

# MODERN AIRPLANE SECURITY

A GENERAL SURVEY

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# WHAT WE'RE TALKING ABOUT

- Should you ever fly again after listening to this presentation?
- How are airplanes currently secured against cyberattacks?
- How can I become an airplane hacker?

*Disclaimer:* Don't do things that ruin good people's days, weeks, or lives, even if you are capable of such things.

*Right:* Cal Poly student Jennifer Mauder presents her research on airplane security, of which this presentation is based on. She is currently a Junior SW Dev at Amazon.



AIRPLANE SECURITY  
Everything you didn't think you wanted to know about computer security on planes

- Saturday Nov. 10th 1pm - 2pm CTF
- Tuesday 10pm 11/14/16 AWS Security Talk
- Wednesday 4pm Home Themes on Sprinkly Hostname from Dennis
- Saturday 4pm 11/19/16 Project Nigara

**Airplane Security - Jennifer Mauder**  
White Hat Cal Poly

YouTube link: <https://youtu.be/uz-v-M7SrMw>

# THE BASICS OF AIRPLANE SOFTWARE SYSTEMS



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# THE BASICS OF AIRPLANE SOFTWARE SYSTEMS

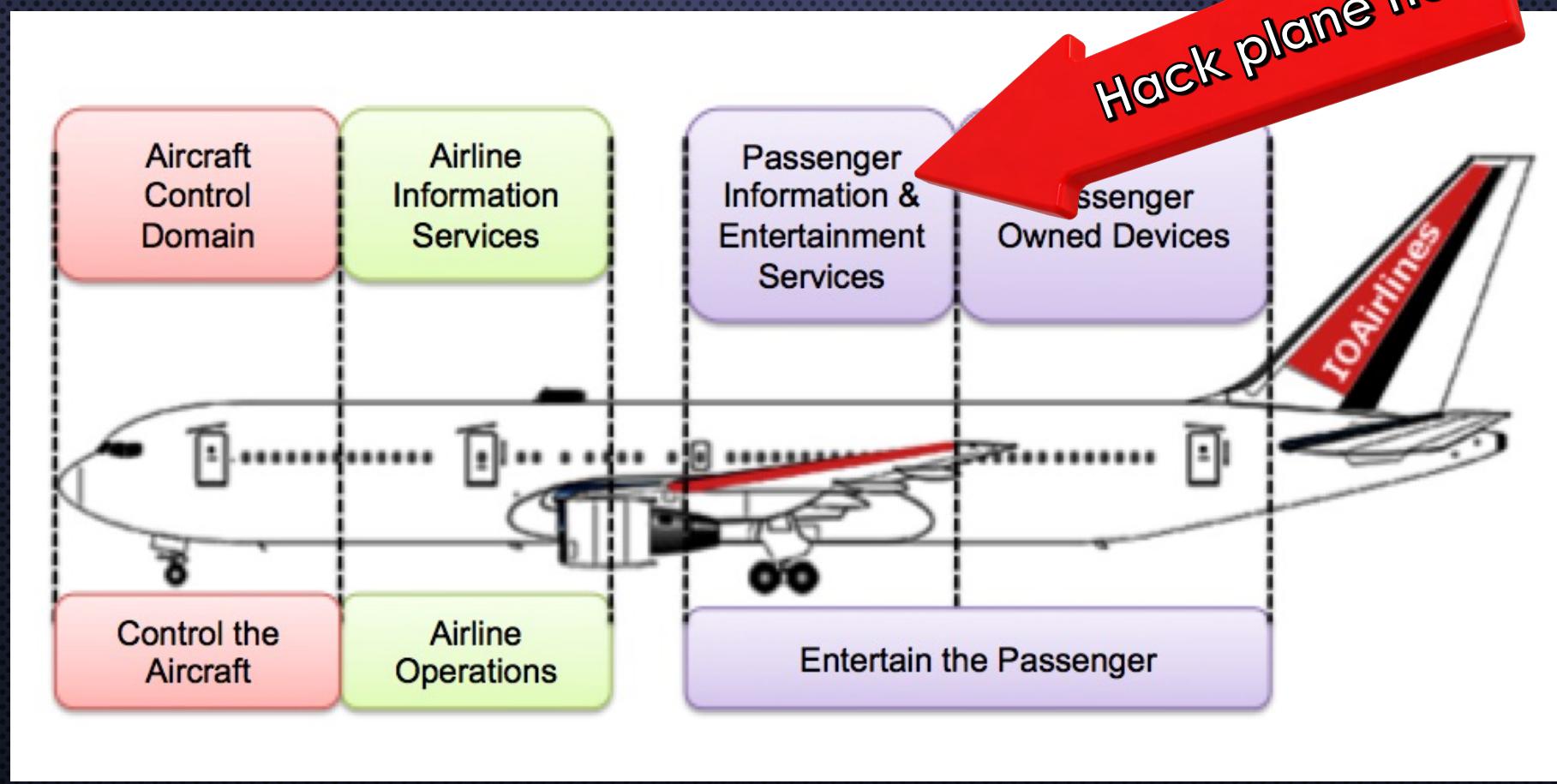


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# THE BASICS OF AIRPLANE SOFTWARE SYSTEMS



# THE BASICS OF AIRPLANE SOFTWARE SYSTEMS



# CAN YOU REALLY HACK AN AIRPLANE THROUGH THE SEAT-BACK ENTERTAINMENT SYSTEM?



Answer:

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Answer:

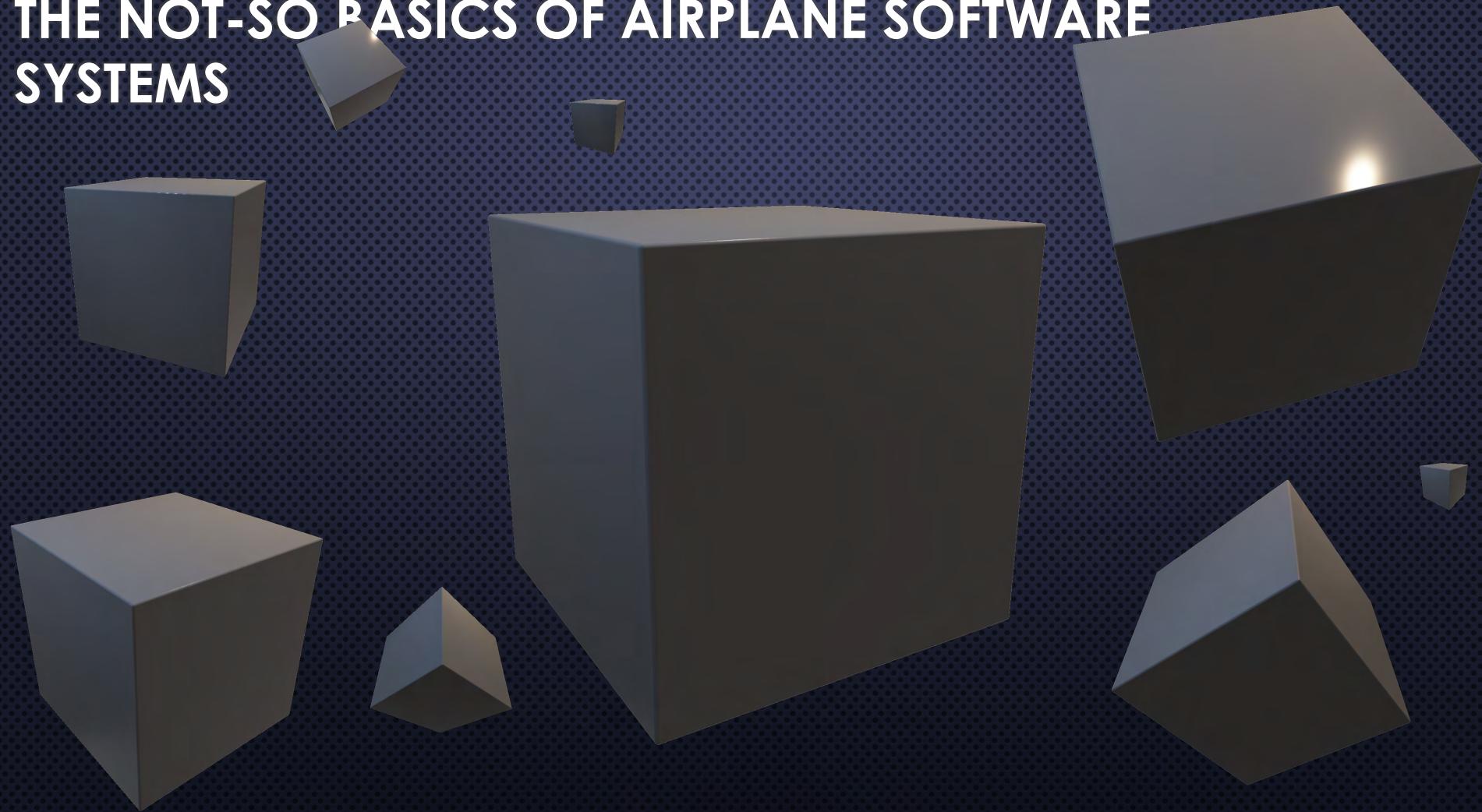
We don't  
know.

