Communities and Local Government

Fire and Resilience Research Programme

2007–08

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Fire and Resilience Research Programme

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Contents

1. Introduction

The Fire and Resilience Directorate (FRD) relies on research and statistics to provide the strong and robust evidence base to support the formulation and delivery of current and future policies, and to provide the baseline for monitoring policies and evaluating their effectiveness.

This paper contains details of the proposed fire and resilience research programme of the Research and Statistics Division (RSD) of the FRD, Communities and Local Government, for the financial year 2007–08. The RSD is a multidiscipline team consisting of operational researchers, physical scientists, statisticians, and a few subject matter specialists from the Fire and Rescue Service.

FRD run an annual fire and resilience research programme of about £1.4m, managed by RSD. It is traditionally a broad ranging programme which reflects the wide range of fire and resilience related research necessary to underpin policy. Key elements include statistical and social research, practical fire research, resilience research, risk management, policy evaluation, performance assessment and management science.

The RSD commissions most of its research through external contracts to private and public sector organisations, academia and individuals. RSD staff are responsible for specifying the aims and objectives of the research to meet policy needs and then analysing and interpreting the outputs with respect to policy formulation. Where possible, research findings are subjected to independent review to ensure robustness and relevance.

This document details the work that the Division plans to undertake in 2007–08. Most of the work is funded by internal budgets, either within FRD or more widely within the Department, although an increasing amount is partly or wholly funded by other government departments and external stakeholders.

The remainder of this document provides more detail on the context of the work, and the work itself:

- Section 2 of this document briefly explains the wider context of the work undertaken, including liaison with other parts of the Department and other government departments.

- Section 3 explains the general Framework which is used to focus the FRD annual fire and resilience research programme and also highlights key priorities for the financial year 2007–08.

- Section 4 provides information about the sources of research funding and overall project costs.

- Sections 5 to 8 set out research which is funded from the annual fire and resilience research programme and:
  - is ongoing and carried forward from last year
  - is planned to begin this year, and
  - could be undertaken if further funding, resources or sponsors can be found.

2. Departmental and Government Fire and Resilience Related Research

Within the Department, there is one other key research programme which covers (or potentially covers) some fire related research – Sustainable Buildings, New Homes and Sustainable Development have a research programme in support of Approved Document B (Fire Safety) of the Building Regulations.

Also within the department, there are other areas of policy work which have an impact on the work of the FRD and vice versa. These policy areas also have research programmes in support of policy development. The head of RSD and the Heads of analytical units within these policy areas liaise to ensure that, so far as possible, the different research programmes are mutually supportive, cross cutting synergies are taken advantage of and that duplication of effort does not occur. The overall aim is to ensure that research and statistics issues across the Department contribute to the evidence base.

Outside the Department, there are other departments and organisations undertaking fire and resilience related research. RSD has established excellent links with these departments and organisations and benefits from cross cutting work and external funding. Examples include:

- The Home Office Science & Technology CBRN[1] Programme provides a budget for the funding of cross cutting research on CBRN. RSD currently manages 6 research projects funded through this route which consider the Communities and Local Government and FRS input and impact on the arrangements for dealing with a CBRN incident. Home Office funding ~ £725k.

- Research into the FRS impact on large losses, including business continuity losses, being undertaken by the Fire Protection Association (RSD is a member of the project board). FPA funding ~ £100k.

- An IRMP[2] 'ideas factory' being run by the research councils, which will allow academics to bid against research councils' money to fulfil policy research needs on IRMP, as identified by the 'ideas factory' (RSD will steer the ideas factory and be on the evaluation board for any subsequent research bids). Research councils' funding ~ £1.3m.

1 Chemical, biological, radiological and nuclear
2 Integrated Risk Management Planning

- The Fire Service Research and Training Trust are currently sponsoring research on firefighter physiology, high potential development scheme and CFS[3] evaluation (RSD is a member of the project board). Potential funding ~ £90k.

- CFOA[4] has successfully bid for research funding for CFS evaluation (RSD is a member of the project board) and RSD have a joint bid with CFOA for funding research in to flooding (if successful this means RSD/FRD will get income for research). EU funding ~ £180k and £100k respectively.

The following departments and agencies have provided information:

Department for Transport, Department for Trade and Industry, Engineering and Physical Sciences Research Council, Health and Safety Executive, Highways Agency, Communities and Local Government (Buildings Division and Research and Statistics Division).

3 Community Fire Safety
4 Chief Fire Officers Association

3. Communities and Local Government Strategic and FRD Business Priorities

3.1 FRD priorities

Fire and Resilience Directorate relies on research and statistics to ensure that its policies are evidence based, relevant and sufficient data are available to monitor the effectiveness of these policies. The projects contained in this research programme are prioritised to reflect the Department's aims and objectives, as embodied in the Business Plan of the Directorate.

For 2007–08, the research programme will support FRD's business priorities:

- Enhancing the critical national infrastructure so that the fire and rescue service has capabilities and resilience to respond to major incidents and disasters.

- Securing and enhancing Regional Resilience – ensuring robust arrangements are in place for contingency at a regional level.

- Providing the framework for an efficient and effective fire and rescue service through the National Framework, an effective performance regime, an effective financial framework which incorporates targets on delivering efficiencies and promoting economies of scale and rigorous data collection and analysis.

- Providing the framework to ensure effective prevention, protection and intervention by Fire and Rescue Authorities by supporting them in creating a risk assessment and management regime which strikes a balance between prevention, protection and intervention, and by providing direct support to some fire and rescue service activity and promoting what works; and by developing a consensus on the expanding and changing role of the fire and rescue service within communities.

- Ensuring the fire and rescue service has the capacity to adapt to changing business needs and has a workforce that is reflective of the society it serves. This includes the Centre of Excellence, the Fire Service College, leadership, equality and diversity.

