CEDR

Conférence Européenne
des Directeurs des Routes

Conference of European
Directors of Roads

Traffic incident management

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1   Executive summary

Background

Good incident management is an important goal for all concerned with the management and safe operation of road networks. Across Europe, incidents account for an estimated 10% to 25%[1] of all congestion and are the largest single cause of journey unreliability[2]. Incident-related traffic congestion affects public safety through secondary incidents, the economy, and the environment. In the past, incident management has not been considered part of the remit of road administrations but a task for the police and other emergency services. Road safety programmes have focused on reducing the number and severity of incidents but little attention has been paid to minimising the impact of incidents once they have taken place.

With the development of the network operator role, national road administrations (NRAs) have the remit to consider other means of delivering their objectives and many are looking at minimising the impact of incidents through better incident management.

This paper establishes the areas that NRAs have considered and identifies opportunities for joint working and cooperation.

Assignment

Task Group O5 was commissioned to explore the developing role of NRAs in incident management and in relation to other responders particularly regarding:

- the role of NRAs in incident management and how they are organised to deliver it;
- how incident-related travel/ traffic information is managed and the methods used;
- how continuous improvement in incident management practices is achieved with a view to reducing the traffic impact of incidents; and
- the measures in place to identify trends in incident causation and the resultant incident prevention measures.

Findings and recommendations

TG O5 notes that the role of NRAs in incident management is evolving in response to customer demands for mobility and incident responders' increasing desire to deliver their key business objectives. This means that many NRAs are assuming new roles in order to reduce the severity and impact of incidents on road users. It was found that in developing these roles, there were both similarities and differences between the approaches adopted. It is recommended that a review be undertaken of the different approaches taken by NRAs, focusing in particular on how the necessary skills, processes, and capabilities have been developed. There are opportunities for NRAs across Europe to share, through CEDR, experience in delivering these capabilities.

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[1] 10-15% in Sweden and Norway, 20% in the Netherlands, and 25% in England
[2] In England, 50% of the worst 10% of journey times are incident related

NRAs have found that changes to roles and responsibilities can only be made in partnership with the police and emergency services and that the management of risks when transferring roles is a key challenge. CEDR should encourage partners across Europe to share their experience by including, in the first instance, the European Traffic Police Network (TISPOL) in this review.

Communication between responders is considered poor, leading to increased response and clearance times, wasted resources, and increased congestion. It is recommended that information sharing should be investigated in order to overcome institutional barriers and make better use of technology.

The most powerful tool in minimising the impact of incidents—and the one that is in the NRAs' direct control—is the provision of fast, direct, high-quality information in a standard format that is acceptable across Europe. This enables road users to make informed decisions about their journeys and reduces the scale of the incident and the resources required to manage it. It is recommended that a 'European acceptable and standard format' should be developed to ensure that all road users can make informed decisions about journeys.

There is no accepted model for valuing the cost of incidents and their impact, which explains why NRAs find it difficult to demonstrate the value of improvements to incident management practice. Therefore, it is recommended that a common method of valuing incidents and their wider impact should be determined. However, this will depend on the results of Task Group O1's business model.

As a first contribution to the above, it is recommended that NRAs should agree on the stages of an incident 'timeline' and should gather standardised data on incidents that could also be used to drive improvements across Europe.

Research indicates that non-injury incidents contribute substantially to incident-related congestion. It is recommended that NRAs consider incident prevention not only from a safety but also from a congestion perspective.

Major emergency management was not specifically included in the remit of this task, but steps to improve cooperative road incident management are likely to make a positive contribution to the contingency planning and operation of this activity.

Actions

The conclusions and earlier observations lead to the following proposed action:

Within CEDR's Strategic Plan 2009–2013, Task Group 13 will carry out the recommendations.

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3   Definition of the task

Purpose

The optimisation of the use of the capacity of road networks enables national road administrations (NRAs) to develop optimum solutions to deliver mobility, safety, and environmental requirements as part of their network operations. The purpose of Task O5 is to inform NRAs of opportunities to reduce incident-related congestion and changes to the infrastructure that would improve journey reliability and to identify areas where collective action by CEDR could support these aims.

Scope

There has been considerable input from other CEDR groups and organisations working on tasks related to network optimisation. It was therefore agreed that Task Group O5 should focus on the developing role of NRAs regarding incident management, particularly in view of the potential impact on optimising capacity.

Good incident management is an important goal for all parties involved in the management and safe operation of road networks. Across Europe, incidents account for an estimated 10% to 25%[3] of all congestion, and are the largest single cause of journey unreliability[4]. Incident-related traffic congestion affects public safety through secondary incidents, the economy, and the environment. In the past, incident management has not been considered part of the remit of road administrations but a task for the police and other emergency services. Road safety programmes have focused on reducing the number and severity of incidents but little attention has been paid to minimising the impact of incidents once they have taken place.

Goals

Task Group O5 was commissioned to explore the developing role of NRAs in incident management and in relation to other responders, particularly regarding:

- the role of NRAs in incident management and how they are organised to deliver it;

- how incident-related travel/ traffic information is managed and the methods used;

- how continuous improvement in incident management practices is achieved with a view to reducing the traffic impact of incidents; and

- the measures in place to identify trends in incident causation and the resultant incident prevention measures.

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[3] 10-15% in Sweden and Norway, 20% in the Netherlands, and 25% in England
[4] In England, 50% of the worst 10% of journey times are incident related

Methodology

A series of workshops was conducted and a case study questionnaire distributed to both those nations participating in the workshops and to other CEDR member states that had expressed a willingness to complete it. The questionnaire (see Annex A) developed by the English Highways Agency sought clarification on how incident management is administered within each country and how each NRA would like to see its roles changing in the future.

Information was also sought from published documents including the Federal Highway Administration's report 'Traffic Incident Response Practices in Europe' (February 2006).

Expected output

- This final report, approved by the CEDR Executive Board (EB)

- A series of recommendations and actions to be taken forward

Status

- This final report for Task O5, Strategic Plan 2005-2009, which was approved by the EB on 12 March 2009.

- It was agreed at the EB of June 2008 that Task O5 would be finalised, and further work taken forward as part of the new Task 13 of the new Strategic Plan 2009-2013.

- The recommendations and actions in the Task O5 final report have been incorporated into Task 13.

- A detailed project plan and programme on how the recommendations and actions of Task O5 are to be taken forward along with Task 13 will be submitted to the EB in March 2009.

4   Ways towards the optimisation of road networks

4.1   General management measures

A variety of general measures will enable a national road administration to develop optimum solutions to deliver mobility, safety, or environmental requirements as part of its network operations. The measures available include:

Managing demand

- Provision of good-quality, consistent traffic and travel information to enable drivers to make informed choices about their journey, improved management of planned events, road pricing, or increased fuel tax

Managing the infrastructure

- Appropriate management of contractor performance, optimisation of the network condition to deliver requirements, management of road-space through roadworks, meaning the number and layout of lanes available to traffic, access to and protection of areas reserved for the work force, and timing of layout changes to accommodate peak or tidal flows, plus specification of diversion routes if required.

Managing traffic (physical measures)

- Dynamic speed, traffic control, road geometry, reversible lanes, ramp metering, enforcement, special lanes, hard shoulder running
- Queue protection
- Priorities for special traffic, high occupancy, freight, public service vehicles
- Route guidance
- Park and ride services
- Signs and information

Managing on-road services

- Improvement of incident management (including the management of major incidents, business continuity, and contingency planning)
- Provision of new on-road services (e.g. IM+ and traffic officer service)
- Development of strategic partnerships with others who provide on-road services including the police, fire service, ambulance service, local road authorities, and vehicle recovery agencies)

Managing interoperability

- Management of interfaces with other transport modes
- Provision of special lanes

Managing investment

- Contract types, performance measurement, incentivised delivery

4.2   Benefits of cooperation

Many countries are considering innovative techniques; collectively CEDR members have access to a much wider pilot programme by sharing experience. Some previous work has had a global perspective, but the European experience provides specific challenges. The work done by Task Group O5 focused on best practice and this European perspective, providing specific and relevant information to European Road Directorates.

4.3 Approaches to incident management

NRAs are working to improve incident management in a number of ways: through changes in roles and responsibilities in incident management processes; the use of better information for incident responders to ensure an appropriate response and for road users to reduce the impact of the incident; improved processes based on experience; and incident prevention from a congestion perspective.

A group of interested specialists was set up to consider the brief. Four workshops were held, involving England, the Netherlands, Denmark, Belgium-Flanders, Sweden, and Norway. At each workshop, countries presented their case study, which was then debated by the group. Reports from these workshops were produced as a record of these discussions.

The case study questionnaire (see Annex A) was distributed to both those nations participating in the workshops and to other CEDR member states that had expressed a willingness to complete it. In practice, however, only five original task group member states plus Austria made returns. The questionnaire sought clarification on how incident management is administered within each country and how each NRA expects or would like to see its roles changing in the future. The questionnaire returns can be found in the annexes as follows:

Country	Organisation	See Annex
Austria	ASFiNAG	B
Denmark	Danish Road Directorate	C
England	Highways Agency	D
Belgium-Flanders	Flemish Road Administration	E
the Netherlands	Rijkswaterstaat	F
Norway	Norwegian Public Roads Administration	G

Annex H contains a tabular summary of questionnaire returns, in which the responses have been condensed to facilitate like-for-like comparison.

Annex I is a brief summary of incident management directives and guidelines for the Netherlands published by the Rijkswaterstaat.

Annex J reproduces an article on incident management from the magazine ITS International (October 2007).

5 Comparison of the roles of NRAs

There are as many responders to an incident as there are roles and responsibilities. These range from the police, who are generally, 'in charge' of the incident but who are principally concerned with criminality; the fire service, which is concerned with public safety; the ambulance service, which is concerned with the health of those involved; and the road administration, which is concerned with repairs to the infrastructure.

In the past, traffic management was generally undertaken by the police and was necessary in order to protect the scene of the incident. No organisation was responsible or was given business objectives relating to the minimisation of incident-related congestion.

The role of NRAs across Europe is changing from that of an asset manager to that of a network operator. This change broadens the scope of the NRAs and is being embraced to varying degrees from country to country. However, a common theme across the continent is that NRAs would like more involvement and hence more control over the traffic incident management process.

For example, both England and the Netherlands have introduced traffic officers on their road networks. These officers are employed directly by the road authority and allow the police authorities to concentrate their resources on dealing with law enforcement rather than traffic management.

Fig. 1: English traffic officers

In Sweden, the Swedish National Road Administration (SNRA or Vägverket) has introduced 'incident management trucks' that travel around the main road network around Stockholm. The provision of these trucks was a joint venture involving the police, the SNRA, and the City of Stockholm.

Incident management trucks are despatched by the road authority's traffic management centre and are usually the first responder at the scene of an incident. They are fitted with blue lights. The operator of the truck can administer basic first aid, extinguish small fires, and initiate traffic management.

Fig. 2: Swedish incident management trucks

In Denmark, the task of setting variable message signs and variable speed signs around Copenhagen has been transferred from the police to the Danish Road Directorate (DRD). This change in responsibilities occurred as a result of pressure on the police authorities' resources. Meetings held between the DRD and police identified that the police did not have the required resources to deal with the increased levels of traffic and the increasing technology required to manage it. In close cooperation with the police, the DRD developed specific incident management, traffic management, and communication plans.

Fig. 3: Setting signs in Denmark

In all the countries that responded to the case study questionnaire, there is a willingness to work closely with the emergency services and help facilitate changes in roles and responsibilities in order to reflect business objectives. This was achieved either by the purchase of equipment for other incident responders or by the provision of alternative resources.

It is clear from the case studies that the primary obstacle to the successful delivery of a review and change of roles is the management of the change programme and in particular the concerns of the police and emergency services regarding possible risks, and their reluctance to engage with the process. Many countries have used specific projects and events to act as a catalyst for change.

For example, the DRD drafts road management plans, which are used during major roadworks. These plans are developed specifically to help deal with traffic and emergencies during construction work. The traffic information centre is upgraded to a traffic management centre for the duration of the works. Moreover, for the duration of the works only, the DRD assumes functions that would normally be assumed by the police, e.g. the erection of speed limit signs. The transportation of abnormal loads is controlled by an annual permit system operated by the police, which requires that in general they keep to a specified road network. The haulage companies have to ensure that they can accommodate any restrictions on height or width. Information about roadworks with height or width restrictions should be available 4 weeks prior to the start of the roadworks on the web site www.trafikken.dk administered by the DRD.

6   Potential for improved effectiveness

Changing roles and responsibilities

There appears to be remarkable **similarity in the themes addressed by NRAs.** Task Group O5 (TG O5) believes that the experience of other responders in other countries should be used to pursue the general interests of NRAs. For example, a number of countries have identified through case studies that communication between incident responders is poor, leading to increased response and clearance times, wasted resources, and increased congestion. In Sweden, a system has been introduced that enables command and control information to be shared via Internet. TG O5 has identified institutional barriers between NRAs and the other responders as the key obstacle to delivering a similar system.

All agencies and responders should have **common goals** on an operational and policy level. Improved understanding and appreciation of targets could be achieved by having more broadly supported and common goals with all those involved in managing incidents.

