

Operational Assurance

London's Command Support System takes emergency command and control to a whole new level

When London's Fire and Emergency Planning Authority conducted a review of how its existing command support structures supported incident commanders at incidents, and then began incorporating the resulting recommendations into the specifications for its fleet of new mobile command vehicles, it launched a process – the Command Support Project – leading to the development of one of the most advanced emergency command support systems anywhere in the world. The resulting Command Support System is now generating interest throughout the international emergency response world. **Stephen Prendergast** looks at the development of the command and control system that is revolutionising incident command

FOR EMERGENCY SERVICES, THE magnitude of the terrorist attacks of 9/11 in New York changed everything. One message was very clear – emergency services would have to reassess every aspect of their responses to complex major incidents.

But terrorist attacks, whether involving hijacked aircraft, Improvised Explosive Devices (IEDs) or CBRN (Chemical, Biological, Radiological and Nuclear) devices, whilst significant and challenging are only one of the many different types of threats for which emergency service organisations must prepare. The Fire Service attends many incidents of differing types and size, each and every day, and it is essential that the protocols and procedures that are applied in extreme circumstances are embedded in the 'every day' to ensure that incident commanders at whichever level have the support necessary to apply appropriate safe systems of work on a routine basis.

Whether an emergency is fire related, a natural disaster or a terrorist incident, many aspects of emergency command management remain the same. Commanders need to know where incidents are occurring, where their assets are deployed (and how long their assets have been deployed), and they need to be able to communicate their command decisions clearly and quickly to all command levels, sometimes over large distances. With consideration of the requirements of the

National Incident Command System in mind, they also need to leave an appropriate logging and audit trail.

Many Outcomes

This was the case for the London Fire and Emergency Planning Authority (the organisation responsible for the London Fire Brigade, the third largest in the world, with 7500 staff and 112 fire stations, training centres and offices). LFEPA considered the range of activities to be delivered by command vehicles and software as part of their internal Best Value Review of incident command. One of the principal outcomes of this work was to trigger the inclusion of command support at an earlier stage in an incident than historically, and the on board systems and software have been designed to support this requirement in full.

Senior managers took the opportunity presented by the need to replace their ageing, mobile map room-style mobile command vehicles with a fleet of new, high tech mobile command vehicles, to undertake a complete rethink of how the organisation could make London safer through improved command and control systems, but also ensuring that safe systems of work are supported at all incidents. Roy Bishop, Deputy Commissioner for the Authority, and his advisory team were not content with making small incremental improvements in strategic and operational command. Instead the decision was made to



Tablet PCs will be used by sector commanders to receive a common operational picture of an incident

test and rethink every aspect of the support provided to commanders at incidents.

Roy Bishop said: "We took this opportunity to take an in depth look at the command support structures at incidents, and identified that a new approach would be required, one combined with sensible, practical procedures that supported a more collaborative style of command and control and that utilised all the best that modern information technology and communications systems would allow."

Led by Group Manager Neil Orbell, project manager of the London Fire Brigade Command Support Project, the advisory team implemented a detailed analysis of all aspects of the brigade's command and control systems, looking at such issues as speed of data update and start up times for mobile command units, access to brigade asset and risk database information, satellite and other emerging communications systems, spatial data, online streaming of imagery, deployment, management and monitoring of firefighting assets (staff, appliances), and staff rostering.

According to Neil Orbell: "The Fire Service, when it turns out to an incident, either as an individual service or as part of a multi agency response, generates considerable communication activity, and robust technology is essential to support these communication requirements to allow London Fire Brigade to provide the right level of service to the public and emergency service colleagues and support



Deputy Commissioner of London Fire and Emergency Planning Authority Roy Bishop inside the first new mobile command vehicle. Also shown is the large format touch-screen and tablet PCs used for creating and sharing a common operational picture across an incident ground

for incident commanders.

Areas of Excellence

"Analysis for the Best Value Review included a full review of existing systems and practices, which identified areas of excellence as demonstrated during 7/7, when the messaging system embedded within existing technology

stood up to the strain."

The group took a long, hard look at lessons learned from practical experience over a wide variety of incident types. Neil and his team concluded that existing command and control systems, both fixed and mobile, while 'cutting edge' when installed, now reflected an earlier IT age, the era when command and control

systems were custom-built, and were not interoperable. In this era, decisions tended to be made at a senior level and communicated on a top-down basis. The technology of this time, before open standards such as XML and GML had been widely adopted, and new communications and display technologies (such as electronic whiteboards and tablet PCs), had been developed and made affordable, was seen as a major brake on the adoption of new, more collaborative forms of emergency management, communications and decision making.