- Securing an FRD which is fit for purpose and operates within the spending constraints placed upon it; is resourced by staff with the appropriate skills; is supported by a robust evidence base; has high quality stakeholder engagement; has a robust high level vision of success

3.2 Strategic priorities and public sector agreement (PSA3) targets

Communities and Local Government's vision is of prosperous and cohesive communities, offering a safe, healthy and sustainable environment for all. In support of this vision the Department has the following five Strategic Priorities:

- Strategic Priority I: Tackling disadvantage by reviving the most deprived neighbourhoods, reducing social exclusion and supporting society's most vulnerable groups.

- Strategic Priority II: Promoting the development of the English regions by improving their economic performance so that all are able to reach their full potential, and developing an effective framework for regional governance taking account of the public's view of what is best for their area.

- Strategic Priority III: Delivering better services, by devolving decision-making to the most effective level – regional, local or neighbourhood.

- Strategic Priority IV: Delivering a better balance between housing supply and demand by supporting sustainable growth, reviving markets and tackling abandonment.

- Strategic Priority V: Ensuring people have decent places to live by improving the quality and sustainability of local environments and neighbourhoods, reviving brownfield land, and improving the quality of housing.

FRD primarily contributes to Strategic Priority III, which includes the following:

- Promoting high quality, customer-focused local services and ensuring that adequate, stable resources are available to local government; and

- Clarifying the roles and functions of local government, its relationship with central and regional government and the arrangements for neighbourhood engagement, in the context of a shared strategy for local government.

- By 2010, reduce the number of accidental fire-related deaths in the home by 20%, with no local Fire and Rescue Service having a fatality rate from accidental fires in the home more than 1.25 times the national average; and to reduce the number of deliberate fires by 10% (PSA 3 target)

- By 2008, improve the effectiveness and efficiency of local government in leading and delivering services to all communities.

The overall programme underpins the eight analytical priorities and individual projects are cross matched against their contributions to these priorities:

- Economic Growth and Prosperity
- Social Justice and Economic Inclusion
- Equalities
- Cohesive and Integrated Communities
- Empowered Citizens and Governance
- Environmental Sustainability
- Measuring Progress
- Improving Effectiveness and Value for Money.

3.3 Key gaps in the evidence base for delivering the FRD priorities

Consideration of the business priorities for FRD for 2007–08 suggests the following key gaps in the evidence for delivery of these priorities:

- Efficiency of FRS: we know little about the potential further efficiencies within FRSs and what an optimum FRS might look like.
- Research to underpin the national critical infrastructure, including ensuring appropriate Detection Identification and Monitoring (DIM) capability and the provision of the underpinning evidence base for decontamination.
- Research to underpin regional resilience, such as ensuring appropriate capability for regional resources, such as the Regional Resilience Teams GIS tools.
- Research to underpin FRS efficiency and effectiveness, such as the size of losses which might be averted by the FRSs are poorly understood in key areas such as business continuity – estimates for losses range from £5m to £500m per annum. Little is known about life loss in road traffic collisions attended by FRSs and the impact FRS activity has on outcomes from road traffic collisions. Little is also known about the efficiency and effectiveness impact of different crewing/shift systems, or the effects of alternative models of deployment, e.g. smaller, fast response vehicles for small outdoor fires.
- Research to underpin workforce change, such as equality & diversity, capability and capacity building.
- Activity which will provide FRD with staff with appropriate skills, such as ensuring the provision of appropriate scientific advice in a crisis and ongoing development of economic expertise.

4. Budgets and Resources for Research and Statistics

Up to 17 scientists/research officers (physical scientists, operational researchers, social researchers and statisticians) will be available to work on fire and rescue related research in RSD. In addition, up to 3 seconded fire officers will assist by providing professional advice, liaison with Fire and Rescue Services and staffing a helpdesk. Data entry of fire incident records and some administrative support is provided by a further 17 staff.

The annual Fire and Resilience Research Programme budget is about £1.404 million. As mentioned earlier, this is often supplemented by other topical budgets as necessary, which in recent years have included funding for research into tall buildings and risk management procedures and processes. This year the topical funding includes money to create an electronic system for collecting and analysing fire incident data, money for further research into tall buildings and some money to maintain the FSEC risk management tool. The total budget from Departmental programmes for 2007–08 is £3,631,000. There is also increasing additional funding from other Government departments and various stakeholders on projects of mutual interest, which currently totals £1,200,000, but is likely to increase during the year. This brings the total to £4,831,000. Table 4.1 summarises the sources of research funding for the financial year 2007–08.

Table 4.1: **Sources of Research Funding 2007–08**

Source of Funding	**Source**	**Projects/Areas**	**Funding**
Outside the Department	Home Office	CBRN resilience research	£1,200,000
	Various Stakeholders	Fire Research Academy	tbc
Departmental programmes outside FRD	The Department, Neighbourhood Renewal Unit	Fire and Rescue Service Incident Data Cleansing for Neighbourhood Statistics	£75,000
Programme within FRD	Fire Legislation Safety and Personnel Division, Arson and Community Fire Safety Programme	Lower Cost Sprinklers, fire safety and arson prevention projects	£20,000
Research and Statistics Research Programmes	Annual Fire and Resilience Research and Statistics Programme	Fire and Resilience related research and statistics	£1,403,500
	FSEC Implementation	Support for Fire Service Emergency cover Toolkit Implementation	£227,500
	Tall buildings (BDAG)	Research into the interaction between buildings and firefighting	£455,000
	Programme Capital	IRS and IRMP stats database, sprinklers	£1,450,000
		Total	£4,831,000

5. FRD Annual Fire and Resilience Research Programme

The research programme for 2007–08 has been divided into the following three categories:

- **Current Commitments** – projects where expenditure and/or effort is already committed as part of current projects which are being carried forward from last year
- **Proposed Projects** – projects which are proposed by RSD for the coming year, and
- **Possible Projects** – other projects which would be possible should more funding or resources become available or be sourced from elsewhere.

A short description of each project is given in Sections 6, 7, and 8 for current, proposed and possible projects respectively.