In the future, traffic incident management could be carried out more effectively by deploying **multi-capable traffic incident responders** who are supported by secondary responders whose capabilities have also been increased, for example by training, enhanced equipment or accreditation to perform higher-level tasks. Their deployment could be based on incident, traffic, and road intelligence; they could be commanded and coordinated in a much more integrated way; and they should be resourced in such a way as to meet the 'incident need'. Despite these possible changes, there would still be an enduring need for the emergency services to attend incidents, albeit on a slightly less frequent basis.

A further example of how the role of NRAs is changing is the design and management of the **infrastructure**. TG O5 saw a number of examples of how infrastructure is being designed to make incident management easier. This activity includes a safety activity that has traditionally focused on reducing the number of people killed and seriously injured on roads but not on congestion. However, research in the Netherlands indicates that non-injury incidents account for 30% of incident-related congestion[5]. TG O5 recommends that this safety activity should be viewed more broadly and attention should be given to reducing the number of minor incidents which nevertheless contribute significantly to congestion.

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[5] Statement made by Dr W J Knibbe at the workshop in Copenhagen, 9-10 January 2007.

It is clear that the role of NRAs in incident management is evolving in response to customer demands for mobility and incident responders' increasing desire to deliver their key business objectives. This means that many NRAs are assuming **new roles** in order to reduce the severity and impact of incidents on road users.

It is recommended that a review be undertaken of the different approaches taken by NRAs focusing in particular on how the necessary skills, processes, and capabilities have been developed. There are opportunities for NRAs across Europe to share, through CEDR, experience in delivering these capabilities.

NRAs have found that the changes to roles and responsibilities can only be made in **partnership** with the police and emergency services and that management of the concerns of the police and the emergency services and the risks they foresee in transferring roles is a key challenge. CEDR should encourage partners across Europe to share their experience by including, in the first instance, the European Traffic Police Network (TISPOL) in this review.

Incident-related travel/traffic information

NRAs are playing a more proactive role in terms of ensuring that the general public is informed of problems on the road network and advised of alternative routes. The majority of nations surveyed have traffic information centres and/or traffic management centres. As well as helping to manage traffic incidents, these centres provide the public with information via Internet, television, and radio.

This information capability is recognised as the most powerful tool in reducing the impact of an incident.

It is also recognised that improved information sharing between responders can lead to improved deployment and reduce the impact and duration of incidents.

In Denmark, the DRD has provided traffic information through a number of different media for more than twenty years. It has formalised cooperation with Danish public transport operators and taken on the role of operator in terms of providing the public with information for the whole country via television and radio.

In England, a key role for the Highways Agency (HA) is to inform the travelling public of events on the network that may affect their journey. Various channels are used to disseminate information. Recently, however, the HA has undertaken a series of trials to develop their own Traffic England radio service. As a result of the trials, the HA was given ministerial approval to take forward a national digital radio station, which went live across England in June 2007.

In Belgium-Flanders, the FRA uses so-called 'calamity routes' to divert traffic off the motorway when there is an incident. Routes are signed with variable message signs and static signs, which are used to divert vehicles onto a pre-set route. These diversion routes allow the FRA to manage the traffic effectively around the incident.

The most powerful tool in minimising the impact of incidents—and the one that is in the NRAs' direct control—is the provision of fast, direct, high-quality information in a standard format that is acceptable across Europe. This enables road users to make informed decisions about their journeys and reduces the scale of the incident and the resources required to manage it. It is recommended that a 'European acceptable and standard format' should be developed to ensure that all road users can make informed decisions about journeys.

Methods of achieving continuous improvement in practices

Performance monitoring is currently the main tool used by NRAs to measure improvement in the management of incidents.

For a number of years, the Rijkswaterstaat (RWS) in the Netherlands has been collecting data from traffic officers, vehicle recovery companies, and traffic control centres mostly concerning times of arrival, clearance, and departure. The aim of this project is to monitor and organise future incident management.

The RWS has developed a **training centre** that offers training opportunities for all road responders. The centre is jointly funded by the RWS and other responders and offers real-life and simulated training exercises. These exercises allow the RWS to perfect techniques and trial new procedures.

In England, the HA holds **post-incident debriefings** several days after significant incidents to evaluate what improvements could be made in the future. The debriefings are attended by all incident responders, who are encouraged to be open and honest in their feedback regarding the incident. A national register of good practices and lessons learned is managed by the HA and the information is disseminated to all incident responders through a bulletin located on HA's website.
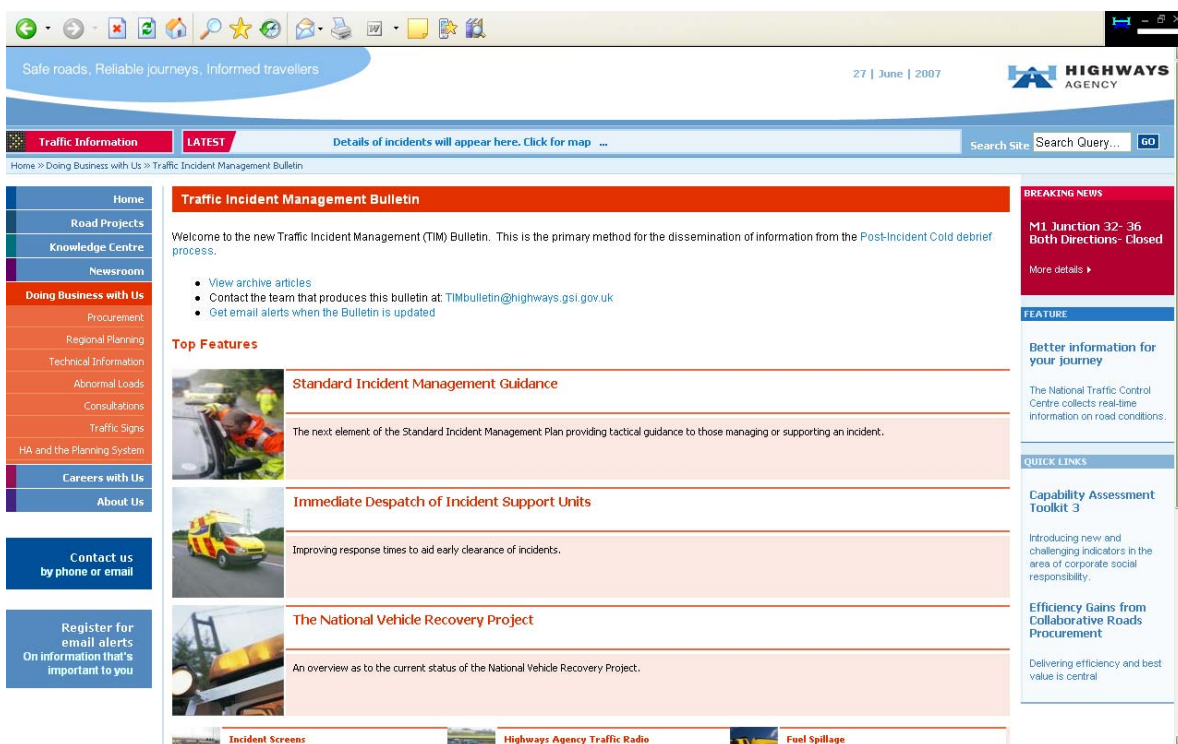

Fig. 4: The Highways Agency's online Traffic Incident Management Bulletin

Through joint training exercises and multi-agency debriefs, NRAs have realised the importance and benefits that can be gained from shared learning. This experience and knowledge can be used to help build business cases for the implementation of new procedures and support the purchase of new equipment.

There is no accepted model for valuing the cost of incidents and their impact, which explains why NRAs find it difficult to demonstrate the value of improvements to incident management practice. Therefore, it is recommended that a common method of valuing incidents and their wider impact should be determined.

As a first contribution to the above, it is recommended that NRAs should agree on the stages of an incident 'timeline' (e.g. detection, verification, response, return to normality) and the interfaces between these stages. NRAs could then be encouraged to gather comparable data on incident management performance that could also be used to drive improvements across Europe.

Major emergency management

Major emergency management is specifically included in the definition of Task 13 under Strategic Plan 2. While it was not a specific concern of Task O5 in Strategic Plan 1, it is mentioned in some responses because it was implied in question 1, part 6 of the questionnaire:

Do you have different procedures for major incidents? Do you have different command structures for them?

An emergency in this context is a one-off event whose effects (possibly indirect) are more than local and which could require not just remedial measures but positive action to keep a situation under control. This could be a flood, a major landslip, forest fire, tunnel fire, terrorist attack, or even severe weather event (although that might be so widespread as to go beyond a network management problem).

Fig. 5: VMS message on 7 July 2005 reading 'Avoid London / area closed / turn on radio'

Apart from their magnitude, the variety and unpredictability of possible emergencies that could require traffic management is much greater than that of possible carriageway incidents. Steps to improve cooperative road incident management are likely to make a positive contribution to major emergency management. Anyone seeking to define best practice for road agencies in emergency management will probably be faced by:

- a variety of definitions of the term 'emergency'

- considerable differences in what is considered a main concern by different countries

- highly variable but inevitably incomplete experience

- different definitions of the responsibilities of various agencies

It is, therefore, advisable to begin by clarifying the relationship between institutions, practices, and results in the light of case studies of actual emergencies and to take account of any literature on the subject.

7 Conclusions

TG O5 notes that the role of NRAs is evolving in response to customer demands for mobility and incident responders' increasing desire to deliver their key business objectives. Specific conclusions of the study are:

- There are opportunities for NRAs across Europe to share, through CEDR, experience in delivering these capabilities.

- NRAs have found that changes to roles and responsibilities can only be made in partnership with the police and emergency services and that the management of risks when transferring roles is a key challenge. CEDR should encourage partners across Europe to share their experience by including, in the first instance, the European Traffic Police Network (TISPOL) in this review.

- Communication between responders is considered poor, leading to increased response and clearance times, wasted resources, and increased congestion.

- The most powerful tool in minimising the impact of incidents—and the one that is in the NRAs' direct control—is the provision of fast, direct, high-quality information in a standard format that is acceptable across Europe. This enables road users to make informed decisions about their journeys and reduces the scale of the incident and the resources required to manage it.

- There is no accepted model for valuing the cost of incidents and their impact, which explains why NRAs find it difficult to demonstrate the value of improvements to incident management practice.

- There is no accepted incident model that enables incident management performance across Europe to be determined and good practice to be shared.

- Research indicates that non-injury incidents contribute substantially to incident-related congestion. Consequently, a commensurate effort should be made to deal with this kind of incident.

8   Recommendations

Recommended positions and actions

The conclusions and earlier observations lead to the following proposed positions and suggestions for actions, where 'taken forward' may in practice refer to the successor of the task named:

Recommendation 1:   **A review should be undertaken of the different approaches taken by NRAs, focusing in particular on how the necessary skills, processes, and capabilities have been developed.**

Actions:

1) This work is being taken forward by Task O1, building an understanding of the relationship between NRA partners and stakeholders in the development of the network operator role. In addition to focusing on all NRAs' approaches to managing incidents, Task O5 will support Task O1 in the delivery of the task and will review whether there is a residual activity to be completed once the initial activity is complete.

Analysis/benefits:

The role of NRAs in incident management is evolving in response to customer demands for mobility and incident responders' increasing desire to deliver their key business objectives. This means that many NRAs are assuming new roles to reduce the severity and impact of incidents on road users. There are opportunities for NRAs across Europe to share, through CEDR, experience in delivering these capabilities. NRAs have found that changes to roles and responsibilities can only be made in partnership with the police and emergency services and that the management of risks when transferring roles is a key challenge.

Recommendation 2:   **Information sharing should be investigated in order to overcome institutional barriers and make better use of technology.**

Actions:

1) CEDR should encourage partners across Europe to share their experience by including, in the first instance, the European Traffic Police Network (TISPOL) in this review.

Analysis/Benefits:

Communication between responders is considered poor, leading to increased response and clearance times, wasted resources, and increased congestion.

Recommendation 3:　　**A 'European acceptable and standard format' should be developed to ensure that all road users can make informed decisions about journeys.**

Actions:

1) This work is being taken forward by CEDR eSafety Roadmap Task O2, sub-task 1.4. Task O5 will contribute to this activity, ensuring that minimum levels of information include relevant incident-related information.

Analysis/Benefits:

The most powerful tool in minimising the impact of incidents—and the one that is in the NRAs' direct control—is the provision of fast, direct, high-quality information in a standard format that is acceptable across Europe. This enables road users to make informed decisions about their journeys and reduces the scale of the incident and the resources required to manage it.

Recommendation 4:　　**A common method of valuing incidents and their wider impact should be determined.**

Actions:

1) Await results of Task O1 business model.

Analysis/Benefits:

There is no accepted model for valuing the cost of incidents and their impact, which explains why NRAs find it difficult to demonstrate the value of improvements to incident management practice. Task O1 seeks to develop a business model for the network operator role. This will require an understanding of costs resulting from incidents. Task O5 will be in a position to develop a common method once Task O1 has defined the necessary parameters for the business model. (Proceed to Recommendation 5)

Recommendation 5:　　As an initial contribution to Recommendation 4, **NRAs should agree on the stages of an incident 'timeline' and should gather standardised data on incidents that could also be used to drive improvements across Europe.**

Actions:

1) A detailed work specification, business case, and programme will be developed.
2) The task is likely to involve:

   - a workshop to define and agree on both the various stages of an incident and the interfaces between them;
   - asking member states to provide incident data according to the agreed timeline;
   - a report that compares performance, explains differences in performance, and outlines 'good practice'.

