
# *Ex-post Evaluation of PASR Activities in the field of Security*

# *Interim Evaluation of FP7 Research Activities in the field of Space and Security*

# *Aviation Security and Detection Systems - Case Study*

January 2011


Centre for
Strategy & Evaluation
Services

P O Box 159
Sevenoaks
Kent TN14 5WT
United Kingdom
www.cses.co.uk

# *Contents*


| | SECTION | PAGE |
|---|---|---|
| **1.** | **INTRODUCTION – AVIATION SECURITY CASE STUDY** | **1** |
| | 1.1 7th RTD Framework Programme 2007-2013 | 1 |
| | 1.2 EU Security Research and aviation security | 1 |
| | 1.3 Case study methodology and structure | 1 |
| **2.** | **POLICY CONTEXT AND KEY SECURITY ISSUES** | **2** |
| | 2.1 EU policy context | 2 |
| | 2.2 Key issues - aviation security | 3 |
| | 2.3 Key stakeholders - aviation security | 6 |
| **3.** | **PROJECT ASSESSMENT - AVIATION SECURITY** | **8** |
| | 3.1 Activities supported in PASR and FP7 Annual Work Programmes | 8 |
| | 3.2 Project assessment – aviation security | 9 |
| | 3.3 Achievements at project level and research quality | 15 |
| | 3.4 End-user involvement in aviation security | 18 |
| **4.** | **CONCLUSIONS - AVIATION SECURITY** | **21** |
| | 4.1 Conclusions | 21 |
| | 4.2 Recommendations | 21 |
| | **Appendixes** | **23** |
| **A** | List of interviews | 23 |
| **B** | Aviation PASR and FP7 SEC Calls | 24 |

# Introduction

1

## 1.1 7th RTD Framework Programme 2007-2013

The 7th Framework Programme for Research and Technological Development (FP7) 2007-2013 is the EU's main instrument for funding research activities. FP7 has a budget of €50.5 bn.

The RTD FPs are a key tool in achieving the aims of the Europe 2020 strategy, which includes *'smart growth: developing an economy based on knowledge and innovation'* as a key priority. The objectives of FP7 have been grouped into four categories: *Cooperation*, *Ideas*, *People and Capacities*. FP7 Security Research is a specific programme falling within the Cooperation objective, which fosters collaborative research across Europe and other partner countries and as such, is the core of FP7.

## 1.2 EU Security Research and aviation security

Following the implementation of the PASR Preparatory Action on Security Research in 2004-2006, an EU Security Research programme was included for the first time in the RTD Framework Programmes in FP7, with a budget of €1.4bn from the European Commission.

The objectives of FP7 Security Research are to: make Europe more secure for its citizens, strengthen industrial competitiveness; promote research excellence and state-of-the-art; prevent the fragmentation of research efforts and strengthen critical mass in particular areas of security research. Specific objectives include: stimulating the development of a European market for new and emerging security products and systems; ensuring the security of EU citizens from new and emerging threats; delivering mission-oriented research results to reduce security gaps; ensuring the optimal use of available and nascent technologies and stimulating cooperation between providers and users of civil security solutions.

Security Research provides support for transnational collaborative research across a number of thematic areas, defined in annual work programmes. Aviation Security was an important area of intervention in both the Preparatory Action on Security Research (PASR) and FP7 Security Research.

The Commission has a longstanding commitment to the promotion of a holistic approach to aviation security, which addresses all three pillars of aviation and their interactions: Aircraft security (covering attacks from within, as well as from the outside of the aircraft), Airport security (the passenger-side as well as the non-passenger side of the airport, both on air and land) and ATM security (the security of facilities, the security of personnel and security of operational data, including Cyber-security, communication security, as well as physical attacks to ATM infrastructure).

FP7 Priority Theme 'Transport – Aeronautics' also funds a number of aviation security projects, including some aviation safety projects that have security relevance. While the latter is not part of this assessment, it is useful in illustrating synergies between different areas of the Cooperation Programme.

## 1.3 Case study methodology and structure

The methodology involved desk research to review key policy and legislative documentation, sectoral research and a review of the annual work programmes in respect of PASR and FP7 Security. Project-specific materials have also been examined, including periodic project monitoring reports. An interview programme was also undertaken with beneficiaries and some end-users. The case study is structured as follows:

**Section 2** - provides an overview of the policy and regulatory context, the underlying rationale for intervention, and of the main challenges and threats relating to aviation security.

**Section 3** – examines aviation security research projects supported through PASR and FP7 Security.

**Section 4** – provides conclusions and recommendations.

# Policy context and key security issues

# 2

## 2.1 EU policy and legislative context

International efforts to improve aviation security were stepped up following the September 11th 2001 attacks, which had a profound impact on the European aviation sector and has led to a reappraisal of aviation security arrangements both within the EU and internationally.

Aviation security is the competence of Member States. National authorities either provide these services themselves or delegate them to the airport, which may subcontract some of the tasks to private security contractors. However, given the transnational and cross-border nature of the issue, the EU plays an important role in coordinating initiatives and policy on common arrangements for aviation security. Within the European Commission, DG MOVE is responsible for aviation security and for policy coordination in this area. The research results from the ESRP have strong potential to feed into the work of DG MOVE, for example, on areas that demand new and improved technologies, such as safer new generation body scanners.

The various regulatory developments at EU level in the area of aviation security are summarised in the table below. It is important to summarise these because the adoption of Common aviation security rules in 2002 and more recent regulatory updates in 2008 and 2009 underpin investment in EU research in aviation security, notably improving detection equipment:

**Table 2.1: Key EU policy and regulatory developments – aviation security**

| Issue | EU aviation security policy document | The main document aims (contents) |
|---|---|---|
| Common aviation security rules | Regulation (EC) No 2320/2002 of the European Parliament and of the Council of 16 December 2002 establishing common rules in the field of civil aviation security (Text with EEA relevance) – Inter-institutional declaration | Objectives are to establish and implement appropriate Community measures to prevent acts of unlawful interference against civil aviation. Common basic standards on aviation security measures were adopted and appropriate compliance monitoring mechanisms were set up. |
| Security procedures for Sky-marshals and airport staff | Common rules for safeguarding civil aviation - sky marshals must be "specially selected and trained". Proposed in 2005, adopted March 2008 | The regulation aims to ensure a high level of aviation security throughout the EU. It lays down common rules and standards, for example on passenger screening and cabin baggage, access control and aircraft security checks. The regulation also deals with in-flight-security measures, such as the deployment of "sky marshals" and the carriage of weapons on board an aircraft.[1] |
| Security of ATM | COMMISSION REGULATION (EC) laying down common requirements for the provision of air navigation services 2096/2005 | This regulations addresses also security and requires the establishment of a security management system to ensure the security of its facilities and personnel so as to prevent unlawful interference with the provision of services as well as the security of operational data it receives or produces or otherwise employs, so that access to it is restricted only to those authorised. |
| Response to the threat of liquid explosives | COM (2005) 429 Proposal for a Regulation of the European Parliament and of the Council on common rules in the field of civil aviation security t[2] | The proposals include tightening hand-luggage checks in airports, better information exchange and tighter screening of passengers, financing research on tracing commercial detonators and liquid explosives. |
| Passenger Name Record (PNR) | Council Decision 2007/551/CFSP/JHA Agreement between the EU and the | PNR allows the transfer of 19 pieces of information, including names, travel dates, full itinerary, billing data |

[1] http://www.europarl.europa.eu/sides/getDoc.do?language=EN&type=IM-PRESS&reference=20080307IPR23282