As mentioned earlier, the purpose of research and statistics is the creation of a sound evidence base upon which policy can be developed, applied, monitored and evaluated.

6. Current Commitments

This section contains detail of each project that has already been started and have commitments for 2007–08.

6.1 Review of guidance

RSD has initiated research to identify guidance issued by the Department and its predecessors to Fire and Rescues Services, Fire and Rescue Authorities and others in relation to all fire related matters in order to determine the Department's liabilities in respect of this. This will also include determining the options for the provision of guidance in the future, including the possibility of other bodies undertaking all or part of the task and the liabilities that can and cannot be transferred to these. On completion, this work will identify gaps or omissions in the current guidance, what revisions are necessary and the likely size and nature of the task of providing guidance in the future. Work already underway will scope the size of the task and issues.

6.2 Lower cost domestic sprinklers

Pilot trials will commence which are required to take the current lower cost domestic sprinkler design from the research environment to installation within properties. This will provide more information on installation issues, room size variations, reliability, installation costs, sustainability, impacts on building regulations, robustness and general proof of concept. A design guide for the lower cost domestic sprinkler system is currently being written. This will describe the system in sufficient detail for designers, specifiers and installers to ensure consistent design, procurement, installation and operation of the system during the pilot trials.

6.3 Understanding attitudes towards fire risk and the work of community advocates

This research will establish the perception and attitudes of those groups considered high risk and hard to reach towards the dangers of fire. It will also explore the role of community advocates and the impact of their work on the attitudes of vulnerable groups. The funding of this work is shared between RSD and Fire and Resilience Policy.

6.4 Evaluation of home fire risk checks

An evaluation of impact of the Home Fire Risk Check initiative and wider CFS activities on dwelling fire injuries and deaths. This project will explore how effectively HFRC interventions have been targeted at the vulnerable and hard to reach, determine good practice in CFS activity and evaluate the costs and benefits of the HFRC initiative. It will add to the evidence base for effective community fire safety work. This work is funded by Fire and Resilience Policy.

6.5 Study of arsonists and arson interventions

This project has three broad aims: to further expand the evidence base regarding the characteristics of firesetters, particularly the extent of prolific offending, and to explore the proportion of prolific offenders within different criminal justice settings; and to survey the evidence Fire Service and Youth Justice Service interventions with arsonists and potential firesetters.

6.6 Arson Investigation and detection

The detection rate for arson (9%) is considerably lower than for other offences. This study focuses on how suspicious fires are investigated, in particular the policies and practices of fire services and police services. The study combines surveys, interviews and a case-tracking exercise where samples of arson incidents are studied from initial call-out through to any prosecution, to discover the reasons for attrition.

6.7 Maintenance and further development of GIS capability for RRTs

A standalone Geographic Information System (GIS) capability has been delivered to each Regional Resilience Team (RRT) on a dedicated laptop. The GIS capability assists the RRTs in fulfilling their main role of co-ordination between the centre and local agencies and to provide briefings, for example, for ministers and senior officials. This project aims to continue to maintain and enhance this capability as required.

6.8 S&T support to the development of the resilience extranet

RSD provides technical input to the project board for the Regional Resilience Extranet, in particular the aspects relating to the potential inclusion of GIS tools and functionality in any extranet that is developed.

6.9 The firefighters survey

The first national survey of firefighters involving a questionnaire being sent to all serving female and a sample of male firefighters as well as all female ex-firefighters and a sample of male ex-firefighters. The study focuses the working life experiences of firefighters from recruitment onwards. It is designed to support the service in developing policies and practical approaches to key issues such as recruitment, retention, progression and bullying and harassment.

6.10 Follow-up to female firefighter advertising campaign

This project evaluates the impact of a recent advertising campaign which was aimed at increasing the awareness of firefighting as a career for women. The study involves re-contacting a group of women who registered their interest in becoming firefighters to see, among other things, whether or not they have actually applied to become a firefighter. This project is co-funded between RSD and Fire and Rescue Service Development.

6.11 A study of sickness absence management within the FRS

Case studies are being carried out in 5 FRSs to determine how well sickness absence management practice is functioning and whether or not it is following best practice. It involves a staff survey and in depth interviews with managers and employees throughout the 5 FRSs involved. This project has been co-funded with HSE.

6.12 A survey of RDS firefighter employers

A survey is being carried out to establish the levers and drivers that encourage businesses to release their staff for Retained Duty System (RDS) duties. This study involves interviewing both businesses who do release their staff for RDS duties and business that do not.

6.13 Point of entry selection tests

Almost all of the development process for National Firefighter Selection tests is complete, but the validation of the process, designed to ensure that it is non-discriminatory, continues slowly due to the lack of number of recruits. However, for this same reason, it will not be possible to assess the impact of the tests on Black and Minority Ethnic (BME)/women recruitment.

6.14 Development of a Fire Research Academy to provide a national strategy and a collaborative approach to research and will support the development of the Centre of Excellence

Taking forward the proposal for a Fire Research Academy to join together government, industry and academic fire and resilience research. The Academy will provide a national strategy and a collaborative approach to research and will support the development of the Centre of Excellence.

6.15 Co-responding

Co-responding schemes are designed to support the activities of the ambulance service, particularly during busy periods and in rural areas. The scheme requires firefighters to be dispatched to specific clinical emergencies. Similar schemes are operated by NHS Ambulance Trusts with other professional groups, and with volunteers. This project will gather, collate and analyse information and opinion on current co-responding activities, apparatus and practices, and those of similar schemes, in order to update and enhance present levels of the Departments information on these themes.

6.16 Risk assessment tools and techniques

The process of assessing and analysing the risks included within the scope of integrated risk management planning is critical to the success of IRMPs. The data and methodology which support risk analysis for IRMPs need to be kept up-to-date and compatible with the risk assessments conducted under the Civil Contingencies Act and future requirements such as collaborative working, regional controls and new and emergent risks which are identified.

