2008 Homeland Security S&T Stakeholders Conference West

"Putting First Responders First"

Fiscal Year 2008
Borders & Maritime Security Division
Science and Technology Directorate

From Science and Technology… Security and Trust

Homeland Security

Borders and Maritime Security Division

Mission Statement

Develop and Transition Capabilities that Improve the Security of our Nation's Borders without Impeding the Flow of Commerce and Travelers

- **Stop Bad Things and Bad People from Entering the Country**

AND

- **In the Maritime - Protect the Public, the Environment, and U.S. Economic and Security Interests**

Borders are all land and maritime borders including U.S. ports-of-entry, vast stretches of remote terrain and inland waterways

Customers:

Include all Federal, State, Local, and Tribal Law Enforcement Agents, including first responders

Homeland Security

Border Security: Representative Technology Needs

- Improved ballistic protection via personal protective equipment *(Borders/Maritime Division Lead)*
- Improve detection, tracking, and identification of all threats along the terrestrial and maritime border *(Borders/Maritime Division Lead)*
- Ability to access ICE databases in which voice information is entered; provide analytical, reporting, and automated case deconfliction; classify, identify voice samples *(C2I Division)*
- Non-lethal compliance measures for vehicles, vessels, or aircraft allowing for safe interdiction by law enforcement personnel *(Borders/Maritime Division Lead)*
- Non-destructive tools that allow for the inspection of hidden or closed compartments to find contraband or security threats *(Borders/Maritime Division Lead)*
- Improved analysis and decision-making tools that will ensure the development/implementation of border security initiatives *(Borders/Maritime Division Lead)*
- Ability to non-intrusively determine the intent of subjects during questioning *(Human Factors Division)*
- Ability for law enforcement personnel to quickly identify the origin of gunfire and classify the type of weapon fired *(Borders/Maritime Division Lead)*
- Ability for law enforcement officers to assure compliance of lawful orders using non-lethal means *(Borders/Maritime Division Lead)*

Homeland Security

Maritime Security:
Representative Technology Needs

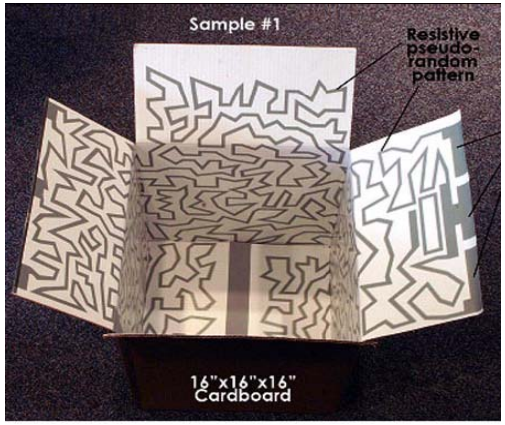
- Wide-area surveillance from the coast to beyond the horizon; port and inland waterways region - detect, ID, and track *(Borders/Maritime Division Lead)*
- Data fusion and automated tools for command center operations *(Borders/Maritime Division Lead)*
- Vessel compliance through non-lethal compliance methods *(Borders/Maritime Division Lead)*
- Enhanced capability to continuously track contraband on ships or containers *(Borders/Maritime Division)*

- Improved ballistic personal protective equipment for officer safety *(Borders/Maritime Division Lead)*
- Improved WMD detection equipment for officer safety; improved screening capability for WMD for maritime security checkpoints *(Borders/Maritime Division Lead)*

Homeland Security

Cargo Security:
Representative Technology Needs

- Enhanced screening and examination by non-intrusive inspection *(Borders/Maritime Division)*
- Increased information fusion, anomaly detection, Automatic Target Recognition capability *(Borders/Maritime Division)*
- Detect and identify WMD materials and contraband *(Borders/Maritime Division)*
- Capability to screen 100% of air cargo *(Borders/Maritime Division)*
- Track domestic high-threat cargo *(Borders/Maritime Division)*
- Positive ID of cargo & detection of intrusion or unauthorized access *(Borders/Maritime Division)*



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Borders/Maritime in the News…

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Border officials fight cover-providing weeds

Updated 180d ago | Comments 33 | Recommend 22 E-mail | Save | Print | Reprints & Permissions | RS

By Mimi Hall, USA TODAY

A giant, aggressive weed growing along the border with Me is draining massive quantities of water, overrunning roads bridges and providing cover for illegal immigrants, drug smugglers and anyone else trying to sneak into the country the Homeland Security Department says.

Called Carrizo cane, the invasive, non-native plant grows stalks up to 18 feet tall and can get so dense it makes roa impassable.

The non-lethal ballistic Boat Trap

from On the Water (221 articles)

December 13, 2006 The rapid progress of technology is a two-edged sword, offering an opportunity for all humans to live a life of dignity, with food and water, and free from disease. At the same time it offers a small, disgruntled community the force-multiplication to strike telling blows against much bigger foes as we found on September 11, 2001. There are daily examples in Iraq of technology's ability to aid a deadly strike against a larger opponent with IEDs and human-driven suicide truck bombs taking a massive toll. Perhaps the best example of a few men being able to strike at a larger enemy was the attack on USS COLE, in Yemen in October 2000, which amply demonstrated the destructive potential of a surface attack and the vulnerability of ships in port. To ensure the safety of military ships, Foster-Miller is developing an advanced Boat Trap system for the United States Department of Defense Joint Non-Lethal Weapons Directorate, working closely with the US Coast Guard. Designed to bolster US harbour security and protect coastal milita... ballistic net...

