TSA
Office of Security Technologies (CTO)

Transit and Rail Inspection Pilot (TRIP)

CTO Operational Integration Division
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Objective

- Determine the operational suitability of commercially available and emerging screening technology for rail passenger screening under multiple threat scenarios.
- Determine the operational effectiveness of canine patrols in a mass transit environment.

- Assist in developing a screening model for Amtrak, WMATA, and commuter rail;
- Review privacy laws and issues; and
- Consider ways to maintain effectiveness while increasing public acceptance.
Threat Scenario

Large amount of explosives carried on board an AMTRAK, Commuter, or Mass Transit train to disrupt transportation along Northeast Corridor and cause significant loss of life.
Scope Limitations

- Does not address sabotage, which is designed to disrupt operations and may include signal and track tampering, vandalism, and the disabling of power supplies and telecommunications networks;
- Will only address access through, from, and around station; or through rail screening car;
- Does not address the intentional manipulation of computer hardware and software to disable communication systems and to destroy or manipulate data; and
- With exception of modifying rail screening car interior, technologies limited to COTS that could be inserted without physical plant and infrastructure modifications.
Approach

- Spiral development of requirements and technology assessments
  - Phase I: Establish operational test-bed site at New Carrollton and evaluate equipment, processes, and procedures against partial set of threat scenarios
    - Lessons learned
    - Technology readiness gap assessment
    - Refine requirements
  - Phase II: Evaluate equipment, processes, and procedures for screening of checked baggage in the rail environment
    - Washington Union Station
    - Checked baggage and parcels
    - Develop end state solution
  - Phase III: Establish operational test-bed site and evaluate equipment, processes, and procedures for on board screening of passengers and baggage
    - Lessons learned
    - Technology readiness gap assessment
    - Refine requirements
Legal Implications

- TSA Office of Chief Counsel has concluded, in light of the threat, that mandatory screening is acceptable.
  - Office of Chief Counsel considered 4th amendment implications; and
  - Office of Chief Counsel obtained an opinion from the Department of Justice.
- Implications of mandatory screening:
  - Passenger participation is estimated to be greatly reduced if screening is NOT mandatory.
  - Availability of National Screening Force means staffing strength sufficient to handle mandatory screening.
  - Procedures are in place to allow passengers to bypass screening if screening would prevent passenger from catching train.
Pilot Checkpoint for Phase I
New Carrollton, MD - Amtrak Station
Concept of Operations – Phase I

- **Large amounts of explosives**
  - Backpacks, large bags, briefcases, suitcases, duffel bags, travel bags
  - 100% of all bags meeting threshold

- **Screening Periods**
  - 5 AM – 10 AM Mon-Fri, 3 PM – 6 PM Mon-Fri, 3 PM – 6 PM Sun

- **WMATA Boardings – New Carrollton**
  - Daily Average Boardings – 9336 Passengers
  - 7671 Passengers per day – peak hours
  - 1665 Passenger per day – non-peak hours

- **Amtrak Boardings – New Carrollton**
  - 2001 – Daily Average: 679 Passengers
  - 2002 – Daily Average: 659 Passengers
  - Peak Times: 8 AM – 6 PM

- **MARC Boardings – New Carrollton**
  - Daily Average Boardings – 550
  - 30 Passengers per train – peak hours
  - 10 Passengers per train – non-peak hours
Rail Passenger Screening Process

- Layered Screening
  - Observation of passengers in waiting area
- Primary Screening
  - Automated Explosives Detection System (L3 Vivid MVT)
  - EntryScan Trace Portal (GE Ion Track)
  - K-9 deployment in Mass Transit arena
  - Radiation detection in station (Radiation “pager” on Amtrak LEO)
- Secondary Screening
  - ETD Resolution of alarms from primary carry-on article screening (Smiths Ionscan 400B)
  - Visual examination or physical search by Amtrak LEO
Test Background

• TRIP Phase I was conducted May 4 – May 26, 2004 at New Carrollton, MD Amtrak station.
• Objective was to evaluate effectiveness and suitability of using COTS technologies to screen passengers prior to entering the train boarding area.
• Equipment used:
  • GE Ion Track EntryScan Explosives Trace Detection (ETD) portal (commercial version). This unit scanned passengers for traces of explosives.
  • L-3 Communications Multi-View Tomography X-Ray (MVT). This unit scanned passenger carry-on bags for bulk explosives at the rail threat mass, which is higher than the air threat mass.
  • Smiths Barringer Ionscan 400B. If a bag alarmed on the MVT, an ETD sample was taken and the bag was physically searched with the aid of MVT-provided bag images.
Success Metrics

- Screen 100% of passengers and their carry-on articles during the designated screening periods;
- Successfully resolve all alarms either through use of technology or by referral to Amtrak LEO for disposition;
- Determine operational effectiveness of processes, procedures, and technologies (i.e. “how well”);
- Determine reliability, maintainability, and availability of technologies used during pilot.
Pilot Checkpoint Floor Plan Drawing
Conceptual Design of Pilot Checkpoint