This project will research and produce advice to Fire and Rescue Services and Cabinet Office on the availability, selection and use of risk assessment techniques, tools, data and guidance within FRSs and by other Category 1 and 2 responders to support the obligations of the Civil Contingencies Act and risk analysis for IRMPs.

6.17 Quality assurance methodology

IRMPs are planned and implemented at a local level, but there is a need for a national standard of quality in the way that IRMPs are produced. The current operational assurance process being developed by the Department and CFOA goes some way towards this, but does not cover all IRMP aspects. This means that FRSs and their stakeholders are not able to consistently validate all aspects of the operational and technical aspects of service, planning and provision. This may in turn undermine confidence that the IRMP process adopted is robust and complete.

In this project, the Operational Assurance toolkit should be further developed to cover all aspects of an FRS IRMP process. A key objective of the project will be to provide consistency in the way FRSs go about developing and implementing IRMPs and in any judgments that are made.

6.18 Legislative base for IRMP

Fire Rescue Services and Authorities currently appreciate the scope required of their IRMPs. However, there are significant shortfalls in their approach to the IRMP process, in particular there is uncertainty as to which legislation and guidance must be considered and there is no established methodology to maintain and review this knowledge base.

This project involves research into existing IRMP strategy; existing and proposed legislation and guidance; shortfalls in current practices, and further proposals in order that FRAs and FRSs be provided with a complete set of relevant legislation and guidance together with the tools necessary for its maintenance and review. This will reduce exposure to an incomplete IRMP and more fully align the FRS and FRA with community risk mitigation strategies.

6.19 National standard of practice for IRMP

Integrated Risk Management Planning is a key element of the modernisation agenda for the fire and rescue service. At present IRMPs are completed by each FRS on an individual basis within very broad guidelines. The IRMP steering group has identified the need for greater co-ordination in the FRSs approach to IRMP. A review of the IRMP process will enable a much more efficient planning process on a consistent basis. Without this work the modernisation agenda cannot be implemented on a coherent basis and comparison of FRSs' IRMPs will remain on an unstructured basis.

This current project extends the original work, although it is expected that it can largely be based on the calculations and considerations already carried out in relation to the original project. The new project will take the consideration of targets one stage further and to develop a methodology for defining areas of notable risk inequality.

6.20 Web-based Met Office information service for the DIM and mass decontamination capabilities

The FRS require immediate 'here and now' weather information (eg wind speed, wind direction) for the initial crews responding to an incident, to ensure safe arrival at the location for example. The data should be accessible from a web based system to the both the FRS and FRD. RSD will act as 'intelligent customer' to ensure that any system proposed by the Met Office will be fit-for-purpose and offer good value for money.

6.21 Evidence based USAR PPE specification

This research will identify suitable personal protective clothing and respiratory protection for the USAR teams, with due consideration to ruggedness, physiological loading, dexterity and CBR protection.

6.22 Physiological burden of USAR Turnout PPE

In recent years, RSD has commissioned work to assess the physiological burden on the wearers of various PPE. However, there has not been an assessment of the physiological burden of USAR PPE. RSD proposed that physiological trials on USAR PPE should be conducted. This would help define the limits of use for USAR PPE and add to the spectrum of data on the various PPE that is available to the FRS. This would also provide a baseline for assessment of any future USAR PPE designed to protect against CBR agents. The main issue concerning possible trials was that all previous physiological trials had been conducted to assess the effects of recognised existing work regimes and procedures. These had not been finalised for USAR activities. Therefore it was important to ensure that the work regimes used in the trials were representative of expected regimes.

6.23 Minimum number of ND assets required to meet planning assumptions

As part of the Long Term Capability Management and in order to justify the appropriate level of support arrangement, there is a requirement to determine which ND assets must be available to ensure that the planning assumptions can be met in high risk areas. This will enable the LTCM contract manager in making Value for Money decisions about using normal vs. emergency repair cycles. Modelling will be undertaken using the National Model to determine which ND assets are likely to used more often and therefore which assets must be available to ensure that planning assumptions can be met in the high risk areas.

6.24 Acetylene cylinders

The Fire & Rescue Services are frequently required to address the practical issues of acetylene cylinders which have been involved in a fire. Acetylene can undergo an explosive runaway reaction if subject to mechanical shock or elevated temperature. This has led to cylinder failure with projection of missiles. The current approach is to impose a 24-hour, 200m hazard zone.
This can create severe local disruption. The Department has participated in a joint project with HSE to review knowledge on the behaviour of acetylene cylinders and precautions taken to mitigate their failure. This concluded that the current FRS procedures were justified on the limited evidence available. RSD currently participates in an acetylene cylinder stakeholder working group which

has been set up to further the evidence base. Experimentation may be required to provide a firmer basis for hazard distances and methodologies for making safe fire-affected cylinders. In this case, the Department will need to make its contribution alongside other stakeholders.

6.25 FSEC reviews

The FSEC Toolkit was rolled out to all Fire and Rescue Services in England, Wales and Scotland in April 2004. Since then, Fire and Rescue Services have been using FSEC to underpin their Integrated Risk Management Plans (IRMPs).

Commencing in July 2005 the Department offered FRSs a 'healthcheck', reviewing their use of the Toolkit. The healthcheck process is provided by an external contractor and provides both the Department and FRSs with a quality assurance on the inputs and outputs of the FSEC methodology. The healthcheck does not consider the extent to which FSEC results have been used by FRSs in their IRMPs. The FSEC Toolkit is to become a function within the FiReControl project – the Risk Management Functionality which will enable FiReControl to use a measure of risk that is consistent across the country. As a precursor to this work, it is important to ensure that FRSs have used FSEC correctly and consistently and so any who have not yet taken advantage of the health check will be encouraged to do so.

