>	Although exempt from formal RSA93 notification to the relevant environment agencies, this item is to be included in the Annual Holdings Return to Dstl – Leaflet 3 refers.
<b>Storage and Labelling</b>	If uninstalled, this item is to be stored in a dedicated area for radioactive materials – see Leaflet 9. The equipment is to display the recognised radioactive valve warning label on it. The storage/installed area is also to have a sign showing radioactive material within i.e. a radiation warning trefoil including the contact name and telephone number of the RPS or WPS and stating the nature of the radiological hazard in appropriate languages “ <b>Items contain radioactive material. No radiation hazard from intact item. Radioactive contamination hazard if item is damaged.</b> ”
<b>Contingency Plans Spills/ Loss</b>	If a breakage occurs the area is to be evacuated and ventilated. Tritium gas will disperse relatively quickly; however some may remain bonded to the component. Once a suitable amount of ventilation time (one hour) has passed, the broken item can be cleaned up using a breakage kit, see Leaflet 40. See below for disposal; if in doubt, seek RPA advice. Reporting of loss and certain other incidents is to be carried out in accordance with procedures described in Leaflet 14.
<b>Transport</b>	This item may be transported within an excepted package provided the total package activity does not exceed 8000GBq.
<b>Disposal</b>	Units and Establishments are to return this item, unbroken, through the stores organisation. Broken items are to be disposed of in accordance with Leaflets 12 and 40.

## LEAFLET 19 ANNEX B



## SUSAT SIGHT LIGHT ASSEMBLY – EXAMPLE OF A SUMMARY RADIATION RISK ASSESSMENT

<b>SUSAT Sight Light Assembly B4</b>	
<b>Description</b>	<div style="display: flex; align-items: center; justify-content: space-around;">    </div> <p style="text-align: center;">SUSAT Sight      GTLS      Equipment marked with trefoil</p> <p>The GTLS light assembly 1240-99-967-0477 is a rod, which is screwed into the Susat sight 1240-99-967-0947 for internal illumination.</p>
<b>Use</b>	Sight internal illumination (Gaseous Tritium Light Device).
<b>Supplier</b>	RO Notts.
<b>NSN</b>	1240-99-967-0477
<b>IPT Details</b>	Combat Support.
<b>Radionuclide</b>	Tritium (H-3)
<b>Ionising Radiation</b>	Beta (0.019 MeV)
<b>Half Life</b>	12.3 years.
<b>Original Activity</b>	4.07 GBq.
<b>Classification</b>	This component is Class C under the GTLD Exemption Order 1985 SI 1047 – Installed/awaiting installation in armed forces vessels, aircraft, vehicles or equipment. This has implications for the legal licensing of the holder of the source in terms of use, storage and disposal, which are briefly outlined below. Your RPA is to be contacted if further information is required.
<b>Hazard</b>	Tritium is a form of Hydrogen and in GTLSs and GTLDs, in the form of gas. If destroyed in a fire, the tritium is rapidly converted to tritiated water – a more hazardous form of tritium. The escape of tritium will result in an internal radiation dose if taken into the body by inhalation, ingestion or absorption through the skin. Of the two forms of tritium, tritiated water presents the greater hazard due to its ability to enter the body both by inhalation and rapid absorption through the skin. Radiation levels on contact $<0.1 \mu\text{Sv h}^{-1}$ .
<b>Risk Assessment</b>	All components with tritium in them leak. The degree of risk from tritium leaking out of this component is negligible. The likelihood of accidental damage to this component to such a degree that tritium escapes is low. A more severe accident, for example, crushing, could possibly result in the release of tritium. Internal dose will be dependent on the duration of exposure and concentration of tritium. An adult in a $30\text{m}^3$ room breathing an atmosphere with 4.0GBq of tritium dispersed in it for an hour could receive an internal dose of around $100 \mu\text{Sv}$ . (DRPS Report 289/2004 dated 10/12/04).

