Aviation Infrastructure

CS 4950/5950
Homeland Security & Cybersecurity

Lesson 28
Aviation Infrastructure

Rick White, Ph.D.
University of Colorado, Colorado Springs

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Aviation Infrastructure

- The **US Aviation Transportation System** is comprised of aircraft, air traffic control systems, and approximately 450 US commercial airports and 19,000 public airfields.
- The air traffic control system, formally known as the **National Airspace System**, consists of more than 690 air traffic control facilities and associated radar and communication systems, plus about 11,000 air navigation facilities.

US Aviation System

- 450 US commercial airports
- 19,000 public airfields
- 690 air traffic control facilities
- 11,000 air navigation facilities

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Together, these systems see to it that more than **23,750 domestic flights** carrying more than **2.1 million passengers** arrive safely at their destination **each day**.

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- Security for the Air Transportation System is regulated under Title 49 of the Code of Federal Regulations.
- **US security regulations apply to all aircraft flying in US airspace, including foreign carriers.**

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PPD-21 assigns **both** the **Department of Homeland Security** and **Department of Transportation** **Sector-Specific Agencies** for the transportation sector.

#	Sector Specific Agency	Sector
1	Agriculture	Food & Agriculture
2	Defense	Defense Industrial Base
3	DHS	Chemical Sector
4	DHS	Commercial Facilities
5	DHS	Communications
6	DHS	Critical Manufacturing
7	DHS	Dams
8	DHS	Emergency Services
9	DHS	Information Technology
10	DHS	Nuclear Reactors, Materials, & Waste
11	DHS & DOT	Transportation Systems
12	DHS & GSA	Government Facilities
13	Energy	Energy
14	EPA	Water & Wastewater Systems
15	HHS	Healthcare & Public Health
16	Treasury	Financial Services

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- DHS has delegated SSA responsibilities for the aviation subsector to the **Transportation Security Administration**.
- The Department of Transportation has likewise delegated SSA responsibilities to the **Federal Aviation Administration**.

Transportation Security Administration

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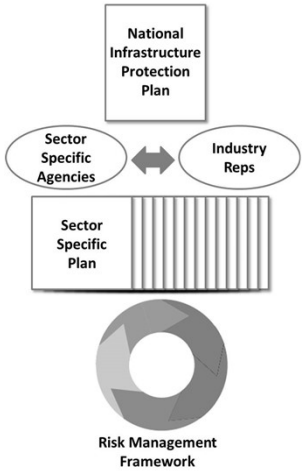
Together, TSA and FAA work together with the **Aviation Sector Coordinating Council** to implement provisions of the **2013 National Infrastructure Protection Plan** and update the corresponding **Sector-Specific Plan**.



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While the post-9/11 transformation of physical security brought about by TSA at the nation's airports has received wide public attention, **cybersecurity measures have received much less notice; that is until recently.**

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In April 2015, a passenger was removed from a flight after tweeting **that they could hack the airplane's in-flight entertainment system.**

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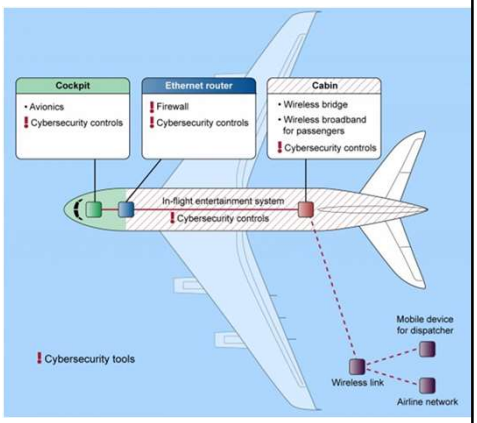
The passenger claimed they were able to **access the aircraft's Thrust Management System** and order one of its engines to increase thrust for a climb, resulting in a temporary yaw.



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While **the aircraft designer asserted the claim was false**, the passenger was still barred from ever flying with that airline.

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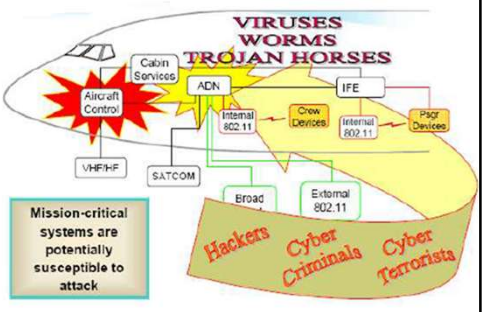
The concern is that new generation **electronic-enabled aircraft**, and older retrofitted aircraft, have **incorporated an unprecedented amount of commercial networking technology into their systems**, and thereby introduced potential new avenues of cyber attack.