Analysis/Benefits:

A common 'timeline' model for incidents (e.g. discovery, verification, initial response, scene management, and restoration to normality) and the interfaces between these stages, will be agreed and the sequence and timing of events detailed by each member state. This will enable incident management performance in member states to be compared and differences and good practice identified. Good practice will enable NRAs to target their development as network operators in this area. Further studies (perhaps every two years) could be implemented to identify the changes over time that could be used to demonstrate the economic benefits and also the benefits of NRA activity.

Recommendation 6: **NRAs should consider incident prevention not only from a safety but also from a congestion perspective.**

Actions:

1) A state-of-the-art assessment of NRA incident prevention activities will be conducted.

Analysis/Benefits:

Research indicates that non-injury incidents contribute substantially to incident-related congestion. Consequently, despite the fact that their profile may be low and the involvement of some emergency services reduced or absent, making a commensurate effort to deal with non-injury incidents would yield substantial benefits through reduced congestion. Furthermore, since injury cannot easily be predicted, incident prevention measures cannot easily be separated into those that improve congestion as opposed to those that improve safety.

Proposed strategy for the implementation of recommendations

The strategy below summarises the link between the recommendations and specific proposed actions to take the task forward:

Strategy 1:

Review the different approaches taken by NRAs and focus on the way the necessary skills, processes, and capabilities have been developed **by taking forward findings in Task O5 and involving more CEDR members in order to get a wider picture.**

Strategy 2:

Investigate information sharing between the intervening rescue teams **by investigating best practice among incident responders in member states.**

Strategy 3:

Define a 'European acceptable and standard format' to inform the road users about incidents/emergencies **by contributing relevant incident-related information to work taken forward by SP1 Task O2 'eSafety Roadmap'.**

Strategy 4:

Define the stages of incident/emergency timelines (e.g. detection, verification, response, return to normality) **by identifying each incident phase separately to facilitate the process and responsibility identification.**

Strategy 5:

Gather comparable data on incident and emergency management performance to be used to drive improvements across Europe **by defining and agreeing stages at workshops and by getting CEDR members to provide data and develop good practice by comparing performance.**

Strategy 6:

Promote incident/emergency prevention not only as a tool for safety but also as a tool for reducing congestion **by gathering information from NRAs on their incident prevention activities.**

Next steps for incident management

TG O5 feels strongly that it should continue work on incident management (including major emergency management). An indicative programme, based on taking forward the recommendations of this report as given by the strategy above, and a realistic view of the resources available (including consultancy support), will form the basis of work on what has now become Task 13 (incident and emergency management) of Strategic Plan 2 as announced on 7 October 2008.

The benefit of the activity could be increased significantly by greater representation of NRAs in the task group. This is why an action to involve more CEDR members is included in the strategy.

Annex A: Case study framework and questionnaire

'Each case study should answer the questions listed below. This could be achieved by either walking the group through an example of an actual incident or by providing individual examples to answer each question. Each presenting country will have approximately 1 hour and 30 minutes to present and one hour to answer questions on their case study. It is important that the representatives are familiar with the subject matter they are presenting to ensure that a full debate can take place and to allow the lessons learned from the case studies to be identified correctly.

Each country, including those that are not participating in the workshops, is asked to provide written answers to each of the listed questions. This will ensure that the final report covers a wider representation of the group members' issues and good practices.'

List of questions which the case studies should aim to answer:

1   Overview of current traffic incident management programme (what is happening now?)

- What is your agency's role in incident management?

- Do you have a formalised multi-responder group that meets to discuss policy issues? How does this team work and how often does it meet?

- Do you have transport management centres or systems to coordinate incident notifications and responses? How do they work? Are they shared with other responders?

- Do you hold multi-responder training exercises? What form do they take and what benefits have been gained from them?

- What are your key response and clearance policies and procedures? Do you have different procedures for the clearance of large vehicles?

- Do you have different procedures for major incidents? Do you have a different command structure for them?

- Do you have integrated inter-responder communications? What systems do you use? Who has access to the systems?

- What performance measures do you use? Do you have established response and clearance targets?

- Do you provide traveller information in relation to incidents and journey times? What systems do you use and how do they work? How does this differ from non-incident traveller information? How do you deal with communications to travellers in queues behind an incident?

- Do you have defined and agreed roles and responsibilities between all incident responders (similar to that demonstrated in the Dutch 'Red Book',[6] *The Roles of the Emergency Services in Incident Management in the Netherlands*)?

- How do you monitor the achievement of continuous improvement in incident management?

- What measures do you have in place to help identify trends in incident causation? What incident prevention measures have you implemented? How successful have they been? How do you measure their success/failure?

2 Overview of what your country is trying to achieve (What direction are you heading?)

- What is your strategic plan? Is it a multi-responder, multi-year plan? Do you have a shared vision?

- How do you derive the benefits?

- Do you have the appropriate budget and resources to deliver your plan? What are they?

- Do you have the relevant policies and procedures in place to deliver your plan? What are the main policy changes required?

- Do you have formal agreements in place? What barriers did/do you have to overcome?

3 The future of traffic incident management (blue sky thinking)

- What policies/procedures would you like to implement if there were no financial or procedural barriers? What are the benefits that would be gained?

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[6] See summary later in Annex H

Annex B: Case Study – Austria

1   Overview of current traffic incident management programme (what is happening now?)

- **What is your agency's role in incident management?**

  Although ASFiNAG VTG and its ITS System VMIS (Traffic Management and Information System) is not actually responsible for incident management and clearance in general, it does play a strong role in those areas where it has LCSs (Lane Control Systems, that is gantries with lane control and speed limit signs). ASFiNAG VTG is constantly expanding its LCSs and building new ones. In these areas, ASFiNAG VTG cooperates closely with all parties involved, i.e. with local maintenance agencies (within our company), the police, and the fire brigade. In these areas ASFiNAG VTG constantly monitors roads using cameras and sensors (for rain, ice, fog, etc.) and counts vehicles using detection loops. ASFiNAG VTG either reports incidents to the local authorities or vice versa, in which case, the local authorities ask ASFiNAG VTG to post information on its VMS panels. VMS are used to warn drivers of accidents or other incidents. ASFiNAG VTG also uses its Traffic Information System to inform road users of these incidents by passing information to the national broadcaster and other types of services.

- **Do you have a formalised multi-responder group that meets to discuss policy issues? How does this team work and how often does it meet?**

  Experiences are exchanged periodically. Intervals between meetings can be extended depending on when cooperation began, e.g. ASFiNAG VTG usually meets with a new LCS once a month. Once cooperation is up and running, twice a year is sufficient.

- **Do you have transport management centres or systems to coordinate incident notifications and responses? How do they work? Are they shared with other responders?**

  ASFiNAG VTG's TMC system does not at present coordinate the clearance of incidents. On the one hand, ASFiNAG VTG acts as a 'detector', using cameras and sensors for reporting. On the other hand, authorities ask ASFiNAG VTG to display information on its VMS. ASFiNAG VTG's 'physical operators' (of which there are always currently at least two, 24 hours a day), communicate by fax, e-mail or telephone. The police and local maintenance authorities have access to the TMC/TIC system. ASFiNAG VTG is currently developing an Online Tool that will provide electronic support for operator procedures (OMBS).

- **Do you hold multi-responder training exercises? What form do they take and what benefits have been gained from them?**

  Major incidents are regulated at provincial level. ASFiNAG acts at national level. The intention is to integrate ASFiNAG VTG into these procedures for major incidents. Exercises are planned, but have not yet taken place with ASFiNAG VTG's participation. ASFiNAG VTG's own operators receive a high level of training.

- **What are your key response and clearance policies and procedures? Do you have different procedures for the clearance of large vehicles?**

  A system of prioritisation has been put in place. Warnings concerning motorists driving in the wrong direction on motorways are the highest priority. The actual clearance of incidents is not the responsibility of ASFiNAG VTG.

- **Do you have different procedures for major incidents? Do you have a different command structure for them?**

  At national level, yes. At this level, the district governor declares a major incident a disaster, which changes command structure. However, this does not affect ASFiNAG VTG's role or that of its partners (i.e. the police and road maintenance authority: ASFiNAG VTG informs them, they inform ASFiNAG VTG, they ask for information to be posted on VMS).

- **Do you have integrated inter-responder communications? What systems do you use? Who has access to the systems?**

  The road maintenance authorities and police have access to ASFiNAG VTG's systems (camera and traffic information). These systems are not intended to be used for communication regarding actions and procedures.

- **What performance measures do you use? Do you have established response and clearance targets?**

  Not at present. This question applies more to the police. However, the situation will probably change for ASFiNAG VTG with the launch of its online operator support tool (OBMS).

- **Do you provide traveller information in relation to incidents and journey times? What systems do you use and how do they work? How does this differ from non-incident traveller information? How do you deal with communications to travellers in queues behind an incident?**

  ASFiNAG VTG does not yet provide information on journey times. Incidents are listed on its website, displayed on VMS, and passed on to the national broadcaster (→ RDS-TMC, spoken FM). Traffic management plans are being drafted and will soon be applied in such cases; the road user will be informed via spoken FM, RDS-TMC and VMS.

- **Do you have defined and agreed roles and responsibilities between all incident responders (similar to that demonstrated in the Dutch 'Red Book', *The Roles of the Emergency Services in Incident Management in the Netherlands*)?**

  Yes.

- **How do you monitor the achievement of continuous improvement in incident management?**

  As far as ASFiNAG VTG is concerned, the main improvement in the field of incident management has been the construction of new LCS sections all over Austria. As ASFiNAG VTG plays only a minor role in incident clearance, it has not implemented any monitoring or benchmarking system. The periodical meetings certainly provide a way of highlighting and improving identified deficiencies. In cases of imminent danger, warning road users takes precedence over informing the police. This is the case with wrong-way drivers. In all other cases (apart from reporting), ASFiNAG VTG acts according to the orders of police and road maintenance authorities.

- **What measures do you have in place to help identify trends in incident causation? What incident prevention measures have you implemented? How successful have they been? How do you measure their success/failure?**

  Trends are identified and reported by Statistics Austria. As far as road safety data is concerned, the Austrian Safety and Prevention Board (KfV) undertakes a more in-depth analysis. Incident prevention measures: LCS in general, sensors for rain (water film depth), snow, ice, fog, derived and communicated warnings. ASFiNAG VTG usually commissions experts to evaluate the benefits of any new measures. It is difficult to compare statistics in cases where periods of observation are short. The benefit/success of LCS is obvious.

2   Overview of what your country is trying to achieve (direction)

- **What is your strategic plan? Is it a multi-responder, multi-year plan? Do you have a shared vision?**

  ASFiNAG VTG's plan is to make the best possible contribution within the scope of its current role by extending LCS coverage and improving its performance, which first of all means being able in future to monitor some one thousand cameras, which inevitably means automatic incident detection.

  Problems exist regarding regulation at provincial level, whereas ASFiNAG VTG's responsibility is at national level, albeit only on motorways and expressways. This means that organisational and legislation issues are a certain barrier. However, ASFiNAG VTG is willing to adapt to changing environments. Its main focus remains the avoidance of incidents, e.g. by communicating warnings (e.g. snow, rain).

- **How do you derive the benefits?**

  As a motorway operator, ASFiNAG VTG's main interest is to provide an unobstructed road infrastructure. Avoiding incidents and clearing incidents as fast as possible is a great benefit.

- **Do you have the appropriate budget and resources to deliver your plan? What are they?**

  €350 million in total (1999–2015)

- **Do you have the relevant policies and procedures in place to deliver your plan? What are the main policy changes required?**

  Procedures and targets are outlined in the Austrian ITS master plan (issued by the ministry). Strategic targets are defined by the board for the entire corporate group. From these documents, time and cost schedules are derived for VMIS.

- **Do you have formal agreements in place? What barriers did/do you have to overcome?**

  Legislation was changed to allow us to display warnings on the road in the event of imminent danger.

3   The future of traffic incident management (blue sky thinking)

- **What policies/procedures would you like to implement if there were no financial or procedural barriers? What are the benefits that would be gained?**

  - Automation: cars that would be able to avoid becoming involved in incidents.
  - Automatic messages: messages that would include information on the exact location of the incident and would be sent automatically to an incident centre, which would then issue a warning to the affected parties (ambulance service, fire brigade, police, and road operators).
  - Minimisation of blockage time and optimisation of expected time in order to enable traffic management centres to inform road users and activate alternative routes that would be defined in advance.
  - Standardisation at European level is important for inter-TMC communication and constant online assessment of alternative routes.

Annex C: Case Study – Denmark

1   Overview of current traffic management program (happening now)

Traffic information

The Danish Road Directorate (DRD) has delivered road user information to a number of media since 1985 on the numbered road network. In recent years, the DRD has formalised cooperation with the public transport sector and assumed the role of operator for informing the entire country about road traffic and public transport directly on television and radio stations. The opening of the new Traffic Information Centre (TIC) in 2003 established that the future role of the TIC would be to coordinate all players involved in traffic information across the country.

Traffic control

The various state, municipality and police authorities have assumed extended operator responsibility across traditional boundaries in order to consider the needs of the users. Traffic control in connection with the extension of the M10 and M3 by VMS, travel time information systems, emergency telephones, and CCTV supervision are examples of how the DRD is and has been working as a traffic operator on several different levels.

