INNOVATION • DEFENSE
NONPROLIFERATION • ENVIRONMENT

SRNS℠

We make the world safer.

SRPPF Air Monitoring Program and Supervisory Solutions at the Savannah River Site

Joey Smiley
Health Physics Services

Mirion Connect August 2025

About Me

- **Degrees in Biology and Chemistry**
- **Savannah River Site 2000-2025**
- **Principal Health Physicist**
- **Air Monitoring Lead/SME Site**
- **Aiken, SC and Albemarle, NC**
- **Married with 4 children:**
    - Diana (6)
    - Emory (12)
    - Kelby (17)
    - Brandon (30)
- **Hobbies - Family, Golf, Fishing, Attending College Football Games (GOOOODAWGS!)**

SRS - Location

The Savannah River Site (SRS), a 310 square mile (198,046 acres) Department of Energy site, is located in the sand-hills region of South Carolina. SRS covers parts of Aiken, Barnwell and Allendale counties along the Savannah River, and is within proximity of several major southeastern cities.

Aiken – 18 miles / 28 min
Augusta – 20 miles / 35 min
Atlanta – 170 miles / 2 hrs 45 min
Columbia – 75 miles / 1 hr 25 min
Greenville – 135 miles / 2 hrs 35 min
North Augusta – 20 miles / 25 min

Facts about SRS

- **Covers 310 square miles of U.S. Government property**
- **Employs more than 13,400 workers**
- **Uses 125 miles of electrical transmission lines, 63 miles of rail track and 129 miles of paved roads**
- **Currently is split into six major contractors:**
  - Savannah River Nuclear Solutions (SRNS) – Management and Operations of SRS
  - Savannah River Mission Completion (SRMC) – Liquid Waste Operations
  - Batelle Savannah River National Alliance (BSRA) – Management and Operations of SRNL
  - Centerra Group – SRS Security
  - Ameresco – Biomass Cogeneration Facility
  - University of Georgia – Savannah River Ecology Laboratory

SRPPF Overview and Background

- **National Nuclear Security Administration**
  - Must implement a strategy to provide the capability and capacity to produce no fewer than 80 war reserve (WR) plutonium pits per year (ppy)
  - Two-site strategy approach
    - *Los Alamos National Laboratory (LANL) – no fewer than 30 WR ppy*
    - *Savannah River Site (SRS) – no fewer than 50 WR ppy*
- **SRS to achieve their objective by construction of Savannah River Plutonium Processing Facility (SRPPF)**
  - Repurposing Mixed Oxide Fuel Fabrication Facility (MFFF)
  - Makes use of an existing seismically-qualified structure
  - Provides over 400,000 square feet of available production space

Aerial view of Building 226-F and supporting facilities in F Area

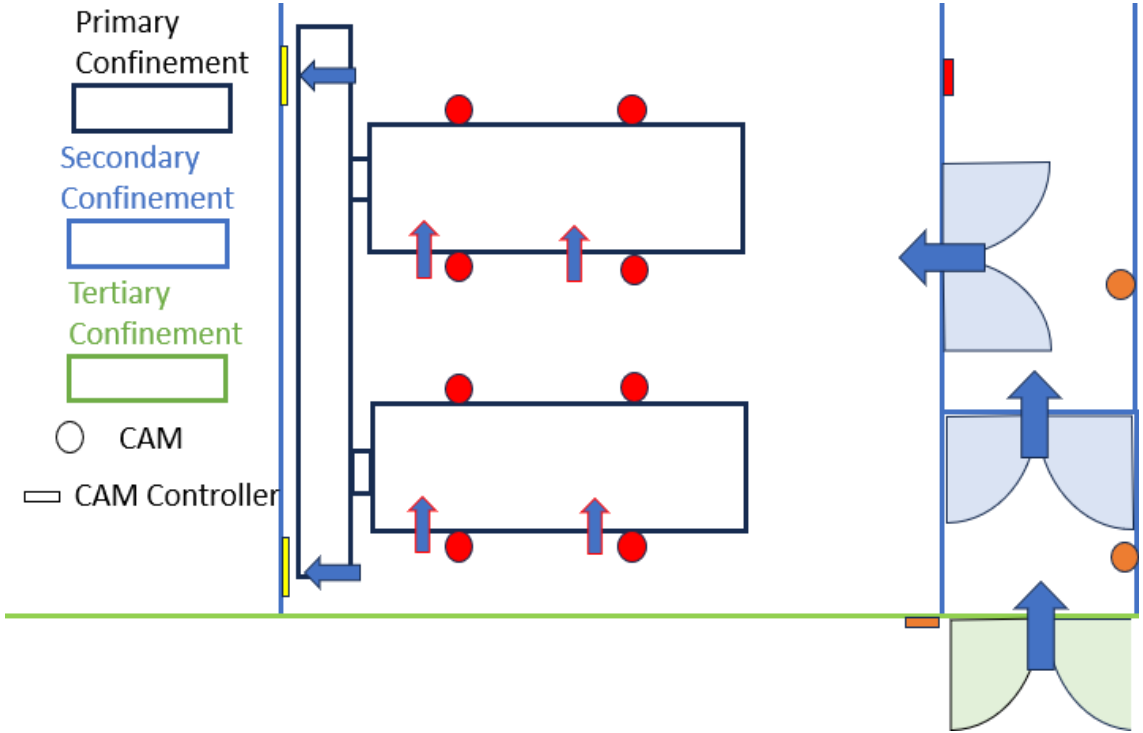
SRPPF Overview and Background

- **Plutonium Modernization Program**
  - Develop and train workforce prior to project completion and startup.
    - *Design includes High Fidelity Training and Operations Center (HFTOC)*
    - *Hands on experience with non-radioactive material*
  - Operate SRPPF for a minimum of 50 years
- **Plutonium Pit Production and Operations**
  - Work force is expected to require more than 1,900 personnel.
  - Will receive NNSA plutonium reserves
    - *Plutonium will be prepared by removing impurities (aged plutonium)*
    - *Formed into machinable components*
    - *Assembled and inspected*
    - *Accepted by NNSA*

