AIRCRAFT VULNERABILITY TO EXPLOSIVES
Terrorist-related threats have spurred more rigorous airport screening over the last several decades, but how does the government define what constitutes a threat and what detection and mitigation technologies to develop to stay ahead of that threat? It is impossible to create meaningful detection standards and technology acquisition requirements without understanding the physical nature of explosive materials and the explosive vulnerability of aircraft structures.

PROTECTING AIRCRAFT FOR DECADES
After the destruction of Pan American World Airways Flight 103 in 1988, the government established the Commercial Aircraft Vulnerability and Mitigation (CAVM) program to address terrorist-based internal aircraft explosive threats. In 2006, the program transferred to the Department of Homeland Security (DHS) Science and Technology Directorate (S&T), with program execution supported by subject matter experts from S&T’s Transportation Security Laboratory. Under the Explosives Threat Assessment program, CAVM and the Homemade Explosives Identification, Detection, and Mitigation (HEID&M) Program paired up to identify the types and quantities of explosives that could critically damage or destroy aircrafts, in order to provide detection and mitigation strategies to DHS Transportation Security Administration (TSA) and to inform technology requirements.

TWO FOCUS AREAS, ONE MISSION
CAVM assesses the explosive vulnerability of commercial aircraft to terrorist-based threats using live fire testing, analysis, modeling and simulation, and evaluation of explosive-resistant materials and technologies for use on commercial aircraft. HEID&M examines the chemical and physical properties of homemade explosives (HMEs) to develop new screening capabilities, perform explosive vulnerability assessments, and create risk assessment and response tools for checkpoint personnel and responders to mitigate HME incidents.

SECURITY FOR TODAY AND TOMORROW
The combined work of the Explosives Threat Assessment program provides data and analysis regarding the effectiveness of explosive-resistant materials and technologies for commercial aircraft and develops explosive threat detection requirements and countermeasures, with potential application in other operational environments. Work on aircraft vulnerability and HMEs allows TSA to develop and field more effective transportation security equipment, provide better training to frontline personnel, monitor current threats, and validate emerging threats. Their tools, modeling, and risk mitigation projects protect national security and our infrastructure’s resilience to emerging threats.

RECENT SUCCESSES
- Reported results of live fire explosive validation testing to TSA for the assessment of commercial aircraft explosive vulnerability;
- Delivered to TSA a Commercial Aircraft (aluminum) Explosive Vulnerability Analysis Tool;
- Defined physical properties of emerging explosive threats and facilitated successful detection of homemade explosives;
- Delivered to TSA a robust review methodology to prioritize research and screening of emerging global explosive threats; and
- Developed an analysis plan for experimental, statistical procedures for testing and delivered it to TSA red team to improve future testing.

UPCOMING MILESTONES
- Complete a modeling and simulation capability of blast responses of composite aircraft panels and deliver to TSA;
- Develop and deliver preliminary commercial aircraft structural damage explosive equivalence recommendations; and
- Provide a Final Analysis and Rating Methodology for outside-the-contiguous-U.S. threats to TSA and S&T.