Public Private Collaboration in Securing our Ports

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Passport Systems
Project Overview

- Nuclear Radiological Imaging Platform (NRIP)
  - Advanced Technology Demonstration – TRL 8/9
  - Primary organization: Domestic Nuclear Detection Office (DNDO)
  - Detect fissionable and radioactive materials
  - Demonstrate in stream of commerce
- UK Home Office, DHS S&T, CBP
  - Detect (other) Contraband: explosives, drugs, weapons,
  - Manifest verification
- Massport
  - Providing site location at Port of Boston
  - Providing some funding and marketing assistance
- Commonwealth of Massachusetts – Housing and Urban Development
  - Providing funding to develop the technology and secure
SmartScan™ 3D
Automated Cargo Inspection System
Conley Terminal Expansion

- Integrating 30-acre former Coastal Oil site for future expansion
- Constructing a new 2/3-mile dedicated truck haul road
  - Removes truck traffic from East First St.
- Construct 4.5 acre community open space
  - Visual and noise buffer
Conley Terminal Expansion
Port of Boston
Conley Port Expansion

NRIP Facility

Port Expansion
Passport Systems Massport Facility Timeline

- State Permitting – September 2014
- Shovel in the ground – April 2015
- Completion of Construction – June 2016
- Passport Integration and Testing – April – December 2016

- DHS Testing – Q1 & Q2 2017
- May 2017 – Available for CBP inspections
Passport Systems Overview

- Private U.S. company addressing security
  - Passport’s technology allows prompt, thorough, and precise cargo screening
  - Identifies cargo by what it is made of - not by how it ‘looks’
  - Passive, scalable, bi-directional sensor network for wide area surveillance

- Passport’s strong intellectual property originates from MIT
  - Passport patents on core detection technologies, HW and applications
  - Unique automated threat detection algorithms

- $85+ million invested in Passport to date
  - Major funding from U.S. Department of Homeland Security ($50M)

- Passport products
  - SmartScan™ Land/Sea Cargo Scanner
  - Networked Sensor Systems SmartShield™ Radiation Detection System

- Experienced management team with proven track record
Full Capability Scanner

During the Primary Scan, EZ-3D™ generates a series of slices that reconstructs the contents of the cargo in 3D

This full configuration identifies anomalies and resolves potential threats
Scanner Core Technologies

SmartScan 3D™ Automated Cargo Inspection System
EZ-3D Volumetric Data of Density and Effective Z

- Cargo is scanned slice-by-slice and reconstructed in 3D
- The voxels are aggregated into regions-of-interest
- These ROI’s are analyzed for targeted materials

Color Scale = Zeff Range
Transparency = Density

Cargos
- Organic
- Inorganic
- Metals
- Dense Metals

Targets
- Tobacco
- C4 Explosive
- Cocaine
- High - Z
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Cargo Types
- Organic
- Inorganic
- Metals
- Dense Metals
HR Transmission with EZ-3D™ Overlay
Cargo SmartScan™ System Operation

SmartScan 3D™ Automated Cargo Inspection System
Backup
## Passport Scanner Technologies

### Beam

**9 MeV Bremstrahlung**
- **CW Photons**

### Measured Particle

**Photons:** Effective-Z (EZ-3D™)
- Nuclear Resonance Fluorescence (NRF)

**Neutrons:** Photofission (prompt)

<table>
<thead>
<tr>
<th>Scan</th>
<th>Algorithm</th>
<th>Input</th>
<th>Functionality / Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>EZ-3D™ Reconstruction</td>
<td>Medium-resolution energy spectrum</td>
<td>3-D density and Effective-Z map Anomaly identification/3D location</td>
</tr>
<tr>
<td>Initial</td>
<td>Transmission X-ray</td>
<td>Medium/High spatial resolution transmission image</td>
<td>Anomaly 2D location &amp; density Shape/edge recognition</td>
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<tr>
<td>Initial</td>
<td>Portal Networked Detection System</td>
<td>Medium-resolution passive spectrum</td>
<td>Identification and localization of radioactive sources</td>
</tr>
<tr>
<td>Initial &amp; Prolonged</td>
<td>Photofission</td>
<td>Digitized pulses from liquid organic scintillator</td>
<td>Identifies presence of fissionable material</td>
</tr>
<tr>
<td>Prolonged</td>
<td>NRF 3D</td>
<td>High-resolution energy spectrum</td>
<td>Complete isotopic composition in the region-of-interest</td>
</tr>
<tr>
<td></td>
<td>Anomaly Classification</td>
<td>Output of NRF 3D, PNPF, EZ-3D™ and transmission algorithms</td>
<td>Performs data fusion, classifies anomaly as threat or innocuous, predicts detect/clear time</td>
</tr>
</tbody>
</table>
Cargo SmartScan™ Inspection Process

Current Inspection Methods

Cargo SmartScan™ Inspection
Passive
Spectral Radiation Detection with Localization
Primary Scan
Hi-Z and Fissile Material Detection
EZ-3D – Zeff and Density Measurements
Transmission Radiograph
Data Fusion and Analysis

Image Analyst – Anomaly Detection

Secondary Scan
Resonance Fluorescence
Isotropic/Elemental Measurements of EZ-3D Regions of Interest and
Passive Radioactive Materials ID

Suspect Item / Devanning Protocol

Unresolved Suspect Items

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