

Aviation Navigation Systems Security: ADS-B, GPS, IFF

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Abstract

This project analyzes the security challenges of Automatic Dependent Surveillance-Broadcast (ADS-B), Aviation Navigation System Security, The Global Positioning System (GPS), and Identify Friend or Foe systems (IFF). The collection of surveillance systems is analyzed in this paper that includes: i) ADS-B allows both the traffic controllers and pilots to observe accurate traffic information from the satellites; ii) GPS, Friend or Foe systems (IFF) and air traffic control systems indicate the location of the aircraft, and aids traffic controllers to determine the specific position of an airplane and the direction it takes.

Index Terms — GPS, ADS-B, Aviation Navigation Systems Security, Identify Friend or Foe systems.

Introduction

The autonomous system technology further exposed the aviation system to terrorists who can quickly take control and cause harm.

- The Aviation system has been compromised, and physical security has substantially increased since the 9/11 terror attack, and cybersecurity is still a significant problem for the aviation industry.
- The GPS vulnerabilities can be avoided by facilitating and influencing the decisions made throughout the designing, procurement, testing, evaluation, and deployment of the satellite-based protocol

Navigation Security

1. Investing in security mechanisms that use advanced machine learning based predictions on target identification or location is the other recommendation that will protect the safety and integrity of the systems.
2. The aircraft control and management centers should invest in intrusion detection systems that will be useful in prompt identification of any anomalies within the system.
3. Issues related to authentication is another security measure that keeps the system free from attacks as only authorized personnel gain access.

Next Generation Aircrafts with ADS-B

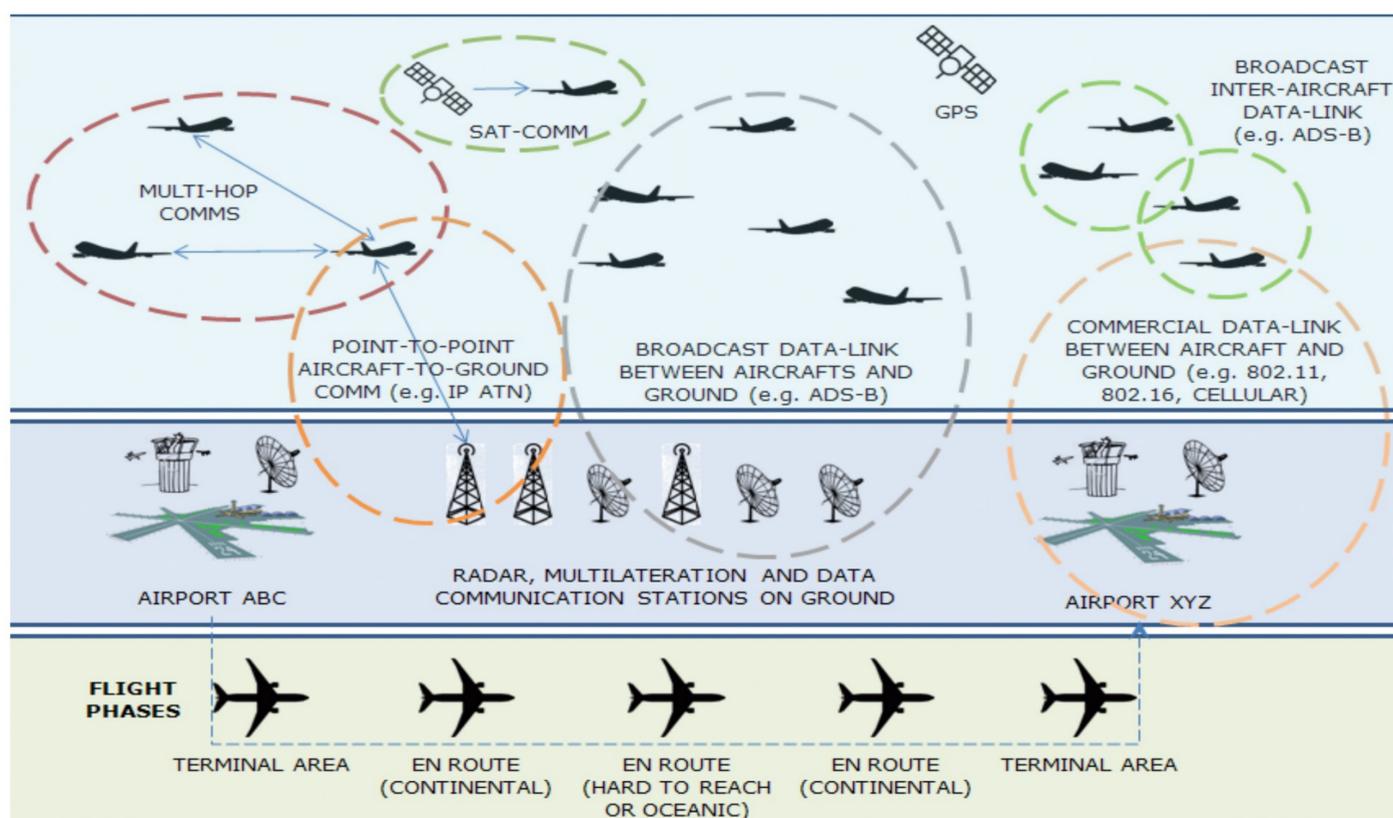


Figure 1 Envisioned NextGen airspace system with ADS-B and e-enabled aircraft[2].

References

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ADS-B Pros and Cons

Table 1 ADS-B Pros and Cons

Some Aircraft Models planned for ADS-B (adsbexchange.com) (ads-b.nl) (faa.gov)	Aircraft requiring ADS-B (Federal Regulation 14 CFR § 91.225) (www.aopa.org)	ADS-B Pros (ainonline.com) (ads-b.com) (faa.gov)	ADS-B Cons (ads-b.com) (flyingmag.com) (ainonline.com)
A400	Aircraft requiring a Mode C transponder will require ADS-B. Mode C transponders are required when flying at or above 10,000 feet MSL. Also, according to 14 CFR 99.13, no person may operate an aircraft into or out of the United States unless operating a transponder with Mode C. The FAA has mandated that after 01 Jan 2020, ADS-B Out capabilities will be required to fly in most airspace where a Mode C transponder is required today.	Enhanced Safety	Fake aircraft can be spoofed onto radar
B767		More efficient spacing and optimal IFR routing in nonradar environments	1090 ES cannot support Flight Information Services (FIS)
C17		Increased airframe value	Shares frequencies with Mode A/C/S/ transponders
C130		More efficient search and rescue	
C135		Proven less expensive than implementing surface surveillance radar	Lack of availability of ground-based transceivers (GBTs)
C5			
F15			
F16			

Conclusion

The aviation industry is quite sensitive since the majority of the operations carried within this particular environment is time sensitive and delicate. Terrorist attacks depend highly on the advancements in technology to take advantage of its vulnerabilities and other aspects that have not been wholly addressed within the system. The management has taken the initiative of stipulating the security measures that can be used to protect the navigation system. This project has therefore covered all the aspects related to GPS, aviation navigation security system, and the ADS-B. Nonetheless, the Aviation department should look into long-lasting solutions as a way of controlling the security issues within the navigations system.

Citation

Pollack, Jason, and Prakash Ranganathan. "Aviation navigation systems security: Ads-b, gps, iff." In Proceedings of the International Conference on Security and Management (SAM), pp. 129-135. The Steering Committee of The World Congress in Computer Science, Computer Engineering and Applied Computing (WorldComp), 2018.
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