

SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

**NRC License Request (Revised)**

Submitted to:

Licensing Assistance Team  
Division of Nuclear Materials Safety  
U.S. Nuclear Regulatory Commission, Region 1  
475 Allendale Road  
King of Prussia, PA 19406-1415

By:

Sensor Concepts & Applications, Inc.  
5200 Glen Arm Road, Suite A  
Glen Arm, Maryland 21057

**1.0 Applicant**

Applicant:

Sensor Concepts & Applications, Inc.  
5200 Glen Arm Rd., Suite A  
Glen Arm, MD 21057  
Incorporated in the State of Maryland

Principle Officers:

Thomas W. Cassidy, President, 5200 Glen Arm Road, Suite A, Glen Arm, Maryland 21057, U.S. Citizen

William E. Kuehne, Chief Financial Officer, 5200 Glen Arm Road, Suite A, Glen Arm, Maryland 21057, U.S. Citizen

James F. Spacco, Radiation Safety Officer, 5200 Glen Arm Road, Suite A, Glen Arm, Maryland 21057, U.S. Citizen

**2.0 Activity and location for Special Nuclear Material (SNM)**

Activity and location for which Special Nuclear Material License is requested:

Sensor Concepts & Application, Inc. (SCA) seeks to possess the following SNM (See Section 4 for complete description):

- [REDACTED] LEU plates
- [REDACTED] Plutonium disc
- [REDACTED] HEU discs
- [REDACTED] canisters of Uranium Oxide

## SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

SCA has been subcontracted by the Transformational and Applied Research Directorate (TARD) division of the Domestic Nuclear Detection Office (DNDO, which is part of the Department of Homeland Security) to conduct tests of new technology under its Shielded Nuclear Alarm Resolution program (SNAR, pronounced snare). Vendors are developing technology to demonstrate techniques to detect special nuclear materials and clear alarms that represent a non-threat that may be hidden in cargo containers.

It is anticipated that the SNAR program will be the first of many such programs under development by U.S. Government agencies.

The licensed materials are to be used as test objects for concept demonstrations and characterization testing at vendor facilities.

At no time will SCA have in its possession Special Nuclear Material equal to or in excess of Formula Amounts (5,000 grams).

The primary location for storage of the special nuclear material will be in [REDACTED] Facility layout and storage location are shown in Appendix A.

The warehouse area is leased from Glen Arm LLC, who is responsible for the buildings fire protection features and maintaining compliance with State and local fire codes and laws such as annual (Jan/Feb) inspections and testing of fire suppression systems, alarms and backup generators. Fire extinguishers, emergency lighting and fire alarm pull are located throughout the facility and tested/checked annually by the landlord.

### **3.0 Duration of License**

Requested duration of license:  
10 years

### **4.0 Description of Special Nuclear Material**

#### **4.1 Description of SNM Test objects**

The SNM Test Objects are U.S. Government owned and as such their possession and use will be under a loan agreement with the U.S. Government supplier. The characteristics of these items where supplied by DNDO.

##### A. Low-enriched Uranium (LEU)

[REDACTED] uranium metal plate [REDACTED] with [REDACTED] plating and a total mass of 3.81 kg. The mass of the U235 is [REDACTED]. The LEU is not in an unsealed state and is not dispersible.

## SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

At no time will SCA have in their possession [REDACTED] of the LEU plates.

### B. Plutonium (Pu)

A [REDACTED] Pu disc [REDACTED], tested and built this plutonium sealed source (AKA the “puck”) for the Department of Homeland Security. This source was designed for use as either a calibration source in the development of new radiation detector systems or to test existing radiation detector systems. The Pu is encapsulated in a tantalum liner that provides an inert barrier between the plutonium disk and the stainless steel outer housing ([REDACTED]). See Appendix B for drawing. The Pu is not in an unsealed state and is not dispersible.

At no time will SCA have in their possession more a single Pu puck.

### C. Highly Enriched Uranium (HEU)

A [REDACTED] disc of [REDACTED] enriched uranium, [REDACTED] is encapsulated in a titanium housing [REDACTED]. See Appendix B for drawing. The HEU disc assembly [REDACTED] and is not in an unsealed state and is not dispersible.

At no time will SCA have in their possession [REDACTED] of the HEU discs.

### D. Uranium Oxide

[REDACTED] enriched  $U_3O_8$  will be contained in a sealed stainless steel canister [REDACTED]. The mass of the contained  $U_{235}$  [REDACTED] density of 3.65 g/cc. The stackable canister for the  $U_3O_8$  will be constructed to meet ANSI/HPS N43.7-2007 testing requirements for Class 2 Sealed Sources and will not be in an unsealed state and will not be dispersible.

At no time will SCA have in their possession more than [REDACTED] of the  $U_3O_8$  canisters.