SRPPF General Operations, Layout, and Airflow

- **Primary operations are to include metal preparation, forming, machining and welding.**
- **These main operations will be completed in glovebox primary confinement.**
  - Number of entry/exit points for material will be minimized and controlled.
    - *Material movement between gloveboxes is completed with a material transport system*
    - *Material removal gloveboxes are separated to specific rooms*
- **Gloveboxes will be located in process rooms designated as secondary confinement.**
- **Secondary confinement process rooms are accessed from a secondary confinement process corridor.**
- **Secondary confinement process corridors are accessed from a tertiary confinement corridor and accessed through an airlock.**
- **Differential pressure ensures airflow direction is from tertiary, to process corridor, to process rooms, to gloveboxes.**

General Airflow Direction



Air Monitoring Program

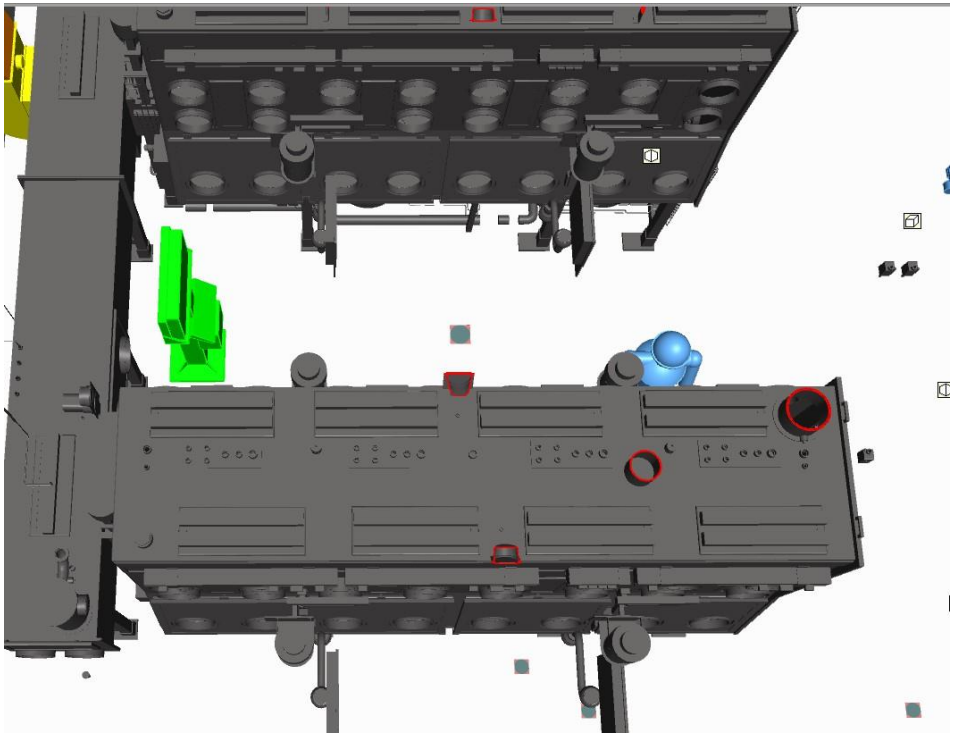
- **10 CFR 835 Requirement:**

> **§ 835.403 Air monitoring.**
>
> (a) Monitoring of airborne radioactivity shall be performed:
>
> (1) Where an individual is likely to receive an exposure of 40 or more DAC-hours in a year; or
>
> (2) As necessary to characterize the airborne radioactivity hazard where respiratory protective devices for protection against airborne radionuclides have been prescribed.
>
> (b) Real-time air monitoring shall be performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material.

- **Pu-239 has a DAC value of 5E-12 µCi/mL**
- **Real-time air monitoring shall be used (CAMs) with alarm setpoint at 10 DAC-hr.**
  - Dual purpose: All real-time air monitoring filter papers will be collected, counted, and tracked. Ensures we are meeting part (a) and (b)
- **Normal operations will not require respiratory protection or RPD coverage**
  - Glovebox confinement, differential pressure, differential pressure alarm, CAMs.
  - ALARA – Total facility dose reduction