<b>Local Orders</b>	Details of the control measures taken from this leaflet are to be included in the local orders for radiation safety (Leaflet 16 refers).
<b>Control measures during use</b>	No protective clothing or special precautions required. Item not to be carried on the person.
<b>Inspection</b>	Annually as well as during routine maintenance. Check to be made for signs of damage.
<b>Leak Testing</b>	Leak testing is not required for this component.
<b>Accounting</b>	This item is to be accounted for on a Radioactive Source List. Leaflet 9 refers. All radioactive material is to be mustered monthly. Any change of location is to be entered in the Source Movement Log together with any change in custodian.
<b>Radioactive Substances Act 1993</b>	Although exempt from formal RSA 93 notification to the relevant environment agencies, this item is to be included in the Annual Holdings Return to Dstl – Leaflet 3 refers.
<b>Storage and Labelling</b>	If uninstalled, this item is to be stored in a dedicated area for radioactive materials – see Leaflet 9. The equipment is to display the recognised radioactive valve warning label on it. The storage/installed area is also to have a sign showing radioactive material within, i.e. a radiation warning trefoil including the contact name and telephone number of the RPS or WPS and stating the nature of the radiological hazard in appropriate languages <b>“Items contain radioactive material. No radiation hazard from intact item. Radioactive contamination hazard if item is damaged.”</b>
<b>Contingency Plans Breakage/Loss/ Incident</b>	If a breakage occurs the area is to be evacuated and ventilated. Tritium gas will disperse relatively quickly; however some may remain bonded to the component. Once a suitable amount of ventilation time (one hour) has passed, the broken item can be cleaned up using a breakage kit, see Leaflet 40. RPA advice is to be sought regarding disposal of the fragments. Reporting of loss and certain other incidents is to be carried out in accordance with procedures described in Leaflet 14.
<b>Transport</b>	This item may be transported within an excepted package provided the total package activity does not exceed 8000GBq.
<b>Disposal</b>	Units and Establishments are to return this item, unbroken, through the Stores Organisation. Broken items are to be disposed of in accordance with Leaflets 12 and 40.
<b>Local Orders</b>	Details of the control measures taken from this leaflet are to be included in the local orders for radiation safety (Leaflet 16 refers).

## LEAFLET 19 ANNEX C

## DAS CONTROL PANEL – EXAMPLE OF A SUMMARY RADIATION RISK ASSESSMENT

<b>DAS Control Panel</b>	
<b>Description</b>	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;">  <p>Mode switch illumination</p> </div> </div> <p>Defensive Aid Suits (Type 42 Destroyers) Control Panels, one either side of the ship. In the centre of the control panel is a white display plate, manufactured with 7 GTLSs, encapsulated in the plate where the legends are located.</p>
<b>Use</b>	Panel illumination (Gaseous Tritium Light Device).
<b>Supplier</b>	SRB Technologies (UK) Ltd.
<b>NSN</b>	1220-99-851-1673 Panel Control (Port) / 1220-99-149-7317 Panel Control (Starboard).
<b>IPT Details</b>	Above Water Systems.
<b>Radionuclide</b>	Tritium (H-3)
<b>Ionising Radiation</b>	Beta (0.019 MeV).
<b>Half Life</b>	12.3 years.
<b>Original Activity</b>	259.74 GBq.
<b>Classification</b>	This component is Class C under the GTLD Exemption Order 1985 SI 1047 – Installed/awaiting installation in armed forces vessels, aircraft, vehicles or equipment. This has implications for the legal licensing of the holder of the source in terms of use, storage and disposal, which are briefly outlined below. Your RPA is to be contacted if further information is required.
<b>Hazard</b>	Tritium is a form of Hydrogen and in GTLSs and GTLDs, in the form of gas. If destroyed in a fire, the tritium is rapidly converted to tritiated water. The escape of tritium could result in a health risk particularly in a confined space. Of the two forms of tritium, tritiated water presents the greater hazard due to its ability to enter the body both by inhalation and rapid absorption through the skin. Radiation levels on contact $<0.1 \mu\text{Sv h}^{-1}$ .