Very few likely do,  
if any.

# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS

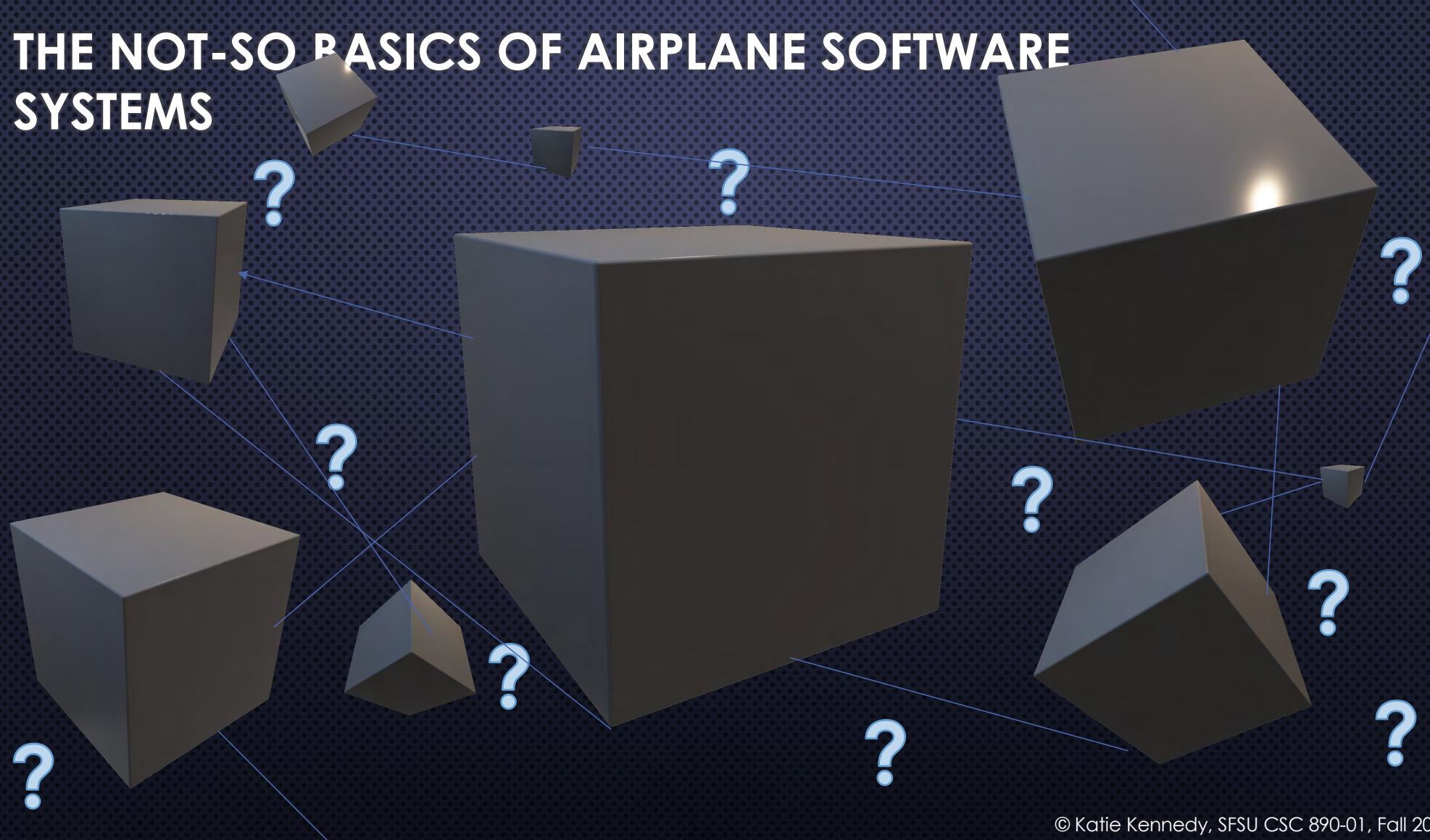


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# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS



# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS

- How are different technical system components separated? Physically or by firewall?
- Black boxes everywhere. Considered old school but is effective here.
- FAA report from 2008 on the 787 Max states that the “passenger network” is indeed connected to avionics control systems.