6.26 Support and development of FSEC

The FSEC Toolkit was successfully rolled out to all Fire and Rescue Services in spring 2004 and is being used to support IRMPs. Since that date, discussions with the FiReControl project team have concluded that the FSEC Toolkit should become a function within the FiReControl project – the Risk Management Functionality. The future supply and support of the FSEC Toolkit will therefore be through FiReControl. This project will manage the FSEC Helpdesk support to Fire and Rescue Services using the FSEC Toolkit until the regional control centres are completed.

6.27 Physiology of firefighters

The physiology research has to date underpinned FRS and other service operational intervention strategies in conventional and CBRN activities. Continuing work will complete the profiling of activities and inform safe practices for emergency responder safety and effectiveness.

6.28 Under-ventilated compartments

The present fire safety arrangements within under-ventilated compartments may present a significant hazard to firefighters because of the potential for

backdraught. The study was initiated with a literature review, published in 2005, and a series of live fire evaluations, using the Royal Navy's Trials and Evaluation Unit, Horsea Island, Portsmouth, which provided data for a computer model study by Kingston University. Further studies by Kingston will be carried out and a study of building and environmental conditions around under-ventilated basements has been commissioned from the Building Research Establishment. This will provide further data for the model studies which will inform Sustainable Buildings and FRSs so as to improve the safety of occupants and emergency service personnel.

6.29 Security and means of escape

Interim guidance has been issued and further work has been carried out to produce updated guidance which will be shared with other emergency services. Collaboration with the Home Office Scientific Development Branch and BRE has been undertaken to evaluate equipment and methods of gaining access. The next phase of the project is to agree the format of dissemination of the research for FRS and other services.

6.30 Human factors advice

Ongoing support supplying human factors expertise to the research programme, and other Department priorities.

6.31 Firefighting media and high rise buildings

The amount of water required to fight fires effectively in high rise buildings is an issue that was highlighted by the attacks on the World Trade Center (WTC) on September 11th 2001, but which is relevant for all high rise fire incidents. Evaluations carried out to date have led to amendments in FRS operational practices, British Standards and Approved Document 'B' of the Building Regulations. A continuing study by BRE has produced a computer model that will be made available to FRS and others to allow the calculation of water availability in a high-rise system and potentially other water supply conditions.

6.32 Fire brigade intervention model

FRS response is a key factor in a number of planning scenarios. A model has been developed (FBIM) in Australasia which can be used as a planning and evaluation tool and RSD has an agreement to develop this tool for UK use. The model may be used as a part of the overall IRMP process to deliver improved efficiency in operational response. The Memorandum of Understanding covering development of the model is between FRD and the Australasian Fire Authorities Council.

6.33 Electronic Fire and Rescue Service incident reporting

This project will enable Fire and Rescue Services to report electronically to the Department details of all incidents attended. This will meet the needs of the National Statistics collection, FSEC, monitoring of the Public Sector Agreement targets for Fire and Rescue and reporting the Fire and Rescue Service Best Value Performance Indicators. In addition, it will provide a wealth of information to support policy development. It is partly funded by the Invest to Save (ISB) budget.

6.34 Electronic collection of Integrated Risk Management Planning (IRMP) statistics

This project will enable Fire and Rescue Services to provide performance and management information electronically. The information is vital for Fire and Rescue Services' IRMP planning, and is used to compile the Corporate Health Best Value Performance indicators (BVPIs) and other performance indicators for the FRS. This project will ensure the data are provided quicker, and in a format more user-friendly for the Fire and Rescue Services supplying the data.

7. Proposed Projects

Policy leads considered and prioritised research needs, which resulted in a ranked list of potential research projects for 2007–08. The research identified as very high, high and medium priority is mainly high level strategic work which will underpin future policy and reform. However, it does contain some relatively operational level work in support of New Dimension roll out, workforce monitoring etc. (deemed necessary in the first case because the Department is developing the New Dimension equipment directly; and in the second because of the Ministers' focus on helping FRSs raise their game on equality and diversity).

In future, FRD's research programme will focus to a greater degree on research to underpin policy, and will look to others outside to focus on the more operational aspects of FRS activity.

The proposed projects were ranked in order of priority, based on their contribution to FRDs objectives. It is proposed that the work will start on the following very high and high priority projects in 2007–08. Medium and low priority projects are listed in Section 8 and will be undertaken if resources are available.

7.1 Very high priority projects

7.1.1 Work to underpin the strategic review

This project aims to consider what the current fire and rescue system looks like, the drivers for change and potential hypotheses for options. It will include aspects such as how might socio-demographics, climatic, political or any other changes affect risk, responsibilities and strategies. It is unlikely that new research will be commissioned in the time available, so this project will draw together existing knowledge into a narrative.

7.1.2 Review of FRD guidance and liabilities

RSD has initiated research to identify guidance issued by the Department and its predecessors to Fire and Rescues Services, Fire and Rescue Authorities and others in relation to all fire related matters in order to determine the Department's liabilities in respect of this. This will also include determining the options for the provision of guidance in the future, including the possibility of other bodies undertaking all or part of the task and the liabilities that can and cannot be transferred to these. On completion, this work will identify gaps or omissions in the current guidance, what revisions are necessary and the likely size and nature of the task of providing guidance in the future. Work already

underway will scope the size of the task and issues and is listed in Section 6.1. Any further work will consider specific aspects in more detail.

7.1.3 Effectiveness of operational intervention

The operational intervention of the fire and rescue service is a key driver for outcomes and costs. This project has delivered a scoping study for areas of further work, and some data analysis work, including the construction of a basic prototype model for operational intervention planning is ongoing. Further work in this area will provide the evidence base of the impact on effectiveness and cost of issues such as:

- the potential for changing shift and crewing systems to deliver improved efficiency and effectiveness
- the current and potential innovations in response eg what are the pros and cons of fast response vans for small outdoor fires
- what are the requirements for 'officer cover' and what impact do they have on FRS costs and incident outcomes.

7.1.4 Optimal size of a Fire and Rescue Service

This work would undertake new research to examine whether there is an optimal size for a fire and rescue service. The work would be likely to include an assessment of economic performance, capacity and effectiveness of an FRS.