Incident management

In 1998, the DRD was given responsibility for operating its own main road network. Two departments in the Maintenance Division, (Road and Traffic Information, Traffic Maintenance) and the three regional offices are now responsible for ensuring traffic flow and safety on the main road network in close cooperation with rescue services. The tasks are carried out in cooperation with private contractors.

New deployments

In connection with the extension of the M3 and the M10, new traffic management systems and roles for incident management have been set up. Although these solutions are being employed for other motorway extension works, they are not generally applicable to traffic management in Denmark. The solutions are instead examples of the direction in which traffic management is moving in Denmark. Consequently, any reference to 'motorways' in the answers that follow indicate standard solutions as they stand today, while references to the solutions on the M3 are an example of the direction in which traffic management is developing.

- **What is your agency's role in incident management?**

    On normal motorways, the DRD plays the above-mentioned role in incident management.

    The DRD informs road users about incidents; the police can ask the DRD to assist with road markings and to remove obstacles from the road.

Minor incidents involving dropped goods or stopped cars are handled directly by the TIC, with information being provided to the police.

Furthermore, in view of the fact that the DRD receives any emergency calls made from emergency telephones, it is, in such cases, the first link in the alarm chain. Specific incident management plans have been developed for the M3 and the M10. According to these plans, the role of the DRD is to:

- receive and pass on alarms;

- warn road users and regulate the traffic;

- inform the police and rescue agency about the situation on the M3;

- provide assistance with mobile road markings.

According to a prior agreement with the police, VMS are controlled by the TIC. The police have no representative in the TIC.

- **Do you have a formalised multi-responder group that meets to discuss policy issues?**

  The DRD does not have a formalised multi-responder group that meets to discuss policy issues. It does, however, have groups that meet on a case-by-case basis to discuss various subjects that could lead to all kinds of changes, e.g. incident instructions for parties concerned.

  Open-agenda cooperation meetings also take place. There are also meetings about agreements between the different parties, e.g. meetings with the Danish broadcasting corporation about the timing of information provision in the event of accidents.

- **Do you have transport management centres or systems to coordinate incident notifications and responses? How do they work? Are they shared with others?**

  The DRD has the Traffic Information Centre (TIC), whose task is to improve safety and traffic flow quality. In addition to the roadside emergency telephones on all motorways, there are two systems for coordinating incident notifications and responses:

  Trafikman is a system for the electronic dispatch of road and traffic information. Based on information from road authorities and police, the dispatch is performed manually by the TIC and distributed to all relevant media, typically radio stations, RDS-TMC and the DRD website www.trafikken.dk. The circle of users is being enlarged to include the police and municipal road administrations.

  Reporterman is used internally by the DRD to record incidents on its roads. Entries are primarily given by road reporters employed by the DRD. However, messages from others are also recorded.

Finally, calls made alerting the police and rescue services to motorway incidents from the alarm centres (telephone 112) appear on a screen in the TIC.

- **Do you hold multi-responder training exercises? What form do they take and what benefits have been gained from them?**

Multi-responder training exercises are primarily held in connection with special locations, e.g. tunnels and the M3.

As far as tunnels in Denmark are concerned, multi-responder training exercises include all relevant parties, i.e. generally

- the police
- the ambulance service
- the rescue services
- technical emergency personnel

The exercises take place every 2-5 years and focus on cases chosen by the operation and maintenance group set up for each tunnel.

The cases can be everything from small special occurrences to simulations of major fires and environmental accidents; the exercises can take place live or as 'table-top' exercises on a 'Training Board' as shown in Fig. C1.

Fig. C1: Table-top incident simulation exercise using a 'Training Board'

For the M3, the above-mentioned parties and the alarm centre for Copenhagen, the TIC, have participated in two training sessions involving theoretical cases that focus on the alarm phase, on communication, and on getting to the right location. For the M3, the exercises resulted in a better understanding of problems for the other parties and especially in a better use of the services that can be delivered by the TIC.

For the tunnels, the benefits have mostly been the training of the personal in those cases where alarm procedures and communication between different personal groups have proven very difficult. The exercises have also resulted in the improvement of different technical systems.

- **What are your key response and clearance policies and procedures? Do you have different procedures for clearance of large vehicles?**

  The DRD has three levels of clearance (A, B, and C).

  - A: Clearance vehicle in place within 30 minutes
  - B: Clearance vehicle in place within 45 minutes
  - C: Clearance after further agreement with the police

  It is standard procedure that the DRD can remove abandoned vehicles after 24 hours, sending a simultaneous message to the police when it does so.

  For other objects, agreements are made on a case-by-case basis.

  The procedure for the clearance of large vehicles is no different.

  For the police and rescue services, common instructions entitled 'Motorway accidents – Instructions for rescue personnel' have been published with effect from 15 March 2005.

- **Do you have different procedures for major incidents? Do you have different command structures for them?**

  Rescue operations in Denmark are based on the guidelines and principles of cooperation in a multidisciplinary collaboration known as 'Danish Emergency Management Agency, September 1999'.

  Depending on the magnitude of the incident, the emergency services turn out with forces of different sizes. In the DRD, there are no special procedures for major incidents other than the rules that determine who provides information about what.

  In Denmark, it is always the police who coordinate the efforts of the emergency services; they can increase the services called upon when needed. In accordance with the above-mentioned guidelines from the Danish Emergency Management Agency, the command structure can vary with the size of incident, e.g. with the establishment of a local command centre in case of major incidents or disasters.

- **Do you have integrated inter-responder communications? What systems do you use?**

  In Denmark there is only a local UHF 2 way radio system (Band 410-430 MHz), which is used by both the police and emergency services. The radios have 5 channels, each of which is dedicated to a particular party and purpose.

The system enables all parties to communicate with each other in the area around the scene of the accident. The DRD is not a party in this communication system.

- **What performance measures do you use? Do you have established response and clearance targets?**

Improvement of traffic flow quality and limits for time in queues are important issues, but there are no exact performance measures.

The response and clearance targets are listed under 'key policies and procedures' above.

The DRD polls drivers' opinions on clearance twice a year.

- **Do you provide traveller information in relation to incidents and journey times? How does this differ from non-incident traveller information? How do you deal with communications to travellers in queues behind an incident?**

Information about incidents and journey time in relation to incidents is only provided on the M3 and the M10 (the Copenhagen area).

Variable message signs (VMS) are normally used to indicate journey times to road users. However, in the event of an incident, they are used to display warnings and guidance.

The first message signs are situated before the entries to the M3 or the M10 and then every 0.5-2 km, which makes it possible to inform road users who are in or on their way to the queue. To warn drivers on their way to the M3, message signs are placed before the approaches to the motorway.

Furthermore, travellers can be reached by radio and RDS-TMC.

Finally, although journey times on motorways outside the Copenhagen area are measured, the results of these measurements are only shown on the internet.

- **Do you have defined and agreed roles and responsibilities between all incident responders (similar to that demonstrated in the Dutch 'Red Book', The Roles of *the Emergency Services in Incident Management in the Netherlands*)?**

As mentioned above, rescue operations in Denmark are based on the guidelines and principles of cooperation in a multidisciplinary collaboration known as 'Danish Emergency Management Agency, September 1999'.

- **How do you monitor the achievement of continuous improvement in incident management?**

  Major incidents are followed by a debriefing, but there are no systematic analyses of improvement in incident management.

- **What measures do you have in place to help identify trends in incident causation? What incident prevention measures have you implemented? How successful have they been? How do you measure their success/failure?**

  An accident investigation team for road accidents (HVU) was established in 2001 with the purpose of acquiring new knowledge, improving traffic safety, and preventing traffic accidents.

  Measures that are or can be implemented include:

  - information and campaigns
  - changes in road regulations
  - changes in vehicles
  - changes in the education of drivers
  - changes in legislation

  The results are evaluated on basis of national accident statistics.

2   Overview of what your country is trying to achieve (direction)

- **What is your strategic plan? Is it a multi-responder, multi-year plan? Do you have a shared vision?**

  For the present, the DRD has no aims that can be evaluated or coherent strategy for improving traffic flow quality in relation to traffic management and forward planning.

  However, the wider vision is described in Traffic Report 2004 from the Danish Ministry of Transport and DRD.

  A report entitled 'Analysis of the network operation in Denmark' outlines the aims and strategies defined by the working group and covers all players in the field of incident management. This report is not a plan but a recommendation on how to achieve the goals set up in the report.

- **How do you derive the benefits?**
  N/A

- **Do you have the appropriate budget and resources to deliver your plan? What are they?**
  N/A

- **Do you have relevant policies and procedures in place to deliver your plan? What are the main policy changes required?**
  N/A

- **Do you have formal agreements in place? What barriers did/do you have to overcome?**
  N/A

3   The future of traffic incident management (blue sky thinking)

- **What policies/procedures would you like to implement if there were no financial or procedural barriers? What are the benefits that would be gained?**

  The above-mentioned report, 'Analysis of the network operation in Denmark', outlines the aims and strategies for future development.

  The development and strengthening of the operator's role includes:

  - an intensified focus on the road network as a whole: defining overall network strategies for traffic flow quality and traffic safety in cooperation with the new municipalities;
  - an improved overview of the traffic situation and traffic flow on the network as a whole, which makes demands on the scope and quality of data;
  - improved communication with road users; coordination of information/services on a national basis;
  - extended interplay with other parties; new and adjusted ways of cooperation, i.e. with the police.

  In order to optimise the use of 'new technology', it is necessary to strengthen the role of the network operator, thus improving control of the increased traffic flow on the network.

  The following benefits are expected: improved traffic flow quality, increased safety, more information to road users, and environmental considerations.

Annex D: Case Study – England

**A report on how the Highways Agency is organised to manage incidents
and to identify best practice
29 December 2006**

Foreword

Purpose of this document

This document, together with a supporting presentation that summarises the key points in this report, provides the English Highways Agency's response to the Conference of European Directors of Roads/Conférence Européenne des Directeurs des Routes (CEDR) review, based on case studies, of how its member states deal with traffic incidents.

Specifically, CEDR Task Group O5 (TG O5) asked each member state to report on the following three questions (see also Annex A) in order to illustrate how they are organised to, firstly, manage traffic incidents and, secondly, identify best practice:

What is currently happening in each member state's traffic incident management programme?

What direction is each member state's traffic incident management programme moving in?

How does each member state consider traffic incident management will be carried out in the future?

Sources of information

The information used to compile this report has been gathered from a number of HA reports and has been supplemented with some open-source material. However, the principal source of this information was the analysis that was undertaken as part of the Highways Agency's Incident Timeline Review project.

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2.4 Policies and procedures
2.5 Agreements

3 What is the future of traffic incident management?

3.1 How incident management may be carried out in the longer term

1 Overview of the current Highways Agency traffic incident management programme

1.1 Roles in incident management

The role of the Highways Agency (HA) in incident management has changed significantly over the past five years (2003–2008). During this time, the HA has moved from being primarily an asset manager to being, in addition, the network operator of England's motorway system. The HA's three aims as a network operator are to ensure:

- safe roads
- reliable journeys
- informed travellers

The following organisations within the HA contribute to incident management:

- The Traffic Officer Service
- The National Traffic Control Centre
- The National Incident Liaison Officers
- The Highways Agency Information Line
- The HA's Service Providers

1.1.1 The Traffic Officer Service

One of the key tools in enabling the HA to execute effectively its new role as a network operator is the Traffic Officer Service (TOS). This service consists of on-road traffic officers (TOs) that patrol the network and regional control centres (RCCs) that manage traffic.

The key objectives of the TOS are to:

- reduce incident-related congestion and improve safety;
- release police from non-crime related tasks so that they can spend more time tackling crime and undertaking other core policing activities;
- develop the HA's role as a network operator.

The TOs and RCCs now play a much greater role in incident management, which centres on managing the traffic around the incident and supporting the emergency services. This has been achieved through the forging of a close working partnership between the police and the HA and by transferring certain roles and responsibilities from the police to the HA. The delivery of new roles and responsibilities for the HA is outlined in a National Guidance Framework document; this document guided the establishment and operation of the new working relationship between the police and the HA. A key challenge in this process has been to address successfully the risks associated with transferring roles.

The current roles and responsibilities, following the transfer of functions from the police to the HA, are illustrated in Fig. D1.

Fig. D1: New roles and responsibilities

In summary, the key responsibilities of the Traffic Officers are to:

Stop and direct traffic: In order to remove debris or safeguard drivers and passengers, traffic officers can stop and direct traffic and close roads.

Support the police: Traffic officers support the police in their traffic duties e.g. by applying temporary road closures at a major accident in order to allow the police to investigate the incident. The police retain responsibility for serious accidents and for enforcing road traffic offences.

Clear up incidents: Managing the safe clear-up after road traffic collisions. This involves the clearance of debris such as shredded tyres or large items of rubbish that could either damage vehicles or cause an accident (this is often carried out by incident support units).

Remove vehicles: Arranging for the removal of damaged and abandoned vehicles that could endanger or hinder road users' journeys.

Patrol: Traffic officers undertake high-visibility patrols on specific routes, looking for, or being directed to, problems such as debris in the carriageway which may cause a threat to safety or congestion.

As a general rule, the HA will lead on minor incidents including collisions without injury, debris, broken down vehicles, and incidents caused by extreme weather. The police will manage all other incidents and will also take the lead wherever suspected criminality exists or where there is a threat to public order or public safety. Where an incident is being led by the police, the HA will support the police and take on the traffic management responsibilities.