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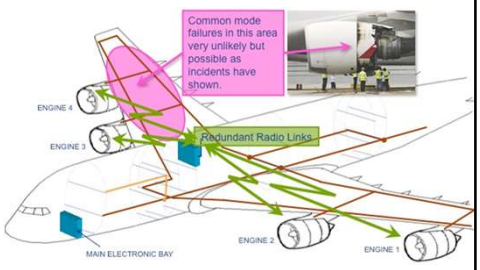
- Understandably, aircraft designers seek to install wireless networking components to **save weight** and increase efficiency.
- Wireless systems **reduce the amount of wiring** within an aircraft, thereby saving weight, lowering fuel consumption, and saving costs.



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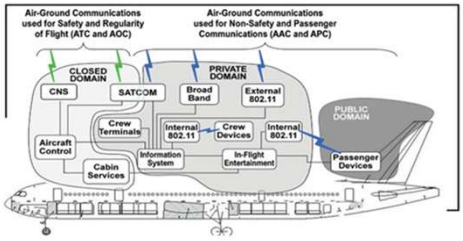
Similarly, e-enabled aircraft can download their maintenance and supply requirements before reaching their gate, reducing turn-around time, also saving costs.



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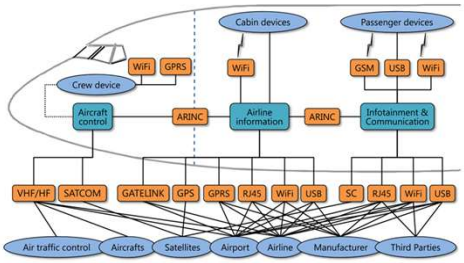
While wireless technology undeniably saves money, it **also creates new vulnerabilities not present in past aircraft** that may have significant impact on aircraft safety.



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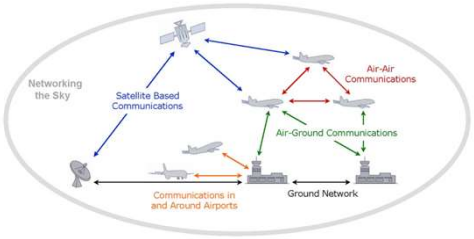
For example, the connection between aircraft and ground systems creates an exposed link that may be susceptible to exploit; and **internal networking may create an avenue for attacking critical avionics from less critical and thus less protected onboard systems.**



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Pilot's Role

- Pilots are responsible for safe and secure flight operation.
- **Flight crews have no training or capability to detect cyber-attack.**
- One defense contractor is developing an on-board intrusion detection system to warn of "anomalous" behavior.
- Another defense contractor is developing a "hardwire" control system that is physically isolated from other components.

Cockpit, Boeing 737-Max.

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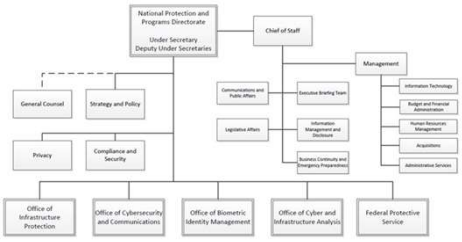
- Out of concern for these emerging threats, in 2004 the Department of Homeland Security National Cybersecurity Division within the National Protection and Programs Directorate established a Control Systems Security Program.
- As a result of this program, in 2009 the Industrial Control System Joint Working Group was created to encourage the design, development, and deployment of enhances security for control systems.



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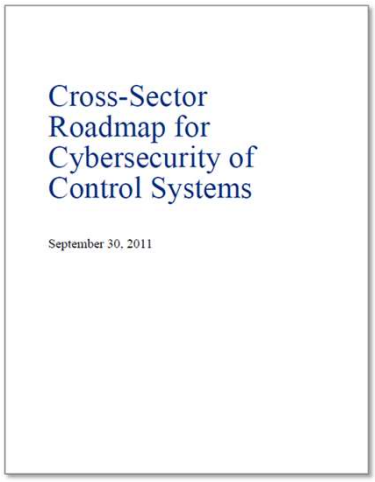
- In 2011, the working group released a Cross-Sector Roadmap for Cybersecurity.
- This in turn spawned the **Roadmap to Security Control Systems in the Transportation Sector**, **a voluntary plan** for improving industrial control system cybersecurity across all transportation modes, including aviation.



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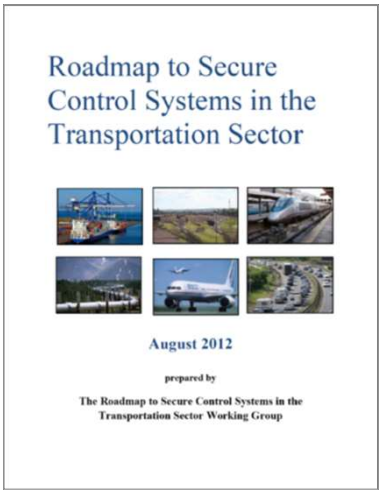
Because of these efforts, in 2014 TSA replied to Executive Order 13636 on Improving Critical Infrastructure Cybersecurity saying they would **continue to press with the voluntary guidelines being developed in their roadmap.**



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Conclusion

Questions?