Comments on Safety & Security Research

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Safety/Security for Commercial Aircraft

- The goal for all of us should be:
  - “Provide an affordable safe haven for the traveling public regardless how hostile the world”

- We have achieved this for historical causes of accidents for large commercial transports.
  - Today, you are more likely to die of natural causes on an airplane trip in the US as you are from an accident.
  - After the 2002 CAST Approved Plan is implemented in 2007, you will be 100 times more likely to die of natural causes.

- Large commercial aircraft accident prevention research has graduated to addressing likely future risks.

- The learnings from CAST:
  - System of systems approach with all stakeholders involved
  - Much more leverage from preventing an accident than mitigating the consequences.
Defensive Systems for Commercial Aircraft

- The air transportation system is now faced with an evolving and potentially extreme security threat environment.

- System-of-systems assessments are required to understand total system (airplane, airport, airspace, etc.) requirements and R&D needs to deal with potential emerging security threats.
  - Need to concentrate efforts on neutralizing security threats before we spend any effort on mitigating the consequences of a security threat.
  - Need to address security while maintaining passenger confidence and still achieve improvements in safety, capacity, ease of travel and cost.

- Protection strategies and technology solutions must consider cost and operational feasibility, as well as unintended consequences.

- Technology can be leveraged from military programs. However, military hardware is not optimized or necessarily the best solution for commercial aircraft in civilian operations.
Very Complex Aviation Security Threat Environment

Perpetrator

- **Terrorist** - plans to inflict terror, disrupt society, wage war.
- **Political** - wants to leave country, gain asylum.
- **Criminal** - needs to escape location (crime), move money, kidnap, ransom.
- **Civilian** - air rage, alcohol problems, mental illness. Disrupt flight.

Scenarios/Threats

- Small arms, guns, knives, etc.
- Grenades, Incendiary devices
- **Bombs, Improvised Explosive Devices**
- Chemical/Biological Weapons, Lasers
- Cyber Attack
- Air Space Disruption
- Missiles, rockets, mortars, EMI/EMP
- Intimidation
- Use of aircraft as a weapon

Modes of Introduction

- **Passengers, and carry-on bags**
- **Checked bags and interline bags**
- Cargo, mail, courier items
- Flight crew (pilots, flight attendants, etc)
- Service (cleaners, ramp, fuel, maint, etc.)
- **Off-board (missiles, jammers, etc.)**
- Air Traffic Center or Infrastructure
- Internet

Some possible “threat vectors” - there are many others

Aviation Security risk mitigation is complex; multiple solutions are needed
Systems Engineering Process Applied to Aviation Security R&D Planning

Aviation Security Strategy and Requirements

1. Scenario-based Security/Threat Assessment
2. Strategy & Requirements

Understand Technology Gaps

1. Consider potential Technologies necessary
2. Consider impact of those technologies (pros, cons, costs, effectiveness, etc.)
3. Prioritize Technology Gaps

Develop & Execute Aviation Security R&D Plan

1. Develop Aviation Security Technology R&D Plan
2. R&D Plan Concurrence (DOT, TSA, FAA, NASA, Industry, etc.)
3. Launch R&D Program (high-payoff technologies & implementation)

Transition Technology

1. Transition Successful Technologies
2. Safe, Secure & Efficient Aviation System

Need to Start Here

What threats are missed by this shortcut?

Too many proposed programs are looking here.
Prioritization of Threat Risk  
- Aircraft, Airport, ATM -

Impact  
(Effects on Air Transportation System, Duration of Impact, and Catastrophic on Individual Aircraft)

Likelihood  
(Ease of Execution and Likelihood of Occurrence within 12 months)
Defensive Systems for Commercial Aircraft

Key Points

- On-board infrared countermeasures (IRCM) have been proposed to protect commercial aircraft from hand-held missile threats. However, on-board IRCM systems were not designed for commercial platforms and are not necessarily the best solution.

- Hand-held missiles are one of many threats that could be used against commercial aircraft. This is not necessarily the most likely or greatest impact threat. A system-of-systems threat assessment needs to be performed to determine the greatest threat risks.