The police retain overall command of the incident but effectively all events outside any inner cordon—the area that surrounds the incident epicentre itself—are managed by the TOS. The TOS is organised into seven regions; each has been based on existing police service boundaries. Traffic in each region is managed from an RCC. Wider traffic management in the area surrounding an incident will typically be managed by operators using gantry signs, variable message signs (VMS), variable speed limits, and diversion routes.

Key facts about the TOS:

- On average, members of the TOS attend 120 incidents a day.

- There are currently more than 1,400 TOs and control room staff.

- TOs patrol approximately 3,000 km of motorway and 200 km of key trunk road. To support this patrolling, they operate out of their seven RCCs and 28 dedicated outstations.

- The TOS will cost £82 million in capital expenditure spread over the period 2003/2004–2013/2014. Using 2004/5 as the base year, the service will cost £66 million a year to run.

1.1.2   National Traffic Control Centre

In 2001 the HA entered into a public private partnership (PPP) to build and operate a National Traffic Control Centre (NTCC). The NTCC is the information hub of the HA. Staff in the NTCC constantly monitor a network of some 1,730 CCTV cameras and over 4,450 traffic sensors. They work 24 hours a day, 365 days a year. They review the road network and deliver vital information to the news media and their operational partners including the police and the TOS. They also set real time messages on the 350 large VMS that are positioned at strategic points across the network.

Fig. D2: The National Traffic Control Centre (NTCC)

During incidents, the RCC is responsible for the tactical management of traffic within its area. The NTCC seeks to manage traffic across a much wider area using strategic VMS to prevent unnecessary traffic entering the affected area.

1.1.3 National Incident Liaison Officers

An important HA resource within the NTCC is the national incident liaison officer (NILO). The role of the NILOs is to collect information from the operational staff in the RCCs, the police, NTCC, and other sources and to disseminate it to the media or other organisations outside of the immediate operational team that require it. The NILO also escalates incident information through the HA organisation as appropriate using Emergency Contact Procedures (ECP).

1.1.4 Highways Agency Information Line

Fig. D3: HA Information Line (HAIL)

A key role for the HA is to inform the travelling public of events on the network that may affect their journey.

Various channels are used to disseminate information but an important function in terms of customer service is the Highways Agency Information Line (HAIL). HAIL is the HA's telephone information service that can be used 24 hours a day throughout the year to get help and information about the network, including:

- current travel conditions along a route and the effect of any incidents
- what conditions are likely to be on a given route at specific times
- the location and progress of roadworks that might affect a journey

1.1.5 Service providers and their incident support units

The HA network is maintained through Managing Agent Contracts (MAC) or combinations of managing agents and term maintenance contractors (MA – TMC), more commonly known as 'service providers'. Service providers maintain the network to meet service level agreements. Service providers also play a key role in managing incidents on the strategic road network.

The service providers are responsible for dealing with incidents at an operational level, providing support to the HA and other responders involved in the incident, providing tactical incident management when required, and undertaking the asset maintenance or repair required as a result of incidents.

Service Providers deploy incident management teams, comprising on and off-road services that have the necessary information and equipment to provide an effective response at the incident.

Principally, incident management teams support, direct and advise incident response services.

Fig. D4: Service provider ISU

Service provider activities are a key feature of contingency plans that ensure service providers, together with the Traffic Officer Service and area performance teams, are able to make a proper response to the situation in order to support the actions and requests of the emergency services. Contingency plans have been put in place to ensure that proper interaction occurs with other organisations and ensure that nuisance to the Highways Agency's customers and major stakeholders is minimised.

Service providers operate incident support units (ISUs). The purpose of an ISU is to minimise disruption to road users by providing assistance to the Traffic Officer Service and the police and by providing a safe and timely response to incidents and clearance of the carriageway to restore normal service. While many different types of incidents occur on the strategic road network, there are a number of basic functions, defined below, which shall be carried out by an ISU at the scene of most incidents. The primary functions of ISUs are to:

- support the TOS and police with the management of incidents;
- assess the incident scene and procure the attendance of additional or specialist resources where the task is beyond the ISU's capabilities;
- be a communications link between the incident scene and the service provider's network control centre, or equivalent;
- make the incident scene safer through the application of appropriate traffic management;
- relieve congestion and remove hazards to safety by the clearance of debris from traffic lanes and hard shoulders;
- undertake repairs to the highway infrastructure which has been damaged as a result of an incident;
- take proactive measures to minimise damage to infrastructure and environment;
- detect and report incidents.

When not engaged in fulfilling the primary functions, the ISU can be employed on secondary activities as long as they do not compromise their response to incidents. Secondary activities include:

- patrolling, monitoring, and reporting on the network;
- undertaking routine maintenance;
- making safe defects to the highway infrastructure.

In addition to ISUs, service providers deploy a secondary response. The purpose of the secondary response is to provide additional services, resources, and equipment that are not provided by the ISU. This will offer increased facilities and capabilities for clearance of the carriageway to restore normal service.

Following a review, the HA is now proposing to enhance the primary and secondary response capability of service providers to improve on time taken to respond and clear the road following an incident.

1.1.6 Other responders involved in incident management

The emergency services play an essential role in incident management. The key emergency service responders are:

The English police forces

England has 40 regional police forces; the levels of roads policing varies across them. Those regions that do not contain motorways do not operate alongside TOs. The structure of regional police forces can differ; some have specialist *motorway dedicated* roads policing units and others having *designated* roads policing units that will be deployed to traffic incidents on any road within the region.

The police's five main objectives for road policing (from the ACPO Roads Policing Control Strategy) are to:

- deny criminals use of the roads by enforcing the law;

- reduce road casualties;

- tackle the threat of terrorism;

- reduce anti-social use of the roads;

- enhance public confidence and reassurance by patrolling the roads.

The fire and rescue services

The fire and rescue services in England are in a period of modernisation and regionalisation following the introduction of the Fire and Rescue Service Act 2004. This act significantly overhauls the powers and responsibilities of the fire and rescue authorities, most importantly explicitly providing a statutory footing for prevention work, and the increasingly important 'rescue' role as well as the traditional fire-fighting roles. With regard to traffic incidents, the fire and rescue services are responsible for:

- attending all incidents if and when alerted;

- extinguishing fires;

- rescue and extrication of people;

- health and safety of the public and responders at the scene;

- making hazardous materials safe so that they can be removed (the Fire and Rescue Services are not responsible for removing materials);

- protection of the environment from spillages or any environmental impact from the recovery itself (i.e. foam, contaminated water etc).

The ambulance services

The ambulance services in England are an executive part of regional National Health Service (NHS) trusts and supply accident and emergency and non-emergency transport to the public. Ambulances are typically staffed by paramedics and technicians. As a crew, the ambulance staff will:

- prioritise and assess casualties with the objective of giving them the necessary treatment as soon as possible;

- stabilize casualties, treat minor incidents and manage pain before removing them from the scene;

- administer advanced first aid.

- Clinical interventions, if necessary, can be given by paramedics, but not by technicians.

Serious casualties needing hospital treatment will be stabilised and evacuated as soon as possible, with the aim of getting them into an operating theatre within one hour of the casualty sustaining the injury; this period is referred to as the 'Golden Hour'. Additional ambulance service support includes extra ambulances, smaller response cars, 'basics' doctors (capable of trauma treatment at the scene), medical incident officers or other hospital based staff.

Vehicle recovery operators

A key function in recovering the road network following an incident is the removal of vehicles from the scene. With the exception of incidents occurring within major maintenance or highway construction projects (where the HA provides a free recovery service within the works) the HA currently has no capability to do this either in-house or via a service provider.

Existing procedures make use of contracts that the police forces hold with vehicle recovery operators (VROs) for removing vehicles using police statutory powers. The HA uses the police contracts to remove vehicles through their statutory powers, invoking them either in person or remotely.

VROs are private companies that also offer services to drivers that require their vehicles to be recovered due to a breakdown. Typically, drivers will be members of roadside assistance clubs. Operational procedures for VROs are detailed in section 1.5.

Fig. D5: Some of key responders in incident management on the strategic road network (from left to right: HA Traffic Officer, Service Provider ISU, Fire and Rescue Service, Ambulance Service, Police)

1.2 Multi-responder policies – Does the HA have a formalised multi-responder group that meets to discuss policy issues?

There are no formal multi-responder forums that cover all responder services. However, the HA does hold regular meetings with the emergency services on an individual basis.

The ACPO and HA Partnership board is the most formal of these meetings with board members from both the HA and ACPO meeting on a 3-monthly basis to discuss issues and opportunities to enhance their working partnership.

More recently, the HA has begun 3-monthly meetings with the Environment Agency to promote mutual working agreements, identify joint research requirements and enhance operational procedures. The HA has also recently begun a trial to publish a traffic incident management magazine that promotes best practice and informs all responders of key issues. Traffic incident management bulletins enhance this initiative on an ad-hoc basis.

1.3 Traffic Management Centres – Does the HA have traffic management centres or systems to coordinate incident notifications and responses?

The HA operates its seven RCCs to support TOs and to manage congestion across the network. The RCCs cover the motorways across a number of police forces and undertake the following roles:

- dispatching traffic officers to incidents;
- coordinating the responses of emergency services and other service providers;
- managing and monitoring traffic conditions, for example by using CCTV;
- providing early warning and responses to incidents;
- putting information messages on the electronic signs over the road;
- answering emergency roadside telephone calls made within their region.

The NTCC takes a more strategic approach to managing the entire motorway network in response to incidents, events, congestion, and weather issues. Other control centres that are involved in incident management include:

- Motorway Police Control Offices (PCO), Fire and Rescue Control Room (FCR);
- Ambulance Service Control Room (ASCR), Service Providers' Network Control Centres (NCC);
- Vehicle Recovery Operator control rooms.

The deployment of emergency services is based around the Police Incident Handling Centre (PIHC) that will be involved if an incident is reported by the public making an emergency '999' call. The PIHC will transfer calls to the PCO, FCR, and ASCR. Calls directed to the ASCR will be routed via a Patient Management Centre (PMC) and an Emergency Despatch Centre (EDC). Some RCCs contain a county's motorway PCO whilst others have Police Liaison Officers (PLOs) to provide the link between the two responder organisations. More recently, moves have been made to locate Service Provider liaison officers within the RCC.

Responders can be notified of incidents through several channels including:

- emergency roadside telephones (ERTs)

- public or mobile phone call to 999 (UK emergency service phone number for public safety and criminality only), 911 or 112

- responder patrols (namely the police, TO, or service provider)

- detection by CCTV or road monitoring technology

ERTs are answered by RCC operators who will log as many details as possible before transferring the incident log to other operators. Public mobile phone calls to the 999 number will be directed through the PIHC to the RCC or Police Control Office. Operators for both the HA and police will open and maintain incident logs.

Patrols will report to their relevant control office with details being shared across other responders as appropriate. The HA and police will exchange incident information in cases where involvement of the other party is required to either manage or be involved in the incident, i.e. when criminality is detected by the HA, or damage-only collisions or incidents involving debris are reported via the 999 system.

CCTV and other roadside technology are monitored by RCC operators. Incidents are rarely detected first through these systems but when they are, the operators within the RCC will respond immediately.

1.3.1 How do the traffic management centres work?

The RCCs play a vital role in incident management and are active throughout the duration of an incident. The RCC will be notified directly of incidents either by receiving ERT calls or by being alerted by TOs.

Fig. D6: Regional Control Centre (RCC)

If an incident is detected by the police or a Service Provider, the RCC will be notified by the appropriate responder's control centre. As soon as the RCC has been alerted, an HA incident log is opened and the initial details entered. These details will be verified by the first responder at the scene.

Based on the requirements of the incident, the RCC will deploy TOs and request appropriate resources from other responder organisations. The RCC will also receive requests from TOs at the scene for more resources from other responders. All incident details will be logged by the operator controlling the incident response.

The incident commander is typically located at the scene with the RCC supporting them by controlling resources and supplying them with information. Command of the incident typically remains at the scene. The RCC will act as the information hub for incidents and will disseminate information to other responders when necessary. Other responders will maintain their own logs of the incident. Details held on the HA and police logs can be exchanged because they have integrated systems.

The RCC has control of the CCTV cameras across the network. If a CCTV camera is located near the incident, the RCC operators will control it to gain a visual record of the incident and assist in controlling the resources.

Where an incident requires emergency traffic management (ETM) or temporary traffic management (TTM), the RCC, in conjunction with the service providers own network control centre, will give guidance to the TOs and ISUs on the most suitable layout.

When an incident requires traffic management on the surrounding network, the RCC will set the signs and signals to communicate relevant details to other road users. Signs and signals typically include: gantry-mounted or central reservation-based variable speed limits; small VMS giving warning messages or larger roadside VMS displaying more strategic information. The RCC for the South East Region also operates a 'controlled motorway' that sets mandatory variable speed limits. The West Midlands RCC operates active traffic management (ATM) that automatically sets lane closures and allows hard shoulder running.

As an incident progresses, the RCC will continue to set signs and signals and to liaise with the NTCC, NILO, local highway authorities, other RCCs, and other responding organisations. The RCC will also typically take on the role of arranging vehicle recovery operators (VROs) although the contracts with VROs are managed by the police.

Finally, the RCC will liaise with the scene commander at the end of the incident to agree to the road being reopened. Once agreed, the RCC will initiate the required traffic management procedure and coordinate resources on the ground to ensure the flow of traffic on the network is returned safely and quickly.