RailScan Security Checkpoint
AMTRAK Station, New Carrollton, MD

Vivid MVT
ETD
EntryScan
Trace Portal
Up Escalator

Light Grid = 1’
Dark Grid = 5’
Automated Explosive Detection System
Vivid MVT

- Three fixed dual-energy x-ray sources to reconstruct and analyze contents of each bag
- Accurately measures mass, density and other physical characteristics in each bag
- Capable of throughput up to 1,800 bags per hour in an integrated system with high speed conveyors
EntryScan Trace Portal – GE Ion Track

- Fully automated visible and audible instructions direct passengers when to enter and leave.
- Uses technology which accurately detects a wider range of explosives with greater sensitivity - even in "dirty" environments.
- Capable of throughput of up to five people per minute.
Smiths Ionscan 400B

- Detects and identifies trace amounts of more than 40 explosive substances in a quick 8 second analysis.
- Evaluated and approved by FAA/TSA.
- Challenged and evaluated in U.S. federal and state courts and has passed the Frye and Dow judicial standards. The IONSCAN® has never been defeated in court.
Screening Process

• A TSA screener told passengers arriving at the checkpoint to place carry-on articles on the MVT entry belt and then step into the EntryScan³.
• If neither the passenger nor their articles alarmed, the passenger was allowed to proceed to the train boarding area.
• If passengers alarmed on the EntryScan³, they were patted down to ensure that they were not carrying explosives and their carry-on articles were sampled with ETD and searched.
• If a bag alarmed on the MVT, an ETD sample was taken using a Smiths Barringer Ionscan 400B and it was physically searched with the aid of MVT-provided bag images.
Screening Equipment

MVT

EntryScan³
Phase I Results

**EntryScan**³: 9,145 passengers screened  
Alarm rate = <2%

**MVT**: 10,177 bags screened  
Alarm rate = <5%
Throughput
EntryScan$^3$ Results

EntryScan$^3$

Total times in sample: 3,029.

- Average time to screen: 14.9 seconds
- Median time to screen: 14 seconds
- Standard Deviation: 3.7 seconds
- Maximum: 95 seconds
- Minimum: 9 seconds

Times higher than 15 seconds were typically caused by exit faults, where the passenger left the portal too soon and had to be screened again. There were 67 instances of early exits among the 3,029 samples (2.2%).
Throughput
MVT Results

MVT

Total times in sample: 4,156.

• Average time to screen: 5.2 seconds
• Median time to screen: 5 seconds
• Standard Deviation: 2.7 seconds
• Maximum: 125 seconds (Atypical result from TSA test excursion)
• Minimum: 3 seconds
Throughput
Entire Checkpoint Results

Checkpoint Traversal

Total times in sample: 118

- Average time to traverse: 96 seconds
- Median time to traverse: 76 seconds
- Standard Deviation: 66 seconds
- Maximum: 413 seconds
- Minimum: 30 seconds
TRIP Phase II
• Conduct screening of long distance checked baggage at a major rail station.
• Pilot conducted from June 7 – July 5, 2004 at Union Station, Washington D.C.
• Objective was to show the capability to screen checked rail baggage, and baggage and parcels checked into the parcel room.

• Equipment:
  • Smiths Heimann EDtS to screen the checked baggage of passengers on selected trains.
  • Smiths Barringer Ionscan 400B Explosives Trace Detection (ETD) unit for secondary screening and to screen baggage and parcels left in the parcel room.
Screening Process

• Checked Baggage:
  • Bags checked by passengers on selected trains were sent to the screening area via a system of belts.
  • The bags were then removed from the belt and placed on the EDtS entry belt.
  • The EDtS processed the bag. If the EDtS alarmed on the bag, the bag was manually searched and cleared using a Smith Barringer Ionscan 400B ETD unit.

• Parcel Room:
  • When passengers dropped off bags, they were screened using outside of bag only sampling with ETD analysis.
  • If the ETD unit alarmed, a full bag search was conducted.
Additional Screening Processes

• In addition to ETD and EDtS screening, other methods of screening were occasionally employed:
  • K-9 screening of cargo / abandoned bags
  • ETD screening of cargo / abandoned bags.

• These methods were not found to adversely impact station operations.
Automated Explosive Detection System
Smiths Heimann EDtS
Phase II Results

**Ionscan 400B**: 3,964 bags screened in the parcel room.
Alarm rate = <2%

**EDtS**: 3,276 bags screened
Alarm rate = <12%
Phase III- Screening of Passengers and Carry-On Baggage Aboard a Passenger Rail Car
Objective

- Determine the operational suitability of commercially available screening technology installed in a passenger rail car for the screening of passengers and their carry-on baggage
  - Assist in developing a screening model for Amtrak and commuter rail
  - Review privacy laws and issues
  - Consider ways to maintain effectiveness while increasing public acceptance
Scope Limitations

- Screening technologies limited to Commercial Off-the-Shelf Technology that can be inserted into a passenger rail car with only internal modifications to the car.

- Determining the operational impact on screening technologies due to installation on a moving train was a focus of the pilot program.

