

GREATER MANCHESTER FIRE AND RESCUE AUTHORITY

POLICY, RESOURCES AND
PERFORMANCE COMMITTEE

2 FEBRUARY 2012

Subject: FUTURE FIREFIGHTING PROJECT – BRIEFING PAPER

Report of the County Fire Officer & Chief Executive

SUMMARY

This briefing paper advises Members of a range of research projects, collectively known as 'Future Firefighting Project'.

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BACKGROUND

1. Members will be aware from our Operational Strategy 2012 – 2015 that the risks faced by the community of the city region of Greater Manchester are ever changing; from terrorism to climate change, from road traffic collision to animal rescue, from fires to floods, from community risk management to facing civil disorder; the Fire and Rescue Service has to be prepared for any eventuality.
2. However, this change in the range of incidents that the fire and rescue service must be prepared for, has come at a time when we face significant financial hardship, and the Government is expecting us to reduce costs by unprecedented, not to say historic, levels.
3. We, therefore, need to balance better our approach to providing and deploying resources, and we must increase our flexibility in how we respond to the kinds of emergencies we now face.

MOVING FORWARD

4. We must also consider new approaches to the tactics of firefighting itself. Whilst over the last few years our tactics have adapted, we have not subjected them to fundamental challenge or explored in detail the opportunities afforded by technological advancements. By investing in research around new technologies and equipment, therefore, and through the potential for amending operational processes and tactics to take advantage of these technologies, it may be possible to provide enhanced levels of service delivery with fewer/different resources.

5. Of course, we must ensure that any changes we propose flow from high quality research, and are underpinned by solid evidence and a credible base, or they will simply be seen as cuts.
6. We therefore intend to embark upon a series of initiatives to develop research opportunities further.

FUTURE FIREFIGHTING PROJECT

7. To achieve the challenging objectives of public value, public safety and firefighter safety, in an increasingly complex and hazardous world we are embarking upon two projects under the umbrella of a future firefighting project.

'Smart@Fire' (Europe)

8. This is a research and development project to specify and develop the most effective personal protective equipment (PPE) for a number of scenarios, and forms part of a European partnership involving Fire & Rescue Services from France, Germany, Italy and Belgium, plus the Hungarian Institute of Innovation; as well as European Commission match funding. This will create a €600,000 pot to fund prototyping of new "kit" and equipment.
9. This work will not only consider the textiles used, but the full range of equipment (boots, helmet, gloves etc.) and also the opportunity to use sensors and remote monitoring technology. All of the elements have to be considered as a potential vehicle for embedding functional components and building up cross compatible layers of protection.
10. The project partners have also recently collectively submitted a funding bid to the European Commission, known as 'ICT Call 8' to the value of €5M. If successful, this funding will prime further research and innovation over the next five years. The costs for GMFRS will be zero as the bid proposes covering all costs; with the exception of the prototyping pot mentioned above.
11. In this regard, therefore, a bid, to the value of £90,000 (€100,000) (included at Appendix 'A'), has been submitted by GMFRS to the Fire Service Research & Training Trust to pump prime our research, and to also match-fund the prototyping pot mentioned above.
12. Notwithstanding the European project bid, GMFRS will also lead a new collaborative approach involving industry, procurers, suppliers, academia and the UK Fire Sector to look into future fire fighting processes, procedures, techniques and equipment to facilitate advances as mentioned above. A "kick off" workshop for this group is being organised for March.

13. The following topics will form the basis of the research:

- a) Firefighting Strategy – As a consequence of the changing ‘value’ and availability of water and the use of more efficient sprays, rather than current branches/jets, we envisage a change in fire fighting strategies.

This would include the regular use of flow meters, high pressure lances, thermal imaging and/or body cameras/sensors and aggressive use of High Pressure Ventilation equipment (PPV); and potentially create a greater capacity to carry a more diverse range of equipment on all appliances e.g. additional hazardous material capability.

In addition, a change to fire fighting tactics will influence pre determined attendances, vehicle design, crewing levels and, potentially, broaden the scope of our current operational response.

- b) Water – As a Service we need to examine a ‘water strategy’ that recognises the increasing scarcity of water as a natural resource and firefighting medium, and embraces flow meter technology, water saving branches/lances, and the way we transport water from sources to the fireground.