## **4.2 Usage**

These SNM Test Objects will be used for testing a variety of sensors under development or being considered for purchase by the U.S. Government to detect the presence of SNM in a variety of smuggling scenarios. These tests require signatures that are isotopically-sensitive (i.e. can system differentiate U-235 from U-238). Depending on the source intensities and detector efficiencies there is a need to employ different amounts of SNM

## SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

per unit volume hence LEU and HEU to test the sensitivity of various sensor configurations. Pu-239 has individually specific signatures as well.

Each SNM Test Object will be used in support of with research, development and testing for government organizations (including, but not limited to, Department of Homeland Security, Department of Defense Counter-Narcoterrorism Technology Program Office, U.S. Customs and Border Patrol, and Domestic Nuclear Detection Office) in conjunction with research, development and testing of anti terrorism systems that detect contraband material. This will include use at temporary job sites.

Typical use scenario consist of removing the SNM from its secure storage, placing the SNM inside a sea cargo shipping container, interrogating the container with the system under test (SUT). At no time will the container leave the test site. Once the SUT results have been recorded the SNM will be removed and returned to the secure storage location.

All usage will be non-destructive. The SNM Test Objects will be used for research and development, and test purposes only.

### **5.0 Technical Qualifications of Applicant**

The Radiation Safety Officer (RSO)

SCA's Radiation Safety Officer is: James F. Spacco

The Radiation Safety Officer is responsible for managing the day-to-day affairs of the Radiation Safety program and acting as recording secretary for the Radiation Safety Committee. The RSO will administer the special nuclear materials license.

Responsibilities include overseeing the use of radioactive materials, package receiving surveys and delivery, preparation of radioactive materials for shipment, personnel dosimetry, maintenance of radiation monitoring and survey equipment, closeout surveys, records management, and basic personnel training. The RSO also administers the SCA's radioactive materials license.

SCA recognizes that the RSO has primary responsibility for assuring license and regulatory compliance at a working level for the State of Maryland Radioactive Materials license and this proposed NRC SNM license.

#### **Qualifications of Radiation Safety Officer**

Mr. Spacco has successfully complete adequate training as put forth in the NUREG 1556, Volume 4 Guide. All future Radiation Safety Officers will also complete this training.

Mr. Spacco has held this position since June 2003. He has trained authorized users, general employees and others in radiation safety; maintained a radiation monitoring

## SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

program and has been responsible for assuring license and regulatory compliance with the state of Maryland and the States of California and Nevada with which SCA has had reciprocity agreements.

Mr. Spacco has been the RSO for programs conducted by the Domestic Nuclear Detection Office (DNDO). For DNDO he has conducted radiation surveys and other field measurements; worked with NIST personnel to develop survey techniques and appropriateness of survey equipment; and managed the control of 250 kilograms of depleted uranium at three test sites.

### **6.0 Facilities and Equipment for Handling Special Nuclear Material**

The SNM when stored or when used in SUT testing will be maintained at ambient temperature conditions (-25° to +65° C), i.e. there will be no high temperature operations.

#### **6.1 Areas of Storage and Use**

Material storage precautions will be used to minimize potential for airborne radioactivity from exposure to fire hazards. Storage for the SNM when not in use or at temporary work sites will be at the SCA Glen Arm facility and away from flammable materials. All materials licensed under this application will be stored in a UL 2-hour fire labeled safe.

A. Glen Arm Facility: The SNM Test Objects described in this license will be stored in a fireproof safe inside a secure woven wire storage cage free of any combustible materials. The caged area has a radiation monitor [REDACTED]

B. Temporary Work Sites: When working at temporary work sites a survey will be conducted to determine a secure location for the fireproof safe used to store the SNM. At a minimum this location will have limited access and a security system.

No additional SNM, other than that under SCA's NRC license, will be present at SCA's Glen Arm facility or temporary work sites. **The SNM listed on SCA's Maryland State Radioactive Material License will be modified to remove SNM once SCA has the NRC license to possess SNM.**

The SNM will be placed in Type B package for shipping between the Glen Arm facility and any temporary work sites.

#### **6.2 Shields, Equipment and Handling Devices**

The low specific activity of the test objects and the fact that all materials will have appropriate cladding allows for direct handling of the material.

#### **6.3 Measuring and Monitoring Devices**

Personnel monitoring devices are required of all persons working with radiation sources if the individual is likely to exceed 10% of their allowable annual limits in accordance

## SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

with 10 CFR 20.1502. Monitoring of additional individuals for particular environments is at the discretion of the RSO. Personnel dosimetry appropriate for the material being used are provided by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited vendor (currently Landauer, Inc.). Direct reading dosimetry such as ionization chambers, direct read pocket dosimeters and electronic dosimeters are available for gamma radiation as needed.

The RSO oversees the use, maintenance and calibrations of these devices.

### **6.4 Radioactive Waste Disposal**

There is no waste associated with this license. The SNM Test Objects are encapsulated and will not be unsealed.