1.3.2   Are the traffic management centres shared with other responders?

The operation of the HA network, through RCCs has, to some extent, been designed to fit into the legacy operational set-up of the different police forces across England. This has resulted in different set-ups being exercised by RCCs with some housing county police force motorway control rooms and others using police liaison officers or operators to communicate with their corresponding county forces.

The different set-ups could complicate the command and control of incidents on the network but efficient communication between the HA and the police has mitigated possible risks.

The three main models that enable operational links to be maintained between the HA and the police are as follows:

Collocation Model: The Police Motorway Control Office is located in the RCC and deploys, controls, and commands police officers dealing with incidents on the motorway and communicates with the HA operators either by command and control log or directly face to face.

Police Liaison Model: The Police Motorway Control Office (PCO) located within their own Force Police Control Office with a police liaison officer (PLO) or an operator located in the RCC who will communicate, on behalf of the HA, with the other PCOs.

Remote Communications: There is no police presence in the RCC and all communication is undertaken remotely.

The extent of communication between the RCC and PCOs is outlined in Detailed Regional Operating Agreements (DROAs). The police and HA can communicate with the FRS and the AS regardless of the set-up in operation. The different set-ups of RCC across the network are shown in Table D1 (overleaf).

Service providers are also beginning to locate resources within the RCC where appropriate and where possible. Operational benefit has been demonstrated in having some form of representation from the service provider within the RCC to liaise with HA operators during incidents.

Collocation can be achieved through:

- a service provider managing resource being located in the RCC during normal hours that can move into a service provider bronze commander role during complex incidents;
- a service provider network control centre liaison officer, controlling incident support units during normal and complex conditions;
- the entire Network Control Centre being collocated within the RCC.

While some representation is of benefit, several barriers to achieving this will often prevent it from happening. The key barriers are space within the RCC, distance from the service provider area to the RCC, and cost overheads.

1.4   Multi-responder training

1.4.1   Does the HA hold multi-responder training exercises, What form do they take and what benefits have been gained from them?

The TOS is a relatively new organisation with some areas only very recently gaining full powers to patrol and operate on the network. Therefore, the HA's training team has until recently been largely focused on foundation and induction training.

This focus is now shifting to refresher training, 'up-skilling' training, and towards the development of single and multi-agency incident management training programmes.

Region	Police Forces	Primary Communication Link			
		PCO Co-located within RCC	Remote PCO with Motorway desk	Telephone/email link	RCC Police Liaison Officer/Operator
South East	Surrey				
	Kent				
	Hampshire				
	Sussex				
East	Hertfordshire				
	Essex				
	MET Police				
	Thames Valley				
	Cambridgeshire				
	Bedfordshire				
East Midlands	Derbyshire				
	Nottinghamshire				
	Leicestershire				
	Northamptonshire				
North East	West Yorkshire				
	South Yorkshire				
	North Yorkshire				
	Humberside				
	Durham				
	Northumbria				
Central Motorway Police Group (CMPG)[7]	West Midlands				
	West Mercia				
	Staffordshire				
	Warwickshire				
North West	Cheshire				
	Merseyside				
	Lancashire				
	Cumbria				
	Greater Manchester Police				
South West	Devon and Cornwall				
	Somerset				
	Gloucestershire				
	Wiltshire				

Table D1: RCC/Police set-ups (section 1.3.2 refers)

[7] The Central Motorway Police Group provides a full-regionalised policing service for the motorways of the West Midlands, West Mercia, Staffordshire, and Warwickshire force areas.

The Agency has recently procured a simulator for the conduct of command and control training; this is located at Quinton. In addition, they have a training area at Throckmorton in Worcestershire which is suitable for responders to undertake practical incident management training on.

Regarding the ongoing training of staff, the HA has recently established the following:

- a lead operations manager to act as the training coordinator in each of the seven RCC regions;

- seven trainers that will each deliver centralised training at Quinton while also having a dedicated affiliation with one of the RCCs. They will plan and deliver training for that RCC on a regional basis.

Off-network multi-responder training

The HA has begun organising large-scale multi-responder training days at locations such as the proving ground at Millbrook in Bedfordshire. These training days help traffic officers and other responders rehearse and practice their response to major incidents. This has been particularly useful for traffic officers that have not yet experienced major incidents but is also of considerable benefit to other responders who are not used to operating with the additional support afforded by traffic officers. Off-network training sessions are organised by the Traffic Learning Centre and the regional operations staff.

One example of a multi-responder training day is the major incident rehearsal that took place at Millbrook in April 2006. An accident involving two cars and a lorry was staged using previously recovered vehicles supplied by a recovery operator. Injuries and a fatality were added and traffic was driven around the test track to simulate motorway conditions. Operators and bronze commanders were designated the day before and operations managers were briefed. The exercise began with traffic officers 'detecting' the mock accident and beginning their response. Traffic officers were responsible for calling the RCC, who then alerted the emergency services involved in the training day. The fire and rescue service, ambulance service (including Air Ambulance), police, service providers, and vehicle recovery operators were all involved in the recovery of the incident.

The training day was deemed to be a success with traffic officers and control room staff successfully operating alongside the emergency services and gaining valuable experience of major incidents.

On-network multi-responder training

The HA also arranges and participates in large-scale multi-responder exercises on live lanes. The purpose of these exercises is primarily to help give responders from all organisations experience of operating on 'live' conditions but they also help operations managers and planners to identify areas for improvement and risks and issues that were not apparent in the planning phases.

Large-scale multi-responder exercises occur throughout the year. Two examples of these are:

A38 Saltash tunnel: A major emergency exercise in the A38 Saltash Tunnel was held by the HA, police, AS, FRS and local authorities, overnight on Sunday 19 November 2006.

The exercise (entitled SALTEX 06) tested responses to a collision in the tunnel involving a number of vehicles and casualties and over 200 personnel.

The Saltash tunnel has undergone significant refurbishment work to upgrade the control and communication systems and improve its visual appearance. The HA and its partners tested an emergency plan to respond effectively to a major incident in the tunnel aimed at ensuring the safety of future users. The tunnel was closed to traffic from 6 pm on the Sunday evening and re-opened before rush hour traffic the following day. Diversion routes were used to minimise disruption.

Agencies and organisations participating in the exercise included the HA, Cornwall County Council Highways and Emergency Planning teams, Cornwall Fire Brigade, Devon Fire and Rescue Service, Devon and Cornwall Police, South Western Ambulance Service, Raynet volunteers, the Tamar Bridge and Torpoint Ferry Joint Committee, the Casualties Union, and Derriford Hospital.

The exercise benefited all participants by testing the relevant procedures for major incidents in the tunnel. This has allowed everyday operation to continue with confidence in the contingency plans produced by the responding organisations. The HA benefited by the TOs gaining valuable experience of dealing with major incidents.

M25 Dartford Crossing: A full-scale, live exercise at the M25 Dartford Crossing tested the emergency response to a major incident. The exercise, involving emergency services from both Kent and Essex, the HA, and the Dartford crossing operator, Le Crossing Ltd, simulated a multiple vehicle accident and a separate road tanker spill in the Dartford Tunnels.

The exercise followed several tabletop emergency planning exercises and was designed to test the response of the emergency services to a serious incident in the tunnels. Police forces, the FRS, and the AS worked together to free the mock casualties and clear the debris from the incident.

The exercise tested procedures to ensure that in a real emergency, all the services involved would work together efficiently to safeguard the public and keep disruption to road users to a minimum.

To follow up the exercise, the HA commissioned a report to highlight what was learned and to ensure emergency procedures are improved where necessary.

The emergency services had to rescue people trapped in their cars and remove nearly 100 volunteers playing the role of evacuees from stranded vehicles. The exercise simulated two deaths and up to 30 casualties in the two accidents, all of whom were evacuated and treated swiftly and safely by the crews.

Civil Contingencies: Beyond road network-specific incident training exercises, the HA also participates in government-run training for civil contingency plans. The HA is a level 2 responder in the Civil Contingencies Act and therefore has a responsibility to rehearse plans for public disasters and emergencies. Traffic officers take part where appropriate and through training can grow their role and involvement in disaster relief.

1.5   Response and clearance policies and procedures

1.5.1   What are the HA's key response and clearance policies and procedures?

The recovery of vehicles and their loads from incident scenes is a complex issue. The HA currently has no powers—and therefore no policy—to remove a vehicle from its network. The police do have statutory powers to arrange for a vehicle to be removed and have contracts in place with VROs to undertake these removals. In most cases, however, vehicles that need to be removed from the motorway network can be recovered using a service that is requested by the vehicle's owner.

The Association of Chief Police Officers (ACPO) guidelines are that vehicles should not remain in situ on the motorway for more than two hours. The police can invoke a statutory removal of:

- abandoned vehicles;
- vehicles that are a danger to the driver or other road users;
- vehicles that are causing an obstruction.

Circumstances including a break of prohibition: a vehicle in the hard shoulder, regardless of a breakdown, is technically a break of prohibition.

If a vehicle does not meet any of the above criteria, the vehicle owner can request their own recovery service but the chosen service must attend within 30 minutes. If the owner is not a member of a recovery organisation they can arrange for recovery from a recovery organisation through the police control room operators. If the owner-requested recovery service agrees to be on scene in 30 minutes, but fails to meet the response time, the police can remove the vehicle using their own VROs.

The process for deploying a VRO will depend on the contractual arrangements that the local police force operate. The two arrangements are:

- A police recovery manager will manage a list of operators that are available to the PCO or RCC. VRO are then contacted directly by the RCC or PCO as and when needed.
- A single recovery managing agent is contracted by the police to manage the collective recovery operators in the area. The PCO or RCC will then contact the managing agent with requests to arrange recovery.

VROs managed directly by the police will be selected through a rota system or based on geographical location but the RCC or PCO are able to select the most appropriate VRO as long as the decision not to use the first on the rota or the closest to the incident can be justified, typically by a lack of capability or a lengthy deployment time.

An HA traffic officer may also make a request to the police to invoke a removal, particularly if the driver's preferred service cannot attend within 30 minutes, or if the driver will not accept the rota recovery operator and associated costs. Formally, a police officer needs to attend the scene to invoke powers, although, in some circumstances, this can be done remotely, as long as the police officer has visual contact with the scene via CCTV.

Once alerted, a police-contracted recovery operator should be on scene within 30 minutes, or 45 minutes for an LGV. Failure to do so may result in a warning being issued and then possible termination of the contract. Police forces can alter the individual contracts but this rarely happens.

A vehicle involved in a collision that results in a carriageway being blocked will be removed by police operators immediately with no owner preference. If the vehicle can be moved to the hard shoulder safely and the road reopened, the vehicle owner is able to request their own recovery. The trigger point for alerting a VRO varies nationally. In some circumstances the VRO is given an early warning of an incident which they are required to attend whilst in other instances a just-in-time approach is operated by the police. Commercial aspects can drive this choice, e.g. a VRO waiting in a holding area is unable to attend another call, losing the operator income.

Service providers are also tasked with clearing debris and removing or recovering shed loads. This is, however, a contentious issue that is under scrutiny. The definitions of debris, shed loads, removing, and recovering are unclear and often inconsistently applied. Work to clarify definitions, roles, and responsibilities is ongoing.

1.5.2 Does the HA have different procedures for the clearance of large vehicles?

The key difference between recovering small and large vehicles is the target response time of the recovery operators. The response time for VRO recovering a car or light goods vehicle (LGV) is 30 minutes, but for recovering a heavy goods vehicle (HGV) the response time is 45 minutes.

1.6 Major incidents

1.6.1 Does the HA have different procedures for major incidents?

The HA classifies 'serious incidents' using general government guidelines and more specific traffic-based definitions. The terms 'emergency', 'major incident' and 'critical incident' are used as follows:

Emergency: This is a term that has been defined by UK Government's Civil Contingencies Act 2004 and covers any challenges that present a serious threat to:

- human welfare,
- the environment,
- political, administrative, or economic welfare,
- the security of the UK.

It includes the process of restoring and rebuilding the community in the aftermath of an incident.

Major incident: Major incidents are any emergencies that require the implementation of special arrangements by one or more of the emergency services, the NHS, or the local authority for:

- the rescue and transport of a large number of casualties;
- the involvement either directly or indirectly of large numbers of people;
- the handling of a large number of enquiries likely to be generated both from the public and the news media usually to the police;
- the large-scale deployment of the combined resources of the emergency services;
- the mobilisation and organisation of the emergency services and supporting organisations, e.g. local authority, to cater for the threat of death, serious injury, or homelessness to a large number of people.

Critical incident: Critical incidents are unforeseen events that seriously impact upon the Highways Agency and its ability to deliver its aim of 'safe roads, reliable journeys, informed travellers'. Importantly, the police, other emergency services or local authorities may not regard the incident in the same light and therefore may not implement the same level of response to a critical incident as the Highways Agency.

The following are deemed to be critical incidents:

1 Multiple collisions involving fatalities, serious injuries, or vehicles disabled on a carriageway

2 Partial or full closure of motorways or trunk roads due to weather or road conditions. This will also include minor incidents occurring at differing locations aggravated by other circumstances, which taken as a whole fall into this category.

3 Collisions involving crossover of a vehicle from one carriageway to another

4 Collisions involving passenger coaches, school minibuses, trains, or public service vehicles resulting in fatalities or injuries

5 Fatal collisions involving fire

6 Serious collisions involving a vehicle carrying dangerous substances (e.g. hazardous chemicals, flammable liquids such as petrol, radioactive materials etc.)

