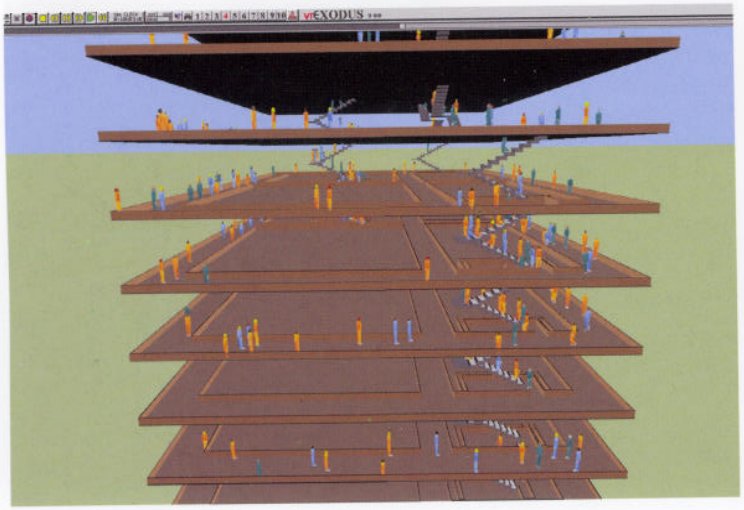

Left: **Evacuation simulation** of the World Trade Center north tower
Right: **Professor Ed Galea** (left) and Professor Jim Shields at the World Trade Center site in New York.

In all, the group interviewed 271 survivors and collected over 6,000 pages of transcripts.

## The Fire Safety Engineering Group

The 30 strong Fire Safety Engineering Group (FSEG) based at the University of Greenwich, is made up of mathematicians, behavioural psychologists, fire safety engineers and computer scientists.

The group, which was established in 1986, carries out research into fire dynamics and human behaviour associated with fire. As part of their research they have developed a number of software packages, including SMARTFIRE fire simulation software, and the EXODUS suite of evacuation models which are being used in 30 countries around the world.

Recipients of a number of prestigious national and international awards, including the Queen's Anniversary Prize 2002 and the European IST Award 2004, the group's airEXODUS software has been used in projects for the aviation industry, including design analysis of the new Airbus A380 aircraft.

In addition, they are participating in the European Research and Technology project, NACRE (New Aircraft Concepts Research), and hosted the second NACRE conference held in Greenwich in July. They have also recently presented details of how the futuristic 'Flying Wing' aircraft design, which could carry over 1000 passengers, could be evacuated safely.

"The readiness of people to provide information was one of the surprises in this study." In all, the group interviewed 271 survivors and collected over 6,000 pages of transcripts. This, notes, Professor Galea, "is a hugely important body of data in itself. We will be making it available to bone fide researchers all over the world, so that it can become a valuable international resource for others to use."

To help interviewees recall and visualise the events and to help them estimate the crowd densities the group used buildingEXODUS, an evacuation simulation software package developed previously by Professor Galea and his colleagues in the Fire Safety Engineering Group. The information about response times, density of people on stairways, speed of movement and the effects of fatigue emerging from this vast database are already providing new insights into evacuation behaviour which could lead to the development of safer evacuation procedures and contribute to improved building regulations around the world.

For example, their analysis has revealed that people travel more slowly down stairs than engineers had previously estimated and that the speed of travel is not related to growing levels of obesity in the community, as some evacuation specialists had suggested. Instead, the slower speeds can be explained by the high crowd density on the stairs. The modelling also showed that the floor population – or number of people on each floor – effectively limits the height of a building that can be evacuated by stairs alone. This, in turn, suggests that for buildings above a critical height, it would be better to design lifts that can be used in emergencies, rather than relying solely on stairs for evacuations.

The analysis of response times also indicates that providing people with good information about what is happening and advice about what to do can significantly reduce response times and lead to a safer evacuation.

"Quantifying the behaviour of people in emergency situations will lead to an improved set of evacuation modelling tools," says Professor Galea. "This, in turn, will lead to better, safer and more efficient buildings."

**For more information about EPSRC-funded projects related to the built environment, construction or fire safety engineering and opportunities for involvement contact:**
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**For more information about The Fire Safety Engineering Group visit:** *http://fseg.gre.ac.uk*