### **7.0 Safety Procedures to Protect Health and Minimize Danger to Life or Property**

SCA has an established Radiation Protection Program that covers the safe conduct of activities with radioactive materials and radiation sources. These procedures in effect satisfy various requirements of the NRC and state licenses for radioactive materials. Procedures are reviewed and adjusted at regular intervals with updated training as required. See supplemental information for SCA's Radiation Protection Program (RPP). **This RPP will be in effect at SCA's Glen Arm facility or temporary work sites.**

A criticality safety plan should not be necessary as the SNM Test Objects will not be altered nor destructively tested.

The radiological hazards for the SNM Test Objects are minimal. HEU and plutonium will be inside containers designed for use as sealed sources. The uranium oxide,  $U_3O_8$  is being manufactured by Y-12 and will follow ANSI/HPS N43.7-2007 requirements for a Class 2 Sealed Source. The LEU is a solid metal block that is nickel plated. Although contamination monitoring will occur, it is extremely unlikely.

### **7.1 Monitoring Procedures**

- A. Personnel dosimetry badges are required by all individuals working with SNM Test Objects.
- B. Condition and location of special nuclear material will be verified at least once every 6 months.
- C. Leak test will be performed on the SNM Test Objects at a minimum of 6 month intervals.
  - 1. All SNM in SCA possession are not unsealed sources and will be treated as sealed sources and shall remain in the sealed/unopened condition.
  - 2. Sealed sources (greater than 10 microcuries) that emit alpha particles will be leak tested at intervals not to exceed three months.

## SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

D. The SNM will be in containers made to sealed source standards or metallic and as a result are not in a soluble or readily dispersible form. As such, personnel are not expected to receive 10% of the applicable limit and therefore will not be routinely monitored for internal exposure. However, if there is evidence of dispersible material or it is suspected that an uptake has occurred, appropriate bioassay will be performed to determine the uptake and dose.

E. Personnel will be required to perform a contamination survey after handling the SNM material.

### **7.2 Operating Procedures**

All use of the SNM Test Objects will be under the direct supervision of an Authorized User or the RSO.

A portable radiation monitor, i.e. hand held survey meter(s), for contamination monitoring will be available at all times.

### **7.3 Emergency Procedures**

New personnel are briefed on SCA's emergency evacuation procedure which is posted throughout our facility. At temporary work sites personnel will follow established procedures of the host facility.

Emergency procedures are contained in SCA's Radiation Protection Program.

There is no appreciable combustible loading within area for SNM storage. Any movement of combustible materials into the radioactive materials area is strictly controlled, with storage prohibited. There are currently no combustible materials in the radioactive materials area.

There are no hazardous chemicals or processes which may contribute to a fire hazard in the SNM storage area. For temporary work site there will be no hazardous chemicals or processes permitted that may contribute to a fire hazard.

### **7.4 Emergency Responders**

The Long Green Volunteer Fire Company is located 3 miles from the Glen Arm facility and is aware of our possessing licensed radioactive materials. They have conducted a site visit with the Baltimore County Fire Department (Station 10).

Nearby hospitals (8 miles from Great Baltimore Medical Center & Saint Josephs Medical Center) are fully equipped and staffed to handle radiological emergencies.

## SPECIAL NUCLEAR MATERIAL LICENSE APPLICATION

### 7.5 Training Program

Individuals working in or frequenting areas where the potential for dose rates above 50 mrem/hr must meet the following applicable training requirements. These training requirements shall be continually reviewed and revised in order to provide function-specific and need-specific training. Therefore these requirements may be modified. Training shall be conducted by the Radiation Safety Officer, or someone of similar training and experience.

#### A. Frequency of Training

As a rule, Radiation Safety training will be required:

1. Before assuming duties with, or work in the vicinity of, radioactive materials or radiation producing devices.
2. Whenever there is a significant change in duties, regulations, or the terms of the license.
3. Annually (refresher training).

#### B. Types of Training

In order to meet function specific training requirements, the following types of training will be offered, at a minimum:

1. General Employee Radiation Training (GERT), Initial
2. Radiation Worker Training, Initial
3. GERT, Refresher
4. Radiation Worker Training, Refresher

Passing a written examination is required for classification as a Radiation Worker.

### 7.6 As Low As Reasonably Achievable (ALARA) Program

All uses of radioactive source material are reviewed by the RSO for adherence to the fundamental principle that levels of radioactivity to be used, and exposures to all sources of ionizing radiation, are to be maintained **As Low As Reasonably Achievable** (ALARA).

### 8.0 Material Control and Accountability

The SNM in the test objects is not easily assessable without evidence of tampering. Material control and accounting will follow SCA's Nuclear Material Control plan as set forth in Appendix D.

A report shall be made to the NRC within one hour of the discovery of a loss or theft of special nuclear material in accordance with 10 CFR 74.11.

## **9.0 Physical Protection of Materials**

The warehouse location where the SNM is secured is a limited access and alarmed area.

The alarm system is monitored 24 hours a day. [REDACTED]

[REDACTED]

## **10.0 Financial Assurance and Recordkeeping for Decommissioning**

The SNM test Objects are U. S. Government owned material. As such, the disposal costs for final disposition of these materials will be the responsibility of the U. S. Government. Any decommissioning or decontamination costs will be the responsibility of SCA.