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Is this a real-life 'light saber?'

Updated 55d ago | Comment | Recommend E-mail | Save | Print | Reprints & Permissions | RS

Enlarge Intelligent Optical Systems

The LED Incapacitator emits a blinking light about as bright as a flashbulb. The colors and rhythm of light are absorbed by the human retina and disorient the brain, which blinds the suspect for several seconds and can also make the person stumble or feel nauseated.

By Mimi Hall and Eric Moreno, USA TODAY

The Homeland Security Department i... agents with a light-saber-type weapo... strobe capable of subduing criminals... unruly airline passengers.

It's the latest government effort to de... — in this case, a powerful beam of l... anyone who looks into it.

"The light could be used to make a ... his eyes, giving authorities enough ... and apply the cuffs, all while sparin... hostages or airline passengers," a... the device from the Homeland Sec... and technology division.

Surveillance targeted to convention

The Boston Globe

Wide network of cameras planned

By Ralph Ranalli and Rick Klein, Globe Staff | July 18, 2004

An unprecedented number of video cameras will be trained on Boston during the Democratic National Convention, with Boston police installing some 30 cameras near the FleetCenter, the Coast Guard

Tracking the Elusive Shipping Container

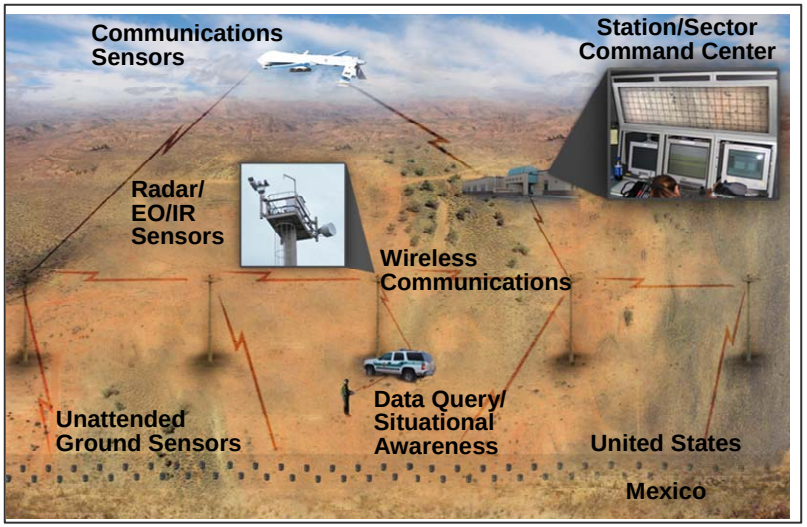
Newswise — The world is a very different place out beyond the horizon. Even as you read this, there are some 40,000 large cargo ships plying the world's waterways and oceans, not to mention innumerable smaller merchant craft, all pulling in and out of ports, loading, unloading, changing out crews and cargos, and steaming from one location to the next.

In what can be a very murky world of shadowy ship registry offices, lengthy manifests, and dockhands who change out faster than Barbosa's crew, how all these ships come by their cargo, how that cargo is loaded, by what polyglot seamen and in what untamed ports, can be an amazingly scrambled and trackless story rivaling the *Pirates of the Caribbean*.

Scenario: A single ship starts out in Singapore with containers filled with electronics, passes through Indonesia where it picks up spices, sails to Calcutta to load cotton, Port Said where it boards an Egyptian crew, Piraeus where it stops for fuel, Tangier where it picks up leathers, Scotland where it packs in woolen sweaters, and finally sets sail for Newark, New Jersey. Eleven million containers packed with such goods reach U.S. ports every year.

Image Gallery

S&T Border and Maritime Technology Projects



Border Net

A wireless communication network that will connect law enforcement agents in the field to real-time information from law enforcement databases and geographic information systems

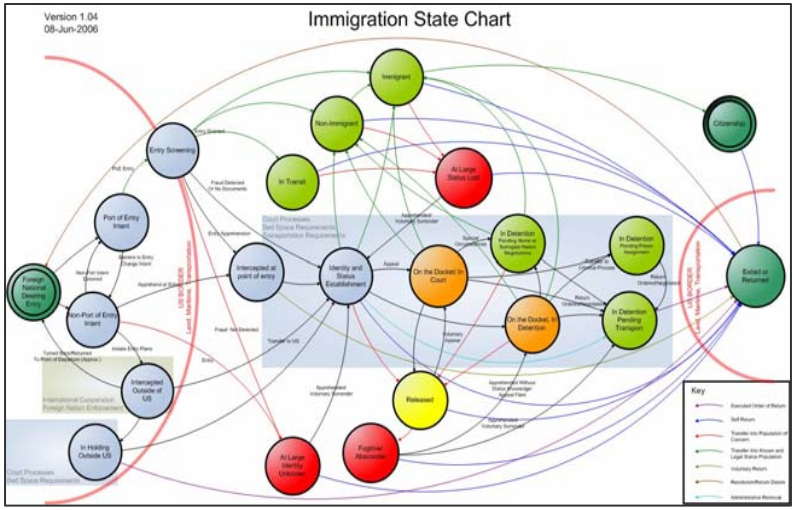
Sensor/Data Fusion and Decision Aids

A set of situational awareness tools that fuse tactical information from multiple data sources such as sensors and monitors, and provide different layers of detail

Homeland Security

S&T Border and Maritime Technology Projects

Border Detection Grid
A grid of advanced sensors to detect cross-border movement, classify what it is (e.g. friendly forces, animals, weather, or illegal activity), and locate geographically where it is