- Installation must achieve a finding on “no exceptions” by FRA/CT-DOT/Shoreline East.
TRIP Phase III - Timeline

- 06/14/04 – 06/22/04: Engineering analysis
- 06/22/04 – 06/30/04: Integration/Build contract award
- 07/07/04 – 07/12/04: Installation of screening equipment in passenger rail car
- 07/19/04: DHS media event kick-off
- 07/19/04 – 08/20/04: Pilot screening of passengers and carry-on baggage aboard a passenger rail car
Rail Passenger Screening Process

- Layered Screening
  - Primary Screening:
    - Advanced automated X-ray explosives detection (L3 APS-II)
    - Document Scanner (Smiths Detection Ionscan 400D)
  - Secondary Screening:
    - Electronic Trace Detection Resolution of alarms from primary carry-on article screening (GE Ion Track I2)
    - Visual examination and/or physical search by TSA screener
- Resolution of prohibited item:
  - By Amtrak LEO in accordance with Amtrak SOP
Advanced Automated X-Ray Explosives Detection (L3 APS-II)

- Uses dual energy X-ray data combined with advanced detection techniques to analyze each object in every item screened.

- A highly accurate materials analysis is performed by a computer that identifies suspect materials based on a number of physical characteristics.

- Results of X-ray analysis are displayed in under 10 seconds.
Document Scanner (Smiths Detection Ionscan)

- An individual who handles explosives will acquire explosive residue, which is easily transferable, on his hands. By swiping the ticket, any explosive residues present will be collected and then analyzed by the Document Scanner.

- The Document Scanner uses similar IONSCAN® technology found in the IONSCAN® 400B, which was used in Phases I and II of TRIP.

- Audio/visual results are displayed within 8 to 10 seconds.
GE Ion Track Itemizer (Secondary Screening)

- Carry-on item is “swiped” with a collection pad, which is then placed in the machine for analysis
- Detects and identifies trace amounts of more than 40 explosive substances in a quick 8 second analysis
- Has proven effective in multiple environments
Shoreline East Commuter Rail
New Haven to Old Saybrook, CT
Screening Car

- “Stripped” SPV 2000 passenger car, CDOT Number 1627
- Tables and equipment secured thru floor to longitudinal support members via bolts
- Extensively equipped with handrails for passengers awaiting screening
- X-ray secured to steel plate at centerline, plate secured thru floor to longitudinal support members
Design of Pilot Checkpoint (Overhead View)
Concept of Operations

- Large amount of explosives
  - 100% of passengers and their carry-on baggage

- Screening Periods
  - M-F, 5:30 – 11 AM
  - Shoreline East Commuter Rail passengers to be screened for primary explosives threat after boarding while train is enroute to next station
  - All passengers from each station must either be screened or bypassed before reaching next station – typically a five minute screening period
Success Metrics

- Screen 100% of passengers and their carry-on baggage during the designated screening periods
  - Virtually 100% screened, less than 20 passengers bypassed screening due to five minute screening period being exceeded
  - Daily number of passengers screened varied between approximately 180 to 290, total was 5,820 passengers
  - Daily number of bags screened varied between approximately 190 to 350, total was 6,231 bags
  - Oversized items screened were approximately 3 to 5 per day
  - Rail presents variety of articles, from bicycles to pets, all successfully screened

- Successfully resolve all alarms
  - 100% of alarms resolved successfully
  - False positive rates were very low, and less than expected: X-Ray – less than 5%, Doc Scanner - less than 2%, Tabletop ETD – less than 2%
Success Metrics

- Determine operational effectiveness of processes, procedures, and technologies (i.e. “how well”)
  - Virtually all passengers screened within time constraints, median time per one station stop group was 253 seconds (to screen all embarking passengers)
  - Average car transit time for non-alarming passenger was 20-22 seconds
  - Up to 30 passengers from one station screened within 5 minutes
  - Public acceptance was very high, most riders very supportive
  - Screeners established cordial relations with daily passengers

- Determine reliability, maintainability, and availability of technologies used during pilot
  - X-Ray was 100% available during 30 day pilot period
  - One Doc Scanner and tabletop ETD’s down for about 12 hours in separate occurrences
Significant Lessons Learned

- FRA/TSA collaboration is key to success in any rail-related security venture, especially if railroad equipment needs to be modified. CTO established outstanding working relationship with FRA.

- Close coordination must be established with rail agency (CDOT in this pilot) and actual operator (Amtrak). Screening car frequently taken away for maintenance and other routine activities without notice to CDOT and TSA, often at same time TSA planned for screening equipment maintenance and other activities.

- UPS essential for ETD technologies since they benefit from constant power source. Removal of engine electrical power without notice during maintenance “bakeout” damaged three tabletop ETDs.
Significant Lessons Learned

- Rail environment induces much more frequent routine maintenance (cleaning of filters and drift tubes) for ETD equipment
- No modifications to equipment or installation were needed
- As is always shown during pilots, early and frequent screener participation in equipment and process design is critical
- Fact that presence of LEO at screening site is essential was validated once again
Transportation Security Administration