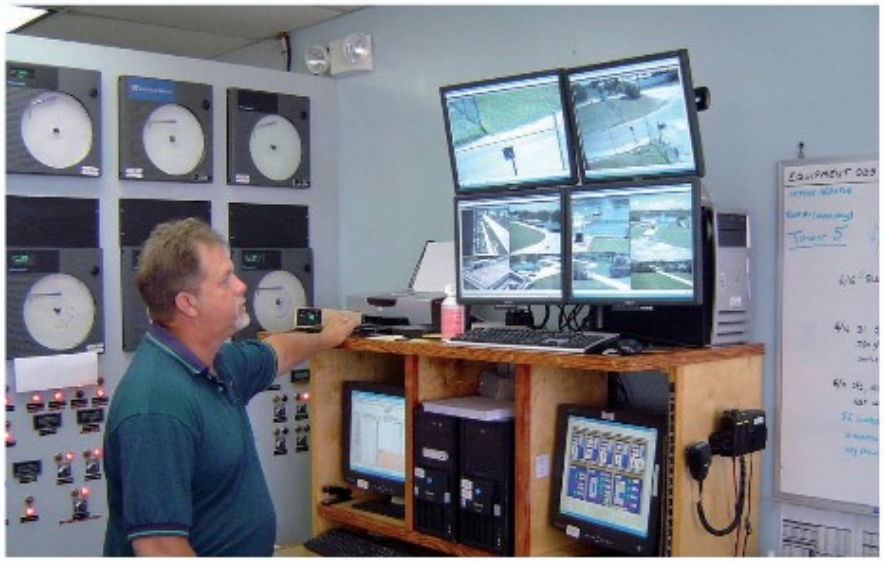

parties can be notified immediately," said Julie Lam, Founder, President and CEO.

The system is open source so it can share information with everyone who needs it, although it has security tiers built in. One problem is that some organizations, such as the TSA, have already conducted security assessments, but they don't share it with everybody. However, it is important to share much of this information. Airports are generally a huge multi-jurisdictional hodge-podge, and that is why there is a serious need for independent risk assessments by people who understand what security needs to be done on a total environment level and who can analyze and test the security without being tied to any one group, she said.

"We don't create the communication systems: we access the ones that are already there and join them together to give more functionality. Our unique design allows this to be accomplished without the exorbitant budget requirements of most crisis communications systems available today. We can do 200,000 notifications over a three-minute period and can also deal with special needs groups in the community – hard of hearing, blind and language impaired.

"Our program allows you to interconnect your communication devices without spending a dollar on new equipment. It is programmed to allow cell phones to communicate with faxes, to landlines, e-mail or text systems. What is unique about our system is that it is an integrated package that enables the computer to convert voice to text and text to voice depending on what device it recognizes that you are using. It allows real-time coordination allowing fire departments to interact with the police, local hospitals, Red Cross, emergency workers, airport employees and airline employees," added Lam.

The system encompasses a complete database program to fully automate an airport's security and Airport Emergency Plan (AEP) according to the requirements set forth by the FAA and TSA. The system provides all members of the response team(s) with instructions for their responsibilities, significantly reducing the chance for error during such heightened emotional times as a crisis.

"One of the things that we realized is that there is a real need for coordinating security and crisis planning – because a major security breach in an airport can quickly lead to a crisis if it is not acted on or responded to. There is a real need to tie into really strong aviation security control and coordination with emergency planning, so what we have now added to our system is built-in virtual command center structures that allow automatic triggering of alerts as a result of security devices, detection systems and protocols," she said.

For effective security and controls, it is imperative that a full audit of all facets of security within an airport occurs and comprehensive measures are taken to rectify any security vulnerabilities (both physical and cyber). This includes the full training of all staff members on the final measures that are taken, as well as government/airport rules and regulations – only in this way can we ensure the safety of air travel within the United States, added Dan Sullivan, Senior VP of Aviation Security.

The Aeralert system is currently operating at Yeager Airport in Charleston, WV, and will soon be in operation at airports around the world. The system is eligible for funding under the Homeland Security's Statement of Administration Policy H.R. 2555 and its subsequent bills dealing with the First Respondent Grant Coordination. Aeralert US has received its pre-certification by DHS and is currently undergoing the rigorous application process towards designation as a QATT (Qualified Anti-terrorist Technology) and is pending product grant approval under the Safety Act of 2003.

Air Traffic Control Facilities Protection

The following are the results to date of a study being conducted by Domenico Asprone, Andrea Prota and Renato Parretti of the Department of Structural Engineering, University of Naples, and Antonio Nanni who teaches at the University of Naples and the Department of Civil, Architectural and Environmental Engineering, University of Miami.