7.1.5 Development of a tool for first responders dealing with HAZMAT incidents (which will be built into regional control centres)

Following the development of the proof of concept Decision Support Tool, the aim will be to develop a full working system which will utilise the proposed FiReControl systems and infrastructure.

7.1.6 Development of software to record individual firefighters' ethnicity etc

A feasibility study to assess whether some of the data collected on the IRMP returns (mostly Human Resources information such as gender, ethnicity) can be collected on a "line by line" basis – the term "line by line" refers to the fact that each individual case (person) within the data set has its own single line of data which contains all the information relating to that particular case. If feasible, such a data collection will enable more policy relevant HR data to be produced quickly.

7.1.7 Capacity of FRSs to deal with the initiatives being rolled out and planned by Communities and Local Government

The three major resilience projects are stretching the capacity of the FRSs to deal with initiatives. On top of this, other initiatives across the Directorate, such as electronic incident reporting and equality and diversity initiatives are also having an impact on key staff in FRSs. Whilst the Department is providing considerable support to FRSs through new burdens funding, there is scope

for a more structured consideration of the Departments initiatives, the timing of their demands on FRSs and the potential for the Department to ease the burdens in a more targeted and constructive manner. This project would consider the demands being placed on FRS staff, their capacity to respond and the potential for a more co-ordinated structuring of demands and new burdens for FRSs.

7.1.8 Interpretation of Detection, Identification and Monitoring (DIM) information to inform operational procedures and protocols

Research will be undertaken to review the current capability and look at the processes developed to date. The outcomes from this research will be used to inform the FRS of the additional skills, knowledge and processes required to enable the outputs from DIM to be effectively utilised operationally in the development of safe systems of work.

7.1.9 A review of the FRS ability to carry out rescues of non ambulant victims from a CBRN hot zone

Research will be undertaken to recommend potential improvements to the FRS capability to carry out such rescues from some distance from the inner cordon.

7.1.10 A project to assess the economic benefits delivered by the ND programme

The roll-out of new dimensions assets is largely complete. At this stage it would be of use to consider further evidence on:

- the benefits of the enhanced capabilities provided by ND equipment, and an assessment of whether it has met its original objectives
- economic benefits delivered by the ND programme, both direct benefits to FRSs and, for example, wider economic benefits to the community
- longer term project on cost benefit analysis of siting/provision of equipment.

7.2 High priority projects

7.2.1 Ensuring the national firefighter selection tests are not adversely affecting under-represented groups

A medium term study to evaluate the impact of the NFS tests – following a sample of recruits through the tests and their work, to assess whether the tests produced people that were appropriate for the Fire and Rescue Service and therefore likely to stay.

7.2.2 Longer term evaluation of the National Firefighter Selection Tests

In the longer term (two to three years), the tests can be revisited in light of the above and revised as necessary. Work would start now as a longitudinal study to provide the evidence base for future reviews.

7.2.3 Production of a high potential development system for the FRS

RSD will write a statement of requirement for a scoping study to consider the case for a High Potential Development scheme for the FRS. The scoping study could consider a fast-stream Graduate Entry scheme among other options. Further work in this area could be prompted by the scoping study. Funding and management of the project will be carried out by the Fire Service Research and Training Trust.

7.2.4 Research into the optimum balance between prevention, protection and response – high level macro-economic approach

The effectiveness and efficiency of FRSs is dependent on the correct balance of safety, protection and intervention. This project aims to consider the separate factors, their interactions and limitations using a high level macro-economic approach.

7.2.5 Further development of a model of the FRS – bottom up approach to cross border efficiencies, the impact of FRS size and the potential local and regional balance between prevention, protection and response

We have developed a national model of the Fire and Rescue Service for use in policy development. It currently considers only dwelling fire risks, but it is planned to include consideration of the risk from other buildings fires and special services and potentially major incident risks. The range of response options available will also be extended from the current functionality. This work will need to develop both the risk assessment methodologies and the software implementation. The model will be used to inform policy and operational decisions by quantifying the impact they may have.

7.2.6 Assessing the impact of incident command

An initial study of the psychological factors affecting incident command and decision making in the FRS has been made and needs evaluation. The intent is to identify those factors that can be improved as part of an individual development programme in support of the FRS modernisation agenda. No other study is, or has been, focussed in this way. Not identifying these factors may have adverse effects on effective FRS incident command.

7.2.7 Evaluation of notable practice in the integrated personal development system (IPDS) for FRS personnel and its implications for IPDS effectiveness

The IPDS project is due for completion in December 2007. Now therefore would be an appropriate time to consider the project's impact by considering the following:

- Promotion and retention under IPDS, in particular for women and black and minority ethnic groups
- The assessment of competence by FRSs using IPDS
- Whether IPDS assessment procedures produce competent firefighters – this will become particularly important as specialist roles increase

7.2.8 Further development of contingency planning and analysis tools

RSD currently have a simplistic national model of the FRS which can give a broad approximation of the effects of resource changes on dwelling fire fatalities. This project will aim to use the national model which is being developed in another project, and to use it for planning and analysis purposes, for validating assumptions and supporting decisions.

7.2.9 The prevalence and potential impact of annual performance assessment for FRS personnel

A survey of FRS staff regarding annual performance assessment to discover:

- How many FRS staff have annual performance assessment
- Any notable practice in using performance assessment to deciding Continuous Professional Development (CPD) payments
- What levers there may be for the Department regarding equality and diversity

This work would best be done in collaboration with the LGA.

7.2.10 The provision of scientific advice in a crisis

To put in place appropriate arrangements and processes for the provision of and access to scientific and technical advice in a crisis. This project will also develop a core Q&A brief on relevant scientific and technical issues which could arise when the Fire Emergency Information Centre/Emergency Information Support Group is operational and ensure the Department's arrangements dovetail into the local and central arrangements being developed by the Cabinet Office for Science & Technology advice.