[2] http://www.euractiv.com/31/images/Commission.aviation_tcm31-158296.doc

| | | |
|---|---|---|
| | US on processing and transfer of Passenger Name Record data by air carriers to the US Department of Homeland Security (DHS) (2007 PNR Agreement) | and baggage information, to US counter-terrorist agencies. |
| Update of 2002 Legislation on Common aviation security rules | Regulation (EC) no 300/2008 of the European Parliament and of the Council of 11 March 2008 on common rules in the field of civil aviation security and repealing Regulation (EC) No 2320/2002 | This updated legislation sets out EU rules on security issues, including access control within airports, the screening of passengers and cabin baggage, surveillance, patrols and other physical controls. It also makes provisions in respect of in-flight security measures. |
| Responsibility for additional costs to aviation security | COM(2009) 217 Directive Of The European Parliament and of the Council on Aviation Security Charges | The proposal aims to establish a framework of common principles, for all EU airports, that should be followed when setting and modifying security charges. |
| Implementing Rules supplementing common basic standards on civil aviation security | COMMISSION REGULATION (EC) No 272/2009 of 2 April 2009 supplementing the common basic standards on civil aviation security laid down in the Annex to Regulation (EC) No 300/2008 of the European Parliament and of the Council | Article 4(3) of Regulation (EC) No 300/2008 further provides that the Commission must adopt detailed measures for implementing the common basic standards on civil aviation security laid down in the Annex to Regulation (EC) No 300/2008. |
| Provides a framework for ensuring a harmonised approach to the use of Security Scanners at airports. | Commission Communication: on the Use of Security Scanners at EU airports, Brussels, COM(2010) 311/4 | The Communication addresses the increasing use of Security Scanners at national regulated airports in the European Union. Different standards of scanners currently deployed in Europe runs the serious risk of fragmenting EU citizens' fundamental rights and escalating their health concerns related to new security technologies. |

## 2.2 Key issues - aviation security

The aviation industry lies at the centre of domestic and international transportation and plays a vital role in supporting the EU's economic development and global competitiveness. Aviation security is therefore a major priority for both national and EU regulators.

A trend in the aviation industry is the significant increase in passenger numbers as well as air-cargo. In the European Union, there has been a marked increase both in passenger numbers and in airline routes since the liberalisation of the European aviation sector in 1993. This has had knock-on implications in terms of the amount of infrastructure space needed in airports to comply with stricter passenger security requirements and on approaches to passenger screening to cope with increased throughput.

In the context of strengthened security measures since 9/11, and subsequent attempted attacks by terrorists, the need for ongoing vigilance has meant that the length and intensity of passenger security checks in airports have grown. This has resulted in a significant increase in the costs of security measures for airports, subsequent changes in the economic model of airport operations, and heavy impact of those security measures on airport throughput and airline delays.

A *Study on the Competitiveness of the EU security industry*[3] was undertaken on behalf of the European Commission's DG ENTR in 2009. This estimated that the European security sector is estimated to represent a market value of €36 billion of which the aviation security sector's share is between €1.5 and €2.5 billion, therefore the EU market accounts for a high proportion of the €5.2

# Policy context and key security issues 2

billion global spending on aviation security.[4] There is an important distinction between aviation security for passengers and for cargo. The study mentioned above focuses on mapping out the sectoral dynamics of the aviation security industry in the cargo area. In light of the attempted terrorist attacks using smuggled bomb materials hidden inside printers in October 2010, improving the technologies in cargo screening is likely to become a more important priority.

There are a number of threats and challenges in the aviation security domain. These include:

- **The protection of airport infrastructure -** through enhanced (and intelligent) surveillance systems, the use of biometric tools to protect secure areas
- **Detection equipment for passenger and baggage screening –** improved detection and screening equipment that provide new generation solutions, for example, to detect liquids in hand luggage, explosives trace detection equipment, artificial sniffers
- **Detection equipment for cargo screening –** the need for enhanced detection systems to detect explosives
- **Information sharing and secure information systems on passenger records**
- **Biometrics -** identification / authentication of staff in secure areas of airports, checking passengers' identity at the gate, and enhanced profiling.
- **ATM and operational Security** – improvements in air traffic management security and in respect of in-flight-security, combating MANPADS, laser- & microwave gun attacks against aircraft

The evolving nature of the security threats facing the aviation industry will require significant investment in the development of new technologies and have implications for overall security planning procedures. The various areas identified above are now examined in detail:

***Protection of airport infrastructure***

A key aim of aviation security systems relating to the **protection of airport infrastructure** is to control the access of people moving into or out of protected areas, such as physical buildings, sensitive areas within airport terminals and information systems through the use of surveillance and monitoring systems. Surveillance is a central element of airport security management and takes place through a number of means, from intelligent video surveillance to the use of biometric tools for checking the identity of airport workers with secure access rights.[5]

**Biometric technologies** can automate the identification of people by one or more of their distinct physical or behavioural characteristics. Biometrics covers a wide range of technologies that can be used to verify identity by analysing individual characteristics and personal attributes. The main types of biometric data include fingerprints, face recognition, iris recognition, and vascular recognition. In order to prevent terrorist attacks both on the ground and in-flight, the aviation industry also faces the challenge of developing appropriate surveillance technologies to detect abnormal or suspicious behaviour.

***Detection and screening equipment for passenger and baggage screening***

Advances in, screening, scanning and tracking devices is another area where technological innovations are adding to combined identification solutions for goods and persons. One of the benefits of these technologies is that they are interoperable across different security sectors and

[4] Study on the Competitiveness of the EU Security Industry Ecorys.. Brussels: DG ENTR. 2009. p 31
[5] ESRIF. p 21

allow aviation authorities to choose from a range of detection products. The main types of detection equipment used in respect of passenger and baggage screening include:

- X-ray screening
- X-ray based explosive detection systems (EDS)
- Explosive and chemical trace detection systems (ETD); and
- Technologies based on neutron beams[6]
- Body Scanners

The main types of scanning and detection devices currently deployed by European and international airports are based on traditional X-ray technologies as well as EDS and ETD detection systems. The US Transport Security Administration has made substantial progress in installing ETD and EDS systems at over 400 airports with the capacity to screen all checked baggage for explosive traces.[7] These systems were gradually brought into large scale operation after 1973 in response to several high profile plane hijackings and a shift in tactics away from the gun toward the bomb. There are a number of disadvantages with regard to the use of existing X-ray, EDS and ETD. For example, screening baggage for explosive trace imposes significant financial and time costs to airports due to the labour intensity of implementing the procedures and need to identify individual passengers through an initial selection process.

***Detection equipment for cargo screening***

While significant investment has been made in improving passenger screening, there is a need to ensure that weaknesses in cargo screening are addressed. For example, there is a need to strengthen conventional detection systems to better detect threats such as CBRN materials which require enhanced detection capabilities. Detection is not only about combating terrorism, aviation cargo needs to be screened for the illicit trafficking of goods, such as drugs and the smuggling of counterfeit goods. The time sensitive nature of air cargo requires fast screening and resolution in order to penetrate a wide range of packaging configurations.

Current cargo screening methods and technologies are limited in terms of detection, throughput, sensitivity, automation and operational costs. In light of the threat from liquid explosives there is a growing need for technologies which can distinguish between different types of liquid materials with a high degree of accuracy. Cargo screening technologies must also overcome expensive false alarms that result from poor operational speed and efficiency especially where the screening of carefully packaged break bulk and containerised cargo configurations are concerned.

***Secure information sharing on passengers***

Some progress has been made in information sharing on passengers between the EU and the US. While data protection and privacy concerns were expressed, an agreement was reached to provide 19 separate pieces of information about individual passengers. A key challenge is in ensuring that this information is passed on to relevant agencies responsible for aviation security and to airlines in a timely manner. This requires more effective coordination between relevant actors: airlines, airport operators and public authorities responsible for security.

Biometric security technologies are beginning to play an important role in passenger authentication and identification. For example, in some European airports, the use of iris technologies has been

[6] Ecorys. p 92

[7] Berrick, C. Aviation Security: Better Planning Needed to Optimize Deployment of Checked Baggage Screening Systems. Government Accountability Office: US. 2005. p 2

piloted by border control guards in order to speed up passport control. There have also been developments with regard to the use of biometrics in the area of fingerprint recognition in passports which could improve confidence in aviation security. International standards for the design of passports are regulated by the ICAO - the present global standard for identification only requires a digital photograph, while the submission of fingerprints and other data is optional.

