

05 August 2010

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Dear Ms. Xu,

Raytheon ELCAN Optical Technologies hereby notifies and requests concurrence of the following modifications to the Sealed Source Device Registry and in-process Exempt Distribution license. During the final preparation for the State of Texas submission, a calculation issue was determined that impacts all three packages. The States of Texas application will go in upon your approval of this revision to the Sealed Source Device application. The Exempt Distribution License is in suspension pending the State of Texas approval and is submitted here to show transparency and determination for a correct and complete application.

Therefore License/Approval/Registration/Certification #: NR1323D101E is amended by modification of:

- 1) An updated dosimetry calculation,
- 2) Clarification that Specter Sighting System OS incorporates the following
 - a) Outer Housing as illustrated (typically for Specter DR 1-4X)
 - b) Updated Streamlined Outer Housing (typically for Specter DR 1-4X)
 - c) Further Updated Streamlined Outer Housing (typically for Specter OS 4X).

If you have any questions please call. Thank you in advance for your attention to this matter.

Regards,



Mr. Robert Clayton
Director, Contracts
Raytheon Canada Ltd, Raytheon ELCAN Optical Technologies

Enclosure(s)

- 1) An Updated Dosimetry Calculation
- 2) Clarification of Specter Sighting System OS
- 3) Drawing of Applicable housings
- 4) Exempt Distribution License as of 5 Aug 2010

1) An Updated Dosimetry Calculation

Throughout the Sealed Source Device Registry Application the correct radioactive level of 0.148Ci per source and since the gunsight requires two sources that equals the 0.296Ci. The last document submitted regarding the dosimetry calculation applied a 0.296mCi value.

A detailed description of how the change would affect safety of the workers, the public, and the environment is provide below with changing the activity from 0.296 mCi to 296 mCi. Obviously the doses go up by a factor of 1000. The levels still comply with Appendix O Standard Requirements for Gunsights Containing Tritium Gas Sealed in Glass Vials and Table O.1 Table of Organ Doses (32.24) because those limits are based on 'normal use' conditions. The change will allow workers, the public, and the environment to operate within acceptable limits.

Response to NRC Comments

Dose Estimates – Accident Conditions

1. Usage – The maximum credible accident involving the use of the gunsight is rupture of the source and instantaneous release of the gas during firing. Given:

- 296 mCi per gun sight
- R = 11.7 cm from sight to face of user
- Breathing zone represented by a cone with apex at the source and base, 10 cm diameter circle at the user's face; radius, r = 5 cm
- All H-3 converted to tritiated water instantaneously
- Effective half-life for tritiated water = 10 days
- Total absorption of inhaled tritium in body fluids
- Mass of soft tissue = 63,000 g (ICRP 30)

Fraction of gas released toward breathing zone:

$$F = [\pi r^2]/[4\pi R^2] = [\pi 5^2 \text{cm}^2]/[4\pi 11.7^2 \text{cm}^2] = 0.0457$$

Maximum estimated dose commitment to user:

$$H = 296 \text{ mCi} \times 0.0457 \times 63 \text{ mrem/mCi} = \mathbf{850 \text{ mrem}}$$

2. Storage – The maximum credible accident involving storage of the sights would involve a fire in the storage area which ruptures the capsules containing the tritium gas. Given:

- 50% of the sources ruptured
- Immediate dispersion of the gas within the storage area
- Conversion of all H-3 gas to tritiated water
- Total rate of absorption of tritiated water into body fluids (mCi/minute) from inhalation and skin absorption = $3 \text{ E-2} \times C$, where C = concentration of tritiated water in air (mCi/m³) (ICRP 30)
- N = 500; maximum number of gun sights in storage
- V = 94.75 m³; volume of air in storage room

$$C = [500 \text{ sights} \times 0.5 \times 296 \text{ mCi/sight}]/94.75 \text{ m}^3 = 800 \text{ mCi/m}^3$$

Dose commitment rate:

$$H = 800 \text{ mCi/m}^3 \times 3 \text{ E-2 mCi-m}^3/\text{mCi-min} \times 63 \text{ mrem/mCi} = \mathbf{1,500 \text{ mrem/min}}$$

Dose commitment to fireman remaining in enclosed area without respiratory protection for 2 minutes for purpose of rescue = 3,000 mrem

3. Ingestion or inhalation of the entire H-3 content of a gun sight:

$$H = 296 \text{ mCi} \times 63 \text{ mrem/mCi} = \mathbf{18,600 \text{ mrem}}$$

