



DS-11
Mystery Risks

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Original Problem Statement

The Countermeasures Program Division (CMP), headquarters, and regional security teams need to, in real-time, identify the changing environment or forensic variables in embassies to help predict security risks, like the Havana syndrome, to more quickly gather environmental data and potentially save lives.

Current Problem Statement

We are evaluating current commercial technology and software in comparison to lab grade technology and focusing on integrating the new devices into pre-existing protocol measures to keep embassy and government personnel safe from radioactive, chemical and biological threats.

From Original Problem to New: How Did We Get Here?

- Redefining Our Problem Statement
 - First Plan of Attack
 - Current Plan



Radioactive Risks

Radioactive Commercial Detection

Electronic CMOS Sensors



Wearable Dosimeters



Electronic CMOS Sensors



Complementary Metal Oxide Semiconductors (CMOS sensors) :
Visible Light

Radioactivity Counter App

- Active Dosimeter: Measures radiation in real time- Xray and Gamma particles
- Smartphone sensor sensitive to radiation as low as 10 $\mu\text{Gy}/\text{hour}$
- Sensitivity affected by heat and battery power; needs 4-10 mins for reading
- Cannot be depended on as a sole dosimeter, but can be used as a dose warner - noise



Wearable Dosimeters

DXT- RAD extremity Dosimeter- Thermo Fisher Scientific:

- Passive monitoring of skin radiation doses
- Detection gammas and betas
- Compatible as a ring, wristband, or headband
- Standard uncertainty levels: +/-15 percent
- Not active- will not detect high radiation in real time