7.2.11 Maintenance and further development of the cost of fire model and the Atkinson productivity model for the FRS

The cost of fire model provides analysis of the cost of fire prevention, protection and response measures, including the cost fire and rescue service provision. It also analyses the costs of losses from fire. This model underpins an annual published report. The model needs maintaining and developing, in particular to include other non-fire incidents. As part of the Atkinson review of public sector efficiency, the Office of National Statistics is producing a model of fire and rescue service efficiency. Economic input into the development of this model is needed to ensure that fire and rescue service efficiency is properly reflected, in particular to ensure that perverse measures which suggest a decrease in efficiency due to fire prevention measures are not developed. Economic advice to underpin Directorate wide business case development will also be needed.

7.2.12 Research to consider what efficiencies might be driven through the IRMP process

Following the introduction of Integrated Risk Management Planning FRSs have been delivering services under more local determinations. This project would assess the potential for driving efficiencies through IRMP, including aspects such as an assessment:

- of the potential further efficiencies achievable
- of the levers available or potentially available to achieve those efficiencies
- of the balance between risk and efficiency
- a forward look for potential efficiencies in the longer term, using trend analysis.

7.2.13 Research and advice on health & safety issues related to Firelink

RSD, through its intelligent customer function, will assist in commissioning a research project for an independent review of the health and safety aspects of the TETRA based National Wide Area Radio system that is being procured and implemented through the Firelink project.

7.2.14 Longitudinal study of the impact of the Regulatory Reform (fire safety) Order

This project will involve a study of the impact of the Regulatory Reform (Fire Safety) Order.

7.2.15 Longitudinal study of what works in equality & diversity

This project will involve a study of successful initiatives in Equality & Diversity.

7.2.16 Enhancement of USAR PPE for use in hazardous environments.

The research will enhance the current USAR PPE to provide high level protection against hazards and risks from heavy dust loads generated by large building collapse and which might also include the presence of toxic chemical and biological materials. It will review the current range of USAR PPE and use the performance specification outputs from FR71 – 01 to enhance that PPE such that it can meet the risks generated by large dust clouds and ensure safe systems of work.

The outcomes will be used to inform operational decision making and the selection of appropriate PPE in high density dust environments.

In addition, the research will identify possible options to enhance existing USAR PPE for use in toxic chemical and biological environments and, if not practicable, to define the performance specification for USAR PPE in such highly toxic areas.

7.2.17 Ensuring the suitability of the ND DIM capability for potential toxic hazards produced by collapsed structures

The currently provided CBRN DIM equipment was provided for the mass decontamination process. The ability for the FRS USAR capability to work in a contaminated Hot Zone relies on the ability to assess the nature of the hazard. Research will be undertaken to ascertain the suitability of the current DIM equipment, skills and knowledge to carry out this role.

8. Other Possible Projects

These are projects that have been identified as potentially valuable research but do not have a budget or staff resources. Should the finance or staff become available or alternative sources found, they may be added to the programme. These projects have been agreed with policy leads as medium/low priority.

8.1 Assessment of the impact and cost-benefits of leadership in the FRS, including leadership training

A research project to assess the impact and cost-benefits of leadership in the FRS, including leadership training. Any study could include comparisons with other emergency services.

8.2 Further development of optimisation algorithms to underpin risk based mobilising during larger incidents/spate conditions in FiReControl

RSD provides ongoing support for the procurement and development of the Risk Management Toolkit, which includes reviewing and providing assurance throughout its software lifecycle, and its integration and roll-out within the full FiReControl solution. RSD will also oversee the further development of optimisation algorithms to underpin risk based mobilising during larger incidents/spate conditions in FiReControl.

8.3 A general project on horizon scanning, unrelated to specific work but providing a wider view

Longer term policy is supported by horizon scanning. The OSI review of science in the Department concluded that we should do more horizon scanning. Whilst individual projects will each have an element of horizon scanning, a specific project would also be beneficial for a view of the wider horizon.

8.4 A project to explore the data that exists and to find how it can be used to better drive forward the aims of Communities and Local Government

The data available on fire and rescue activities in the UK is some of the best in the world. At the moment it has been used to various degrees to support models, research, policies etc, however, there is a considerable body of information that has not yet been exploited to its full extent. This project would aim to explore the data that exists and to find how it can be used to better drive forward the aims of the Department.

8.5 A project to consider potential Gershon efficiencies in FRSs

This project will aim to use the possible measures of efficiency and evaluate the various changes that have been made, or are proposed, under the modernisation umbrella. Performance indicators, and other analysis tools such as data envelopment analysis, will be used to get an overall picture of improvements under IRMP.

8.6 A study of noise and vibrations from USAR operations

Noise and vibration is an issue generally for the FRS, but is particularly an issue during USAR training and operations. We have good information from manufacturers about what the equipment used produces in standard tests; however, this is clearly not relevant to actual use. Within the USAR environment noise and vibration levels will depend critically on the physical surroundings, potentially to a greater extent than the noise output of the equipment. The purpose of the project is to gain a better understanding of the typical levels encountered in a variety of "normal" USAR operations and typical scenarios. This would link in with work that the Fire Service College needs to do to assess the exposures of their USAR trainers (linked to, but not the same as, operational exposures). The information will be used to inform the generic assessments and operating procedures for USAR work on which incident commanders can make informed decisions about working patterns etc. It will also be provided to any FRSs that have regional/local USAR training rigs.

8.7 Producing a model to provide incident commanders with sound advice on structural building collapse, for major incident planning and operations, to be included in FIReControl

An initial study has evaluated the feasibility of a building collapse computer model. Further work investigated the presentation of this model and a third

phase is envisaged to draw together these elements and take forward the development of a model.

8.8 A study to provide the evidence base for evacuation management of large buildings, such as fire safety engineered spaces

In complex built environments, such as tall buildings and underground networks, FRS intervention often occurs whilst evacuation is still in progress. Currently little is known on how these two demands can be balanced. The incidents at the WTC highlighted this issue and a study will inform planning and operational intervention strategies. Without better information for the FRS leading to a better understanding of the issues evacuation and incident control may be competing and not complementary activities.