Above: A Boeing's 787 Dreamliner makes its public debut on July 8, 2007. Photo from Wired Magazine.

# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS



VS.



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# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS



The different systems need to be physically separated!



VS.



# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS



The different systems need to be physically separated!

That's unrealistic!!!



# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS

How much does it cost to change one line of code?

# THE NOT-SO BASICS OF AIRPLANE SOFTWARE SYSTEMS



How much does it cost  
to change **\$1 million** line of code?



**per line**

# WHAT ARE THE CURRENT MAJOR ISSUES IN DAY-TO-DAY AIRPLANE CYBERSECURITY?

## GPS Jammers

Right: Devices for sale on Amazon as of Oct. 5, 2020.  
Though legal to purchase and possess, they are illegal to sell or operate in the U.S.

Below: An ad for a high-end device lists the types of networks it supports disruption for.



Anti-Spy GPS Signal Jammer, RF Tracker, WiFi GSM Detector, Hidden Camera/Bug Finder Device, Black

★★★★★ 1

\$94<sup>49</sup>

FREE Shipping



Hidden Camera Detector, LONOYE Anti Spy RF Signal Wireless Bug GPS Tracker GSM Listening Device Finder...

★★★★★ 554

\$46<sup>99</sup>

Save 10% with coupon

Get it as soon as Wed, Oct 7

FREE Shipping by Amazon

More Buying Choices

\$35.00 (7 used & new offers)

# WHAT ARE THE CURRENT MAJOR ISSUES IN DAY-TO-DAY AIRPLANE CYBERSECURITY?

## GPS Jammers

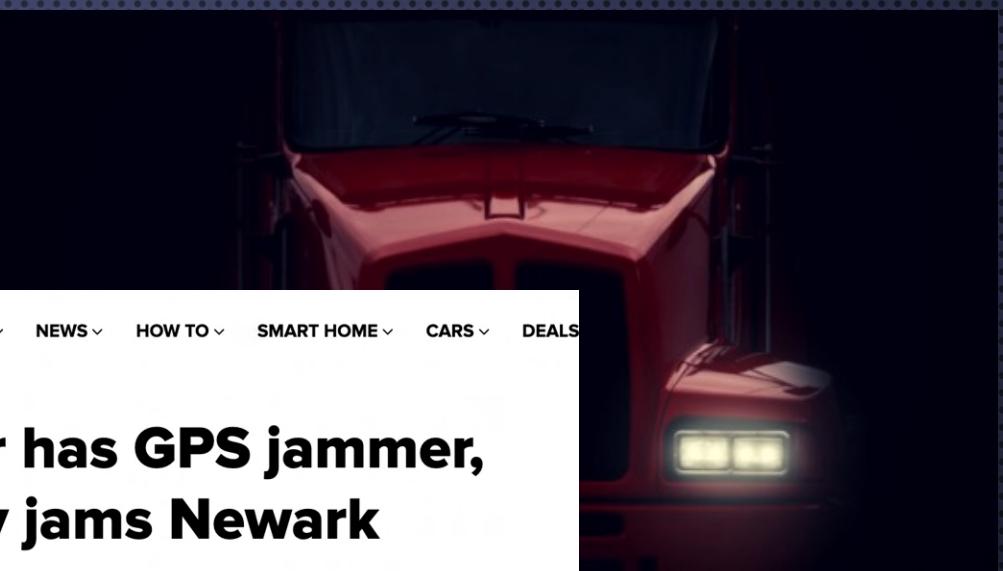


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### Truck driver has GPS jammer, accidentally jams Newark airport

An engineering firm worker in New Jersey has a GPS jammer so his bosses don't know where he is all the time. However, his route takes him close to Newark airport, and his jammer affects its satellite systems.



# WHAT ARE THE CURRENT MAJOR ISSUES IN DAY-TO-DAY AIRPLANE CYBERSECURITY?

## GPS Jammers



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# WHAT ARE THE CURRENT MAJOR ISSUES IN DAY-TO-DAY AIRPLANE CYBERSECURITY?