<b>Risk Assessment</b>	All components with tritium in them leak. The degree of risk from tritium leaking out of this component is negligible. The likelihood of accidental damage to this component to such a degree that tritium escapes is low. A more severe accident, for example, crushing, could possibly result in the release of tritium. Internal dose will be dependent on the duration of exposure and concentration of tritium. An adult in a 30m <sup>3</sup> room breathing an atmosphere with 260GBq of tritium dispersed in it for an hour could receive an internal dose of around 7mSv, which would trigger a MOD investigation. The whole panel is fitted to the ship superstructure and no spares are carried.
<b>Local Orders</b>	Details of the control measures taken from this leaflet are to be included in the local orders for radiation safety (Leaflet 16 refers).
<b>Control measures during use</b>	No protective clothing or special precautions required. Item not to be carried on the person.
<b>Inspection</b>	Annually as well as during routine maintenance. Check to be made for signs of damage.
<b>Leak Testing</b>	Leak testing is not required for this component.
<b>Accounting</b>	This item is to be accounted for on a Radioactive Source List. Leaflet 9 refers. All radioactive material is to be mustered monthly. Any change of location is to be entered in the Source Movement Log together with any change in custodian.
<b>Radioactive Substances Act 1993</b>	Although exempt from formal RSA93 notification to the relevant environment agencies, this item is to be included in the Annual Holdings Return to Dstl – Leaflet 3 refers.
<b>Storage and Labelling</b>	If uninstalled, this item is to be stored in a dedicated area for radioactive materials – see Leaflet 9. The equipment is to display the recognised radioactive valve warning label on it. The storage/installed area is also to have a sign showing radioactive material within i.e. a radiation warning trefoil including the contact name and telephone number of the RPS or WPS and stating the nature of the radiological hazard in appropriate languages <b>“Items contain radioactive material. No radiation hazard from intact item. Radioactive contamination hazard if item is damaged.”</b>
<b>Contingency Plans Breakage/Loss/ Incident</b>	If a breakage occurs the area is to be evacuated and ventilated. Tritium gas will disperse relatively quickly; however some may remain bonded to the component. Once a suitable amount of ventilation time (one hour) has passed, the broken item can be cleaned up using a breakage kit, see Leaflet 40. RPA advice is to be sought regarding disposal of the fragments. Reporting of loss and certain other incidents is to be carried out in accordance with procedures described in Leaflet 14.
<b>Transport</b>	This item may be transported within an excepted package provided the total package activity does not exceed 8000GBq.
<b>Disposal</b>	Units and Establishments are to return this item, unbroken, through the Stores Organisation. Broken items are to be disposed of in accordance with Leaflets 12 and 40.
<b>Local Orders</b>	Details of the control measures taken from this leaflet are to be included in the local orders for radiation safety (Leaflet 16 refers).

**LEAFLET 19 ANNEX D****SPECIFIC GUIDANCE FOR GTLD REPAIR WORKSHOPS**

- 1 In workshops where GTLDs are repaired, the number of radioactive items held in the work area is to be kept to a workable minimum. Equipments held in temporary storage within the workshop pending completion of repair are to be stored on fire proof racking marked with a radioactive warning trefoil and a suitable legend (e.g. RADIOACTIVE ITEMS CONTAINING TRITIUM). The number of spare GTLSs held within the room is to be kept to the minimum required for the work in hand, stocks being replenished from the main store on a daily basis. Where practicable, all items containing a GTLS are to display a radiation hazard trefoil, the symbol "T" or T and the activity of the GTLS.
- 2 Doors providing access to the building and to the workshop area are to display a radiation warning trefoil which are available through the appropriate service channels or obtained locally and should be in relevant foreign languages.
- 3 The fire officer is to be kept fully informed of the quantity and locations of all radioactive materials within the workshop. These locations are to be described in local radiation safety rules, preferably as a diagram.
- 4 In order to prevent the accumulation of tritium contamination, areas where equipment containing GTLSs/GTLDs are repaired/maintained or stored are to be cleaned at regular intervals. Bench tops are to be of a non-permeable material (e.g. Formica) with sealed edges and joints or covered in a non-permeable material (e.g. polythene sheet). Work surfaces are to be wiped down with damp tissues at the end of each work period. The tissues may be disposed of with domestic wastes. Once per month bench tops are to be thoroughly cleaned using a detergent solution.
- 5 Large stores or workshops which occasionally have to deal with broken GTLSs, are to seek specific advice from their RPA in relation to the procedures and control measure that they need to adopt with regard to monitoring work areas for tritium. A GTLS breakage kit (put together locally), with instructions for its use (Leaflet 40) is to be available in each work area. These instructions are to be included in local radiation safety orders.

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