Preventing Rogue Drones From Endangering Airport Flight Operations

A Counter UAS System For Airports

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Flight 1972 is descending through 2,500 feet on approach to runway 180 when the first officer sees what looks like a large bird on the port side. Except this bird is flying alongside and parallel with the plane. It is actually a small unmanned aerial system (UAS) and it has no authority to operate anywhere near the airport. Welcome to the new world of aircraft technology, where a child can now operate real world flight systems in the form of a UAS. Just a few years ago, military drones were the bulk of the mature UAS and available only to government users. According to the Consumer Electronics Association, commercial sales of UAS have exploded, with over 700,000 units sold in 2015 in the U.S. alone. It is as easy as signing on to your favorite e-commerce website and buying a full system for less than $1,000. While most of the buyers and users will be paying attention to the law, many will not, either through ignorance or maliciousness.

Drones have yielded many positive benefits for society. Legitimate use of drones by law enforcement, government agencies, and commercial operators is on the rise and the FAA and NASA are working hard to put systems and procedures in place for their use in the NAS . The need to protect airports, high value targets, and critical infrastructure from rogue drones is now paramount in institution decision-making.

SkyTracker's passive RF detection ensures that the system does not interfere with other RF-spectrum-dependent functions, such as FAA or airport electronic systems.

According to the FAA, airline pilots report nearly two drone sightings daily, including a total of 238 sightings in 2014 and more than 650 by August 2015. Other reports of UAS misuse include:

- Multiple reports of drones used to deliver cell phones, narcotics, or other small packages inside the perimeter of U.S. prisons.
- Drones spotted flying above 13 French nuclear power plants.
- An emerging threat of weaponized drones, including drones with traces of radiation landing close to the Japanese parliament.
- Reports of drones illegally flying over stadiums – in one instance crashing into the bleachers at the U.S. Open Tennis Championship.
- Drones interfering with firefighters and first responders.

Until recently, commercial technologies lacked the precision and reliability to effectively address the threat of UAS misuse. For example, areas where drones commonly intrude often contain sensitive equipment, and counter-UAS technologies, such as broadband jamming, significantly disrupt area communications, airport systems, and electronics systems, making them an unviable solution for airports. Radar has some advantage, but is sometimes unable to distinguish between non-UAS flying objects, such as birds. Geo-fencing technology involves outfitting commercial drones with built-in safety parameters, but operators modifying their aircraft may circumvent these safeguards.

Moreover, none of these technologies has the capability to locate the drone operator, significantly limiting law enforcement's ability to find and engage operators in incidents of inadvertent or unlawful misuse. SkyTrackerTM, CACI's proprietary system, effectively addresses the scope and scale of all these challenges.

SkyTracker

CACI's SkyTracker system enables customers with legal authority to accurately and reliably detect, identify, and track UAS threats flying in banned or protected airspace like as the five-mile area around airports. SkyTracker works by establishing an electronic perimeter around sensitive locations that cannot be circumvented by individuals modifying their aircraft. SkyTracker:

- Identifies and locates UAS and their operators, speeding law enforcement's and airport authorities' response time in intercepting unlawful operators.
- Rapidly detects UAS and delivers countermeasures within seconds.
- Is not affected by drone size or shape.
- Does not disrupt legitimate electronics, area communications systems, or responsible UAS operators due to its non-kinetic mitigation.
- Is unaffected by weather, time of day, or non-UAS flying objects such as birds or large aircraft platforms.

Passive Detection

The SkyTracker system is composed of multiple sensors that can be networked to existing airport security systems. SkyTracker deploys this sensor array to create an electronic perimeter around an airport.

The RF-based system provides long-range, high-fidelity detection and identification with low, near-zero, false alarm rates. The sensors detect the RF communication link between the drone and its operator. SkyTracker's passive RF detection ensures that the system does not interfere with other RF-spectrum-dependent functions, such as FAA or airport electronic systems.

SkyTracker is designed to support automated functionality, using an intuitive graphical user interface (GUI) for system operation. Since SkyTracker relies on software-defined technology, simple web-based software updates are provided to ensure that the sensors are properly configured to the latest drone technologies and communication protocols. Skytracker can also fully integrate with existing security and status tracking systems, eliminating the need for a separate terminal. The sensors are in constant communication with networked command and control centers, reporting detected signals, forensic data collected from selected signals regarding the identity and location of UAS and their handheld controllers, as well as the health and status of the sensor system – all displayed to users via the GUI.

Location and Tracking

SkyTracker utilizes UAS RF emissions to identify and locate aircraft systems flying within the electronic perimeter defined by the sensor system. Multiple sensors extract the UAS communication

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signals, working in coordination to provide accurate geolocation and tracking both of UAS and their operators, and a greater number of deployed sensors provides highly accurate geolocation and tracking. The efficacy of the sensor system is unaffected when increasing the scale of the electronic perimeter.

The SkyTracker system supports multiple users and automatically alerts users to drone tracking data and drone operator and handset location. The forensic data collected by the sensors may be further used for analysis or in support of legal enforcement efforts.

Non-Kinetic Action

From the moment UAS threats are detected, SkyTracker rapidly locates the misused aircraft and is capable of delivering non-kinetic countermeasures. Because these countermeasures are RF-based, effects can be achieved from long distances and will not interfere with legitimate electronic or communication systems in the area, or with responsibly operated aircraft. SkyTracker's targeted ability to stop specific UAS allows responsible UAS users systems to remain unaffected and mission capable.

Conclusion

CACI's SkyTracker system leverages precise signals detection to address the evolving threat posed by the misuse of commercially available UAS platforms. The SkyTracker system exemplifies the necessity of cyber solutions to keep pace with the proliferation of commercial technologies that are increasingly cheap, available, and sophisticated, and which pose significant challenges to the safety of the NAS. Further, the SkyTracker system has also been successfully tested by the FAA as part of the agency's Pathfinder Program, which found that SkyTracker does not interfere with normal flight operations at commercial airports.

Until recently, commercial technologies lacked the precision and reliability to effectively address the threat of UAS misuse.

CACI advances such solutions by leveraging the full range of its cyber expertise and strategic goals. For example, the company combines niche digital signals and RF expertise with years of cyber and electronic warfare experience to deliver significant defensive and offensive platform cyber capabilities. These solutions include the passive detection of signals emitted by platforms. By leveraging all available resources, CACI is able to respond to rapidly emerging, non-traditional global threats with precision technologies and techniques. Now, the company is applying these solutions to address safety issues posed by commercial drones in a manner that supports public safety even as it benefits responsible UAS hobbyists.