Enhancing airport security

31 August 2011

International air transport has been an object of terrorist attacks for decades. In the 70s and 80s, numerous planes were hijacked, revealing for the first time the vulnerability of the security system that was then in use. As a consequence, personal security checks were introduced to which all passengers have had to submit. Later, following the Lockerbie attack of 1988, all items of luggage checked in were made subject to security clearance.

While all the new checks did serve to enhance security, they piled up into a hurdle that affected the entire chain by which passengers, luggage, and freight were processed. Today, the checks conducted at airports cover all individuals that enter the defined security zone: travellers, pilots, flight attendants, technicians, and airport employees as well as workmen and service providers who are employed there. Queues waiting at the checkpoints are the rule rather than the exception. Airlines especially find them a factor that makes it increasingly difficult to calculate exactly when passengers will be arriving at the departure gates. At the same time, the patience of airport personnel working in the security zone is often put to a severe test at shift-change time.

Protection from future hazards

Essentially, it is the task of security research to develop new technologies for processing passengers, luggage, and freight. These are supposed to offer protection from potential dangers of the future, such as new explosives, for instance. One of the key concerns of the researchers is to adapt security technologies as perfectly as possible to the various processes going on at an airport.

The Institute of Air Transport and Airport Research in Braunschweig forms the hub of all DLR activities relating to airport security in which employees of two DLR research areas, space and transport, are involved. At the same time, airport security forms part of security research, DLR's cross-departmental programme under which defence- and security-related research and development activities are being planned and controlled.

Improving process coordination

Airport security is a constituent element of airport management and, as far as future research questions are concerned, of the Total Airport Management (TAM) project. The objective is to improve the coordination of airport processes so as to put available resources and information to the best possible use. DLR's security research focuses on solutions that are of practical relevance to the police, security service providers, airports, airlines, and other stakeholders.

Thus, for example, scientists working on the FAMOUS project (Future Airport Management Operating Utility System) are concentrating on technical innovations to detect explosives and hazardous substances by, for example, analysing terahertz spectra and imaging data.

The Level of Security measuring system was developed for monitoring security at airport terminals and evaluating it objectively. To put the concept to the test, the first step taken was to map an airport in a simulation environment based on DLR's TOMICS simulation software. Thus, realistic forecasts of passenger flows permit discovering optimisation potentials and deploying available resources more efficiently while maintaining or even enhancing the level of security.

Improve security, improve efficiency

Sponsored by the Federal Ministry of Education and Research (BMBF), the Critical Parts project is dedicated to the development of technologies specifically designed to support security checks of employees and goods. The objective is to develop a combination of processes and technologies that will enhance the reliability and efficiency of staff security checks at airports. Present and future technologies are being investigated to find out which technology configuration would cause the shortest waiting time at a checkpoint, given various load scenarios and performance characteristics of the partner technologies involved.

For this project, DLR has designed a simulation environment which permits analysing the impact of new technologies on the checkpoint itself. Furthermore, the environment may be used to investigate the effects of local changes on the airport system as a whole including, for example, the expected time it takes for passengers to arrive at the departure gate.

Improved networking of all stakeholders

Next to the strategic development of checkpoints and checking processes, the importance of security management is growing. DLR is actively involved in networking airlines and other aeronautical airport stakeholders under several airport management projects. The objective is to establish a new culture of communication in order to improve process transparency and coordination, especially in the case of system disruptions. There are plans to extend the network to include ground-based partners, such as airport operators and security authorities.

At present, researchers are mainly interested in two core aspects:

- Situation awareness: this investigation is concerned with the information a decision-maker employed in the field of security needs to comprehend and evaluate a situation quickly and unambiguously so that concrete action recommendations and instructions can be developed on that basis.
- Integration of decision-makers who are active in the field of security into Total Airport Management (TAM): in this case, communication and decision-making structures are being investigated under TAM, including airport security concerns, and concepts are being developed for their operational implementation.

A highly diverse threat potential

The threats to which an airport is exposed are many and varied. Next to known risks, such as bomb attacks or aircraft hijacking, there are many other attack scenarios to be considered, ranging from the use of laser pointers to dazzle pilots and rocket attacks on aircraft taking off or landing to attacks on airport IT networks and logistical structures.

There are plans to use the current geopolitical situation as a basis for investigating the likelihood of each of these threat scenarios and prioritising them with the aid of an evaluation system yet to be developed. This will tell researchers what threat scenarios should be considered in TAM plans. Moreover, long-range trends may be derived that will show which technologies will be needed in the future and which processes should be modified.

Integrating all players

In order to safeguard airports as traffic hubs of economic relevance effectively and permanently, certain security questions relating to the infrastructural environment will have to be answered. Consequently, road and rail transport operators and users will have to be integrated step by step into a permanently evolving security system.

Because threats change all the time, communication, decision-making, and implementation methods need to be adapted constantly. To develop effective security strategies, state and federal security agencies need to cooperate closely with security service providers, airport operators, airlines, airport service providers, and researchers.

Contacts

Andreas Deutschmann
German Aerospace Center (DLR)
Institute for Air Transport and Airport Research
andreas.deutschmann@dlr.de

Critical infrastructure

Critical infrastructure: Airports as a pivotal point of mobility.

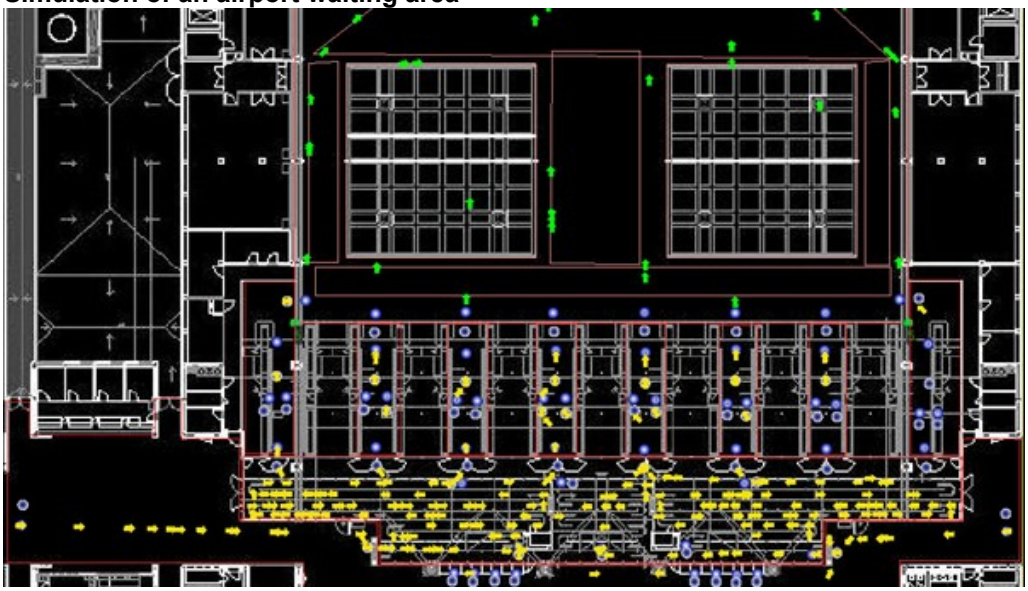
Credit: DLR (CC-BY 3.0).

Airport security checkpoint

Airport security checkpoint.

Credit: Image: picture-alliance/dpa.

Simulation of an airport waiting area



Simulation of an airport waiting area with adjoining passenger security checkpoint.

Credit: DLR (CC-BY 3.0).

Contact details for image and video enquiries as well as information regarding DLR's terms of use can be found on the DLR portal imprint.