**OPTAG**

**Improving Airport Efficiency, Security and Passenger Flow by Enhanced Passenger Monitoring**

**Funding:** European (6th RTD Framework Programme)

**Duration:** Jan 2006 - Jan 2009

**Status:** Complete with results

**Total project cost:** €2,212,971

**EU contribution:** €1,647,928

**Call for proposal:** FP6-2002-AERO-1

**CORDIS RCN:** 72807

**Background & policy context:**

Up to 5% of aircraft departure delays are caused by late passengers or late bags at the gate, and the impact of this in missed slots and subsequent costs will increase as the number of flights increases.

The OpTag system will enable the immediate location of checked-in passengers who are either missing or late, and thus reduce passenger-induced delays and speed up aircraft turn around. The system could also form an essential component of Airline passenger identification and threat assessment systems through the automated identification of suspicious passenger movements or through the closer monitoring of individuals considered to pose a risk to secure operations.

**Objectives:**

The three main developments required to create the OpTag system are:

- a compact far-field radio frequency identification (RFID) tag and a reader capable of reading a large quantity of tags within its range without interference;
- a high-resolution, panoramic imaging system and corresponding software to follow a target and confirm the identity of the tagged individual or item. The system will be able to work over a network and allow different operators to select different views from the same camera;
- an ergonomic user interface to facilitate augmented surveillance, monitoring and targeting of individuals who may pose an economic or security risk to effective airport operations.

The security and efficiency environment of airports was also researched so that the Optag system could be understood in context and developed to meet real requirements and with full understanding of the legal and operational factors and IP of the design.

**Methodology:**

In order to achieve these objectives, the work focused on:

**Tag Development:** A compact, active tag was developed with an expected range of at least 10 metres and which will work in conjunction with new readers to provide direction and range finding.

**Camera Hardware Development:** A digital camera system was developed which consists of 8 camera sensors mounted in a ring. The outputs from the sensors will be combined and processed to provide a single 360 degree high resolution panoramic image.

**Image processing Software Development:** Software was developed which will process the output from the panoramic cameras and transmit the images over a network in such a way that individual views and zooms may be selected by a remote operators.

**Final Integration and Airport Trial:** A man-machine interface to control the image selection was
developed and trialed along with an interface to the tag tracking system so that an operator can track and identify a person on a monitor view. Four camera systems were installed in a small airport so that experiments could be undertaken on the performance of the system in a real life environment.

Exploitation: Covering IP management along with research into airport organisation. In addition, the legal and ethical framework of the operation of a passenger tracking system will be studied.

**Parent Programmes:**
FP6-AERO-1.4 - Increasing Operational Capacity and Safety of the Air Transport System

**Institute type:** Public institution

**Institute name:** European Commission

**Funding type:** Public (EU)

**Lead Organisation:**

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<td><strong>Address:</strong></td>
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<tr>
<td>33 Sheep Street</td>
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<tr>
<td>CIRENCESTER, GLOUCESTERSHIRE</td>
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<td>United Kingdom</td>
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**Partner Organisations:**

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<td><strong>Organisation Website:</strong> <a href="http://www.ucl.ac.uk">http://www.ucl.ac.uk</a></td>
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**Key Results:**

The OpTag project ran for three years from 1st February 2004 and successfully concluded with an experimental trial of the prototype OpTag system at Debrecen Airport in Hungary in January 2007.

Despite technical problems during the system development and during the trial itself, it was possible to demonstrate the original project concept and many useful results and practical experience were obtained.

However, the current prototype OpTag system would require further engineering development work in order to produce a viable commercial implementation. The current tag, reader and camera designs are still very prototype in nature. They would need to be re-designed for commercial production in order to improve performance, make them easier to manufacture, and to reduce costs. In particular, a very low tag cost is probably critical to the commercial viability of any system like this one.

There is another important point to consider. During the latter stages of this project, there has been considerable commercial and media interest in the OpTag concept for a variety of reasons. There appears to be a genuine commercial interest in the concept of using a real-time location system in conjunction with video images – and being able to link and operate these two systems in a straightforward manner. Equally, it should be recognised that some of the media interest in OpTag has been fairly negative. This reflects an understandable concern to see adequate protection of individual privacy and freedoms, whilst balancing these issues against the need for improved security in certain environments. It would be important to address this topic openly as part of any future commercial development of the OpTag concept.

**Technical Implications**
There were several key conclusions to be drawn from the experimental measurements taken at Debrecen Airport:

1. Location accuracy with a centrally-mounted RFID reader was found to be very variable, typically of the order of 1-3 metres. Radio propagation effects were very significant in this particular reader configuration, as reflections from walls and other objects were often found to exceed the strength of the direct path with misleading results.

2. The results obtained with the RFID reader placed in the corner of the room were much better in terms of direction-finding and hence location accuracy. This is doubtless due to the improved propagation environment with a corner-mounted reader. In addition, this arrangement makes for a more straightforward location algorithm. This configuration is therefore preferable.

3. Obstruction by one or more persons was found to cause a significant reduction in signal strength, around 10 dB, but still provided ample signal.

4. Experiments were also conducted to show the affect of a crowd of people surrounding the tag, this tends to affect the location estimate accuracy, but not to an unacceptable degree. The presence of more than one person in the direct path makes little difference to the received signal, indicating that at these frequencies (5.8 GHz) a single person causes a large attenuation of the direct path.

5. Tag operating range was found to greatly exceed the required target of 10 metres. The signal was well above the -90 dBm threshold, even to ranges of 25 m and with an intervening wall. This was a very pleasing result, indicating that quite large cell sizes should be possible, with reduced infrastructure requirements.

6. One of the results obtained with corner-mounting showed that the mean error with location bearing was close to zero, indicating that there was no bias in the reader, but there was considerable variation around this mean, dependent on the tag location. The RMS variation in this particular set of results is 16 degrees, equating to 1.4 m of location error at the typical operating range of 5 m.

These findings provide useful guidance for the design of any commercial RFID implementation of the OpTag concept.

Documents:
- Improving Airport Efficiency

**STRIA Roadmaps:** Network and traffic management systems

**Transport mode:** Air transport

**Transport sectors:** Passenger transport

**Transport policies:** Digitalisation, Safety/Security

**Geo-spatial type:** Infrastructure Node