Evidence suggests that, currently, many FRS’s do not use water ‘efficiently’ and, as such, we invest in large pumps, hose and branches to deliver high quantities of water to the fire. Often actions to provide water supplies are resource intensive and frequently result in said supplies not being fully utilised.

- c) Improvements to equipment could create a more effective and environmentally friendly intervention. The cost of research and procurement of new equipment could also be offset by future re-design of appliances, reductions in quantities of hose carried and subsequent operating/maintenance costs.

- d) PPE – For many years the basic design of fire kit has not radically changed. The modern fire and rescue service now attends a much wider range of diverse incidents and so we require PPE which will meet the demands of a range of incidents and situations. In examining our fire fighting strategies, and engaging new technologies, it is also appropriate that the protection we wear reflects the changes to operational procedures and practices. For example, this could include the integration of thermal imaging or other sensing technology into fire helmets, gloves or tunics and different PPE for low risk activities such as rural or wildfire fire-fighting. This element will be influenced by progress on the ‘Smart@Fire-(Europe)’ project.

- e) Training – The Fire and Rescue Service has yet to embrace some of the technologies used within the military and the aviation industry, such as simulated environments, providing immersive, synthetic

environments via simulators for the provision of training and assessment.

As a result of fundamental changes to our operational strategies the level of training required to ensure all personnel are competent will be significant.

However, opportunities exist, via the use of simulation, to reduce significantly the amount of time taken to achieve this. Training time in the fire and rescue service has a huge bearing on the overall establishment levels.

As such, any future training methodologies which reduce training times could significantly assist in reducing establishment figures and thus provide savings.

CONCLUSION

14. The projects outlined here would not only support the changes necessary for GMFRS and the Greater Manchester community, and seek to achieve safer European citizens and safer firefighters; but potentially develop new techniques and technology that are transferable/ marketable in a global market place.
15. The ultimate goal being that the way a firefighter deals with a fire and the tactics deployed will be very different, and not only less hazardous to themselves, but also save lives as well as reduce economic loss, damage and environmental impact.

RECOMMENDATIONS

16. Members are asked to note and support the approach to research and development, complementary to the draft Operational Strategy.
17. Note that if the bid for funding is successful we will submit more detailed proposals.
18. Note that if the bid is unsuccessful, we intend to progress as much of the work as possible from a more narrow UK perspective, and seek alternative funding streams, but absorb any work within existing resources.

STEVE McGUIRK
COUNTY FIRE OFFICER
& CHIEF EXECUTIVE

LIST OF BACKGROUND PAPERS UNDER SECTION 100D
OF THE LOCAL GOVERNMENT ACT 1972

DOCUMENT	DATE	FILE OR OTHER REFERENCE	PLACE OF INSPECTION
Operational Strategy 2012-2015	-	R&D Section of Emergency Response	Fire Service Headquarters 146 Bolton Road Swinton
'Smart@Fire' (Europe) funding bid	-	Review via Sharepoint	Manchester M27 8US
Fire and Research Training Trust Bid	24.1.12	Appendix A	

S. McGuirk
(Proper Officer)
19.01.12

**GREATER MANCHESTER FIRE & RESCUE
SERVICE**

FUNDING BID TO

FIRE SERVICE RESEARCH & TRAINING TRUST

Submitted on Tuesday 24th January 2012

1. Background

Over recent years there have been significant changes to our built environment in terms of design, construction and inherent risk; and these have brought new and difficult challenges to Fire & Rescue Services. Amongst the most significant changes have been the way in which buildings are constructed, the materials they contain and the legislation that governs them.

The terrorist threat and the effects of climate change, with associated hazards of flooding, forest fires etc., have added further and new layers to the existing risks firefighters face.

In addition, the financial crisis that is apparent now, and will continue to affect the world, provides no immunity for Fire & Rescue Services. They too will have to find innovative ways of still continuing to protect and safeguard citizens in emergency situations, as well as protecting firefighters themselves, who must confront and deal with events and situations most people would run away from; but against a backdrop of fewer resources.

Over this same time period the Fire & Rescue Service has maintained a relatively traditional approach to fire fighting techniques and the provision of its equipment. Many of the procedures, processes and equipment used for fire fighting are broadly the same today as they were thirty years ago. And, whilst this has stood FRS's in good stead, it is apparent that 'new technologies' have not been embraced to the degree that they have been in other sectors.