***ATM and operational Security***

ATM security is mainly concerned with those threats that are aimed at the ATM System itself, such as attacks on ATM assets, or where ATM plays a key role in the prevention or response to threats aimed at other parts of the aviation system (or national and international assets of high value) and limiting their effects on the overall ATM Network. The main challenges in this area include the increased vulnerability of ATM due to the introduction of new and networked technology (the new European ATM system SESAR), the lower resilience due to the introduction of more interdependent and integrated systems (and procedures), and researching how threats such as MANPADS, laser- & microwave gun, and cyber attacks on integrated networked systems might best be counteracted.

Cyber threats to ATM systems of systems are an increasing challenge for airlines and civil aviation authorities. This was recognised by the Commission in its 2001 Communication on the Information Society.[8] Cyber security is often addressed in the specific operational context of terrorism, organised and financial crime, the Commission has taken an active interest in the development of cyber security policy more generally, which led to the launch, in 2006, of a proposed Strategy for a Secure Information Society.[9] Investment through the ESRP in strengthening cyber-security for critical infrastructure protection has potential benefits for airports.

The Single European Sky ATM Research (SESAR) initiative by DG MOVE addresses specific ATM security-related concerns. It deals with aspects such as the evolution towards System Wide Information Management (SWIM) and other enabling changes (standardisation, legislation, regulation and integrated management of environment, safety and security)[10]. SESAR is designed to be interoperable with the equivalent US programme Nextgen in order to enhance cooperation and information sharing on ATM security.

## 2.3 Key stakeholders - aviation security

In order to understand the way in which EU Security Research in the field of aviation security has contributed to promoting increased security for EU citizens, it is important to identify the relevant stakeholders. These include EU and national regulatory authorities in the area of civil aviation, airport operators and airlines. The key stakeholders are summarised in the following table:

**Table 2.2: Key stakeholders - aviation security**

| *European* | *National* |
|---|---|
| • European Commission's DG MOVE (aviation security) and DG JLS (immigration and asylum, *customs and excise*)<br>• European Parliament's Transport and Tourism (TRAN) Committee | • National Civil Aviation Authorities<br>• National Supervisory Authorities<br>• Immigration authorities<br>• National authorities responsible for |

[8] Commission of the European Communities, 'Creating a Safer Information Society by Improving the Security of Information Infrastructures and Combating Computer-related Crime', COM (2000) 890 Final

[9] Commission of the European Communities, 'A Strategy for a Secure Information Society: "Dialogue, Partnership and Empowerment"', COM (2006) 251 Final, 31 May 2006

[10] EUROCONTROL. European ATM Master Plan, 2009. https://www.atmmasterplan.eu/http://prisme oas.atmmasterplan.eu/atmmasterplan/faces/index.jspx

# *Policy context and key security issues* 2

| | |
|---|---|
| • ECAC - the European regulator on aviation security<br>• European agencies and bodies involved in aviation safety and security – e.g. European Aviation Safety Agency, EUROCONTROL<br>• Other EU stakeholders - ACI EUROPE, the European Civil Aviation Conference, the European region of Airports Council International. | customs and excise<br>• Airport operators |

# Project Assessment – Aviation Security 3

## 3.1 Activities supported in PASR and FP7 Security Annual Work Programmes - aviation security

PASR and FP7 Security have provided support to a number of aviation security projects. The projects selected for analysis in this case study are summarised in the table below:

**Table 3.1: Selected PASR and FP7 Security Projects - aviation security**

| Project acronym | Name | PASR PROJECT Priority Mission | Call | EU Contribution | Budget |
|---|---|---|---|---|---|
| ISCAPS | Integrated surveillance areas for public security | Situation Awareness | 2004 | € 1,699,999 | € 1,699,999 |
| TERASEC | Protection of air transportation and infrastructure from terrorism | Protecting against terrorism | 2004 | € 2,149,679 | € 2,149,679 |
| PALMA | Protection of airliners against Manpad attacks | Protecting against terrorism | 2005 | € 1,457,000 | € 1,457,000 |
| PATIN | Protection of air transportation and infrastructure from terrorism | Protecting against terrorism | 2005 | € 2,651,542 | € 2,651,542 |
| ISOTREX | Integrated system for on-line trace explosives detection in solid and vapour state | Situation Awareness | 2006 | € 1.242.265 | € 1,242,265 |
| **Project** | **Full name** | **FP7 SEC Call heading** | **FP7 Security Mission/ cross-cutting theme** | **EU Contribution** | **Budget** |
| iDetecT 4ALL | Novel Intruder Detection and Authentication Optical Sensing Technology | SEC-2007-2.3-04 | Security of infrastructure and utilities | € 2,298,014 | € 2,298,014 |
| SAMURAI | Suspicious and Abnormal behaviour Monitoring Using a network of cameras & sensors for situation awareness enhancement | SEC-2007-2.3-03 | Security of infrastructure and utilities | € 2,478,052 | € 2,478,052 |
| SUBITO | Surveillance of Unattended Baggage and the Identification and Tracking of the Owner | SEC-2007-2.3-01 | Security of infrastructure and utilities | € 2,581,055 | € 2,581,055 |

**Thematic focus in calls for proposals**

Under PASR, a number of research topics were supported in the area of aviation security. Although PASR 2004 did not make specific reference to aviation security, there was a strong a focus on technology solutions for threat detection, identification, protection and neutralisation. In 2005 PASR, aviation was directly prioritised for the first time under the theme 'Protection of air transportation and infrastructure'. This was followed up in the 2006 PASR call, which emphasised the need to develop an integrated system for trace explosives detection in solid and vapour state.

The strong focus in FP7 on the Security of infrastructure (including airports) was followed up on in successive calls, for example in the 2009 and 2010 FP7 Calls, where there was an emphasis on developing a more comprehensive approach to airport security through improving the cost and time effectiveness of passenger security at airport facilities as well as integrating new technologies for cargo screening and to prevent MANPAD attacks. The 2010 Call expanded support for technologies that help to protect civil/commercial air transportation (including airports) against a wider range of

threats (e.g. MANPADs, Electro Magnetic Pulse, microwave-weapons, virtual radar etc). A detailed review of thoseresearch topics supported in the field of aviation security is outlined in PASR and FP7 annual work programmes and calls for proposals, which are provided in Appendix B.

## 3.2 Project assessment – aviation security

The sample of projects selected in the area of aviation security includes 5 PASR and 3 FP7 projects. In order to respond to the challenges posed to the aviation industry by aviation security threats, EU security research has supported a number of types of activities, including projects that relate to:

- **Protection of critical infrastructure (airports)** –iDetecT4ALL, PATIN
- **Improved detection systems** - iDetecT 4ALL, ISOTREX, TERASEC)
- **Surveillance and monitoring of people and luggage in airports** - ISCAPS, Samurai, iDetecT 4ALL, Subito,
- **Protection of airborne aircraft** – e.g. PALMA, PATIN

***Protection of critical infrastructure***

Critical infrastructure is vulnerable to a range of threats such as terrorist attacks and non-malevolent accidents that could seriously disrupt social and economic cohesion. The interconnected nature of the modern European at European level, there are a number of critical infrastructures, the destruction or disruption of which would have significant cross-border impacts.

PATIN (PASR, 2005) carried out a systematic assessment of threats to physical infrastructure. In order carry out a thorough assessment of the underlying security threats to critical airport infrastructure, the project implemented a holistic approach which accounted for the vulnerabilities of physical and procedural components of aviation security. Civil aviation authorities have identified key areas in which air transportation and infrastructure are considered to be at risk from a combination of illegal immigration, trafficking in CBRN, and terrorist attacks using MANPAD's.

| **Project(s):** | **PATIN: Protection of Air Transportation and Infrastructure** |
|---|---|
| Project timeframe: | January 2006 – April 2007. |
| Lead Partner: | Diehl BGT Defence Germany |
| Total cost and EU Contribution | € 3,538,298 and €2,651,542 |
| Project type: | Capability project |
| PATIN aimed to secure EU passengers by protecting the entire air transportation system against terrorist attacks, including airport concourses, aircraft, critical ground infrastructure and the information system. A threat assessment and security assessment methodology was established to identify risks to the existing air transportation system as well as new security requirements.<br>The methodology assessed whether the new requirements were likely to be met by the proposed enhancements to aviation operations, procedures, systems and technology. Where these requirements addressed the critical issues in aviation security PATIN was ensured that they were incorporated into draft regulations and recommended practices.<br>During the second stage of the project, the technologies for protection of air transport and infrastructure against different terrorist attacks were identified and analysed. State of the art and upcoming technologies were identified, analysed and specified on the basis of potential threats and operational requirements (such as surrounding airport security instillations and perimeter protection). The complete air transport and infrastructure chain was considered, including information infrastructure, airport, aircraft on ground and aircraft in flight.<br>The project was built on a layered protection mechanism which forms a system-of-system interconnected through networks. A top level information network provides situation awareness for the whole of European | |

| |
|---|
| air transportation. Local networks detect anomalies at airports followed by reactive and proactive measures against co-ordinated terrorist attacks. Major deliverables were the basis for developing the roadmaps required to establish a platform for the future European Security Research Programme. |

Responses to the threat to critical infrastructures can take many forms. The PATIN project (PASR, 2005) for instance, took a broad and systematic approach to the issue and specifically considered the inter-relationships between a combination of infrastructure protection measures.