Secure Border Initiative (SBI) Systems Engineering and Modeling & Simulation
A set of systems engineering tools and models to help border enforcement agencies to make informed improvements in immigration and border security policy and operations, as well as investments in technology, complex systems, and infrastructure

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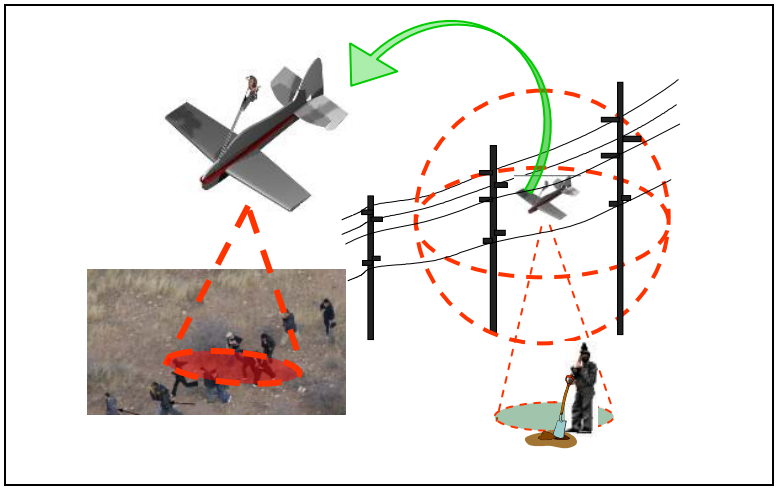
S&T Border and Maritime Technology Projects



Power Line Urban Sentry (PLUS)

Small scale unmanned aerial system (UAS) that uses power lines to recharge with autonomous operation for long periods of time, provides enhanced sensor usage while collecting power from power lines, and enables UAS deployment to remote areas for long periods of time without the need for human interaction

Advanced Technologies for Unattended Ground Sensors (UGS)

Energy management using power harvesting techniques and/or awake/sleep modes for an unattended lifetime of at least two years, using multi-sensor and/or signal processing techniques. Maximize communications range and include techniques to achieve low-probability-of-detection and low-probability-of-interference

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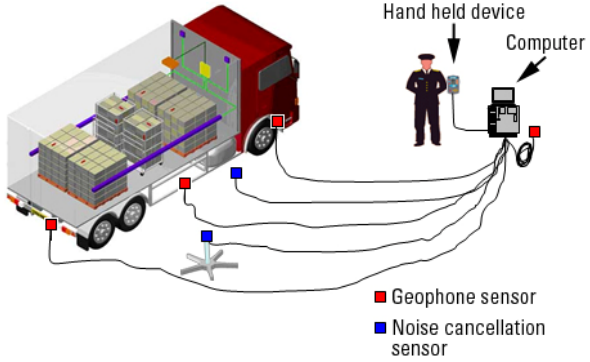
S&T Border and Maritime Technology Projects

1. Stop vehicle
2. Turn off engine
3. Occupants exit vehicle
4. Input relevant vehicle information into hand held device
5. Place correct number of sensors on flat metal surface of vehicle (bumper, storage bin, axle)
6. Place noise cancellation sensors
7. Run test
8. Remove sensors



Improved Heartbeat Detector

A portable set of geophones mounted on a vehicle/conveyance to detect acoustic wave frequencies resulting from human heartbeats with noise canceling algorithms to reject wind and ground vibrations

CBP Air Long Range Tracker (LRT)
P-3 Sensors Upgrade

P-3 sensor upgrade efforts are in progress to determine: technical requirements; feasibility; cost effectiveness; life cycle management impacts; performance of candidate sensor systems; and recommendation for sensor system acquisition

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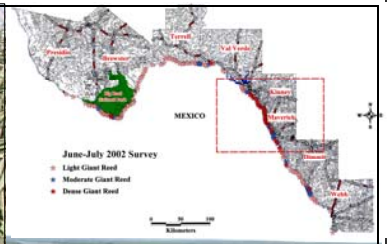
S&T Border and Maritime Technology Projects



Arundo wasp
Larva form galls & kill canes

Arundo fly
Larva kill new shoots

Arundo scale
Nymphs feed on rhizomes

Arundo donax Eradication

Accelerate the biological control program to eradicate the Arundo donax infestation along the Rio Grande River by evaluating, selecting and gaining approval for biological control agent(s); conducting a pilot release program; and initiating a mass-rearing and application program

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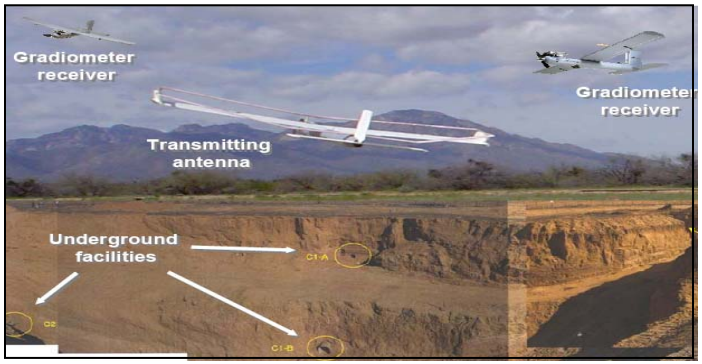
S&T Border and Maritime Technology Projects

SCOPE

Demonstrate operational utility, versatility, and affordability of Global Observer (GO) Unmanned Aircraft System (UAS) to provide persistent wide area surveillance (WAS)



Tunnel Detection

Demonstrate the use of multiple technologies to detect, identify, and characterize illegal cross-border tunnels using unmanned aerial vehicles (UAVs), land-mobile platforms and embedded sensors.