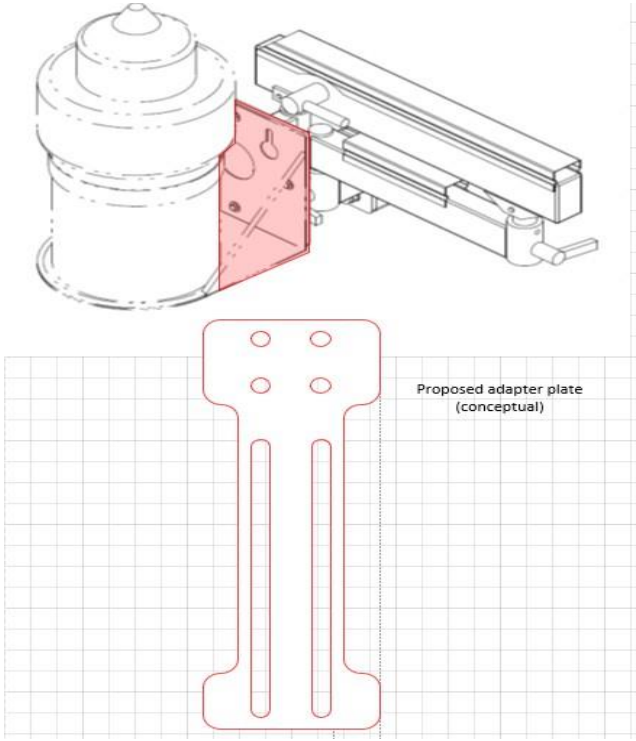
CAM placement

- **CAMs are positioned as close to the anticipated release points as possible and located downwind and/or between the release point and the worker**
  - The highest potential release point will be the glove ports.
  - Final positioning will be determined by the results of an Air Migration Study.



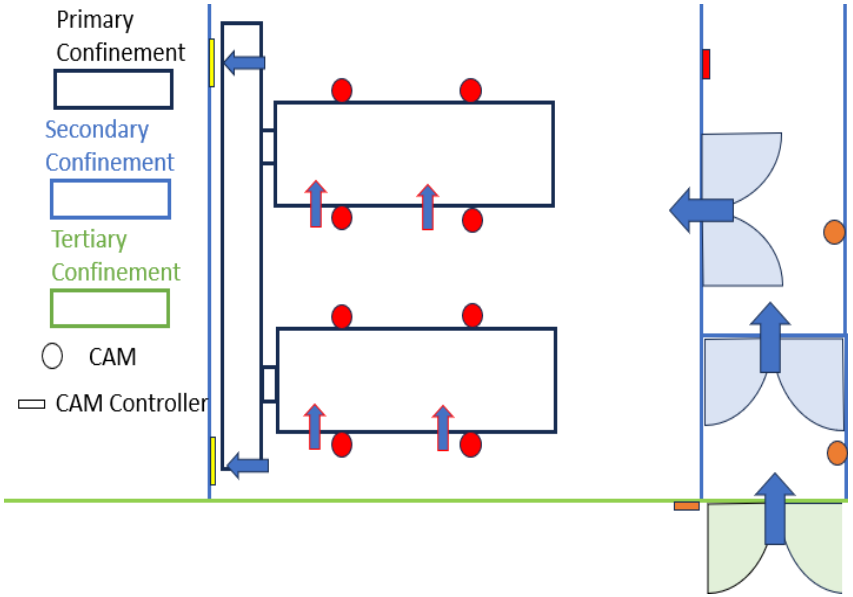
CAM to Glovebox connection

- **CAM mounts will be connected to an adapter plate and articulating arm.**
  - Allows 24” movement to the left or right
  - Allows 8” + 30” of movement up or down
- **Final horizontal positioning will be downwind of all possible release points.**
- **Final vertical positioning will be at the height of the center of the glove port.**
- **Enable final position of CAM air intake to be effectively located without the use of air sample lines.**
  - Ease of changing filters
  - Avoid difficulties with air in-leakage and testing



CAM Data

- **CAM controllers will be located outside of the room the CAM is located.**
  - Air activity can be viewed before entering
- **CAM data will also be transmitted to the Operations control room and the RPD control room.**
  - Operations control room will only receive alarm status and will allow them to make appropriate notifications
  - RPD will be able to review all data associated with the CAM



Open Items

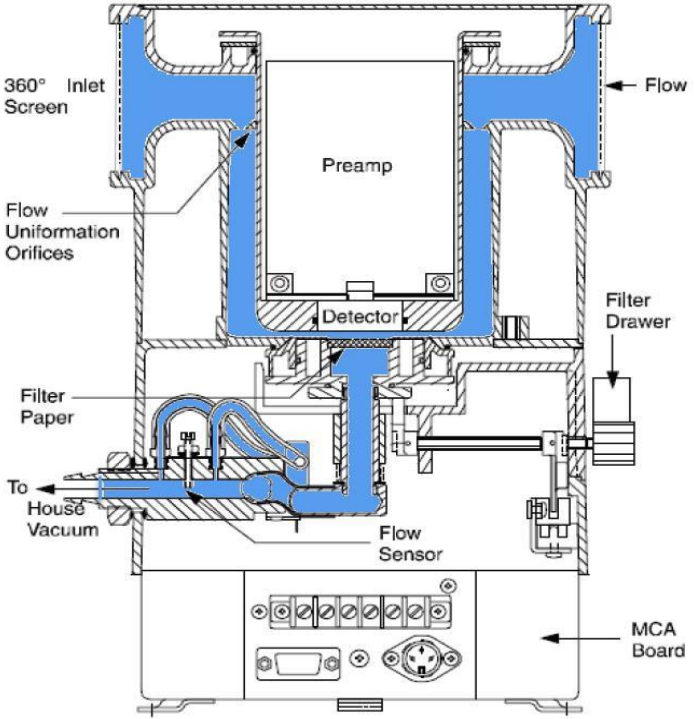
- **Final location of CAMs will be determined by the results of an Air Migration Study**
- **Filter Paper Changeout Frequency**
  - Will conduct a dust loading study when construction is complete
    - *Excessive dust loading can result in false alarms by attenuating Radon-Thoron progeny alpha particles, resulting in a shifted NORM alpha peaks into the transuranic region of interest.*
  - Expected frequency is expected to be 1-2 times a week.
- **Filter Paper Counting Location**
  - Send filters to Centralized Counting Facility (CCF)
  - Create a SRPPF Counting Facility

