



AIR-SEAL Report Summary

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Periodic Report Summary - AIR-SEAL (An Innovative RFID Security SEAL for Aircraft Galley Trolleys)

Project Context and Objectives:

Air-Seal is a two-year project, funded via the European Commission's Framework 7 Programme within the 'Research for the benefit of SMEs' scheme. This summary highlights the projects background and objectives for the second reporting period and consortium participants.

High Level Scope

Air-Seal is an innovative Security Seal for the Aerospace industry. The Air-Seal system will be used during the storage and transport of inflight service trolleys whilst outside secure areas and will only allow access to airport security and airline personnel with the appropriate electronic security device.

This retrofitted electronic security system monitors the sealing and opening of food and duty free trolleys. Access is controlled and recorded centrally and can be set to be location dependent. Any tampering with the trolley will be detected.

The key characteristics of the project are:

- * Record all actions on the lock and location of the lock
- * Provide secure access via a centrally controlled user id
- * Display the current security status on the lock itself
- * Detect and record any opening of the trolley
- * Offer asset tracking

Project Results:

Below is a brief summary of some of the work performed and results of the Air-Seal project.

Intrusion detection

During the research into RFID proximity and RSSI application, with regards to trolley security, issues were identified in the effectiveness of the RF intrusion detection system. This system proved impractical to implement due in part to the complex nature of the RF field involved, the high current consumption of the RFID reader and frequency of scans required.

As a result of the issues encountered with the original concept an alternative intrusion detection method was developed. The final sealing technology has exceeded the original specification, which was to detect intrusion into the trolley for holes of $>\varnothing 30\text{mm}$. The new system is capable of monitoring intrusions below 30mm depending on the pitch of the electrical tracks. This system is easily fitted to the trolley panels with a simple wired construction linking each of the panels together and a contact free interface to door mounted control electronics, thus minimising the issues associated with wired connection through the trolley door hinge and probable damage to the connection.

Seal control system

The hardware and firmware was designed in tandem, with the aim of developing an intuitive low power highly secure system with a graphical user interface. Through continual testing and improvement the final system was developed. Given that the power supply is based on a supercapacitor system, high priority was placed on minimising the size of the supercapacitor so that the recharge time was kept as short as possible. The size of the power supply also impacted on the weight of the total Air-Seal system, which is extremely significant in an aircraft application.

The hardware was selected specifically to be rugged, surviving the extreme conditions as specified in the airline standards, whilst also requiring minimum power. The display utilised is the very latest OLED technology within its field and uses minimal power to display clear and crisp information that can be seen in bright and low light levels.

Considerable attention was also given to the software performance producing a low power microprocessor control

system designed to maximise performance in power down and sleep state, which in turn optimises the supercapacitor storage life whilst minimising the size and weight of the final system.

Security communication and auditing measures

The technology utilised within the Air-Seal product is based on the latest encrypted banking level algorithms. The system employs a challenge response security system utilising a secure hash algorithm derived from a buried common secret to ensure only authenticated access is granted to authorised system users.

This not only provides a means of secure data transfer from trolley to the database, but also significantly reduces the ability to compromise the seal / lock status indicator. No longer will duplicate seals / access keys or other lock picking devices be able to compromise the system. If the trolley's door has been opened by unauthorised means, it registers visually and in real time.

The use of electronic virtual seal numbers that can be applied to individual trolleys and audited within a process, is a first within the airline catering / duty free sector and offers an opportunity for those early adopter companies to set the bench mark for the rest of the industry. This security process is used through the Air-Seal systems from the database, database interface, PC software through to the Air-Seal trolley based hardware and firmware

Power source charging system

The project has developed a high performance supercapacitor storage and charging system. This is composed of two main components, firstly the wireless power source, responsible for delivering wireless power. Secondly and the energy storage device, which is responsible for the reception of energy and power supply to the electronic seal.

Potential Impact:

The Air-Seal concept provides an electronic security audit trail, unlike any existing security device. The system will be used during the storage and transport of a trolley outside of a secure area and will contain technology for asset management. Airport security and airline personnel will be authorised to access and seal the trolley, whilst informing them of the security level of the individual or company responsible for sealing the container prior to dispatch. Through the research and development of the Air-Seal systems, we will be able to provide our customers with a functional and reliable technology, with the following unique selling points.

- * Secure transportation seal to identify individual responsible for container access/sealing
- * Electronic audit trail of sealing numbers to reduce manual workload
- * Retrofit and low cost security seal for trolleys, during transportation outside of secure areas
- * Location and maintenance information of all trolleys and containers
- * International control and access system with an electronic audit trail and unlimited access
- * Clear / manual indication of a containers integrity
- * Automatic electronic indication system to monitor container integrity
- * Reduce the possibility of a large security issues with aircraft trolleys resulting in a large infrastructure event

The original proposal identified current airline trolleys as a security risk around which the original proposal was drafted. However it has become apparent that multiple opportunities exist for the technology developed in the Air-Seal project.

The main alternative market opportunities for this technology are listed below:

1. Medical/Hospital supply chain for secure transportation of blood, organs, vaccines etc.
2. Transportation of goods by air
3. Transportation of goods by sea

List of Websites:

<http://airseal.pera.com/>

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