FIRE-FIGHTING WITH ICCARUS

The cost of a major fire in terms of property and content damage and of fire-fighting resources averages £10,000 per minute. In the UK each year there are over 80,000 fires, of which ten per cent are major incidents. A saving of only one minute on every large fire could save the country up to £80 million annually.

Such time savings can only be achieved by improving the skills of the senior fire officers in charge at an incident. Improving skills means training, something that has proved a consistently difficult challenge for fire services all over the world. The development of **ICCARUS**, an 'intelligent' interactive multimedia simulation package, was funded by the Employment Department in a project which set out to meet this challenge.

The Shortcomings of Existing Training Methods

The UK has 62 fire brigades and around 5,000 fire officers. Of these, there are some 500 officers each year who need training prior to promotion and up to 300 who need 'refresher' courses. Being in command at a major fire incident demands on-the-spot decisions. It also demands skill in referring problems and in allocating resources; all while maintaining a workable and efficient on-site communications network and a full overview of the incident.

Training within the fire services has traditionally been carried out either by learning 'on the job' or via large scale mock-ups. Both these methods have major shortcomings in terms of the need to offer consistent, cost-effective training to a large number of officers.

Being trained 'on the job' leaves scope for mistakes that could have serious consequences for both property and human life. The infrequency of call-outs to major incidents also means that it is

difficult for the trainee to consolidate what has been learnt; an officer usually attends only a few large fires each year.

Mock-ups, on the other hand, require the marshalling of huge resources for the training of a single individual or small group and so are not cost-effective.

To date, these have been the only options available to trainers wishing to achieve realism and to reflect the pressures and stresses of fighting a real fire.

ICCARUS; Command and Control through Simulation

The ICCARUS project was launched in October 1988 and a research consortium formed, combining the expertise of Workhouse Ltd, the Design and Information Research Team (DIRT), the School of Architecture at Portsmouth University and the West Midlands Fire Service (WMFS).

The initial aim of the project was to create a package that would help develop and maintain officers' expertise by allowing them to use their skills in a simulated fire-fighting environment. The target audience was to be station officers, divisional and assistant divisional officers and assistant chief officers.

An initial survey of simulator requirements indicated a range of priorities. Most important, however, was the need to reproduce as closely as possible the pressures and stresses of being in the command role at a major fire. In addition, it was decided that the package must:

- stand alone
- operate in real time
- present a realistic fire progress
- incorporate the resources which would be available at a real incident
- require the trainee to make important decisions
- bombard the trainee with information from several sources
- provide as few system prompts as possible
- provide learning through experience
- be able to offer the trainee a visual debrief after the simulation
- be available in a hardware/software environment not costing over £12,000.

Detailed research was carried out to establish an understanding of the domain of fire-fighting and its terminology. The research team then created a prototype which was used as a starting point for discussions and interviews with senior fire officers from all over the UK. The results of these discussions enabled the team to add detail to their initial findings and led to the creation of a full specification for the ICCARUS simulator.

Multi-Media Simulation

The success of ICCARUS depended on the integration of two major components:

- suitable delivery hardware and user interface
- a unified AI/computing environment capacity to relay appropriate audio/visual material.

State-of-the-art technology was used to deliver the simulation. A Macintosh IIci hosted the central processor which was supported by a transputer and controlled an array of peripherals; an A3 high resolution screen, a videodisc player and a CD-ROM drive. Visual output was through a PAL standard TV monitor and audio effects were mixed and amplified via a stand-alone stereo speaker.

ICCARUS incorporates five core modules:

- tutor set-up (which allows the tutor to choose from a range of fire scenarios)

- the fire model (emulating the behaviour of a real fire)

- stage/actors/script factory

- action/event recorder

- de-brief.

An Authentic Simulation

In designing the package, the team was aware that the creation of a realistic fire-fighting environment was paramount. This was achieved by the use of live footage of the controlled torching of a disused cinema complex. A parallel two hour soundtrack was recorded on CD which was overlaid with authentic fireground and command unit messages.

Using ICCARUS

Many of the problems associated with commanding a fire incident arise from combining the two major priorities of fire-fighting whilst also maintaining a logistical overview of the event.

At the beginning of the simulation, the user listens to an introductory voice-over which sets

the scene. The journey to the incident is then portrayed on the video screen and, on arrival, the user is offered the option of 'taking command' of the fire. From this moment, the user has access to the command and control structures of the interface. The audio-visual environment supplies 'stressors' such as the arrival of relatives or of other rescue services. Additional problems in the form of the discovery of hazardous contents or the news that people are trapped in the building are also added.

At the end of the simulation a personalised de-brief is created based on the data that has been collected. This reviews the moment-by-moment responses of the user as the incident progressed. Thirty minute timelines chart the events of the simulation against the fire officer's actions.

Testing and Evaluation

ICCARUS was piloted over two months with divisional and assistant divisional officers who used the simulation and flagged any problems as they arose. An independent evaluator was then appointed to assess the effectiveness of the package. The evaluator's brief was to establish to what extent using ICCARUS 'felt like being involved in a real command and control situation'.

The evaluator worked closely with 15 senior fire officers at the Fire Services Training College at Moreton-in-Marsh, all of whom had experience in the area of training. Their responses to the system were monitored and logged.

A Future for ICCARUS

The evaluator's report found that ICCARUS was unequivocally successful in its primary objective of creating a low-cost interactive 'intelligent' simulation operating in real time, which would represent a realistic training experience for fire officers preparing for the command role. It was noted that many of the officers participating in the evaluation engaged with the software and were willing and able to 'suspend their disbelief' and treat the simulation as seriously as if it were a real incident.

ICCARUS is already in use at the Fire Services Training College which has allocated further funds to fine-tune the software to meet its own requirements. Planned enhancements include the extension of the de-brief module so that it incorporates the FSC's own training feedback.

Outside the UK, similar simulation training packages are being developed. In Sweden and Germany, for example, a total of £4 million has been spent developing simulators destined for the fire rescue services. However, the cost-effectiveness of ICCARUS has attracted enquiries from abroad, to the extent that Sweden is considering buying the system.

ICCARUS represents an innovative and valuable contribution to the challenge of providing training for fire officers working in a highly complex and demanding environment. Simulation has proved its effectiveness as the vital bridge between a theoretical knowledge of fire-fighting and the pressures of taking command at a major incident.