Because, at the same time, there have been significant advances in technology which are typified by the 'i-phone' culture, and the new ways that people interact with each other at work and home; but the outcome of this social shift means that the technical infrastructure and architecture is now in place potentially to enable a transformation in fire fighting tactics.

Accordingly, the time is now right to think in a much more transformational, but evidence based, way.

2. The Project

It is clear that new ways of applying technology and innovation provide the only real possibilities of achieving the challenging objectives of public value, public safety and firefighter safety, in an increasingly complex and hazardous world.

There is a very good argument, therefore, that by investing in new research around new technologies and equipment, and amending operational processes and tactics to take advantage of these technologies, it may be possible to provide enhanced levels of service delivery with fewer/different resources.

Currently, firefighters rely heavily on their equipment, as well as established operational procedures and tactics. This also includes the textile products of their PPE (Personal Protective Equipment) and encompasses underwear, trousers, jackets, boots, helmets, gloves etc.

PPE itself has gone through a true revolution over the past decades, with new materials and systems improving the level of protection and comfort significantly.

In spite of this, firefighters still suffer from injuries; and firefighting remains a perilous profession which takes people and equipment to the limits.

Each year over 5,000 deaths are caused by fires in Europe alone and, among those killed, are more than one hundred firefighters. Some of the injuries are very difficult to avoid (e.g. buildings that collapse), but others might be prevented by smart monitoring and early warning systems and by adapting firefighting tactics in light of technological advancement and new equipment.

3. Specific Objectives

To achieve the marriage between the new technologies and the revisions to operational procedures we want to develop a project to:

- **provide a detailed narrative of a “firefighter of the future”**
- **set up a dialogue with the stakeholders in order to determine specifications for future firefighting equipment, PPE and vehicle/equipment design to support any recommended revisions to future service provision**

The following topics will therefore be researched to facilitate advances on our current levels of safety and service provision:

- f) **Firefighting Strategy** – As a consequence of a revised water strategy (see below) and the use of more efficient sprays, rather than current branches/jets, we envisage a change in fire fighting strategies. This would include the regular use of flow meters, high pressure lances, thermal imaging and/or body cameras/sensors and aggressive use of PPV; and potentially create a greater capacity to carry a more diverse range of equipment on all appliances e.g. additional hazardous material capability. In addition, a change to fire fighting tactics will influence pre determined attendances, vehicle design, crewing levels and, potentially, broaden the scope of our current operational response.
- g) **Water Strategy** – As a service we need to examine a ‘water strategy’ that recognises the increasing scarcity of water as a natural resource and embraces flow meter technology, water saving branches/lances, and the way we transport water from sources to the fireground. Evidence suggests that, currently, many FRS’s do not use water ‘efficiently’ and as such we invest in large pumps, hose and branches to deliver high quantities of water to the fire. Often actions to provide water supplies are resource intensive and frequently result in said supplies not being fully utilised. Improvements to equipment could create a more effective and environmentally friendly intervention. The cost of research and procurement of new equipment could be offset by future re-design of appliances, reductions in quantities of hose carried and subsequent operating/maintenance costs.
- h) **PPE** – For many years the basic design of fire kit has not changed. The modern fire and rescue service attends a range of diverse incidents and we require PPE which will meet the demands of a range of incidents and situations. In examining our fire fighting strategies, and engaging new technologies, it is appropriate that the protection we wear reflects the changes to operational procedures and practices. For example, this could include the integration of thermal imaging

technology into fire helmets, different PPE for low risk activities such as rural or wildfire fire-fighting.

There is significant research that has already been undertaken to develop Smart PPE which will advance fire fighting and support safer working practices. We are already engaging with European partners in developing a Smart PPE project which will look to scope and develop the advancement of Smart PPE. Some details of this project are set out below.

- i) **Training** – The Fire and Rescue Service has yet to embrace some of the technologies used within the military and the aviation industry, such as simulated environments, providing immersive, synthetic environments via simulators for the provision of training and assessment.

As a result of fundamental changes to our operational strategies the level of training required to ensure all personnel are competent will be significant.

However, opportunities exist, via the use of simulation, to reduce significantly the amount of time taken to achieve this. Training time in the fire and rescue service has a huge bearing on the overall establishment levels. As such, any future training methodologies which reduce training times could significantly assist in reducing establishment figures and thus provide savings.