Homeland Security

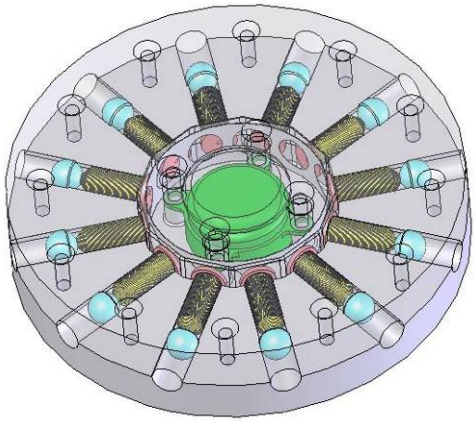
Predator B


144T
-12T
ULTN
BLK
GATE
LIN LAKE
AGFT
N 31°37'45"
W110°43'11"
15,250 MAT
-12
-120
N 31°48'59"
W110°42'41"
ARM
SAFE

S&T Border Officer Tools and Safety

S-afe
Q-uick
U-ndercarriage
I-mmobilization
D-evice

SQUID



Lightweight, portable, self-contained, and self-powered less-lethal, vehicle stopping device that entangles vehicle undercarriage rotating components, minimizing danger to law officers, vehicle occupants, and the general public

Officer Safety Load Carriage System

Provides high level of safety and integrates floatation with heavy ballistic and personal equipment; locates an officer's equipment/load where it is easily accessible and distributed

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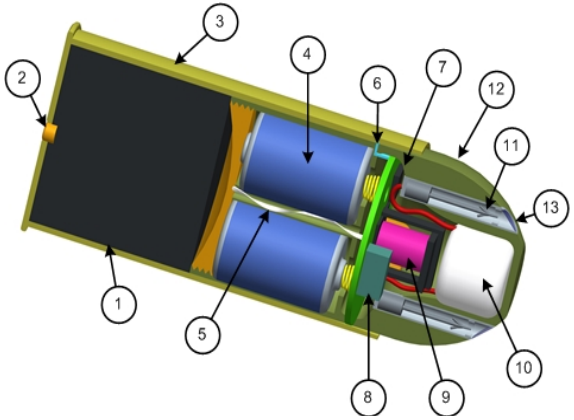
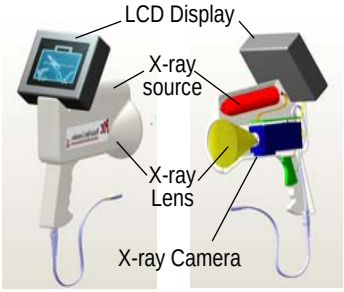
S&T Border Officer Tools and Safety



Non-Tethered Electro-Muscular Disruption (EMD) Device

Less-lethal, non-tethered, low-cost, COTS-based round that is deployed by widely used conventional weapons platforms using wireless technology to allow officers to administer additional EMD bursts after the initial impact and EMD delivery

Shipboard Compartment Inspection Device Detecting Contraband



Design of the Compartment Inspection Device

Shipboard Compartment Inspection Device

Handheld through-the-wall imaging device to identify false bottoms/walls and detect illegal cargo aboard ships, which focuses and acquires backscattering photons from hidden objects irradiated by a cone beam from a low-power X-ray generator

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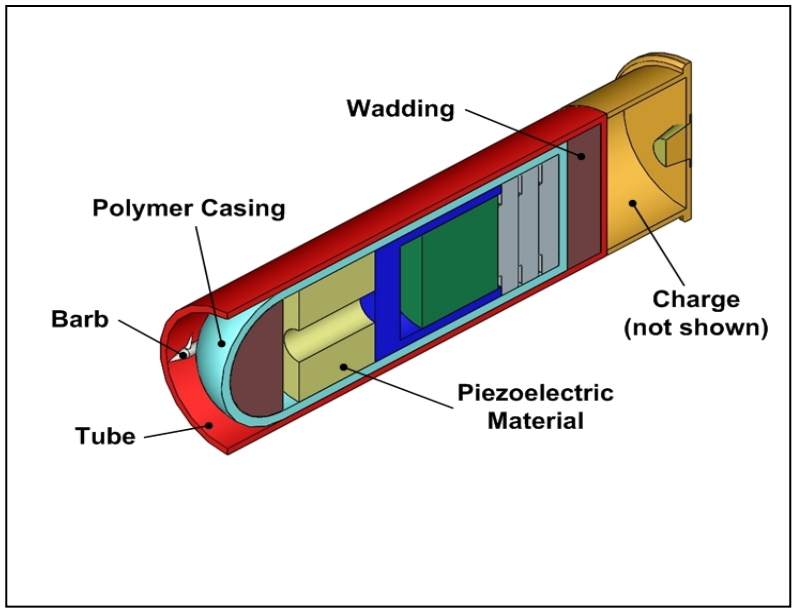
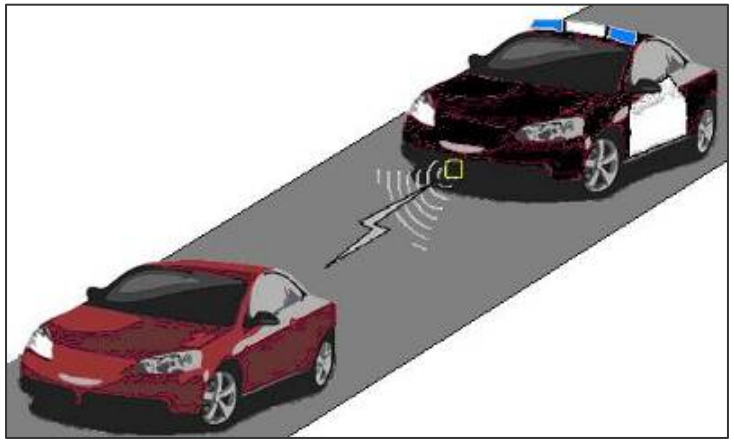
S&T Border Officer Tools and Safety



