



The PROACT Demonstration Program: Enhanced Airport Chem-Bio Facility Defense

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High-value facilities represent a vital component of urban CBW-defense systems

- **Many present attractive targets for bio-terrorism**
 - Critical and/or symbolic targets
 - Public access
 - Large numbers of people
- **Unsophisticated attacks can have large impacts**
 - Interior attacks contain agent in buildings
 - An attack could cause thousands of casualties with a relatively small quantity of material





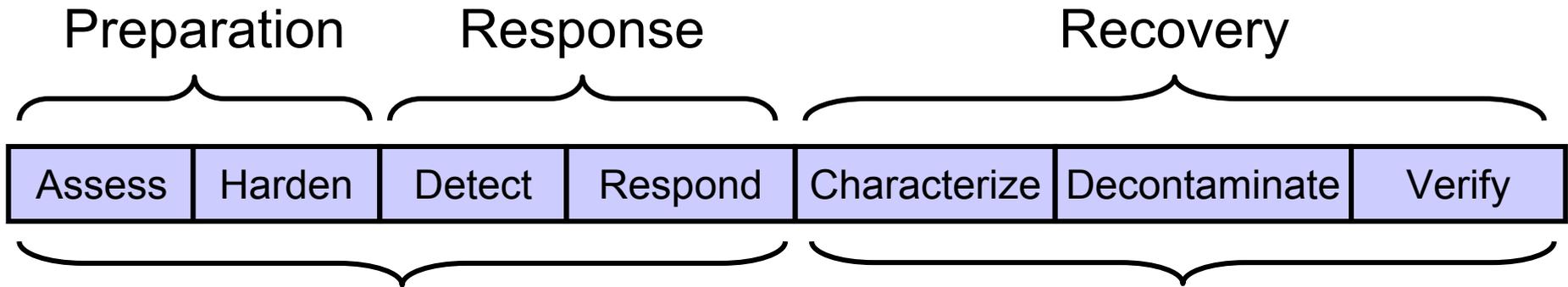
Biological attacks on airport facilities are particularly worrisome

- **Rapidly spread contagion worldwide**
- **Disrupt the national air transit system**
- **Cause regional economic damage**
- **Produce large numbers of casualties**
- **Contaminate a large portion of the facility**





DHS demonstration programs are taking a comprehensive approach to facility CBW-defense



- **PROACT program**

- “Preparation and initial response”
- CBW program initiated in 1999
- Sandia National Laboratories
- Point of Contact: Susanna Gordon, Sandia National Labs

- **Restoration program**

- “After the tape goes up”
- BW program initiated in 2003
- Lawrence Livermore National Laboratory and Sandia National Labs
- Point of Contact: Dennis Imbro, Lawrence Livermore National Laboratory

San Francisco International Airport (SFO) has been an active partner in the development of biological and chemical facility defense concepts since 1999.





PROACT is focused on improving CBW preparedness of our nation's airports

PROACT: Protective and Responsive Options for Airport Counter-Terrorism

- **Facility assessment and characterization methods**
- **Passive protection measures (particularly important for BW)**
- **Biological and chemical detection architectures and system deployments**
- **Response plans (with and without CBW detectors)**



San Francisco International Airport



This DHS demonstration program is working to prove the critical functional elements of facility defense in collaboration with SFO.





Outline

- **Facility analyses and guidelines**
- **Biological detection systems**
- **November airport bio-defense exercise**





Facility assessment and analysis methods have been exercised at two airports

- **Vulnerability assessment**
- **Facility characterization testing**
- **Analysis and model-based studies**





Vulnerability assessment provided top level data regarding facility protection needs

- **Expert team**

- Air handling and physical security experts
- Participants from the PROACT team and from the airport

- **2-day site visit**

- Focus on airborne threats
- Broad spectrum of agents and dissemination methods





Two characterization test series at SFO provided valuable insights for airport defense

- **June 2000 smoke and tracer gas tests**

- Boarding Area G
- Conducted over three days in new International Terminal prior to initiation of flight operations
- Extensive investigation of air handling response options



- **June 2002 tracer gas tests**

- Diverse test venues
- Conducted over a four-day period in operational areas during off-hours
- Passive protection and response recommendations exercised



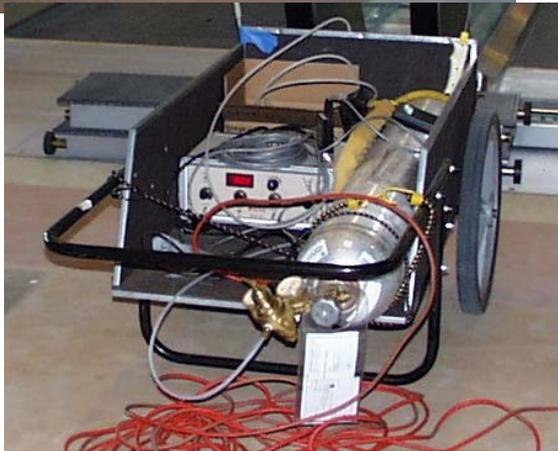


Smoke and tracer testing were conducted in Boarding Area G in June 2000



Biological Agents...
(e.g., Anthrax, Smallpox)

... simulated by smoke aerosol



Chemical Agents...
(e.g., Sarin)

... simulated by SF₆ tracer gas





Tested response strategies included four HVAC operational modes

- Normal operation
- Smoke control
- Purge
- Shut down





Sensitivity analysis was utilized to evaluate protection and response options further

- **Assessment of both aerosol (bio) and gas (chem) incidents**
- **Calculation of effectiveness in a boarding area**
 - Passive protection measures
 - Active response options, including people movement such as evacuation
- **Investigation of the highest leverage options**

Recommendations were formulated for hardening of airport buildings against chemical and biological attacks.