Alpha Sentry Detection Head

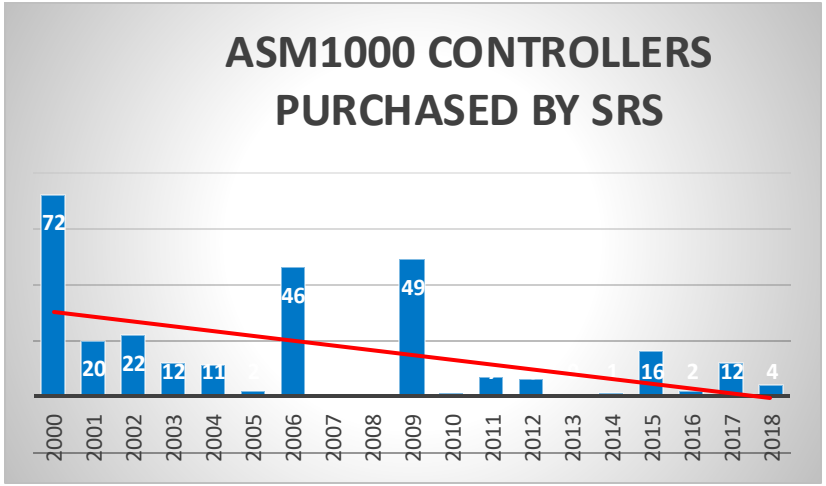
- Design is based on research from LANL and Texas A&M University's Aerosol Laboratory
- High sensitivity lowers false alarm rate
- Cleanable, rugged high-resolution detector
  - PIPS detector (Passivated Implanted Planar Silicon)
  - Active surface area of 1700 mm^2
- Patented radon reduction screen
  - Removes > 95% of newly formed radon daughter products
- Patented mass flow meter for accurate air flow measurement

Alpha Sentry Detection Head

- Air flow comes in through screen at top
- Flows down through filter which is sitting directly below the detector (Millipore/SpecIon 5 µm PTFE)
- Air then exits through port on back to pump
- Inline adapter available for connection to pipe or duct



We have aging ASM1000 controllers with part(s) obsolescence issues.



ASM2000 Controller

- **Powerful Platform**
  - Modern table computer collects data from up to 8 CAM heads
  - Provides web interface
  - Temporary local measurement storage
  - Supports add on software solutions such as the new Training Simulator
  - Transmits data to supervisory software
- **RS485 communication to CAMs**
  - Total RS-485 Network: up to 1200 meters (4000 feet) in total length.
  - Recommended cable: Belden 3105A RS485 Cable or equivalent UL-Listed cable
- **Ethernet via RJ45 for communications**
  - Used to send data to supervisory systems
  - Allows remote connection to web interface for administrative tasks
  - WiFi is optional for special applications

ASM2000 Hardware Platform

- **Dell Ruggedized Tablet:**
  - IP-65 rated, -20°F to 145°F
  - 12” Touch screen, 1200-nit direct sun viewable, included stylus
  - Optional handle useful for portable systems, and maintenance activities
  - Linux Ubuntu Operating System (DOE Approved)
- **Built-in UPS – Dual hot swap batteries can provide power during AC interruptions to avoid loss of data or corruption**
- **Docking Station**
  - Provides cable management, more IO ports, physical lock
  - Rear cover protects cable connections, includes standard VESA 75 mount
- **Vibration & Shock per MIL-STD-810-H**
- **Cable feedthrough zip-tie holes to secure cabling**

Light and Sound Option

- Light stack to indicate operational status including Radiological Alarms and Faults
- Audible Alarm for chronic and acute alarms
- Powered and controlled by ASM2000 (no separate power needed)
- Lights can be mounted on left or right side, or mounted separately
- Useful for areas where CAM head is in different room than ASM2000

ASM2000 System Display

- Main Display shows status of each CAM
- Clicks on CAM Status Blocks to show data related to that head

How do you manage data from 600+ Alpha Sentry CAMs/100+ ASM2000 Controllers in one facility?