Safe Fired EMD Round (SAFER) 12 Gauge Shotgun

Less-lethal, non-tethered, low-cost, Commercially Off the Shelf (COTS)-based, EMD 12 gauge shot-gun round that is deployed using widely used weapons platforms



Microwave Vehicle Stopper

Uses targeted modulated microwave energy to disable uncooperative vehicles by imparting energy that will cause on-board vehicle computer controllers needed to maintain engine control to fail, of which the control function failure will interfere or stop ignition and fuel control

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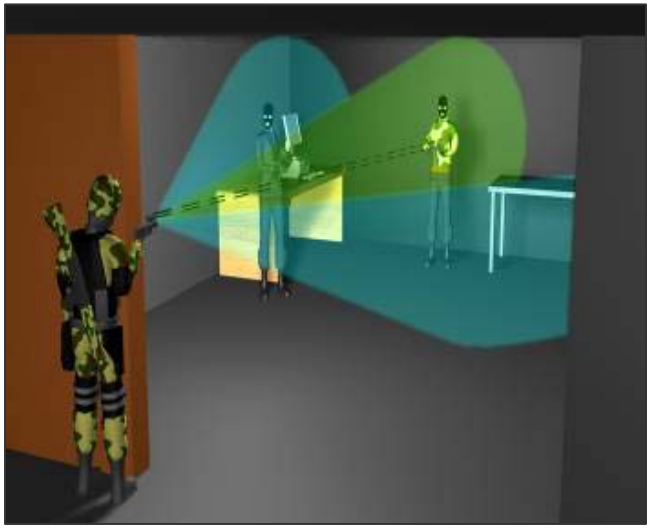
S&T Border Officer Tools and Safety



Light Emitting Diode Incapacitator
LED clusters produce a bright, flashing light that results in disorientation and strong flashblindedness, which incapacitates the individual

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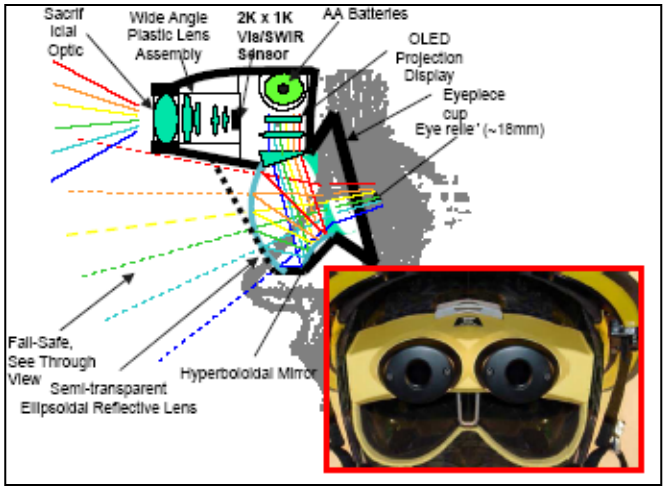
The LEDI

Maritime Security

Class B Automatic Identification System

Self-contained transponder GPS receiver and antenna, built for small craft application, which transmits and receives vessel status while interfacing with vessel chart display and power supply



Extreme Wide Field of View IR/NV Capability

Helmet mounted wide field of view device that incorporates short wave infrared camera technology with dual imaging lenses placed above the operator eyes with a field of view of 150 degrees x 59 degrees and weighing 1.5 lbs.

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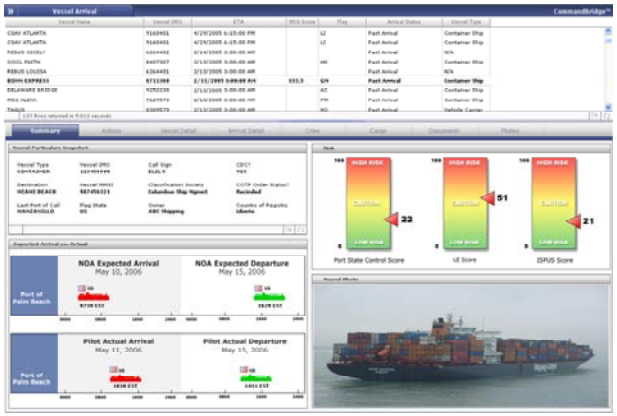
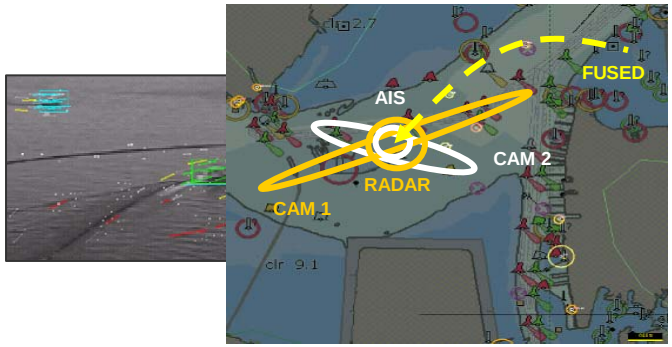
Maritime Security