Up until the recent past whiteboards and marker pens, clip boards, maps and paper were commonly used for managing incident information, but data and decisions could not be recorded electronically, or communicated and distributed easily and efficiently to achieve a common operational picture across an incident ground or between different levels of a command structure. The benefits of modern technology were not being fully exploited in emergency command.

System and communications resilience was another key concern. With Hurricane Katrina and other major incidents in mind, any future systems would have to be capable of withstanding major catastrophic threats, with multiple redundancy built in, to ensure emergency communications systems



Group Manager Neil Orbell, leader of London Fire Brigade Command Support Project, and Roy Bishop inside the new command vehicle, which includes two operator areas located behind the main central touch screen

continued to operate when mainstream communications systems had failed.

From these investigations the team compiled a comprehensive set of requirements, which was checked for feasibility by external specialists. A detailed tender specification was then drawn up. The project name chosen for the proposed system reflected the new approach being adopted – Command Support, rather than Command and Control. Instead of adopting a top-down approach to command, dictated in the past by the technology being employed, the new system would aim to provide key information, clearly displayed, to commanders throughout the fire ground (achieving a common operational picture), drawing on GIS mapping, the service's databases, live news and other imagery feeds.

Meeting the Requirements

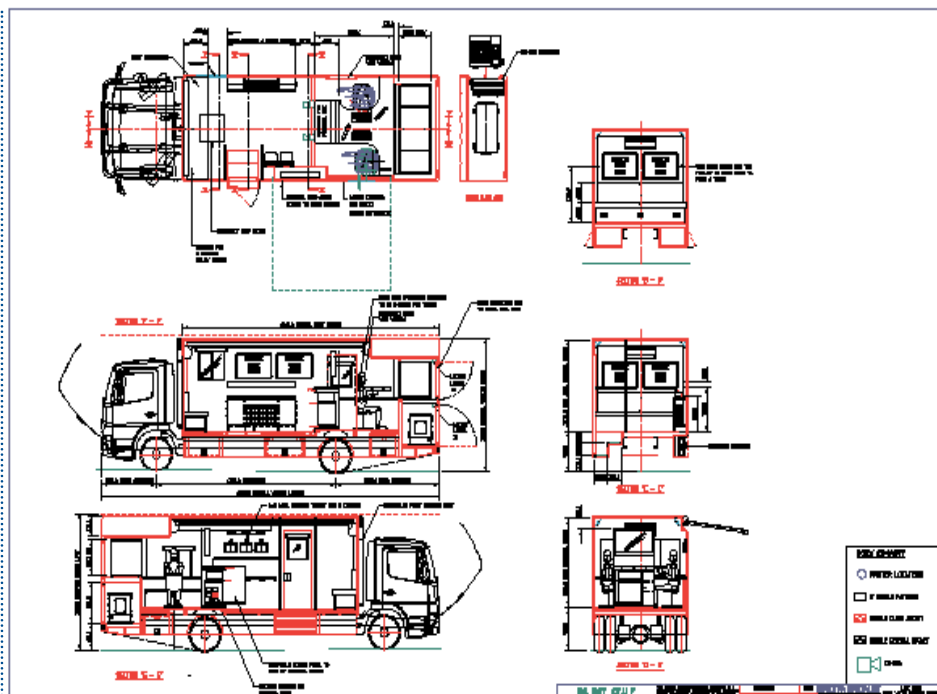
London Fire Brigade's proposed solution for the fleet of eight new vehicles combined sophisticated information technology with advanced vehicle design. Working with designers at AssetCo, the leasing company supplying and maintaining LFEPA's fleet of fire appliances and other specialist vehicles, Neil Orbell and his team prototyped and tested a number of different mobile command vehicle internal and external layouts before arriving at the agreed design specification. The intention was to create a command vehicle in which command teams could meet and discuss developments and make decisions, with a large touch screen mounted on the outside of the vehicle to allow for external briefings of sector commanders that would not disrupt the work being done inside the command unit itself.

According to Neil Orbell: "One of the requirements was to facilitate meetings for up to 12 people in a dynamic setting. We wanted a good working space for the operators and we also wanted some external visibility via external screens, not just so we could present the information outside but also to give some respite within. We also wanted the vehicle to be a mobile training facility, so we can take it around to fire stations to train people and run through incident management scenarios. The vehicle meets all of these requirements."