## GPS Jammers



Federal  
Communications  
Commission

Home / EDOCS / Commission Documents /



\$32K Penalty Proposed for  
Use of a GPS Jammer by an  
Individual

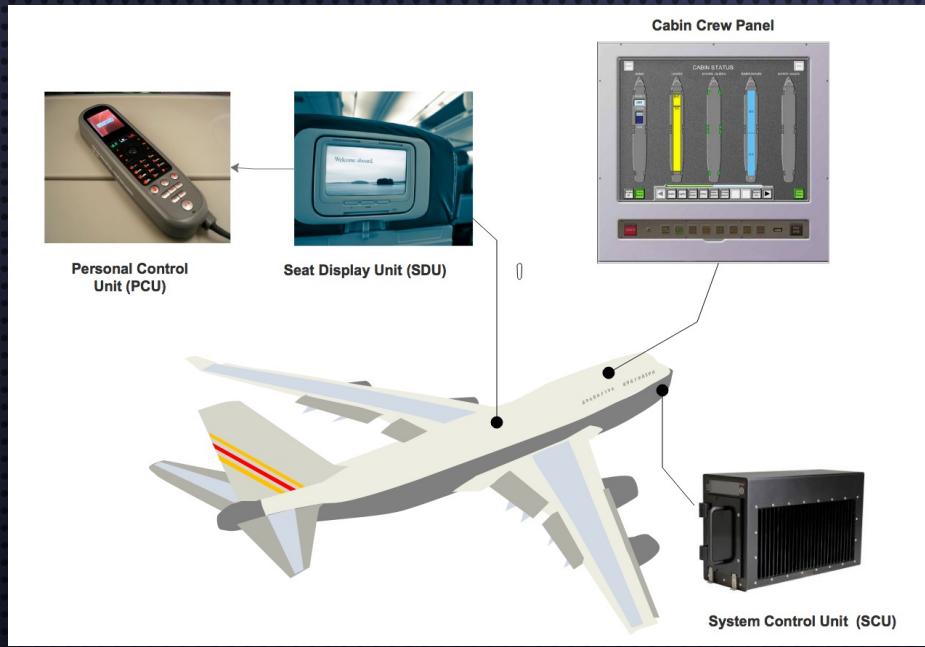
Full Title: Gary P. Bojczak

Document Type(s): NAL, Notice of Apparent Liability For Forfeiture

Bureau(s): Enforcement

# WHAT ARE THE CURRENT MAJOR ISSUES IN DAY-TO-DAY AIRPLANE CYBERSECURITY?

## Inflight Entertainment Systems



# WHAT ARE THE CURRENT MAJOR ISSUES IN DAY-TO-DAY AIRPLANE CYBERSECURITY?

## Inflight Entertainment Systems

ARINC 429 data bus  
(one-way)

vs.

ARINC 629 data bus  
(two-way)



# WHAT ARE THE CURRENT MAJOR ISSUES IN DAY-TO-DAY AIRPLANE CYBERSECURITY?

## Social Engineering

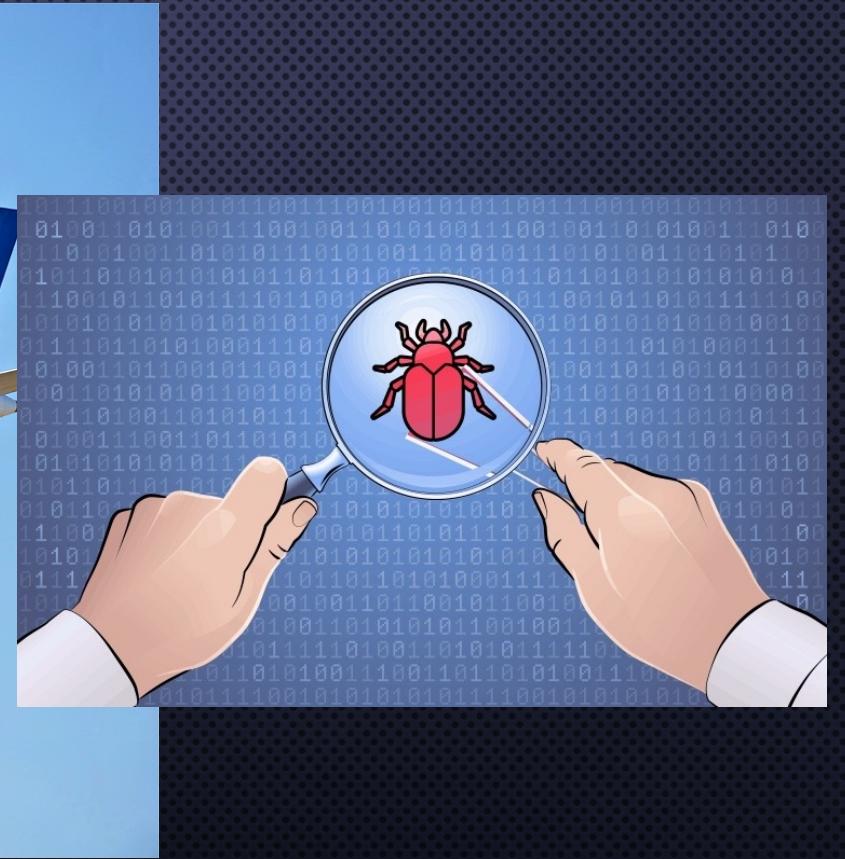


Right: A tweet from a Delta customer.