Visualization Tools for Sector Command Center Situational Awareness and Emergency Response

Accurate situational picture that assimilates relevant sensor data and couples it with amplifying information from database or user input, which identifies threats rapidly and establishes "Blue Force" capacity and readiness



Automated Scene Understanding

Automates the detection of prohibited, suspicious, and anomalous vessel behaviors via the Hawkeye surveillance system sensors using cameras to perform autonomous search, slew to cue, or operate independently; detects and tracks vessels, estimates vessel lengths, learns normal behavior patterns, and generates alerts

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Maritime Security

Offshore Deepwater Buoys for Vessel Detection

Buoy based non-cooperative vessel detection system that is a communication relay used in depths of 4 km of water

Hawkeye Watchkeeper Prototype

An evolutionary prototype system for Coast Guard Port and Coastal surveillance which would provide detection and tracking, via RADAR, within the harbor and 12-20 nm offshore; classification and identification via daylight, low-light and night time cameras; multiple situational awareness displays for the watchstanders and Commanders; and Blue Force Tracking of participating Federal, State, and Local Port Partners

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Maritime Security

Boarding Team Communications

Repeater devices that act like breadcrumbs throughout the ship to relay communications between inter-deck, vessel-to-ship, and ship-to shore

Vessel Stopping

Less-lethal capability to compel, stop, or significantly slow non-compliant target vessels by dropping a net from a helicopter in front of the vessel, which becomes entangled into the vessel's propeller and engine

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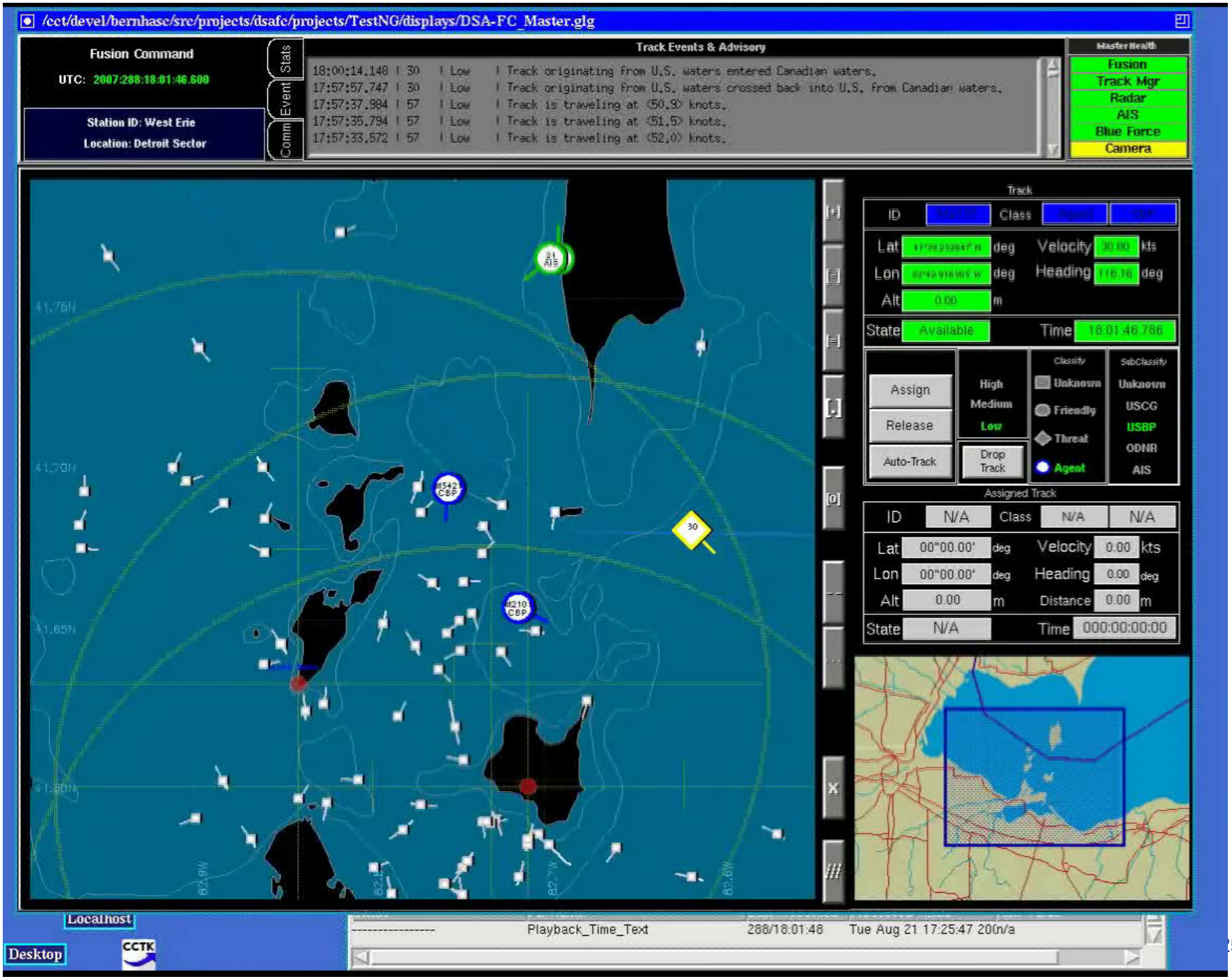
Boarding Team Communications