The iDetecT4ALL project (FP7, Call 1), , was established as a result of the growing amount of evidence of the increasing vulnerabilities to Critical Infrastructures. It focuses specifically on improving security for critical infrastructures by addressing a perceived problem in identifying unauthorised access to sensitive areas.

| **Project(s):** | **iDetecT4ALL : Novel Intruder Detection & Authentication Optical Sensing Technology** |
|---|---|
| Project timeframe: | 1st July 2008 – 31st December 2010 |
| Lead Partner: | Instro Precision Ltd |
| Total cost and EU Contribution | €3,236,675 and €2,298,014 |
| Project type: | Capability project |
| The iDetecT4ALL project addressed the need for reliable intruder detection technologies by developing a novel photonic sensing technology which was based on an innovative approach using ultra low cost electro-optical components that relied on a single sensor for the detection and authentication of objects. The technology is capable of detecting the presence of objects (human beings, vehicles, goods), inside or in areas around restricted critical infrastructures. The sensor technology identifies authorised objects and signals an alert where unauthorised objects are discovered within a protected zone.<br>The system was implemented through the development of an ultra sensitive optical sensing and detection technology. The sensing technology enabled intruder detection and remote scanning of optical tags in a range of different environments. The sensor and tag were also designed to allow optical communication and secure data exchange. By attaching the tags to specific objects the system moves can identify and authenticate carry out automated alert tracking (i.e. implement autonomous surveillance measures), network with a wide number of security personal and communicate real time developments via secure communication networks.<br>The system provides 24 hour operational capability in all lighting and weather conditions. It is compatible and can be easily installed in existing security infrastructure and is designed to be maintenance free. Overall by utilising state of the art digital signal processing techniques iDetecT4ALL will dramatically improve the performance and reliability of intruder detection systems at critical infrastructures. | |

**Improved detection systems**

Some PASR and FP7 Security projects have focused on the development of new technologies to strength the effectiveness of screening and detection equipment relating to searching persons and luggage, the presence of unauthorised persons or goods and the detection of explosives and CBRN. Examples include the TERASEC, iDetecT 4ALL and ISOTREX projects (all funded in FP7, Call 1).

There is a clear threat to public security from suicide bombers and explosive devices in luggage and mail packages. The detection of explosive devices and other dangerous material is the main objective of screening and searching mechanisms and routines at all airports. Luggage is currently checked by X-ray machines, but X-ray is difficult to apply when scanning large numbers of people due to radiation safety issues, which are covered by specific regulations. Furthermore, current procedures rely on a visual identification of suspicious material on the part of staff operating the X-ray machines. Alternative technologies that do not use X-rays are required, especially if these can automatically identify substances in luggage or packages. These technologies need to be fast,

reliable and work in real time. Further advance are also required identify potential threats at a distance rather than in close proximity to security systems. A summary of the TERASEC project is provided below.

| **Project(s):** | **TERASEC: Active Terahertz Imaging for Security** |
|---|---|
| Project timeframe: | 1st Jan 2005 – 31st Dec 2006 |
| Lead Partner: | DLR - Deutsches Zentrum für Luft- und Raumfahrt |
| Total cost and EU Contribution | € 2,977,484 and €2,149,679 |
| Project type: | Capability project |
| ***Capability project, Integrated project, Demonstration project**<br>Terahertz (THz) rays contain unique properties which offer an alternative inspection method to X-ray. Furthermore they can be used to identify explosives, pathogens and chemicals hidden on a person or inside an object such as letters or luggage. The project designed a THz imaging system for close-by and stand-off detection of explosives and bio agents at a distance of 25 meters. Although there is wide scope for improving the scientific foundations of THz based screening technology, the project designed a reliable system that operates on low power and at room temperature. Further development in this field could reduce unit costs and allow the technologies deployment at land, air and sea border checkpoints. Many sectors are currently interested in adapting TERASEC concept for chemical engineering and the environment. | |

A clear and obvious threat to security arises with the presence of explosive materials in places characterised by the transit of a large number of people and goods (airports, railways stations, heavily used banks and the main post offices). Developing the ability to detect these materials is an equally obvious response, but this has to be done without imposing unacceptable delays and without excessive intrusion.

Detecting hidden explosives from traces released into the environment (gaseous emissions) or from dispersed particles on packing surfaces or cloths has been the response to these problems, but there is a wide of scope for improvement in discriminating between substances, in detecting low-level traces and in the facility with which the detection mechanisms can be deployed.

| **Project(s):** | **ISOTREX: Integrated System for On-Line Trace Explosives Detection in Solid and Vapour State** |
|---|---|
| Project timeframe: | 1st Feb 2005 – 31st Jan 2007 |
| Lead Partner: | SAGEM Défense Sécurité, France |
| Total cost and EU Contribution | € 2,312,892 and €1,699,999 |
| Project type: | Capability project |
| ISOTREX aimed to develop fast screening sensors in a portable demonstrator that could be implemented at checking points in airports and other places with large numbers of people and goods in transit. The project exploited the capabilities offered by laser technologies characterised by high selectivity and sensitivity, to detect low levels of vapour and particles. Given the range of explosive types, the instruments were intended to recognise the presence of the energetic materials and to identify the most common explosive types and materials. Unknown substances were marked for further investigation. The technology offered a good prospect of miniaturisation and significant subsequent opportunities for commercial development of the instruments. | |

# Project Assessment – Aviation Security 3

**Surveillance and monitoring people and luggage in airports**

Situational awareness is a growing area of importance for both national security research and the ESRP. In response to terrorist attacks in crowded areas such as mass transport systems, future generations of CCTV cameras must use active rather than passive technology, which alert operators to unusual behaviour. There is also a need for camera technology equipped with advanced pattern recognition algorithms to provide automated warning of anomalous or suspicious behaviour (such as leaving bags unattended). Security users are also interested in developing the capability to recognise and tag images so that suspect individuals can be tracked through a transport system and cross checked against common databases.

Airports provide 24 hour monitoring and surveillance through the widespread deployment of static, networked Pan-Tilt-Zoom (PTZ) Closed Circuit Television Cameras (CCTV). Most CCTV systems are controlled manually by operators on an ad-hoc basis rather than by automated systems that allow for 'on-the-fly' decision-making, which is needed to reduce false alarms. Furthermore, there has not been a significant research drive towards the development of effective and robust algorithms that allow object appearances to be shared, categorised and utilised as well as mapping behaviour information across multiple cameras.