Supervision Should Be Simple – Joey Simple

- **Managing radiological instruments across a large site presents significant challenges:**
  - Need for real-time monitoring
  - Maintaining instrument health, and
  - Efficiently responding to radiological conditions

- **The complexity is compounded by requirements for historical data analysis, adherence to regulatory controls, and the capability to predict future conditions through trend analysis.**

- **In collaboration with SRS, Mirion has developed "Vital Supervision' formerly known as SuperVision-One', a comprehensive supervisory solution, to effectively addresses these challenges.**

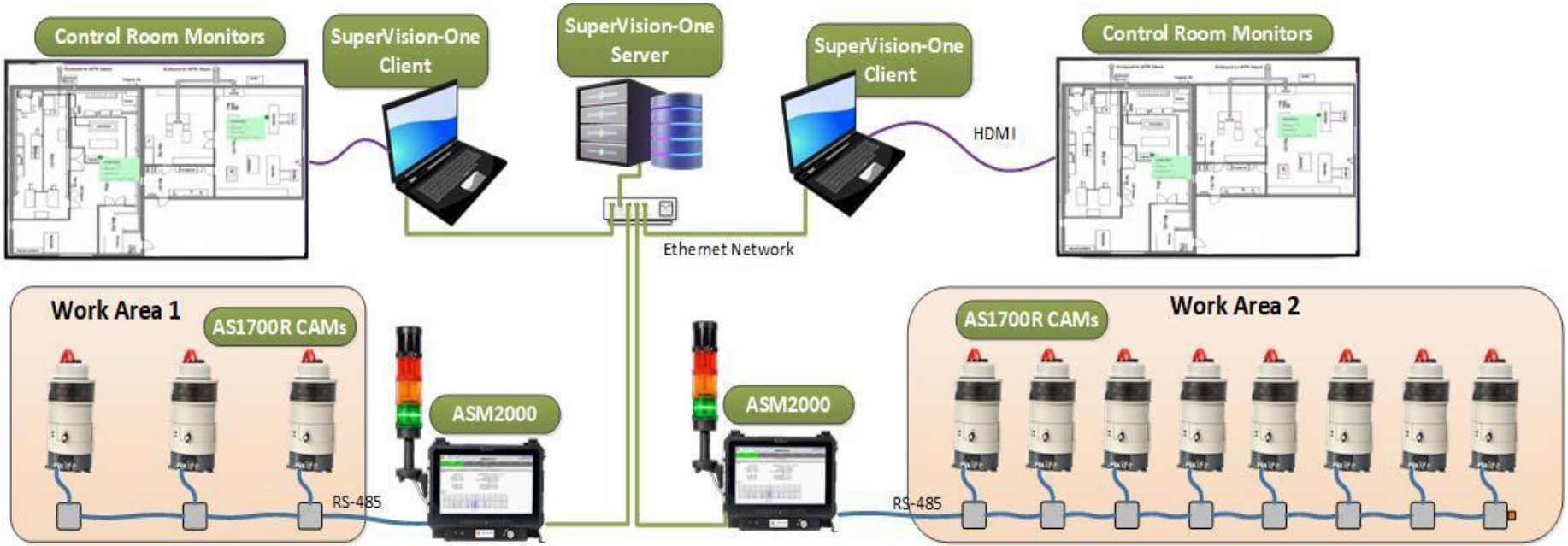
SRNS

A Comprehensive Supervisory Solution for Radiological Instruments

- **Simplify Monitoring** of a wide variety of radiological instrumentation
- **Common Data Repository** for efficient data collection from thousands of instruments
- **Increase Safety** through real-time monitoring of instruments, radiological alarms, events, & SoH (State of Health)
- **Streamline Operations** with remote operation of instruments
- **Drive Improvement** using historical measurement and SoH data for post-incident analysis and trending

Alpha Sentry CAM Monitoring

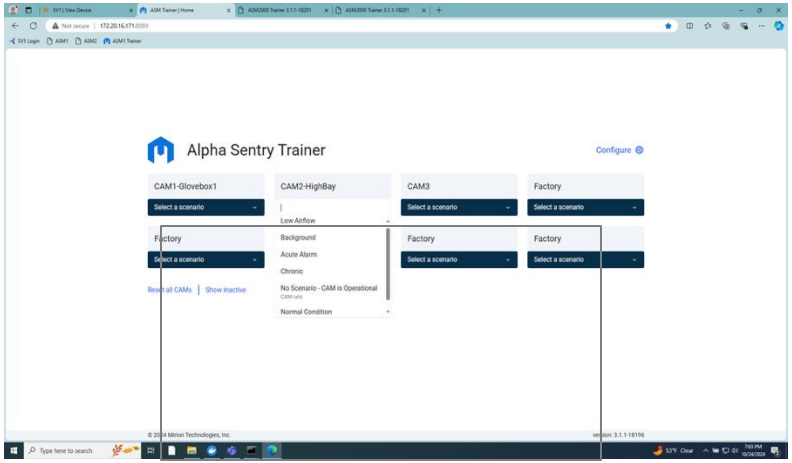
Example networking for multiple CAMs and ASM2000 controllers connected to SuperVision-One