Less-Lethal Vessel Stopping


/cct/devel/bernhase/src/projects/dsafc/projects/TestNG/displays/DSA-FC_Master.glg
Fusion Command
UTC: 2007:288:18:01:46.600
Station ID: West Erie
Location: Detroit Sector
Stats
Event
Comm
Track Events & Advisory
18:00:14.148 | 30 | Low | Track originating from U.S. waters entered Canadian waters.
17:57:57.747 | 30 | Low | Track originating from U.S. waters crossed back into U.S. from Canadian waters.
17:57:37.984 | 57 | Low | Track is traveling at <50.9> knots.
17:57:35.794 | 57 | Low | Track is traveling at <51.5> knots.
17:57:33.572 | 57 | Low | Track is traveling at <52.0> knots.
Master Health
Fusion
Track Mgr
Radar
AIS
Blue Force
Camera
Track
ID
Class
Lat
deg
Velocity
kts
Lon
deg
Heading
deg
Alt
m
State
Available
Time
18 01 46 786
Assign
Release
Auto-Track
High
Medium
Low
Drop Track
Classify
Unknown
Friendly
Threat
Agent
SubClassify
Unknown
USCG
USBP
ODNR
AIS
Assigned Track
ID
N/A
Class
N/A
N/A
Lat
00°00.00'
deg
Velocity
0.00
kts
Lon
00°00.00'
deg
Heading
0.00
deg
Alt
0.00
m
Distance
0.00
m
State
N/A
Time
000:00:00:00
41.78N
41.70N
41.65N
M542 CBP
M210 CBP
30
82.9W
82.8W
82.7W
82.6W
Localhost
Desktop
CCTK
Playback_Time_Text
288/18:01:48
Tue Aug 21 17:25:47 200n/a

Cargo on Rough Seas and in Hazards

- As seen in the following photographs, cargo undergoes many hazards:
  - Rough seas
  - Floods
  - Accidents
  - Fire
  - Smoke

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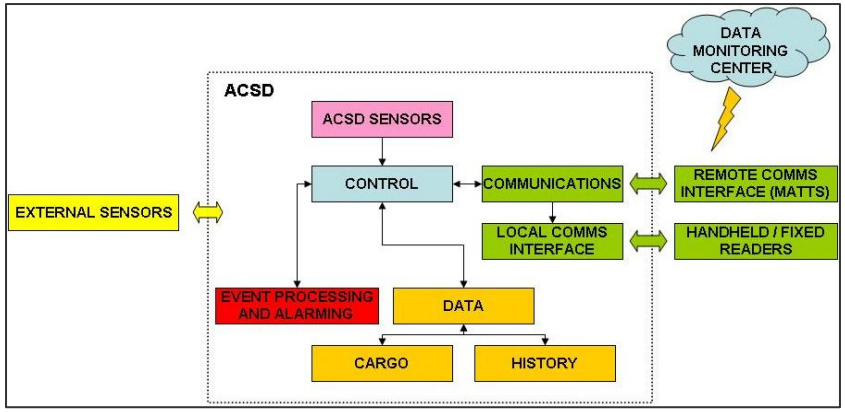
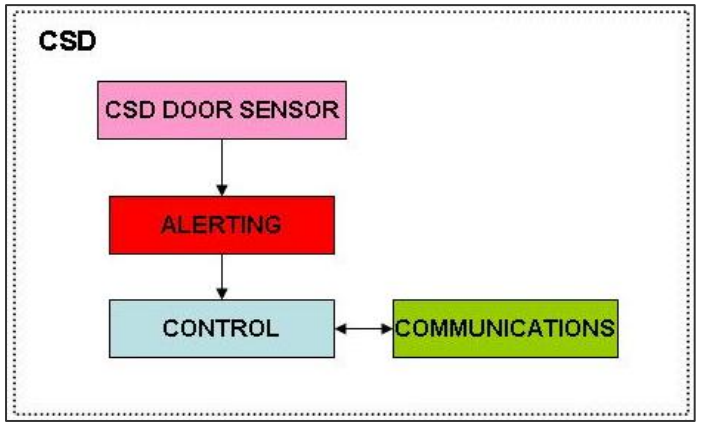
Cargo Security Programs



Advanced Container Security Device (ACSD)

An in-container sensor to detect and alert of intrusion on any six sides, door openings or the presence of stowaways



Container Security Device (CSD)

A small, low-cost sensor mounted on or within a container to detect and warn of the opening or removal of container doors

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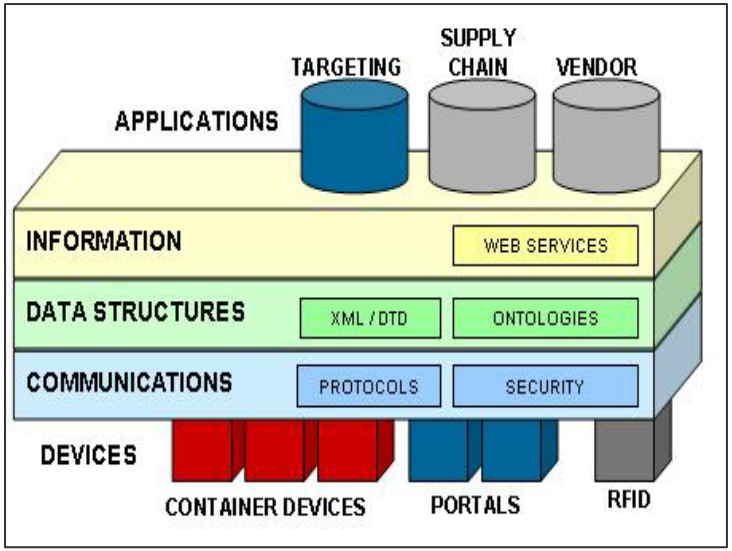
Cargo Security Programs