A number of research projects were supported concerned with the surveillance and monitoring of people and luggage in airports. These include the following projects: **Samurai, iDetecT 4ALL, ISCAPS** and **Subito**. Further information about the Samurai project, funded in the first call in FP7, which sought to develop innovative solutions to monitoring abnormal behaviour through the installation of cameras & sensors for situational awareness enhancement, is provided below:

| **Project(s):** | **Samurai: Suspicious Abnormal Behaviour Monitoring Using a netwoRk of cAmeras & sensors for sItuational awareness enhancement** |
|---|---|
| Project timeframe: | February 2008 - February 2011 |
| Lead Partner: | Queen Mary, University of London Department of Computer Science |
| Total cost and EU Contribution | €3,638,131 and €2,478,052 |
| Project type: | Capability project |
| The overall aim of SAMURAI is to develop and integrate an innovative intelligent surveillance system for monitoring people and vehicle activities at both inside and surrounding areas of a critical public infrastructure. To this end SAMURAI developed a system of robust moving object, segmentation, categorisation and tagging in video captured by multiple cameras from medium-long range distance, e.g. identifying, monitoring and tracking people with luggage between different locations in airports and other public areas.<br><br>The system is designed to automatically respond to abnormal behaviour characteristics via a distributed sensor network that includes fixed and mobile cameras, positioning sensors and wearable audio or video sensors. The system markedly reduces the time it takes for surveillance teams to identify threats and take preventative measures by coordinating communication.<br><br>A key priority was to establish global situational awareness assessment by retrieving and categorising object images according to the type and movement patterns of incidents across a distributed network of cameras. This information is processed by SAMURAI's online adaptive abnormal behaviour monitoring software that enables inferences and profiling to be carried out depending on how the images fit models of abnormal events and behaviour.<br><br>The project has already made a significant impact by raising the level of public awareness and confidence of CCTV security systems designed to identify, track and trace potential risks in public areas. Samurai may also have a positive impact on the European security market by placing European producers of monitoring and | |

surveillance systems in a relatively more advanced position compared to global competitors in the same area. This could also provide an added value in terms of increasing the capacity of the EU's scientific community as well as leveraging support for similar innovative security technologies that help to maintain Europe's competitive advantage in the global security market.

PASR supported a number of intelligent surveillance activities including the ISCAPS project on Surveillance of Crowded Areas, the PROBANT project on tracking individuals together with the TRIPS and EUROCOP projects which delivered specialised surveillance technologies for railway stations and pedestrian police officers. Through FP7 SEC, several contracts have been awarded to develop intelligent surveillance systems. These include the SUBITO project on tracking the owner of abandoned baggage, the LOTUS project (see example), the IDTECT4ALL project for the detection of intruders and the ODYSSEY project to develop a Pan-European Ballistics Intelligence Platform for Combating Organised Crime and Terrorism.

| **Project(s):** | **SUBITO: Surveillance of Unattended Baggage and the Identification and Tracking of the Owner** |
|---|---|
| Project timeframe: | 1st January 2009 – 31st September 2011 |
| Lead Partner: | SELEX Sensors and Airborne Systems Limited |
| Total cost and EU Contribution | €3,895,730 and €2,581,055 |
| Project type: | Capability project |

The project researched and developed a system for automated detection of abandoned luggage, fast identification of the individual responsible and the tracking of their subsequent path. The consortium consisted of a diverse group of technology and implementation experts from across the EU who developed an integrated threat detection system that provides a robust, timely alert for security personnel. Working closely with end users, the team designed a system capable of distinguishing between genuine threats and false alarms in order to alert the user to high priority situations.

The project will improve the efficiency of security personnel by automatically filtering out the major false alarms and therefore focusing their attention only on credible threats. Expected results With the help of our end user partners, SUBITO will demonstrate that a solution to this problem is achievable using existing infrastructure and security technologies from real locations operating under standard procedures.

The projected succeeded in combining robust detection, tracking, identification with facial recognition and PTZ Cameras (i.e. 3D image generation) to effectively analyse individual patterns of behaviour. SUBITO is expected to integrate the new surveillance software into existing and future closed circuit television, thereby benefiting the security of all European citizens.

Public spaces including airports where there are large numbers of people gathering are clearly a potential target for terrorist attack and a number of projects address different approaches to the aim of identifying people with a malicious intent. One aspect that needs consideration arises from the very fact that crowded places have large numbers of people present and they can act in different ways depending on the function and structural characteristics of the public space.

Furthermore these same characteristics determine to a large extent the actions that can be taken by the authorities to respond to potential threats. Direct security checks may be undertaken at an airport, but are less appropriate in a shopping centre. Important improvements to public security are being made by the integration of effective early warning measures with surveillance technologies. One such project was ISCAPS.

# *Project Assessment – Aviation Security* 3

| Project(s): | **ISCAPS: Integrated Surveillance of Crowded Areas for Public Security** |
|---|---|
| Project timeframe: | 1st Feb 2005 – 31st December 2009 |
| Lead Partner: | ENEA (Ente per le nuove tecnologie, j'energia e l'ambiente) |
| Total cost and EU Contribution | €1,656,359 and €1,242,265 |
| Project type: | Capability project |
| ISCAPS concentrated on the early, proactive detection of major threatening events linked to terrorism and crime. Three different types of threat scenario were identified together with corresponding operational requirements. Each scenario was matched by a type crowded area where control or identification poses a significant challenge. These included channelled areas where there are few entry and exit points, such as crowded streets or commercial centres and restricted areas in which strict controls and full biometric identification can be performed at entry points (e.g. in amusement parks).<br>These activities were combined with research on key technologies (i.e. sensors, information processing, threat detection, communications and system configuration), to help develop open system architectures. ISCAPS also supported the integration of a combination of sensors such as visible and infrared cameras, biometrics and optical authentication tags in order to increase the quality of identification and the tracking of persons, goods and vehicles. | |

**Protection of airborne aircraft and airport protection**

There is a threat in some parts of the world from attacks by MANPADs (Man-Portable Air Defence Systems). While in Europe, there have not to date been any recorded MANPADs attacks, in the context of the evolving terrorist threat, the possibility of such attacks in future cannot be discounted. Among the main threats of MANPADs include the protection of civil/commercial air transportation (including airports) as well as the adverse use of Electro Magnetic Pulses (EMP's), microwave-weapons and virtual radar to disrupt civilian flights.[11]

The importance of airports as potential targets for terrorist attacks has also increased with the intermittent occurrence of terror attacks such as the 1985 Rome and Vienna airport attacks, and the attack on Glasgow airport in 2007. Since the attacks of September 11th, airport authorities have come under greater scrutiny with regard to their level of planning and response capacity to deal with the emerging threat from illegal migration, and the smuggling of CBRN materials at converging points of international travel.

In order to respond to the threats posed by both MANPADs and the need to better protect airport infrastructure from attack, EU funding has been provided through both PASR and FP7 Security Research. Specifically, under PASR, the PALMA and PATIN projects were supported. A research topic was also supported on civil aviation security, including support for protection against MANPADs attacks through the third call for proposals in FP7 Security. Through this Coordination and Support Action, support will be provided to research the evolving nature of the threat level and possible technological solutions to protect civil/commercial aviation. However, no projects were supported.

[11] COM. C(2009) 5893 *Work Programme, Cooperation Theme 10: Security*. Brussels: European Commission. 2009. p 20

# Project Assessment – Aviation Security 3

| Project(s): | PALMA: Protection of Airlines Against Manpads Attacks |
|---|---|
| Project timeframe: | January 2006 – June 2007 |
| Lead Partner: | EADS CCR DCR/STI/T France |
| Total cost and EU Contribution | €1,984,538and €1,457,000 |
| Project type: | Capability project |
| PALMA aimed to identify functional and operational requirements, provide technological analysis, conduct experimental investigations and make recommendations for future research. The project played a key role in preparing the necessary strategic, legislative and scientific capabilities for a community response to the threat from MANPAD's against airborne targets. This was particularly important to ensure that the protective technology is made to comply with ethical and legal parameters. The project defined Intermediate solutions with existing technologies and a research programme for a fully compliant system. | |

There are cost considerations and ethical concerns that make airlines reluctant to equip civilian aircraft with protection against missiles. While the technology is already available in the defence sector, in the absence of regulation, it is felt to be unlikely that airlines will bear the cost of installing such systems. There is a lack of public acceptance of the integration of anti-missile capabilities in aircraft and there are not currently any regulatory drivers that could promote take-up.