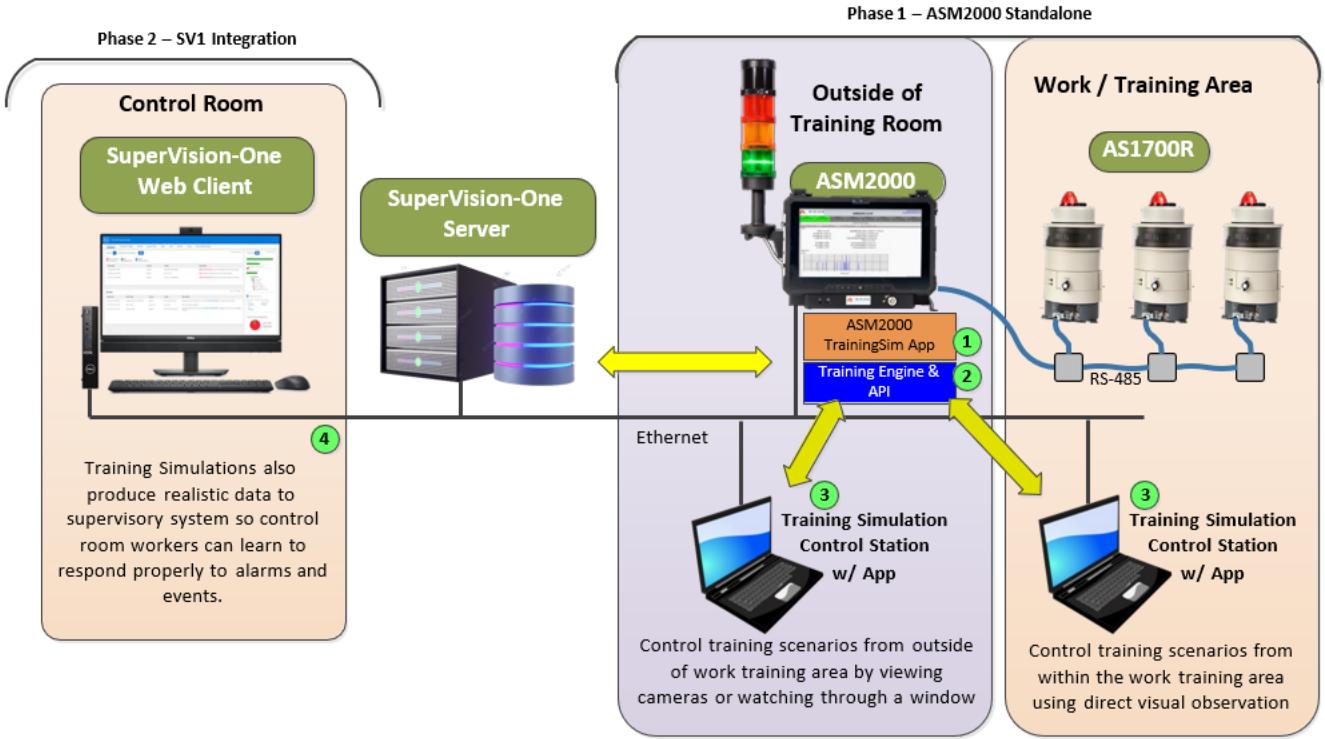
How to you train 600 Radiological Control Inspectors to become efficient at using this new technology?

ASM2000 Training Simulator

- Custom add-on module for ASM2000 built for SRS
- Adds simulation engine to create realistic scenarios with the CAM and ASM2000
- Configure unique scenarios for each CAM connected to the ASM2000
- The CAM will react as if the event was real
- The ASM2000 will also react & display the appropriate spectra for an event
- Each CAM controlled by the ASM2000 can run different scenarios
- Scenarios can be created from real measurement data and events recorded by the ASM2000