Left: Rueban Santamara finds hundreds of publicly available firmware updates for assorted IFE systems via Google.

A screenshot of a Linux terminal window running on a seat in an airplane. The terminal shows a series of 'ln -s' commands being executed, which typically creates symbolic links. The screen also displays a Linux Tux logo and some configuration files for a seat system, including 'seatAppBase.cram' and 'seatAppBase.init.d'. The background shows the interior of an airplane with a 'STOW DURING' sign visible.

# HOW IS AIRPLANE SYSTEM SECURITY TESTED?



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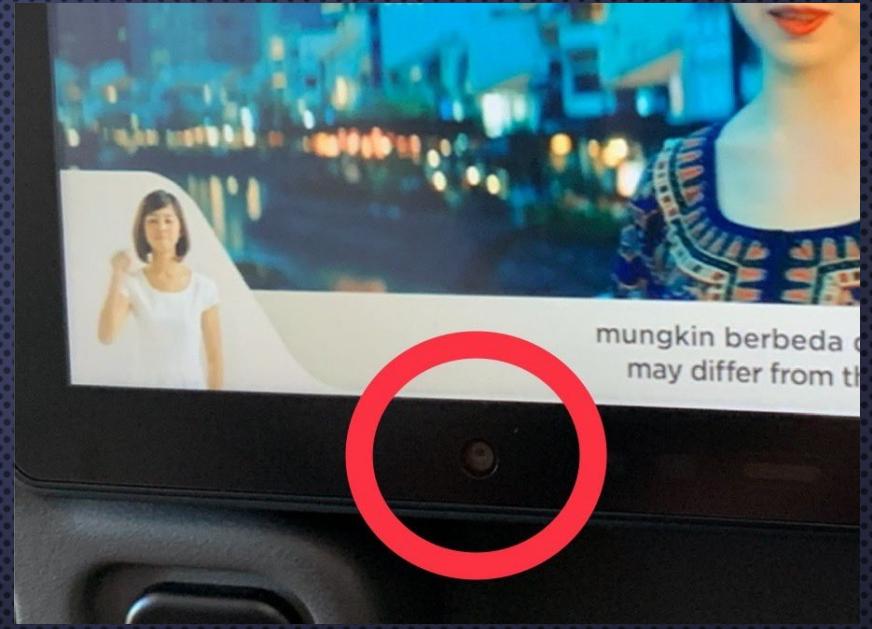


## United Airlines Bug Bounty Program

Must hack from over here – no access onboard.

## OTHER ISSUES

- Quiet integration of cameras to IFE seatback units
- Malware elsewhere (i.e. maintenance computers)



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## WRAP IT UP

- Should you ever fly again after listening to this presentation?

YES, airplanes are historically very safe with respect to cybersecurity.

- How are airplanes currently secured against cyberattacks?

Mostly secrecy. Plus, hackers typically don't have access to commercial jets (planes are expensive- less ubiquitous)

- How can I become an airplane hacker?

You become extremely wealthy and purchase your own plane to play with, or join the Department of Homeland Security.



# SOURCES

Inside GNSS Editors. (2013, August 31). FCC fines operator of GPS jammer that affected Newark Airport GBAS. *Inside GNSS Magazine.* <https://insidegnss.com/fcc-fines-operator-of-gps-jammer-that-affected-newark-airport-gbas/>

Maunder, Jennifer. [White Hat Cal Poly].(2020, February 12). *Airplane Security*. [Video]. YouTube. [https://www.youtube.com/watch?v=uz-v-M7SrMw&ab\\_channel=WhiteHatCalPoly](https://www.youtube.com/watch?v=uz-v-M7SrMw&ab_channel=WhiteHatCalPoly)

Santamarta, R. (2016, September 20). In flight hacking system. IOActive. <https://ioactive.com/in-flight-hacking-system/>