## 3.3 Achievements at project level and research quality

Progress in the implementation of PASR and FP7 SEC in the field of aviation security is reviewed below. The findings are grouped around the main topic areas in which projects have taken place:

### *3.3.1 Protection of critical infrastructure (airports)*

**Although only a small number of critical infrastructure projects have dealt specifically with threats to airports, a number of cross-cutting projects have been supported to enhance vigilance and strategic planning at airports.** Examples include the use of foresight exercises that focus on a range of potential future threats to critical infrastructure (e.g. illegal immigration, terrorism, smuggling of illicit goods including CBRN substances).

**FP7 SEC has also made a contribution to promoting physical security in airport facilities, for example, through improved monitoring of sensitive areas.** Projects such as iDetecT4ALL broke new ground by delivering state of the art research on technologies to detect the presence of objects (human beings, vehicles, and goods), both inside and outside restricted areas of critical infrastructures.

**A number of projects have been supported through the ESRP on biometrics, both in PASR and the joint ICT-Security Call.** Greater use of biometrics has potential to improve airport security (access to secure areas) and the efficiency of passenger screening facilities in future**.**

**Improving the protection of personal identity and privacy was widely supported by FP7 security**. The TURBINE project focused on developing a privacy technology which combines advanced cryptography with a biometric fingerprint database. Technology which fuses coded software with biometric signatures is likely to play an important role in verifying people's identity and could be used in multiple systems and environments, such as the identification and authentication of passengers at Boarding Gates.

**However, there is a need to win societal acceptance for the deployment of biometrics technologies.** The research found that the potential wider use of biometrics has caused debate and controversy in some EU countries and there is a need to reassure the public about data protection and privacy concerns.

### *3.3.2 Improved detection systems*

**The ESRP has invested in 'new generation' technologies since the current generation of conventional walk-through metal detection (WTMD) equipment is becoming increasingly inadequate to address new and emerging security threats,.**

**There is a need for improvements in passenger screening technologies to detect CBRN and liquids.** Although some technologies are already available in the market, and have been introduced in airports, such as X-ray based explosive detection systems (EDS) for hand baggage, and explosive and chemical trace detection systems (ETD) for passenger search, there remains a need for users to work with suppliers to develop reliable and cost-effective solutions that can be deployed easily.

**Aviation security research projects have carried out research to improve detection technologies in respect of passenger and cargo screening, including body scanner technologies.** Projects have used X-rays, neutron beams, Ultra High Frequency sound waves, laser-induced breakdown spectroscopy and laser photo-acoustic spectroscopy in order to detect explosive particle, liquid and chemical traces as well as CBRN materials.

**Through the ESRP, some projects have focused on improving cargo screening and on minimising the security risks associated with the transport of air cargo.** While passenger screening has been given greater attention by both the travelling public and regulators in the aviation security field, there is a need for improved technologies to improve cargo security. The ESRP has strong potential to address some the current shortcomings in technologies.

**ESRP has added value by addressing specific gaps in airport detection technologies in passenger screening, while at the same time addressing passenger health and safety**. The ISOTREX project for example is developing an integrated system for detecting vaporized explosive traces. This offers the possibility of more efficient screening for the aviation industry.

**There is a need for ongoing research into the health and safety implications of the deployment of new detection equipment in passenger screening, notably the use of body scanners.** Projects such as TERASEC have potential to allay public concerns about the adverse health and safety impacts of the deployment of body scanners in airports. While research is at an early stage, the project could potentially see the replacement of x-rays with safer Terahertz frequency waves.

**Cooperation has been strengthened between project partners on collaborative research and there has been progress towards developing a critical mass of detection research.** The TERASEC project has potential to reduce delays at airports through automated screening, together with improvements in passenger health and safety from non-radiation emitting scanning equipment.

**Some attention has been given to the societal and ethical aspects of passenger screening technologies and this is likely to be growingly important in the aviation security domain in future.** Body scanners have attracted considerable controversy and there is a need to ensure that privacy considerations are taken into adequate account prior to their deployment. Small research projects on the societal aspects of aviation security could contribute towards reassuring the public[12].

[12] The TSA in the US undertook extensive piloting and market research with the public across US airports prior to the deployment of scanners in the US, and this could be a useful potential model for the EU.

### *3.3.3 Surveillance and monitoring of people and luggage in airports*

Although there are societal considerations relating to privacy linked to the deployment of CCTV cameras more widely, evidently, in airports and other critical infrastructure, it is **imperative that improvements are made in monitoring technologies through dynamic and mobile CCTV cameras.**

**Some projects have combined CCTV surveillance with physical recognition software setting out new applications for existing technologies.** The SAMURAI project has played an important role in widening the scope for potential camera networking by demonstrating ways in which advanced computer algorithms can be used to network surveillance cameras and to fuse data between them so as to help track suspicious individuals and items of baggage.

**However, intelligent and mobile tracking CCTV networks can only form part of the solution and must be weighed against the social, legal and ethical dimensions of surveillance**. One project that addresses these concerns is ISCAPS. While utilising breakthrough technologies, the project partners have sought to involve end-users through social dialogue to ensure that technological outcomes meet the needs of society and target beneficiaries.

### *3.3.4 In-flight security and Air Traffic Management*

**There has been some limited support to fund research on protecting aircraft against ManPad attacks through PASR projects.** However, while airlines accept the need to prepare for 'low probability, high impact events', they do not believe that installing anti-missile protection on aircraft is viable from a cost perspective.

**Ground-based protection for aircraft has received limited attention to date, and may need further research in future.** Protecting airborne aircraft is the responsibility of ground airport facilities which can best achieve protection by applying a multilayered security system. The PATIN project (PASR) promoted in-flight security by improving collaboration between airport ground and air staff through a system of enhanced operational, procedures, systems and technology.

**A new generation of integrated Air Traffic Management (ATM) systems will shortly be introduced, with improved coordination between civil aviation authorities on ATM.** While this will improve the efficiency and effectiveness of ATM, it brings with it the possibility of new intelligent security threats, such as attack on networked systems and systems of systems.

### *3.3.5 Conclusions – research quality*

ESRP has **promoted the development of 'state of the art'** in particular areas of aviation security. For example, prototype technologies developed through an FP7 project have strong potential to improve the surveillance and monitoring of people and luggage in airports through the use of mobile and dynamic CCTV surveillance. The demonstration trials show strong promise and the high level of interest from airport operators suggests that such technology shows real promise in promoting 'new generation' solutions to evolving threats.

FP7 SEC has attracted the participation of a number of leading players in the airline industry and of airport operators. This suggests **strong interest from among end-users** in the research being undertaken, which in itself is an indicator of research quality.

Projects that focused on carrying out early-stage research also appear to have **contributed to achieving research excellence** in the aviation domain. For example, the TERASEC: Active Terahertz Imaging for Security project has potential over the long-term to bring about a significant evolution in the quality and reliability of detection equipment used in airports. It also has potential health benefits in that it may be safer for the travelling public than the present generation of x-ray technologies.

# Project Assessment – Aviation Security 3

Due to the absence of benchmarking information, it is sometimes difficult to assess the quality of research outcomes at this relatively early stage in the implementation of some projects, such as those that involve research to improve the reliability of detection equipment to meet evolving threats which only have research outputs to show at this stage. There is a need to obtain the independent views of a panel of end-users so as to compare views on how emerging research outcomes compare with products already available on the market.

## 3.4 End-user involvement in aviation security projects

Users of the results of aviation security research include airports, law enforcement agencies (e.g. transport police, anti-terrorism bodies, customs and border control agencies), the emergency services, public agencies and national and regional authorities responsible for security and safety at airport facilities. Users were involved in a large number of aviation projects. They played an important role in ensuring that projects remained relevant to the identified needs of the aviation sector. This helped to increase potential take up and marketability of project results.

Critical infrastructure including airport transport hubs are mainly owned and run by private sector users, such as BAA in the UK. Users are also increasingly responsible for defining threats and challenges to the aviation sector as well as in supporting the implementation of technical solutions. This has led to a reshaping of the security role played by public authorities with a transition from direct responsibility for managing airport infrastructure to the provision of security intelligence to relevant stakeholders and helping to reinforce physical security when needed.