ASM2000 Training Simulator

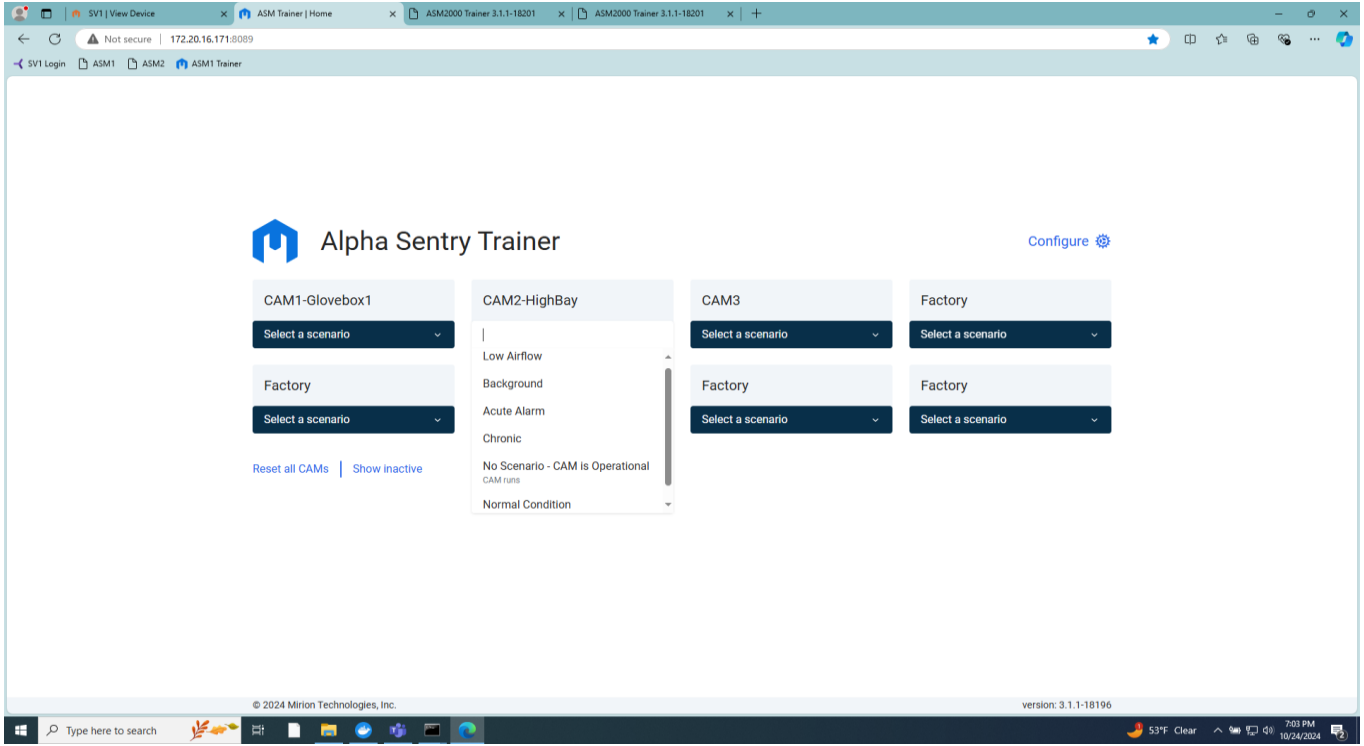


1) Training Simulation Web App
2) Training Simulation Engine
3) Simulation Control Station
4) Supervisory System

ASM2000 Training Simulator

- **Simulation Training Benefits:**
- **Enhanced learning**
  - Realistic events improves retention and contextual understanding
- **Improved decision-making abilities & competence**
  - Practice improves proper response, especially in stressful situations
  - Using PPE and unexpected events (alarms) improves proper reaction
- **Immediate feedback**
  - Realistic training in real-time improves learning
  - Workers can get immediate feedback & identify areas for improvement
- **Improved safety**
  - Reaction time can reduce exposure during a radiological event
  - Recalling & following procedure(s) during an event is critical to safety

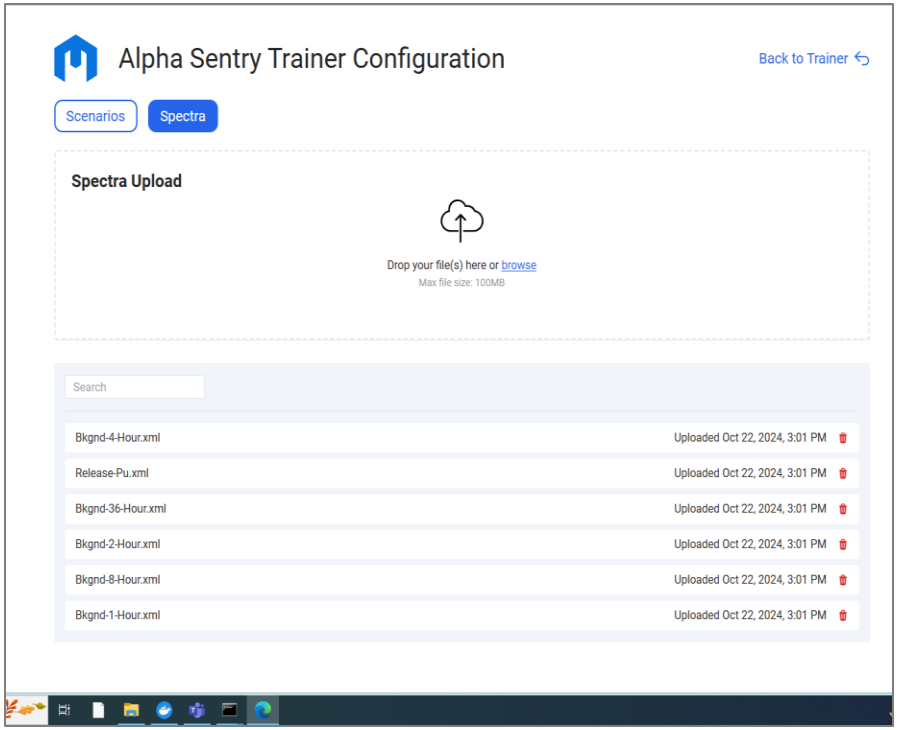
ASM2000 Trainer – Main Screen



- Web UI can be remoted access from another PC on the network
- Shows what scenario is running on each CAM
- Instructor can trigger events in real-time and monitor worker reactions