7 Collisions on motorways or trunk roads resulting in serious/potentially serious structural damage (e.g. to a bridge) necessitating road closures

8   Fatal collisions on motorways or trunk roads where roadworks are in progress

9   Any significant event impacting partial or full closure of motorways or trunk roads due to collisions, security alerts, or criminal/terrorist acts

10   Any incident off or adjacent to the network that may meet any of the above criteria, and affects the network

11   Suicide or attempted suicide resulting on the closure of lanes or carriageways

12   Roadworks overrunning by 30 minutes or more, and likely to have an impact on the network

Essentially, procedures for managing incidents do not change due to their severity or criticality. However, the command and control of an incident will change.

1.6.1   Does the HA have a different command structure for them?

Incidents will be commanded at the lowest level where the commander has the empowerment, competencies, and resources to affect a resolution.

Levels of command in the HA reflect those of the emergency services, are designated based on the complexity of the incident and the risk to the HA, and are supported by coordinating groups and a supply and support system.

Gold (Strategic Command) can be summarised as coordinating, managing impact and collateral consequence, setting the strategy, providing resources, and agreeing the scale of events. In exceptional circumstances, one or more agencies may find it necessary to implement 'strategic level' of management. Incidents can place considerable demands on the resources of the responding organisations, with consequent disruption to day-to-day activities. Such matters require attention by senior management.

Silver (Tactical Command) can be summarised as a level that carries out the plan for resolution and delivers Gold's strategy, when established (there may be more than one 'silver', depending on the scale of the incident e.g. multiple scenes). It will involve a tactical level of command that exists to determine priority in allocating resources, to plan and coordinate when a task will be undertaken, and to obtain other resources as required. They must take appropriate risk reduction measures and give due regard to health and safety requirements.

Bronze (Operational Command) can be summarised as a level of operational deployment, reporting to 'silver' (when established) with a responsibility to carry out a particular plan or set of duties. There may be more than one 'bronze' depending on the scale of the incident (e.g. multiple scenes). This level reflects the normal day-to-day arrangements for responding to smaller scale incidents. It is the level at which the management of 'hands-on' work is undertaken at the individual site.

Strategic Coordinating Group can be summarised as an enabling group at 'Gold' command level existing in an incident in which a multi-agency commitment and response at strategic level is required to bring about an effective resolution. This group will take some time to assemble and will be involved in only the more serious incidents when a longer-term multi agency coordinated strategy is required. In accordance with nationally agreed procedures, it will normally be a police responsibility to establish and chair the Strategic Coordinating Group. The group will comprise a nominated member from each agency involved. Each person must be able to make executive decisions in respect of resources within their agency and have the authority to seek the aid of other agencies in support of their role.

Gold Coordinator can be summarised as setting strategy and coordinating resources on a national level for incidents that are cross regional or have a profound national impact. It is worth noting that the vast majority of HA incidents are managed at 'bronze' level with most regions managing less than five 'silver' incidents a year.

1.7   Inter-responder communications

1.7.1   What integrated inter-responder communication systems does the HA use?

The TOS is now equipped with the government standard emergency service radio system called 'Airwave'. Airwave is a secure digital radio network dedicated for the exclusive use of the UK's emergency and public safety services. Designed to carry voice and data communications, the system offers guaranteed levels of coverage across England, Wales, and Scotland. This means that users can stay in instant communication even in remote areas or within confined spaces of buildings and tunnels where radio coverage has often failed in the past.

Airwave is part of UK government's critical national infrastructure and is designed to continue to work even during major incidents when conventional mobile and fixed telephony networks may overload or fail.

1.7.2   Who has access to the systems?

The police are in the process of migrating all of their forces over to Airwave, allowing police and HA to communicate across a shared channel. There are plans to migrate FRS and AS to Airwave but this is not expected to be started until 2008.

The HA and police resources in each region operate on different Airwave channels, allowing them to communicate with colleagues without distracting other responders. When an incident requires a multi-agency response, shared channels can be used to allow all responders involved to communicate with each other.

Service providers and VROs are not equipped with Airwave and typically use civilian-based radio systems or mobile phones.

1.8 Performance measures

1.8.1 What performance measures does the HA use?

Journey Time Reliability Average Vehicle Delay (formerly Public Service Agreement)

In July 2005, the Department for Transport announced a new Public Service Agreement (PSA) target for journey time reliability on the strategic road network. This target will be achieved if the average delay for those vehicles in the 10% slowest journeys is lower in the target year than it was in the baseline period (August 2004–July 2005). The formal period of measurement has now expired and this delay measure is now referred to as average vehicle delay or AVD.

For the baseline year, the average delay per 10 vehicle miles for the 10% slowest journeys was 3.50 minutes. This had grown to 3.74 minutes for the period June 2005–May 2006, and exceeded 4 minutes for the period October 2006–September 2007, though it subsequently fell to a value of 3.92 minutes in March 2008 at which point, for pragmatic reasons, the baseline was reset.

All initiatives, schemes, operational changes, or major projects are now assessed, in part, against their contribution to the AVD measure.

Safety Public Service Agreement

A PSA target was also set to reduce the number of people killed or seriously injured by 40%, which has been delivered in partnership with Department for Transport's Driver and Vehicle Operator (DVO) group of agencies as well as local authorities. The HA plays a key role in delivering the department's target of improving road safety.

The HA's network of roads, motorways, dual carriageways, and single carriageway roads (both urban and rural), carries about a third of all traffic but accounts for only about an eighth of all accidents.

Casualty reduction targets have been set by the government and by 2010, compared with the 1994–1998 average, the following are expected:

- a 33% reduction in the number of killed or seriously injured (KSI) casualties;

- a 10% reduction in the rate of slight casualties; and

- a contribution to the national target of a 50% reduction in child casualties.

- Highways Agency motorways have fewer fatalities than comparable roads in Europe despite carrying more heavy traffic. The HA continues to work hard to make England's roads even safer.

1.8.2   Does the HA have established response and clearance targets?

On-road TOs have response time targets of either 15 or 25 minutes depending on the location of the incident. High-priority sections of the network will be patrolled in order to ensure a 15-minute response time, whereas lower priority sections will be patrolled to ensure a 25-minute response time.

The TOS is not a 'blue light organisation' and so can not exceed the speed limit when responding to incidents. Meeting response times, therefore, relies on staffing levels and deployment patterns. TOs are permitted to use the hard shoulder to access an incident but must not exceed 20 mph in that lane.

ISU deployment times are covered in the service provider contracts. Current response times vary between 20 minutes and 90 minutes depending on the time of day and section of the network. This response time is for the first response, which is typically a smaller vehicle with limited capacity. This will review the scene and verify what equipment is needed, ensuring the correct equipment is made available as quickly as possible.

Some response times are measured to the back of the queue, others to the incident scene itself. ISUs are not 'blue light organisations' either and cannot, therefore, exceed the speed limit. Service providers are permitted to use the hard shoulder for maintenance purposes but have to ask permission from the police to access an incident via the hard shoulder.

Service providers will typically have specialist sub-contractors that undertake work such as electrical maintenance, lighting repairs, and environmental hazard clearance. These sub-contractors will sometimes have response times in their contracts but often they will be required to attend in relatively long time scales to the back of the queue.

1.9   Traveller information

1.9.1   Does the HA provide traveller information in relation to incidents?

Information on network conditions is collected, analysed, and quality assured before being disseminated to customers through various information services. There are around 350 strategic VMS located at the key decision points on the motorway network which are set by NTCC operators and used to supply longer distance diversion advice and information during major incidents helping drivers avoid these areas (see Fig. D7). The HA is not permitted to disseminate details of the incident itself; this is the responsibility of the police. The HA's role is to disseminate traffic and travel information to the public to keep them informed and to help them make decisions about their journey.

Fig. D7: MS3 Variable Message Sign

The media are also informed of traffic conditions and roadworks information which is used as a basis for their radio and television traffic broadcasts.

From September 2004, real time traffic information (Traffic England) became available on the Traffic Information section of the HA's website (see Fig. D8). In March 2005, the information services were expanded further with the release of the easy to use automated telephone service providing up to date information on traffic conditions.
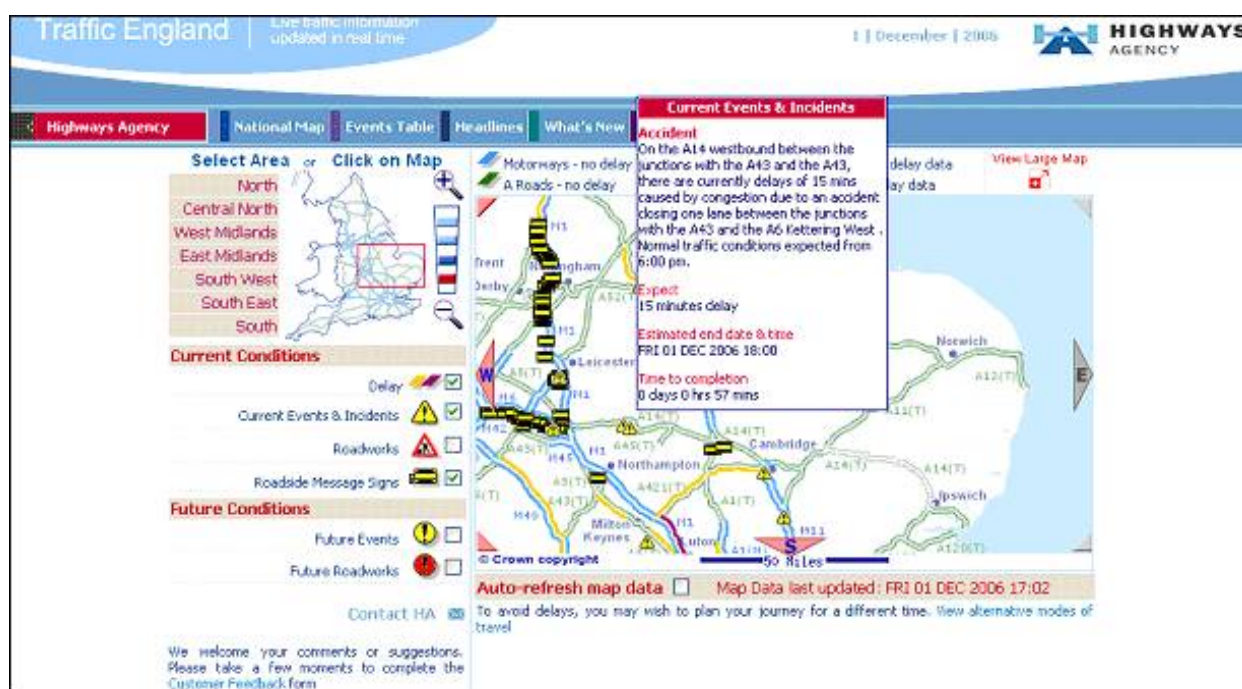

Fig. D8: Traffic England website

The NILO continuously monitors and reports all major/critical incidents on a 24/7 basis 365 days a year. The NILO provides information to radio and travel information providers and the HA's Press Office. They work closely with area teams and RCCs to ensure customers are alerted to major incidents affecting the motorway and trunk road network by updating the Traffic England website and keeping the Highways Agency Information Line (HAIL) informed throughout the life of an incident.

The HA is currently trialling an internet-based HA Radio Service. It is intended that a service on either AM, FM, and/or Digital Audio Broadcasting (DAB) will subsequently be rolled out nationally. The radio service provides a traffic and travel information service 24 hours-a-day. The service provides a combination of both national and regional information to travellers. HA Internet Radio operates out of five regional offices and aggregates information from a wide range of sources.

Traffic management signs and signals are operated from the RCC to control traffic flow in the area surrounding an incident. These are used to optimise traffic flow rather than to keep drivers informed of incidents.

The HA also has formal agreements with local and national radio stations. Traffic bulletins are broadcast every 15 minutes using information provided by a number of sources, including the HA. Most radio stations also operate 'call-ins', allowing drivers to report delays on any network. As part of the agreements, the HA displays radio frequencies on VMS to alert drivers to the most convenient channel for traffic bulletins.

1.9.2   Are journey times provided in relation to incidents?

Journey times are not displayed on standard VMS or gantry signs. The information disseminated by the HA and NTCC does not give explicit journey times. However, when road users are warned of an event, an estimated delay time is given where possible. The box entitled 'Current events and incidents' in Fig. D8 (above) shows an example of this.

The Traffic England website also forecasts traffic levels at future times and dates using historic journey times. This does not consider events and incidents in real time but is a useful indicator of recurrent congestion.

1.9.3   What systems does the HA use and how do they work?

The key tool used for real-time traffic speed and flow data are inductive loops installed as part of the Motorway Incident Detection and Automatic Signalling (MIDAS) system. MIDAS detector induction loops are placed in every lane of a motorway spaced ideally every 500m. The loop data are assembled into files which record count, speed, traffic density, and vehicle length, averaged for each minute of the day.

The HA has invested in technology solutions to give robust journey time data to complement the MIDAS loops. A key component of this is a network of measuring sites installed by Trafficmaster. Trafficmaster's real-time traffic information is derived from continuous data supplied by a network of 7,500 sensor sites that consist of:

- fixed infra-red sensors mounted on motorway over-bridges
- Passive Target Flow Measurement 'blue pole' cameras installed at the roadside on trunk roads.

