Homeland Security
Science and Technology

Transportation Security Laboratory

Core Laboratory Capabilities

Explosive Effects Laboratory

Mission: The Explosives Effects Laboratory (EEL), a multi-site laboratory headquartered at the Transportation Security Laboratory (TSL), performs fundamental research to characterize improvised explosive devices and their effects on structures.

Overview

Research programs at the EEL are designed to test, analyze, and model the explosive energy release of ideal and non-ideal energetic materials and the corresponding response of targeted structures. EEL's partners and customer base includes several Department of Homeland Security components (including the Science and Technology Directorate and the Transportation Security Administration) and other government agencies, including Department of Defense, Naval Surface Warfare Center Carderock Division, and the Army Research Laboratory.

Pressurized Aircraft Passenger Cabin Test

Facilities:

Transportation Security Laboratory Test Facility (1200 ft^2, explosive sensitivity and characterization tests):

- Photron APX-RS high-speed camera, 250,000 fps; Dolphin low-speed camera
- MBOM Impact Test Machine
- National Instruments Pressure Transducer 136-channel DAS and Strain Transducer 4-channel DAS
- PCB pressure transducer, to 1000 psi
- Modeling and Simulation Software Tools (BlastDam, MSC Software, CTH)

Aberdeen Test Center (ATC) Test Facility:

- Aircraft Vulnerability and Mitigation Test Ranges
- High Speed Photographic and Image Correlation System
- Witness Panel Blast Response Measurement System (WP-BRMS)
- Shock Hole Test Fixtures

Expertise:

- Design and implementation of test programs to characterize blast waves and the response of structures to those blast waves.
- Measurement, analysis, and interpretation of high speed structural blast response.
- Assessment of the relative potency of conventional and improvised high explosive materials in terms of their potential for causing damage.
- Development and validation of blast modeling software.
- Development and testing of blast mitigation systems.
- Hydrocode and finite element analysis of structures subject to explosive blast.

Pressurized Aircraft Passenger Cabin Test

Recent Activities

- Development of software tool for structural response modeling of aircraft structures (BlastDam).
- Explosive equivalence testing of different improvised explosive devices.
- Characterization of blast impulse and pressure-time histories in close proximity to the detonation.
- Explosive vulnerability assessments of critical structures.
- Statistical regression analysis on aircraft vulnerability test data for aircraft vulnerability assessments.
- Identification and characterization of attenuating and amplifying factors for blasts in confined spaces.
- High speed imaging (10,000 frames/sec) of blast structural response.
- 3D measurement of high speed blast-induced structural deformation and strain by digital image correlation.
- Testing, evaluation, and development of aircraft blast damage mitigation systems (e.g., blast-resistant cabin liners and cockpit doors).
- Characterization of explosive detonation sensitivity, blast intensity, and explosive equivalence.
- Hydro code/finite element analysis of structures subject to explosive blast.

Pressurized Aircraft Cargo Hold Test

Transportation Security Laboratory

The mission of the Transportation Security Laboratory (TSL) is to enhance homeland security by developing and validating solutions to detect and mitigate the threat of improvised explosive devices. Established in 1992 at the William J. Hughes Technical Center, Atlantic City International Airport, the TSL's 12 acre secure campus includes specialized explosive storage and handling areas and a multi-laboratory infrastructure designed for research, development, and test and evaluation of technology for explosives and weapon detection and blast mitigation. TSL's team of physicists, chemists, engineers, research psychologists and mathematicians is internationally recognized for its unique ability to advance technology from conception to deployment through applied research, development, prototyping, test and evaluation, assessment, certification, and system qualification. Research areas at the TSL include

- Vehicle and Infrastructure Vulnerability Assessment,
- Automatic Explosive Detection in Checked Bag
- Containerized, Bulk, Palletized and Parcel Cargo Screening,
- Fast Noninvasive Screening of Passengers, and
- Blast Mitigation Technologies and Strategies.

With award-winning R&D and ISO 9001 Certified Independent Test and Evaluation TSL proudly contributes to America's Domestic Security.

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For more information regarding the Explosive Effects Laboratory and other capabilities and activities of the Transportation Security Laboratory, send e-mail to TSLinfo@dhs.gov