Dose Estimates – Normal Conditions

1. Normal Use – No radiation dose commitment is anticipated during normal use.
2. Storage – Distilled water immersion tests on the sights indicated a maximum leakage rate of 79.2 dpm, or $3.6\text{E-5 } \mu\text{Ci/sight}$ in 24 hours. Assume:

- 500 Gun sights in storage
- $V = 94.75 \text{ m}^3$
- Air exchange rate, $\lambda = 1 \text{ h}^{-1}$
- $I = \text{rate of influx of H-3 gas} = [3.6 \text{ E-5 } \mu\text{Ci/sight} \times 500 \text{ sights}]/24 \text{ h} = 7.5 \text{ E-4 } \mu\text{Ci/h}$

$$C = I/(\lambda \times V) = 7.5 \text{ E-4 } \mu\text{Ci h}^{-1}/[1 \text{ h}^{-1} \times 94.75 \text{ m}^3] = 7.9 \text{ E-6 } \mu\text{Ci/ m}^3 = 7.9 \text{ E-9 mCi/ m}^3$$

The annual dose commitment to a warehouse worker, working in the area for 1 h/d, 250 d/y, assuming all H-3 gas is converted to tritiated water and the rate of absorption of tritiated water into body fluids (mCi/min) is $3 \text{ E-2} \times C$ where C is the concentration of tritiated water in air is:

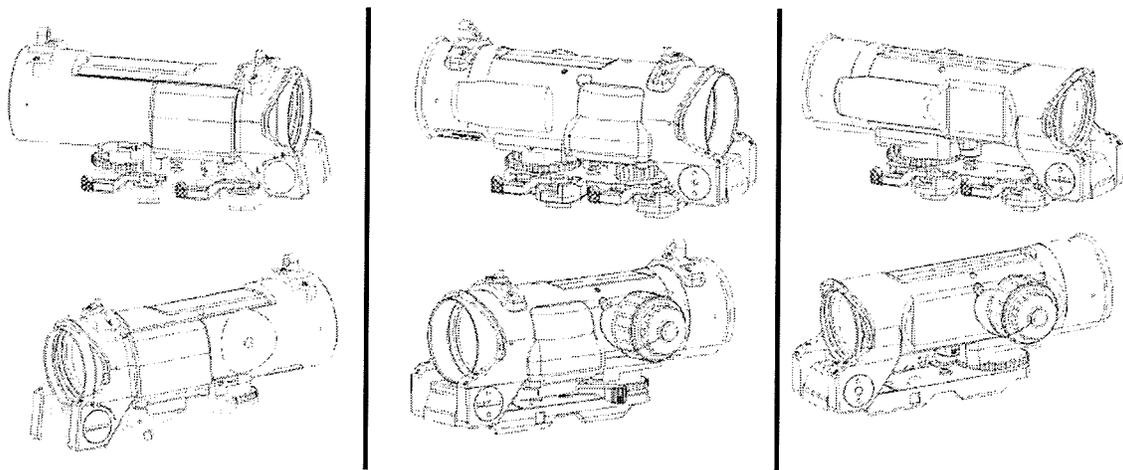
$$H = 7.9 \text{ E-9 mCi/m}^3 \times 3 \text{ E-2 m}^3/\text{min} \times 60 \text{ min/h} \times 250 \text{ h/y} \times 63 \text{ mrem/mCi} = \mathbf{2.2 \text{ E-4 mrem}}$$

2) Clarification of Specter Sighting System OS

Clarification that Specter Sighting System OS incorporates the following

- a) Outer Housing as illustrated (typically used for Specter DR 1-4X)
- b) Updated Streamlined Outer Housing (typically used for Specter DR 1-4X)
- c) Further Updated Streamlined Outer Housing (typically used for Specter OS4X)

The streamlining of the housing decreases the outer diameter allowing the exterior to more closely follow the layout of the internal components. The Specter OS4X removes the internal components required for the Dual Field of View mechanism. Therefore the side pockets have been removed from the housing to become a Single Field of View gunsight.



Picture of: a)

b) Streamlined

c) Further Streamlined

The change does not affect safety of the

- a) workers as can be seen by the pictorials would use the similar surrounding hardware and integration of radioactive sources and follow similar assembly process and methods,
- b) the public is not impacted as the streamlined housings are of the same rugged Aluminum alloy casting material with a hard anodized surface finish. The housings have a protective lip at the objective and eyepiece ends to minimize damage. The gunsights meet the environmental performance specification and have been qualified by the United States Department of Defense Special Operations Command and the United Kingdom Ministry of Defense, and
- c) the environment is not impacted as similar production, usage and disposal methods apply as the original license submission.