Advanced Screening and Targeting (ASAT)

A project that develops computer algorithms and software that will automatically collect, combine, analyze and find suspicious patterns in the shipping information of containers



Supply Chain Security Architecture

A framework for how near-term (i.e. CSD) and future container-security technologies (i.e. ACSD) will be incorporated by industry into supply chain security operations and how information can be communicated securely to CBP officers

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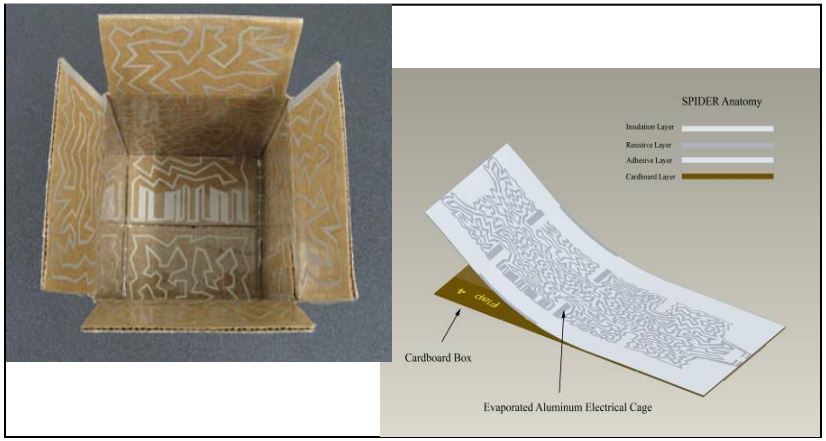
Cargo Security Programs

Secure Wrap

A more flexible and secure tamper-indicative wrapping material for palletized cargo shipped through the international supply chain across various shipping modalities (e.g., air, maritime, land)



Secure Carton

A shipping carton with embedded security sensors that detects and communicates tampering to the carton once closed, providing improved visibility into the supply chain

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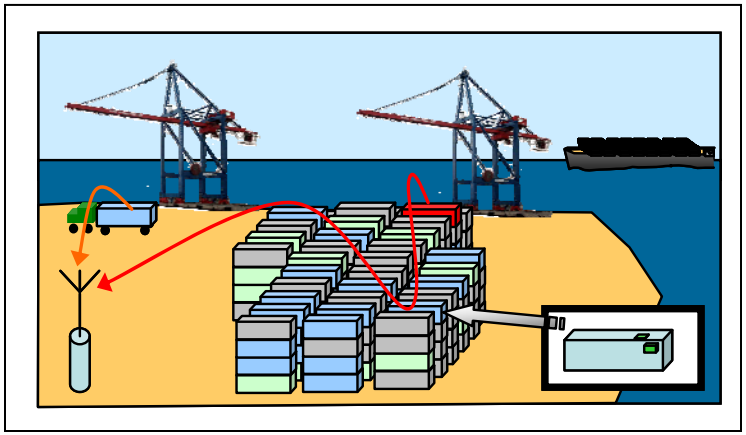
Cargo Security Programs



Marine Asset Tag Tracking System (MATTS)
A remote world-wide communications and tracking tag for transmitting alarms

Hybrid Composite Container

A potential next-generation lightweight and durable ISO shipping container with embedded security sensors to detect intrusions

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Marine Asset Tag Tracking System (MATTS)

- MATTS
  - Remote global communications and tracking tag
  - Transmits security and location data via adaptive standards-based protocols
  - Multi-modal use across truck, rail and maritime

- International Testing
  - Successful cooperative U.S.-Japan test, Sep 07
    - 100 MATTS-tagged containers tracked from the Port of Yokohama to the Port of Long Beach to inland U.S.

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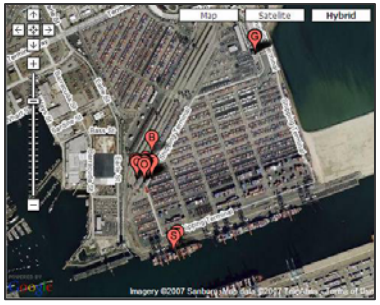
Marine Asset Tag Tracking System (MATTS)

APL Terminal, Yokohama

Tracking Data Yokohama to DeKalb, IL

Deconsolidation Center DeKalb, IL



APL Terminal

Rail Yard – Rochelle, IL

Composite Container

- The Hybrid Composite Container
  - Next-generation shipping container with embedded security sensors to detect intrusions
  - Lighter weight and stronger than existing steel containers

- Commercial Benefits include:
  - Increased load per container
  - Fuel savings across modes of transport
  - More durable, increased resistance to corrosion and rust, lower maintenance costs

- International Standards Organization (ISO)-compliance Testing
  - Met all ISO test criteria for standard ISO container
  - Exceeded performance of existing steel containers

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Composite Container

Prototype Testing

Prototype

Composite Material with Embedded Sensors

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Cargo Security Programs

SAFECON

A crane mounted sensor system that interrogates shipping containers unobtrusively and detects and identifies dangerous cargo (chemical agents, biological agents, explosives, and human cargo) during normal ship load/unload operations.

Homeland Security

Homeland Security