The PATIN project dealt with direct threats to the physical and information infrastructure of airports in relation to both grounded and airborne aircraft. While there remain challenges in persuading airlines to take up technologies that could help to prevent attacks on airborne aircraft, the close involvement of users in simulation activities, such as the European Organisation for the Safety of Air Navigation (EUROCONTROL) to make direct contributions to the practical and legal design of the project. The following example illustrates the important role of users both in defining their requirements and also in taking part in the testing and validation phases of project implementation, which provided valuable feedback to others organisations in the consortium.

**PATIN Project (Protection of Air Transportation and Infrastructure) (PASR)**

**EUROCONTROL – a user perspective on aviation security**

The European Organisation for the Safety of Air Navigation (EUROCONTROL) is responsible for air traffic management (ATM) system for civil and military users. While its primary interest is ensuring continuity in ATM Services (protection/resilience of air navigation services), it is also concerned with wider aviation security issues , such as in-flight security. EUROCONTROL was involved in the project as a user. The project was led by Diehl in Germany and 3 end-user organisations took part: Eurocontrol, Munich Airport and the Czech Airport authorities.

Project activities included a mapping exercise to identify security measures to protect air transport systems. A threat assessment and risk analysis was undertaken to examine various terrorist threats and a methodology was developed to assess whether future security requirements in the air transportation and ATM domains could be met through enhancements in operations, procedures, systems and technologies.

The 3 user organisations were involved in defining user requirements and also other activities, including a 'live' test cross-border flight to trial particular scenarios. This was viewed as ground-breaking, since it required cooperation across different national airspaces and authorities for security research purposes. At the end of the project, a conference for air transportation stakeholders was organised to test the practicability of a plan to improve aircraft self-protection and install technologies to do so.

Overall, EUROCONTROL viewed participation in the project as having been useful. Prototype technologies were developed through the project to help protect aircraft from missiles, and some valuable lessons were

learned by participants. The project was also successful in bringing together a range of relevant stakeholder organisations from both the demand and supply side that had not previously cooperated together.

Gaining access to the technological know-how of different industrial partners, who had different functional expertise was seen as helpful. The opportunity to exchange information on net-centric threats both to aircraft and systems of systems was also valuable, given the increased risk of intelligent and unconventional threats, including ATM cyber security breaches.

However, since the project was completed, 'not much has happened'. Among the obstacles include the high implementation costs of some of the proposed aviation and aircraft security measures, along with a lack of political will and reluctance on the part of airlines, airports and ANSPs to make the necessary investments.

In the absence of a regulatory framework to drive take-up, despite the threat of international terrorism, the technologies have not yet deployed. EUROCONTROL believes that ground-based systems may be more useful. Eurocontrol stated that there was a need for a clearer strategy on how the results would be used, and project follow-up, not only the need for continuity in (aviation security) research activities, but also the importance of carrying out targeted research in particular areas – e.g. net-centric threats, higher interconnectivity of airborne and ground systems, etc.

Idetect4all also involved **users closely in the identification of problems** linked to the reliability of surveillance systems, and current technology gaps. Low cost solutions derived from the commercial CCTV market were not delivering the reliability and performance required while the high technology sensors developed for defence markets were too expensive for large scale deployment. This informed the project's decision to use novel photonic sensing technology. This saved the research team involved in defining functional requirements time by giving them a better understanding of user needs and how the technology should be pitched in terms of the level of technology and future pricing strategies that could help to maximise potential deployment of the technology.

The ISOTREX project established **strong working relationships with end-user organisations** in demonstrating its prototype particle/vapour detection system. User involvement was seen as critical, especially since the project intends to be portably deployed at large check points such as airports, customs, main post-offices and special police teams. The Italian Scientific Military Corps supported the project throughout and partnership and this work greatly benefited from their suggestions. ISOTREX has also benefited from close collaboration with the Italian and Polish forensic police who advised the final test and helped define the scenarios for use. The project has applicability in the aviation sector since there is a need for improved CBRN and explosives detection in airports.

Some projects found it more difficult to involve users due to the long incubation periods for scientific research. For example, beneficiaries in the Terasec project understand that to ensure a clear route to market for Thz detection systems, there is a need for the scientific community and national border authorities to support the continuation of the research. However, attracting users to take part at this stage in the nascent technology's development, given that the project involves fundamental research, has proven difficult. In future, the lead coordination thought that users could play an important role in **promoting awareness** about new generation detection technologies.

While not involved in FP7 SEC as a project beneficiary, airlines are among the prospective user community of research results. A major airline in the UK was interviewed as part of the research. There was interest in some of the projects relating to improved detection equipment, not only in relation to the need for improved efficiency in passenger screening (improved throughput of passengers being a factor impacting profitability, but particularly cargo screening.

Compared with passenger screening, to date, there has **been less attention through the ESRP to improving cargo screening technologies**. There remains an urgent need for a new generation of

screening equipment to be developed capable of dealing with new and emerging threats. The importance of urgent action in this area has been heightened by the recent terrorist incident in which bomb materials hidden inside a printer were sent from the UAE to the US via cargo plane. The equipment failed to identify the suspect package, and the plot was stopped instead through timely intelligence.

There is heightened awareness about the need for high quality video surveillance to monitor people and luggage in airports. Presently airports deploy 24 hour static, networked Pan-Tilt-Zoom (PTZ) CCTV. Currently, most CCTV systems are controlled manually by operators on an ad-hoc basis rather than by automated systems that allow for 'on-the-fly' decision-making, which is needed to reduce false alarms. **SAMURAI** (Suspicious and abnormal behaviour monitoring using a network) has developed a sophisticated algorithm to identify, monitor and track people with luggage between different locations in airports and other public areas. The technology has reached a critical stage in its developed and tests have been carried out with end-users in the aviation industry.

With regard to user involvement, airport operator BAA was satisfied with the prototype technologies that have been developed to date. These have potential to significantly enhance the capacity of human surveillance operators for identifying security threats. BAA helped the project to address areas in airport security by **identifying limitations** with existing CCTV cameras and highlighting gaps in surveillance capabilities. They were involved in the trialling process and would like to see the system rolled out in the short-medium term. At this stage, it is too early to talk about deployment and take-up by users will depend on whether the technology can be rolled out at reasonable cost.

The SUBITO project built end-user requirements into the study design. In particular, Glasgow airport made a significant contribution as well as the police services in the towns of Grossetto and Fiera di Genova which contributed their **understanding of operational matters in identifying suspicious and abnormal behaviour in monitoring crowded places**. Although the project is not yet at a stage where the results can be demonstrated, the partners intend to involve a large number of end-users in the demonstration aspects.

# Conclusions - Aviation security

4

## 4.1 Overall conclusions

**The ESRP has begun to make a real contribution to strengthening aviation security at EU level.** Progress has been made in various areas, for example, the development of prototypes for new generation surveillance and monitoring systems, improved detection and screening equipment that responds to the need for strengthened capabilities to identify new and emerging threats, such as detecting liquids in hand luggage, explosives trace detection equipment, and artificial sniffers.

**Progress has also been made in strengthening cooperation between suppliers and users of security products and services.** End-users have shown strong interest in getting involved in projects and have played a valuable role in defining user requirements.

**The strategic focus of EU Security Research has strong potential to enable public authorities to better anticipate threats in the aviation security domain (and to develop appropriate technologies that address these).** There is a need for national authorities and regulators at EU and national level to adopt an anticipative approach to the identification and mitigation of threats and challenges.

**The ESRP has potential to promote efficiency improvements through the development of new technologies for use in airport security – especially in passenger and cargo screening and in protecting airport infrastructure.** Examples include biometrics (rapid identification and verification of e-documents), the faster scanning of bulk cargo, and the introduction of integrated detection systems at passenger screening points, which has potential to increase passenger throughput.

**Regulation has played an important role in driving take-up of security products, services and solutions, especially of detection equipment.** Common minimum EU standards on civil aviation security allow for flexibility in implementation, but provide for the introduction of new generation detection equipment to improve passenger, cargo and mail screening, and set out common procedures for in-flight security.

**There is a need for a risk-based approach to aviation security.** In order to ensure ongoing public acceptance of security measures, there is a need for an appropriate balance in ensuring robust security, while at the same time ensuring that measures and technologies are cost-effective.