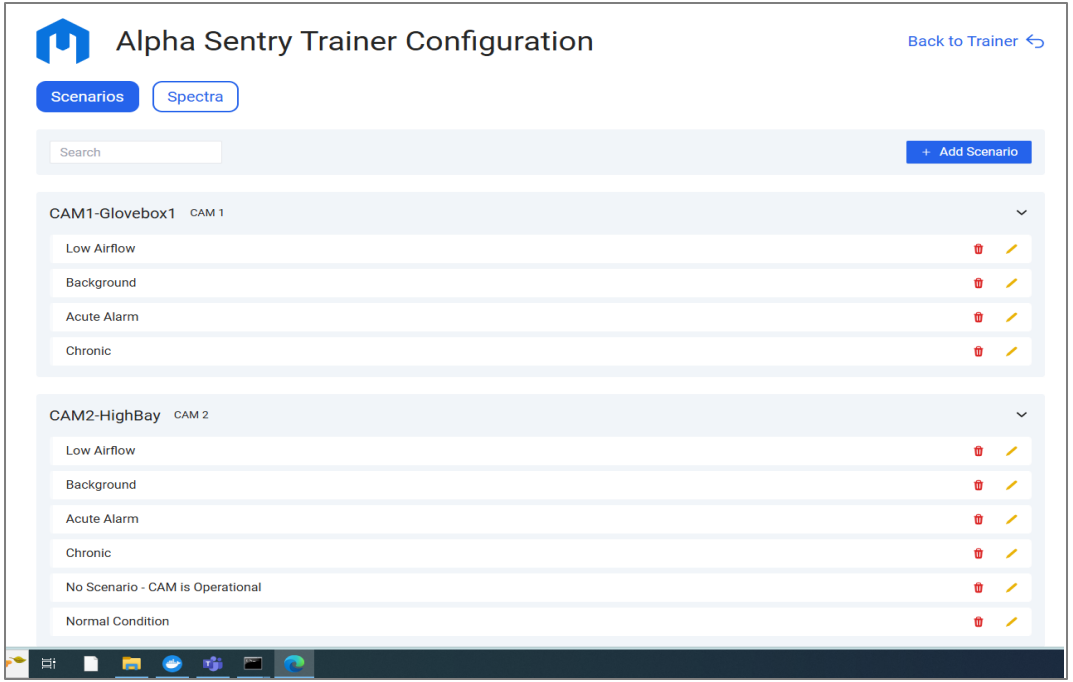
ASM2000 Trainer – Add Spectrum

- Add spectra to the system to be used in Scenarios
- Spectra can be taken from real events recorded by an ASM2000
- Spectrum files are XML based and same format as the ASM2000 uses
- You can use the same spectra to create multiple scenarios

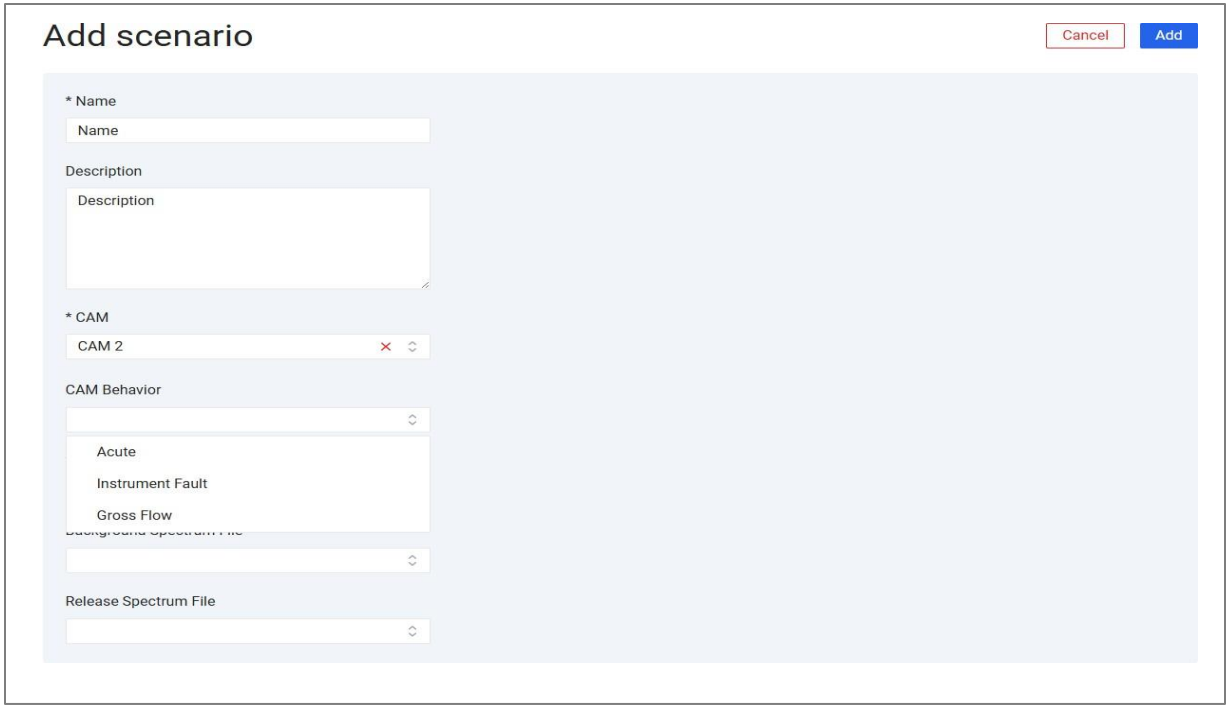


ASM2000 Trainer – Scenario Configuration

- Create any number of scenarios for each CAM connected to the ASM2000
- Add and modify each scenario from the configuration screen



ASM2000 Trainer – Edit Scenario



- Each scenario is configured for a specific CAM
- Names & descriptions can be added
- Select behavior which controls how the CAM will react (lights/sound)
- Choose contamination spectra and background spectra

Special Thanks

Entire Mirion Executive Team

- Shelia Webb
- Audrey Summers

Mirion Technical Team:

- Steven Laskos
- David Stewart
- Lee Reagan
- Peter D'agostino

Mirion Sales Team:

- David Gebbie
- Andrew Thebes
- Jim Kost
- Jeff Raimondi

Thank you

SRNS Team:

- Eugene Gyakari
- Walker Gaddy

Mirion Field Support:

- Tim Royals
- Jason Corbett
- John Atkinson
- Kharis Johnson

Retired Mirion/Canberra:

- David Anteck
- Ron Vermilye
- Al Loach

Retired LANL Team:

- Thomas McLean (Tim Gildea)
- Jim Bland (Mikayla Thompson)


INNOVATION • DEFENSE
NONPROLIFERATION • ENVIRONMENT
SRNS
Savannah River Nuclear Solutions
We make the world safer.