**Paper:** [**Wireless Attacks on Aircraft Instrument Landing Systems**](https://www.usenix.org/system/files/sec19-sathaye.pdf)

**Summary**

This paper is about the investigation of wireless attacks on aircraft Instrument landing systems (ILS). The authors in the paper talk about how low-cost, commercially-available SDRs can be used to cause dangerous scenarios for aircraft such as missing landing zone, undetected off-runway landings, and more. Two types of wireless attacks are described in the paper - 1. The overshadow attack - uses higher-power ILS signals to overpower legitimate signals as the ILS receiver always tends to use only the high-powered signal. 2. The single-tone attack - uses single-frequency to interfere with and control the course deviation indicator needle and thereby affecting the estimated offset. These attacks were then evaluated and successfully performed on advanced flight simulators qualified by FAA. Also, there is a brief discussion of the location of the attacker and potential countermeasures to these attacks.

**Strengths**:

1. Detailed analysis and evaluation of ILS systems and their vulnerabilities are discussed. This can possibly lead to securing these systems and preventing such attacks in the future.
2. Assumptions of attackers and ILS systems using FAA-qualified simulators give more credibility to the paper and techniques described in them.
3. Concrete results such as runway offset of 18m to 50m also show a thorough and deep understanding of ILS systems and attackers' capabilities.

**Weaknesses**:

1. The authors also don't discuss many countermeasures on how to prevent these attacks from happening. No actionable recommendations on how to fix these systems.
2. In the discussion section of the paper, the authors talk about the ideal location of the attacker being on the centerline of the runway and receiving lobe of the onboard antenna but not an estimate of the reasonable distance and offset from the centerline of the runway from where the attack can be successfully accomplished.
3. As stated in the paper, these attacks were performed on a flight simulator and not a real flight, so they are some unknowns about airplane cockpit display sensitivity, antenna placements on the aircraft, and more.