Nowadays structural designers of most constructed facilities must consider in their analysis and models extreme load conditions, which could be induced by natural or man made actions, such as blast and impact. This involves a very complex scientific approach since the dynamic phenomena cannot be described without taking into account impulsive dynamics, large deformations, high-rate strain effects, strongly nonlinear behavior of materials and so on. These considerations are surely important in airport structures where many critical facilities from passenger terminals to radio communication towers are present and their safety and protection against extreme actions is a priority aspect during the design phase. Apart from the logistic optimization of a facility spatial distribution, which remains a primary objective, addressing elements like protection barriers becomes essential to the overall security strategy. In fact, designers cannot ignore the possibility that malicious disruption could be experienced during the lifetime of the facility and, as a consequence, an effective physical protection may become a lifesaving tool.

Based on these considerations, in December 2006 AMRA, an Italian research center of excellence, ENAV, the Italian agency for air traffic control, in cooperation with the University of Naples-Federico II and other industry partners started a research project titled Security of Airport Structures (SAS). The project has the financial support of the European Commission-Directorate General Justice, Freedom and Security, through the European Program for Critical Infrastructure Protection (ECPIP 2006). The project leader AMRA, the Center for Environmental Risk Analysis and Monitoring (Analisi e Monitoraggio del Rischio Ambientale), is a research agency specializing in broad environmental risk issues and undertaking a wide variety of research projects addressing seismic risk, hydro geological risk, coastline protection, volcanic threat assessment and others. In 2005, AMRA created a specific division called Homeland Security with the intention of working on manmade risks and, in particular, terrorism. The SAS project, like others started in recent years, represents for AMRA a keystone research activity that contributes to the creation of a network of partners including national and foreign universities, state agencies, and

the private sector, each of them with different interests, expertise and mission related to the topic of terrorism.

The SAS Project – Completed Activities

The main objective of the SAS project is to design, validate and deploy a specific barrier system to protect air traffic radio communication facilities from malicious disruption and specifically to acts of eco-terrorism. In particular, the project focuses on VHF Omnidirectional Range (VOR) stations and antennas installation widely distributed over the territory (Fig. 1).

Figure 1. A typical VOR station

They are fundamental in determining the flying coordinates of civilian aircrafts, thus playing a fundamental role in air traffic control. Obviously, the security solutions obtained for these particular sites could easily be extended to other critical facilities with similar types of demands. The first phase of the project has identified which physical and mechanical properties should characterize the barrier system. It was recognized that structural properties would be the discerning aspect as the primary role of these elements is that of protection; mechanical strength is then a fundamental attribute. Moreover, these elements are required to be transparent to electromagnetic waves to avoid disturbing or preventing communications. Additional attributes that stem from installation in remote and pristine areas are: low maintenance and long-term durability, aesthetic compatibility with the surrounding environment and ease of construction.

To satisfy the project requirement and to obtain high structural performance without interfering with radio frequency (RF) communications, a glass fiber reinforcement polymer (GFRP) material system has been considered. GFRP composites are characterized by excellent mechanical properties in terms of ultimate strength and ultimate strain, good stiffness to weight ratio, excellent durability and, furthermore, their electromagnetic properties contribute to their high value of RF transparency. While the definition of the material system was taking place, the assessment analysis was performed with the objective of determining the threat level characterizing this type of structure to be mitigated through the intervention. Several risk levels were considered, and different structural systems were designed to resist the different actions. In particular, for the most severe condition, composite elements were combined with concrete as a hybrid solution. Having designed the elements of the barrier in all their details, structural models were then built to simulate the conditions induced by malicious external actions.

To define the models, a systematic approach to the problem was used combining structural models with fluid dynamics models. In fact, the particular configurations of the elements in terms of shape and cross section forced the researchers interested in estimating the blast pressure abutment to solve the fluid dynamics problem of the explosion against the barrier. Simple direct blast models to evaluate the actions of an explosion on the target, even potentially useful for simple geometrical configurations, could have been unreliable in the case of this project.

Cost optimization was also performed driving the design to a precast solution of the barrier, which is composed by relatively small and light elements to be assembled in-situ. This choice, in addition to being less expensive in terms of implementation, provides a more flexible solution since the ground profile can be easily matched without excessive excavation (Figure 2).

Figure 2. Rendering of the barrier in case of a rough ground profile

RF numerical models were built to predict the transparency of the barrier in its service configuration. Preliminary analytical results confirmed that GFRP components do not disturb RF communication, even when used in conjunction with concrete.

Future Activities

The results of the numerical simulations will be validated by blast tests to be performed in a fire range on full-scale prototypes of the barrier. Quasi-static mechanical tests are now being carried out in the laboratory on components of the barrier and on the complete structural system to verify that the mechanical properties are effectively achieved. This experimentation is necessary to ensure the ability of the proposed solution to meet the project requirements. In addition to the structural performance characterization, RF transparency tests will be conducted in an anechoic chamber on full-scale prototypes of the barrier.

Conclusions

The project will be completed in November 2007, with a validated design of the barriers. The results, in accordance to the European program philosophy, will be made available to any air traffic control agency in the Union providing the necessary guidance to address a manmade malicious disruption threat.

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