## 4.2 Recommendations

**Funding should be provided for projects that explore the interaction between people, processes and technologies.** Effective aviation security will not be achieved through technology alone, and this should be recognised in the deployment of new technologies in the aviation security area (e.g. screening devices, body scanners, biometrics).

**The Commission should fund a research topic to promote good practices in the design of new airports and the adaptation of existing airport infrastructure to meet tomorrow's security challenges.** Future airports should incorporate a holistic approach to aviation security from the outset of the design process. Existing airport infrastructure and security procedures were developed prior to the increase in passenger numbers within the EU and the emergence of terrorist threats.

**Scope should be explored for increased standardisation in the aviation security domain**. While there are already common minimum requirements for detection equipment in European airports, the development of common testing and certification procedures and interoperability of detection equipment could be further promoted.

**A stronger focus could be placed in future FP7 SEC calls on improving in-flight security and in the identification of potential vulnerabilities.** Given that the new generation of aircraft have more integrated and networked control systems, there is a need to tackle threats to ICT systems.

# Conclusions - Aviation security

4

**The Commission should promote enhanced cooperation among civil contingency planners and airport authorities.** This would help to identify where there are gaps in physical security measures and to identify vulnerabilities within airport facilities.

**ICT infrastructure should be made more resilient to cyber attacks and network failures in order to prevent potential cascading failures.** Aviation infrastructure (including ground and in-flight ATM) relies on continuous and uninterrupted information flows and databases, which cannot be allowed to fail. Airports and border gateways are dependent on information assurance regarding data, control systems, networks and protocols that support the effective functioning of aviation.

**Ongoing research is needed to strengthen the effectiveness of detection equipment in response to emerging threats.** X-ray based explosive detection systems (EDS) for hand baggage, and explosive and chemical trace detection systems (ETD) for passenger search are already on the market. However, there remains scope to improve the effectiveness of the current generation of detection technologies to better address new threats such as CBRN(E) materials and hazardous substances.

A medium term challenge for the aviation industry is to **combine infant detection technologies with a single networked system of detection capabilities** that can be deployed in a variety of airport/flight locations, while maintaining maximum user flexibility, a high degree of accuracy and minimal inconvenience to passengers. **This research topic could be addressed through future calls**.

# *Interview List*

A

| *Name/ position* | *Organisation* | *Organisation type* | *Project* |
|---|---|---|---|
| Khoen Liem /Commission official | DG ENTR | Security Research Unit, H3, Principal Scientific Officer | NA |
| Mireille Doerr/ Commission official - policy user | DG MOVE | Aviation Security Unit, research and technology | NA |
| Klaus Scheerer | Diehl BGT Defence, Uberlingen | Beneficiary | PATIN |
| Rainer Kölle | Eurocontrol | Beneficiary | PATIN |
| Gilles Fournier | EADS CCR | Beneficiary | PALMA |
| Jean-Marc Suchier | Sagem Securite | Beneficiary | ISCAPS |
| John Morcom | Instro Precision Ltd (SME) | Beneficiary | iDetecT 4ALL |
| Peter Lodewyckx | Royal Military Academy Belgium | Beneficiary | iDetecT 4ALL |
| Paul Crompton | Arttic Brussels | Beneficiary | iDetecT 4ALL |
| Dr Mark Daniell and David Humphre | Selex Gallileo | Beneficiary | SUBITO |
| David A Ritchie | Active Terahertz Imaging For Security | Beneficiary | TERASEC |
| Dr. Heinz-Wilhelm Hübers | Deutsches Zentrum für Luft- und Raumfahrt e. V (German Aerospace Center) | Beneficiary | TERASEC |
| Stephen Challis | BAA | Beneficiary | Samurai |
| Andrew Dyer | BA | Prospective beneficiary | NA |

NA – Not applicable

# *Aviation PASR and FP7 SEC Calls*

B

| Work Programme/ Calls | Aviation Security - types of activity supported |
|---|---|
| PASR 2004 | Aviation security was not directly mentioned but 1 project funded under 'Improving situation awareness: Integrated surveillance areas for public security'. 2 projects funded under protecting against terrorism: to identify and prioritise the material and information requirements of governments, agencies and public authorities in combating and protecting against terrorism and to deliver technology solutions for threat detection, identification, protection and neutralisation<br>Under 'wider measures', there was also a possibility of carrying out a survey of good practice in screening measures (goods and persons) in Member States, and other regions and including an evaluation of the economic viability (costs and throughput) of activities and of the transferability of systems and capabilities across the enlarged EU; |
| PASR 2005 | Aviation security not directly mentioned but project funded Protection of air transportation and infrastructure under 2005 Call, Theme 'terrorism' |
| PASR 2006 | Aviation security not directly mentioned but project funded Integrated system for on-line trace explosives detection in solid and vapour state under 2006 Call, Theme 'Situation Awareness' |
| FP7 2007 | Security of infrastructure and utilities, topics SEC-2007-2.3-01 and SEC-2007-2.3-03 |
| FP7 2009 | 10.2. Security of infrastructures and utilities<br>SEC2009.2.2.2 Integrated comprehensive approach to airport security<br>The task is to create an integrated comprehensive airport (land, surrounding infrastructure and adjacent airspace) security system capable of providing accurate situational awareness. It aims to develop a cost and time effective system with a passenger security focus that covers the whole airport area and integrates relevant technologies that together can meet current and coming security threats. The proposed system must respect passenger privacy and keep time spent at check-in, security controls etc to a minimum.<br><br>Aspects to be addressed include passenger, crew and staff screening (including detection of non-metallic weapons, explosives, drugs, etc); passenger area surveillance (abnormal behaviour, illicit substances and objects); outdoor 24h surveillance at the airport area; and checked luggage and cargo screening (including detection of explosives and other illicit substances or objects). This integrated approach could include a comprehensive threats analysis, and the research needs for the detection and the protection of commercial aircrafts against MANPAD attacks.<br><br>The system will improve situation awareness at airports through the monitoring and tracking of complex transport environments as a consequence of the continuous arrival and departure of cargo, planes, vehicles, staff and passengers, and also the potential threats by vehicles and individuals inside and at the surroundings of the airport area. This will include mobile and fixed detection and recognition systems in order to provide intelligent event detection, supporting the decision control; investigation into cargos and luggage scanner outputs fused with airplane passenger and cargo list information, external risk assessment and a-priori threat knowledge which allows for automatic anomaly detection. |
| FP7 2010 | Area 10.2.4 Coordination and Support Actions<br>Topic 10.2.4-1 New concepts to meet the requirements for the protection of civil/commercial aviation<br>With the continuous development and proliferation of technology, new opportunities and risks in relation to the security of aviation have to be faced. Within this action, emerging opportunities and risks should be explored, and concepts to mitigate threats and to make use of emerging opportunities should be identified, taking into account European/international ongoing and planned activities for protecting the civil/commercial aviation. The state of relevant European capabilities should be catalogued and compared against relevant requirements and a countermeasure/ opportunity roadmap should be recommended, taking also into account cost aspects.<br><br>This includes:<br><br>• A comprehensive view on new technologies and proliferation issues, and their impact on the protection of civil/commercial air transportation (including airports) against attacks (e.g. MANPAD, EMP, microwave-weapons, virtual radar etc).<br><br>• Definition of potential risks and future challenges in the area of civil/commercial aviation, taking into account solutions to mitigate the threats and to make use of emerging opportunities |

# *Aviation PASR and FP7 SEC Calls*

B

| | |
|---|---|
| | (ground and onboard; air-side and land-side; day-to-day operations; disasters and terrorism; short, medium and long term etc).<br><br>• The management of standardisation issues (such as threats, aircraft, airport, efficiency of solutions), export control and non-dissemination, certification (safety aspects), environmental constraints, operational and costs aspects.<br><br>• European technical recommendations and tools to enable future regulation for example exploring new possibilities offered by interconnection of security database and airline database, which maybe be supported by biometric technologies.<br><br>• A cost-benefit analysis of the implementation of the different security scenarios, including operational and maintenance constraints and requirements for the airliners. |