4. Example

One example of how this fundamental review could affect fire fighting of the future is set out below:

High Rise – currently an issue exists with the provision of water as a fire fighting medium on floors above a certain height. This is due to problems associated with pressure/flow/height /fixed installations and in providing a suitable droplet size at the branch for use in compartment fire environments. One solution may be to research the issues firefighters are confronted with; determine if the medium employed is the most efficient; develop portable equipment capable of extinguishing the fire no matter what the height/remoteness of the building e.g. portable high pressure lances.

If this proves successful this may influence future building design as the need for certain fixed installations in the form of dry/wet risers may no longer be a requirement.

5. Benefits

This project will consider how advancements in knowledge, technology and approaches from other sectors, e.g. military, engineering, academia, can be transferred and adapted to the Fire and Rescue/Civil Protection sector in an innovative way to change firefighting tactics; as well as better protect the firefighters themselves.

The ultimate goal being that the way a firefighter deals with a fire and the tactics deployed will be very different, and not only less hazardous to themselves, but also save lives as well as reduce economic loss, damage and environmental impact.

Smart PPE (Europe) Project

Several European projects have been launched on the development of the smart firefighter suit/smart PPE. They address new, advanced materials as well as functional components such as sensors, actuators, energy scavenging, antennas, data processing (soft and hardware) and their integration.

Unfortunately, they have all chosen a different approach, with all having specific advantages and limitations. So, the ultimate PPE will not evolve from a single project.

Consequently, research and development to specify and develop the most effective PPE for a number of scenarios is being scoped as part of a European partnership (Enprotex). This work will not only consider the textile itself, but the full range of equipment (boots, helmet, gloves etc.). All of the elements have to be considered as a potential vehicle for embedding functional components and building up of cross compatible layers of protection.

6. Applicability to wider UK Fire Service

It is intended that all research will be shared with the appropriate bodies to advance fire fighting across the United Kingdom as well as adopting the available research and expertise from our European partners.

Through engagement with industry it is hoped that our direct involvement will drive these companies to producing PPE and equipment that will service the 'Firefighter of the Future'.

Through working with industry it is also hoped that this project will influence the future standards of PPE, and as such will enable a greater range of products to be developed suitable to support the more diverse role that firefighters are now engaged in.

7. Estimated Cost

A key part of this work will be for Greater Manchester Fire & Rescue Service to become a partner of the European Smart PPE project.

This will open up a network of contacts and facilities to assist in future research. It will also give us direct access to industry, research and academia without going through usual procurement/legal protocols and the constraints that that brings. In addition, by joining this project, it is expected that other funding streams will become available to assist and support future work.

As such, Greater Manchester Fire & Rescue Service submits a bid to the Fire Service Research & Training Trust for £90,000. This money would not be required until 2013 at the latest and would be used to match fund the contributions of a least three other European countries (France, Germany and Belgium), as well as the European Commission to create a €600,000 pot to fund prototyping.

This partnership will then, subject to a successful European Commission 'ICT Call 8' European funding bid, be positioned to call on project funding of up to €5M to develop fire fighting PPE and equipment for the future.

8. Other Proposed Funding

Earlier in this bid we touched upon the constraints of the current financial climate. This dictates rather prudent use of funding and resources. However, we feel strongly enough, and realise the benefits both in terms of firefighter safety and financial savings, to consider investing the time of up to four dedicated officers to this project.

9. Intended Timing

- Work has already commenced internally to look to scope the project.
- An ideas workshop is planned for 9th March 2012 where industry, procurers, academia and FRS sector attend to discuss and develop all of the areas outlined above.
- It is expected that the research and conclusions will be available to a wider audience over a time period of the next 1 to 3 years. Some technologies are already known and being implemented in other sectors.
- In respect of the European Smart PPE project, funding will be called upon following the completion of the 'ICT Call 8' European funding bid which is expected to be known in September 2012.

10. Conclusion

As we said in the introduction the massive issues we face require transformation, but underpinned by a solid evidence base.

Our firefighters rely heavily on their equipment and PPE, underpinned by robust operational procedures and techniques, to ensure they remain safe in a perilous environment.

By investing in new research around technologies and equipment, and amending operational processes and tactics, we can work to ensure we achieve a marriage between said new technologies and procedures.

This will allow us to achieve the ultimate goal of making the fire fighting environment less hazardous, save lives as well as reduce economic loss, damage and environmental impact.