The LFEPA requirement specified that the design should include:

- On-board conferencing facilities for up to 12 people
- Be a single unit with integrated technology
- Overall size had to be restricted to the footprint of a standard pumping appliance
- The unit would have the capacity to enable three operators to work, and also to be transported within the unit.

The vehicle model selected for the mobile command units was the Low Height Mercedes Atego truck. Combining this model with an



Detailed plans for the mobile command vehicle developed with AssetCo. Plan courtesy AssetCo

innovative body design enabled London Fire Brigade to deploy the unit within the footprint of a standard pumping appliance, meaning that it could be accommodated in existing fire stations throughout the capital. Since the vehicle will also have a training role when not being used for operations, this was considered to be especially important.

After a highly competitive international open tender, UK-based emergency training and technology company VectorCommand was selected in late 2006 as the supplier of the Command Support System. In winning the bid, the company could draw on its extensive international experience and successful track record in virtual reality-based emergency command training and exercising, emergency command and control systems, advanced technical development and project management.

The Command Support System takes emergency command and control to a whole new level. Now commanders will be able to draw on a comprehensive range of information sources – database information, streamed video imagery from helicopters, traffic cameras or incident cameras, templated or ad hoc organisational asset information, GIS mapping and electronic whiteboard sketch maps (known as 'mudmaps') – to create a clear, accurate picture of an incident. They can then share that information as a common operational picture on a dynamic, single screen image throughout the incident command structure, as well as back to a fire service headquarters and to other interested multi-agency organisations.

It is the combination of intuitive, hand drawn 'mudmaps' (illustrating key features of

a fire ground or outlining how a fire will be attacked or a rescue performed), combined with drag and drop organisational asset charts and icons, that are proving to be some of the most appealing features of the new system. Plume overlays, flood plan overlays, electronic management of BA main control function and automatic supply of related standard operating procedures are some of the additional types of functionality that will also be included in the system.

Symbology Vocabulary

Even while a mobile command vehicle is travelling to its destination the mobile data terminal (MDT) onboard is receiving data relevant to the incident sent from the command headquarters. Risk information (drawn from the risk database), asset data (showing what fire assets a commander will have available for deployment), hydrant locations and standard operating procedures aligned to incident type can all be included in these data packets.

Once the mobile command vehicle has arrived at the incident location, the MDT will immediately export that data to the four on-board networked PCs and have it ready for use. A specially developed symbology vocabulary and standard desktop interface will allow operators to access and set up the system with great speed. The Command Support System solution addresses a major issue identified in LFEPA's analysis of mobile command – the time taken to set up a mobile command unit, and additional logistics issues when command is handed over from one level of command to another.

The vehicle standard equipment includes,



A large touch-screen mounted on the side of a vehicle allows for external briefings using the Command Support System that will not disrupt the work of the command team in the vehicle

large format touch screens (both inside and outside the vehicle), networked, ruggedised tablet PCs linked to the main system for use throughout the fire ground, high bandwidth and wireless communications and systems capable of receiving streamed imagery.

In the past, technological limitations meant that it was difficult to share a common operational picture across a fire-ground or other emergency area. In the case of wildfires in Australia, for example, a fireground can be up to 100 miles long and 20 miles wide, and in the case of other natural disasters, such as a tsunami, a disaster area can be even larger. Managing assets and communicating command decisions across such large areas, or smaller areas where there are complex events and issues to be managed, requires a more sophisticated approach than can be supplied by conventional command and control systems (which may sometimes only be a white board with pens), and even those which incorporate Geographic Information System mapping only may not be up to the challenge.

Huge Potential

The technology is being developed for use in sophisticated mobile command vehicles, but is equally useful and deployable throughout fixed command headquarters and other

locations, a critical point when emergency responses to incidents are being monitored by centralised, multi-agency political and command organisations. Neil Orbell comments: "We have a standard brigade desktop that has a number of business applications on it. One of the business applications will be the Command Support System. It will be available to everybody at their desktops.

"Some users will just be observers; they will not be interacting, but will be able to see what is going on. This will dramatically improve the way that we remotely monitor incidents."

According to Dr Mike Griffin, technical director of VectorCommand: "With the development of the Command Support System, the company is taking emergency command and control to a whole new level. We are doing this by exploiting to the full the huge potential of the latest command, control, communications and display technologies.

"Once installed, Command Support System can then be integrated with our company's range of Emergency Command System products and services for operational and tactical training and exercising. In our view, this is the future for emergency command, communications and control."

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