Wearable Dosimeters

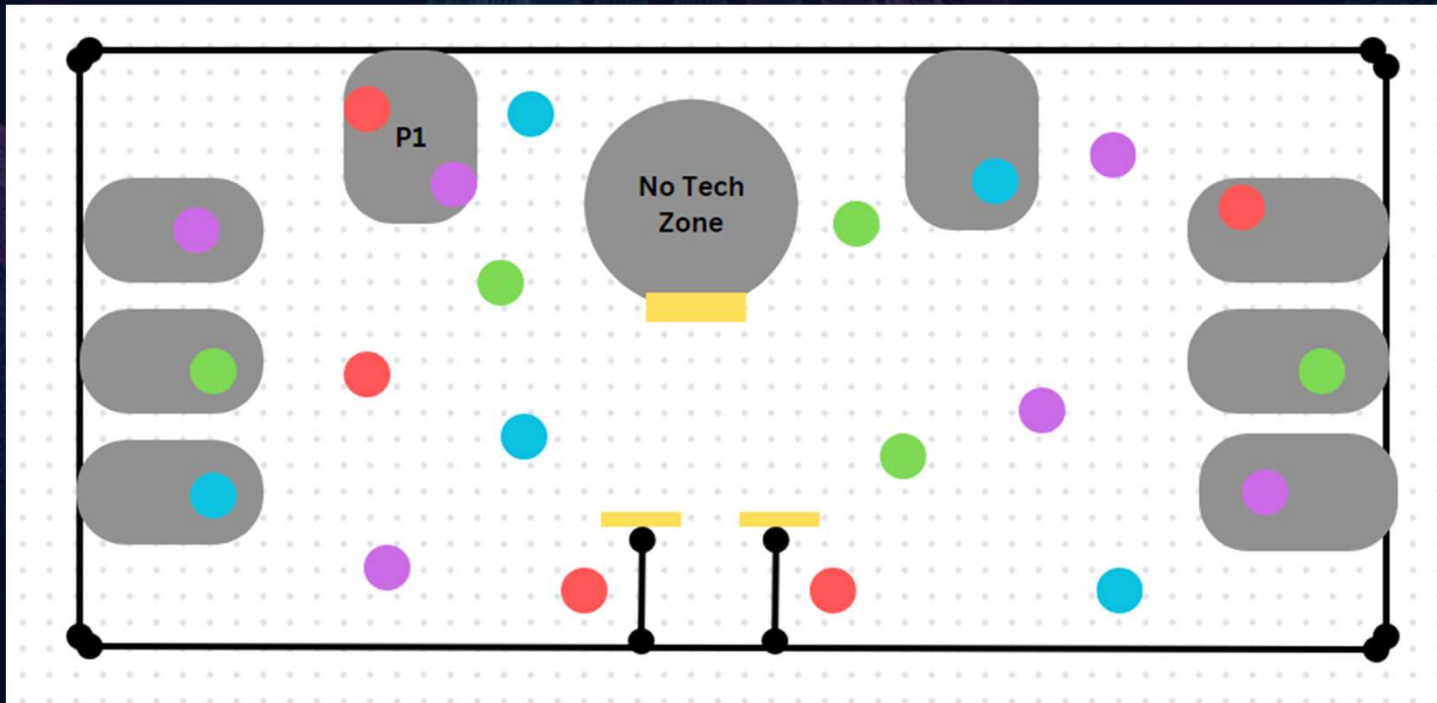
Active Personal Dosimeters

- RAD-60R Personal Electronic Dosimeter (T)
- Polimaster RadFlash Electric Personal Dosimeter (B)
- Active dosimeter with alert capabilities
- Xray and Gamma detection
- Standalone devices
- At calibration Rad-60R performs at +/- 5%, and Polimaster performs at +/- 15%
- Issue of Size and battery life



Multi-layer Application

Goal: Create a multilayered web of different forms of dosimeters to mitigate false positives and ambiguity in data.



- Pocket Ion Chamber
- Wearable Dosimeter
- Passive Dosimeter
- Electronic Sensor
- Stationary Sensor



Chemical Risks

Chemical Warfare Agents (CWA)

Nerve Agents

G-Agents

- Tabun (GA)
- Sarin (GB)
- Soman (GD)

V-Agents

- VX

Blister Agents

- Sulfur Mustard (H)
- Nitrogen Mustard (HN-1, HN-2, HN-3)
- Phosgene Oxime (CX)
- Lewisite (L, L-1, L-2, L-3)

Chemical Warfare Agents (CWA)

Blood Agents

- Hydrogen Cyanide (HCN)
- Cyanogen Chlorine (CNCl)

Choking Agents

- Chlorine (Cl)
- Phosgene (PS)
- Diphosgene (DP)
- Chloropicrin (CG)

Why Is It Important To Detect CWAs in Real Time?

- Considered one of the most brutal forms of warfare
- Small quantities of CWAs can lead to mass casualties
- Very easy and inexpensive to produce

Smiths Detection: LCD 4

- Lightweight Chemical Detector
- Uses non-radioactive Ion Mobility Spectrometry
- Detects nerve, blister, blood, and choking agents and TICs
- Based on LCD 3.3 ~ Chosen by DoD for Joint Chemical Agent Detector Program



Teledyne FLIR: 5 Year Pentagon Contract

- Contracted by the Pentagon's Compact Vapor Chemical Agent Detector program in 2021
- Developing individually worn unique dual-sensor to detect CWAs, TICs, flammable gasses and depleted oxygen levels
- Determines if air is safe to breath and if it is safe to fire a weapon





Biological Risks

Biological

We want to track 4 main vitals:

- Body temperature
- Heart rate
- Respiration rate
- Blood pressure

Goal:

- Find devices that can detect these vitals

RingConn Smart Ring



- Tough, accurately detecting wearable that can monitor for 24 hours a day 7 days a week
- Discrete and stylish
- Monitors heart rate, blood oxygen saturation, and temperature
- Battery will last 5-7 days

YHE[®] BP Doctor Pro Blood Pressure Smartwatch

- Convenient wearable watch
- Can detect heart rate, blood pressure, and oxygen level
- Some water resistance
- Doctor recommended



How these devices keep people safe?

- Biological threats tend to spread rapidly and can go unnoticed if unprepared.
- By having the vital information on hand, we are more easily able to identify trends and patterns concerning the spread of the agent
- In theory we would go back to the data collected by the devices to try to estimate when symptoms first presented.