8.9 Further work to develop and refine to assumptions underpinning the business case for FIReControl

The business case for FiReControl identifies that FiReControl is cost effective simply on savings made in FRS control rooms. However, the case makes some assumptions which could be further refined, including a further articulation of wider economic benefits, and an analysis of the other benefits derived by FRAs from implementing functionality which will be available to all under FiReControl.

8.10 A study to provide the evidence base for refinement of the staffing model for FIReControl, using call demand patterns

Analysis of future demand patterns could be further refined, using data from external sources and trend analysis. This would improve crewing modelling and assist with benefits analysis.

8.11 A comparative study to consider how FRS in other jurisdictions tackle issues regarding the recruitment and retention of retained/voluntary firefighters

A comparative study to consider how FRSs in other jurisdictions (especially Europe and the US) tackle issues regarding the recruitment and retention of retained/voluntary firefighters. The work would inform the current debate within the Practitioners Forum/CFOA and the national/regional/local contingency and resilience initiatives.

8.12 A study to examine the levels of unwanted CO_2 emission that are prevented each year by the Fire and Rescue Service, and will put them into perspective against the best national figures for emissions

A major cause of CO_2 emissions is the release of carbon trapped in fuels when they are burned. One of the roles of the Fire and Rescue Service is to stop the undesired burning of fuels, and therefore to stop the unwanted release of CO_2 into the atmosphere. This project will look at the levels of unwanted CO_2 emission that are prevented each year by the Fire and Rescue Service, and will put them into perspective against the best national figures for emissions.

8.13 An assessment of the potential for efficiencies from voluntary mergers of FRSs

Where Fire and Rescue Authorities choose to merge there may be economic effects that are claimed or presumed. This project would aim to take a broad and independent view of the benefits and problems that may occur with mergers.

8.14 Decision support tool for the selection and deployment of PPE

This project will aim to develop a suitable user-friendly decision support tool which will assess the hazard and risk against which to select the most suitable PPE related to the operational task.

8.15 Crowd behaviour and its impact on the throughput of people in the mass decontamination process

The planning assumptions for mass decontamination call for significant flow rates of people through the decontamination process. This project will investigate whether the planned flow rates of people through the decontamination process is realistic and achievable and whether any improvements can be made to the process.

8.16 Further evaluation of the impacts and costs of community fire safety

The evaluation of the Home Fire Risk Check initiative – a £20m programme of smoke alarm installation/fire safety advice aimed at the most at-risk communities – will add to the evidence base for effective community fire safety work. Depending upon the outcome of the current study, further work may be necessary throughout the year regarding the effectiveness of Home Fire Risk Checks. Additional evaluation of wider CFS practice could also prove useful.

8.17 Evaluation of the impact of the fire prevention grant

Between 2006–07 and 2008–09 fire and rescue services have received Fire Prevention Grant funding, covering both arson and community fire safety, based on population and risk. A study will look at the extent to which fire safety activity has been mainstreamed and the role for central government from CSR07 period and beyond.

8.18 A study to consider the fire risk in non-domestic buildings

This project will look to build up the evidence base for fire in non-domestic properties such as schools, hospitals or businesses. Although less numerous than other types of fire (e.g., dwelling, vehicles), fires in non-dwellings cause extensive damage A project can explore building owners' attitudes towards fire safety and help establish effective prevention strategies.

8.19 A study to provide a benchmark of performance of current command and control systems, so that improvements provided by FIReControl can be quantified

Little is known about the current performance of FRS command and control rooms IT systems, for example how long does it take to search address data. In order for FiReControl benefits to be highlighted, a base lining exercise will be carried out although this is likely to be contentious.

8.20 A study to develop generic risk assessments for resilience incidents under the Civil Contingencies Act

Generic Risk Assessments (GRAs) are specific to the Fire and Rescue Service at the present time. With the obligations under the Civil Contingencies Act to assess, prepare and respond to common risks to society there is a need to ensure that generic risks are consistently identified and used by responders as the basis of their individual risk assessments and policies and procedures. This project would aim to develop common set of generic risk assessments for the range of emergencies planned for under the Civil Contingencies Act.

8.21 Research to examine the best way to improve communications with stakeholders, in particular control operators, for FIReControl

The Select Committee suggested that FiReControl should improve communications with key stakeholders, mainly FRS staff and elected members.

Market research would assist with understanding the communications gaps and targeting future communications more effectively.

8.22 Refining a future fire indicator

A project has been carried out to investigate risk based performance measures for the Fire and Rescue Service and to consider, amongst other things, their robustness at a national and local level. Targets were suggested for each measure and this work will be finished off to provide the precise format for the proposed 'primary fires' measure. This work could be refined and developed, for example by the collection of better non-fire related incidents such as road traffic collisions and flooding, which would allow the indicator to be extended if appropriate.

8.23 National capability survey

Scientific and Technical input into the design of future questionnaires is required to ensure that the collection of the results is simple and lends itself to inclusion into the National Capabilities Survey GIS capability. Research would also be undertaken to ensure that the marking of the results is robust and based on available evidence.

8.24 Making regional management boards more effective

Regional management boards have been established to co-ordinate the planning and response of FRSs to incidents. Whilst there are some examples of good practice, it is felt that research into the following areas could be productive:

- what are the outcome we want from RMBs and how do we measure them
- what are the barriers to effective regional co-ordination
- is there technology/data sharing protocols which currently exist which could easily improve the performance of RMBs.

Whilst some of this work could be undertaken by the Audit Commission, it is likely that the more technical/data sides of improving performance would be best undertaken by the Department.

8.25 Evidence base on Home Office (HO) PSA on counter terrorism

Analytical support will be provided to the development of the Departments performance indicators for the HO Counter terrorism PSA.