Tracer testing in June 2002 validated conclusions

- **Vulnerabilities quantified in multiple airport boarding areas and terminals**
- **Passive protection and incident response recommendations exercised**





Effective facility protection requires both facility modifications and response measures

- **Security enhancements**
- **Passive protection to minimize consequence of all attacks, even if undetected**
- **Active responses to further reduce consequences of detected attacks**





An airport facility defense guide will soon be published for airport planners

“Guidelines to Improve Airport Preparedness Against Chemical and Biological Terrorism”

- **The primary goal is to aid airports nationwide in enhancing their near-term chem-bio preparedness**
- **Content will include:**
 - Facility assessment: What needs improving?
 - Facility hardening: Prioritized air handling and security modifications
 - Response plans: Response to chemical and biological incidents
- **Collaboration with Lawrence Berkeley National Lab**





These guidelines are drawing on airport experience and existing guidance for building protection

- **Sandia recommendations based on airport assessments to date and experience from other facility protection programs**
- **Existing LBNL guidance for building protection**
 - “Protecting Buildings From a Biological or Chemical Attack: actions to take before or during a release,” LBNL/PUB-51959, 2003
- **Guidance published by other organizations**
 - “Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks,” NIOSH, 2002
 - “Protecting Buildings and Their Occupants From Airborne Hazards,” U.S. Army Corps of Engineers, 2001





Outline

- Facility analyses and guidelines
- **Biological detection systems**
- November airport bio-defense exercise





A facility-defense bio-detection system has been proposed and is being demonstrated

- **One-week field test held at SFO**
 - Examined feasibility of proposed bio-detectors
 - Deployed devices in two air-handling units
 - Collected detailed information to examine the potential for false alarms
- **These sensors appear promising**
 - Longer-term testing required for concept validation





Initial testing focused on examination of background and false alarm issues

Motivation

- To examine the feasibility of using proposed bio-detectors to detect biological attacks in an airport.

Objectives

- Characterize airport aerosol background
- Evaluate detector performance in airport

Conclusion

- Use of bio-detectors with appropriate responses may provide significant defensive enhancement





Longer-term testing and analyses are required to validate this concept

- Long-term field deployment of selected sensor(s)
- Optimization of detector operation
- Laboratory validation of proper operation
- Studies of networked bio-detection architectures





Outline

- Facility analyses and guidelines
- Biological detection systems
- **November airport bio-defense exercise**





An airport bio-defense preparation exercise was conducted November 19, 2003 at SFO

- **Demonstration of limited operational bio-detection system**
 - Sensor Management Architecture (SMA) including multiple bio-detection devices
 - Sensors linked to provide real-time data and control
- **Tabletop to exercise decision-making, communication, and responsive actions in the event of a bio-terrorism incident**
 - Explored consequence management of detection system alarms
 - Used new facility bio-defense simulation (WMD-DAC/Facility) to provide “ground-truth”
 - Response options including air handling control and evacuation
 - Airport decisions impact metrics such as infections and flight delays





A simulation environment (WMD-DAC/Facility) provided “groundtruth” for the tabletop exercise

Interactive environment for exploring response strategies

- Provided representative, incomplete information
- Illustrated the uncertainty of a real event
- Placed participants under time pressure
- Provided a mechanism for recording responses
- Estimated results of decisions that airport and regional officials made in a simulated bioterrorism event
- Tracked metrics

Decisions made during the tabletop influenced the evolution and outcome of the scenario. There was no script.





Over 60 people from airport, regional, and federal organizations participated





Summary of PROACT fiscal year '04 activities

- **11/19/03 multi-agency bio-defense exercise at SFO**
 - Bio-detection system architecture demonstration
 - Tabletop driven by new WMD-DAC/Facility simulation
- **Analysis and communication of facility defense guidance**
 - Airport facility defense guidance document
 - System design tradeoff studies for chemical and biological detection-based response architectures
- **Demonstration of bio-detection system feasibility**
 - Extended testbed including multiple instruments
 - Limited system deployment to explore architectural issues
- **Ongoing outreach to coordinate with other similar programs**



Note:

Official Use Only (OUO) material presented on 2/26/04 has been removed from this version of the briefing. Interested parties with need-to-know may contact the author to obtain a copy of the complete briefing. OUO reports describing the facility assessments and testing are also available.