Traffic information is updated on a three-minute cycle, ensuring that the end systems are always supplied with the current status on traffic conditions.

The HA is also increasingly investing in its own network of automatic number plate recognition (ANPR) cameras to supply journey times. These are used at permanent locations, most recently on the active traffic management network, and at temporary sites such as roadworks. ANPR cameras can also be used for enforcement, making them an attraction for the police as well as the road authorities.

1.9.4   How does this differ from non-incident traveller information?

Travel information is based on events that disrupt the network with either a single event or a combination of events, determining what plan of action is required. Incidents are classed as a type of event along with congestion, roadworks, adverse weather, public events etc. and as such are not treated any differently.

1.9.5   How does the HA deal with communications to travellers in queues behind an incident?

MIDAS systems sense slowing traffic and queue formation. Gantry signals are set automatically downstream of the traffic to slow drivers down and warn them of the oncoming queue. No channels of communication exist that specifically disseminate information to traffic trapped behind an incident. Gantry signs will display information but existing message sets do not contain any messages specifically for trapped traffic. Radio broadcasts are the most common source of traffic data.

The general direction of stationary traffic—i.e. if traffic is to be turned around or be relieved through a central reservation gate—is undertaken by traffic officers at the scene.

1.10   Agreed roles and responsibilities

1.10.1   Does the HA have defined and agreed roles and responsibilities between all incident responders?

Police

The principal operation of the motorway network in England is achieved through a close working partnership between the HA and the police. Closely defined roles and responsibilities are contained in the National Guidance Framework (NGF) and Detailed Regional Operational Agreements. The NGF covers all roles and responsibilities included in network operations split into three categories: control room, on-road, and central functions. Fig. D1 in section 1.1 illustrates the split of functions between the HA and police.

Fire and Rescue Services (FRS)

The HA has a Memorandum of Understanding (MoU) with the FRS that aims to:

- develop a structured working relationship in order for each organisation to understand, in more depth, the issues, which face the other;
- provide a framework to manage and resolve issues;
- develop areas of mutual interest and opportunities for joint working.

The MoU has been produced to enable the FRS and HA to develop joint working practices for the management of incidents on the trunk road network and to establish efficient communication channels. It provides a focus to establish a regular meeting cycle regime between the two organisations, with a provision for more 'ad-hoc', unscheduled meetings should any serious issues arise requiring quick resolution.

The MoU provides a framework for information sharing to be encouraged throughout both organisations to facilitate the working relationship.

Ambulance Services (AS)

The HA does not have any joint memorandum of understanding with the ambulance services beyond a broader agreement as part of the Traffic Officers Service delivery to work with and support all emergency services. The AS works more to the FRS and as such has an MoU outlining how they can operate effectively together.

Service providers

While service providers are contracted to the HA, joint operating procedures are still required to ensure a consistent level of service is achieved nationally.

These principles govern the interactions between the Traffic Officer Service and HA service providers including:

- collision management
- treatment of damaged/broken down/abandoned vehicles
- clearance of debris
- patrols
- traffic management

1.11 Continuous improvement

1.11.1 How does the HA monitor the achievement of continuous improvement in incident management?

Hot debrief

Most services responding to incidents on the network will conduct or participate in 'hot debriefs'. Hot debriefs will take place immediately after an incident that has had a degree of severity or complexity. The debrief will identify key successes and shortcomings, reasons for the successes and shortcomings, other factors that may have caused problems, and suggested improvements or actions. Hot debriefs will focus on the specific incident and rarely extend their focus beyond minor improvements at the scene.

Cold debrief

A cold debrief is a planned meeting which takes place a week to a month after an incident has occurred to review what happened during the incident. The incident responders—including the police, traffic officers, service providers, recovery contractors, area performance teams—that helped to deal with the incident are invited to attend the debrief. They are all then encouraged to share information to gain a better understanding of what did and didn't go well during the incident.

Crucially, everyone can talk freely and individuals will not be held accountable for highlighting issues of concern. The aim is to improve the understanding of a situation so that when the next incident occurs, all responders have a better grasp of what to do and how to react. The format of the meeting follows the progress of the incident from its beginning to establish and agree the sequence of events in chronological order.

During these discussions, each responder will raise any issues that arose during the course of the incident and a note will be made with the resulting actions. At the end of the debrief the actions are collated and responsibility for them is agreed.

People who are not present at the debrief may have actions that they need to complete so a register has been developed. The area performance teams manage these spreadsheets and ensure that they are kept up-to-date as issues are resolved. Any issues that can not be tackled at a local or regional level are escalated to the Traffic Operations Traffic Incident Management team.

Cold debriefs should take place after all major incidents and be considered for critical incidents, but as a rule of thumb, would normally take place in the following circumstances:

- where exceptional or significant damage has occurred to the asset;
- where road users have experienced exceptional or significant delay;
- when multiple responders or stakeholders have been involved;
- where there was, or potentially could have been, a significant environmental impact
- where there were a significant number of vehicles involved.

Tasking and coordination

The HA has developed one national and seven regional intelligence units (NIU/RIU). One aspect of the NIU and RIUs role is to use intelligence gathered from the network to better optimise tasking and coordination of traffic officers and to generally improve the overall service. Analysis is undertaken at an Area level with service provider and traffic officer teams inputting to intelligence. Regional meetings then collate data and pass recommendations for further discussion to the divisional directors.

1.12 Incident causation

1.12.2 What measures does the HA have in place to help identify trends in incident causation?

The HA has an extensive top down research and development programme that links high level objectives for improving road safety down to specific aspects of incident prevention. This programme includes work to study past incident statistics[8] and data to learn how incidents can be prevented in the future. Other intelligence on the causes of incidents comes from police data, traffic officer and service provider information, vehicle recovery feedback, and ad-hoc commissioned reviews of road safety. These aspects of research inform the wider incident prevention aspects of the programmes.

1.12.2 What incident prevention measures has the HA implemented?

The HA undertakes a wide range of incident prevention initiatives as part of a research and development programme. There are four general approaches for preventing incidents: engineering, education, encouragement, and enforcement. The research programme includes several initiatives that work towards reducing the number and severity of incidents based largely around these approaches. Examples of research and development include:

Engineering

The HA is responsible for the maintenance of the strategic road network and for setting safety standards for the maintenance of Design Build Finance and Operate[9] (DBFO) sections of the network. The HA research programme covers several aspects of road design and maintenance that can improve safety and reduce incident numbers and severity. For example, skid-resistant tarmac is being researched to reduce vehicles losing control and new designs for barriers are reducing carriageway crossovers.

Education

Research has shown that driver error is a significant factor in traffic incidents. Education campaigns aim to inform drivers of better driver practice before they begin a journey. The HA partakes in national and local driver education programmes with other government departments including the Department for Transport (DfT), Vehicle and Operator Services Agency (VOSA), local authorities, and police forces. Education campaigns include:

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[8] Killed and Seriously Injured (KSI) data is completed by police officers attending an incident scene. The data captures details of fatal incidents or incidents that result in serious injury.

[9] Design Build Finance and Operate (DBFO) schemes are long-term public private partnership contracts to build and maintain sections of the network.

- improvements to road worker safety (reduced speed through roadworks);

- helping drivers prepare for journeys (winter readiness);

- drink and drive campaigns (focused during the summer and Christmas period).

Encouragement

Encouragement is similar to education in that it involves the HA partaking in campaigns with other organisations to reduce the bad driving that leads to incidents. The main difference between encouragement and education is that, whilst education can happen before a driver begins a journey, encouragement can continue during the journey. Examples of campaigns and initiatives that aim to encourage a change in behaviour include:

- displaying safety messages on strategic VMS (Don't drink and drive);

- road markings to improve driver behaviour (close following chevrons);

- traffic officer representation at motorway service areas.

Enforcement

Several English public sector agencies that are involved in casualty reduction and road safety invest in safety cameras to reduce excessive speeds on the road networks. The HA contributes to partnerships that have been formed with local authorities and police forces to work together in order to achieve their shared aims. The HA also supports the police in enforcing against misuse of the hard shoulder, blocking incident responders, and anti-social behaviour on the road network.

1.12.3   How successful have they been?

The Killed and Seriously Injured (KSI) statistics are used by the government to measure road safety on all roads in the UK. The national road safety Public Service Agreement is contributed to by several public sector agencies and organisations, including the HA. The HA's contribution to this PSA is detailed in section 1.8.1 above.

Road safety in the UK has been a high-profile measure for a number of years. European targets for reducing fatalities and serious injuries on the roads have been taken very seriously and largely met ahead of the target date.

The HA can boast some of the safest motorways in the world. Highways Agency motorways have fewer fatalities than comparable roads in Europe despite carrying more heavy traffic but the HA continues to work hard to make the roads even safer.

2   What is the Highways Agency trying to achieve?

2.1   Strategic plan

2.1.1   What is the HA's strategic plan?

Strategic vision

The HA's[10] vision for incident management, including the services and functions provided for it by third parties is:

'To become a recognised and credible partner in incident management playing a full and effective role in delivering the high quality service expected by our customers, by providing a reliable and safe network and developing our ability to minimise the impact of incidents.'

Strategic objectives for incident management

In achieving the strategic vision, there are a number of high-level objectives for the HA:

- to establish an integrated incident management capability within the HA and its service providers with clear roles and responsibilities supported by a culture of continuous improvement;
- to engender a culture of safety of incident responders and the wider public;
- to develop the services and capabilities of the HA to deliver a reduction in incident related congestion;
- to complete the transfer of responsibilities from the police by the HA as established in the National Guidance Framework;
- to actively involve other emergency services and responders in a collaborative partnership such that the HA can take the key role of developing, negotiating, implementing, and monitoring better incident management procedures.

The 'road map' for improved incident management

The HA is still relatively new to incident management and must develop its competence and capabilities as a responder and work with other responder organisations to develop and deliver a shared vision for improved incident management and benefits for all parties. Fig. D11, shows the journey the HA will make to achieve this as a number of concurrent steps that need to be undertaken and achieved over the next three to five years.

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[10] In the HA's Traffic Incident Management Strategy, the term 'HA' refers to the HA and its service providers.

Moving from one stage to the next will be a matter of confidence of the parties involved, although it is expected that work will continue in the previous stages to maintain this confidence.
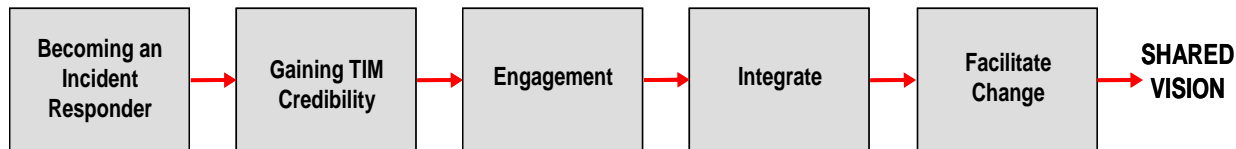
| Becoming an Incident Responder | → | Gaining TIM Credibility | → | Engagement | → | Integrate | → | Facilitate Change | → | **SHARED VISION** |

Fig. D9: Five-step strategy to improve incident management

Becoming an incident responder

The HA has a long-established role, through its service providers, in support of incident commanders, a Traffic Officer Service that is developing as an incident responder, and capabilities to provide trusted, reliable, and valued information to road users. It also has an emerging role as a category 2 responder under the Civil Contingencies Act in response to civil emergencies. To become an incident responder, the HA must integrate these services to deliver efficiently and present clear roles and responsibilities to other responder organisations. It must also complete the transfer of roles and responsibilities from the police.

Gaining TIM credibility

The credibility of the HA with other responders in traffic incident management is key to delivering longer-term change in incident management. Credibility can only be achieved over time and in its relationships at all levels, but important elements that are part of a credible incident responder include: collaboration and cooperation with other responders, delivering a learning environment, and the sharing of information and intelligence. Credibility has to be 'earned' and maintained and is vital to progressing to the next stages of the 'journey'.

Engagement, Integrate, & Facilitate Change

Full and longer-term benefits can only be achieved though working with other responders and is represented on the journey as 'engagement', 'integrate', and 'facilitate change'. The HA is already engaging, integrating and facilitating change, in building its credibility and capability, but at an operational, not at a strategic level. These stages are centred around building on these foundations to further develop and sustain strategic partnerships with other key responding organisations. It may be that the most effective means of delivering these stages will be to focus attention on a single organisation, such as the police, and complete the stage before considering relationships with other responders.

During the 'engagement' stage, the HA will seek to agree a shared vision for incident management together with strategic agreements and establish multi-agency governance arrangements for its delivery.

Building upon this, the HA will seek, during the 'integrate' stage, to clarify roles, responsibilities, accountabilities, and liabilities of responders. An important output will be agreed operational guidance for all responders.

The final 'facilitate change' stage will seek and negotiate improvement to the management of incidents between responders and deliver changes to procedures that will deliver benefits for all parties.

On-going initiatives

Supporting these stages of the strategy are a number of on-going initiatives, which are both internally and externally focused, for instance stakeholder liaison, communications and managing change to the vision and strategy to ensure that they deliver the required benefits.

Benefits

There are significant benefits to be gained by the HA as it becomes an excellent network operator from improved incident management. Reducing the frequency, severity, and clearance times of incidents will support the delivery of journey reliability and safety targets, demonstrate good value for money, and deliver good customer service. There are also a number of wider benefits to consider. For instance there are environmental benefits to be gained by reducing pollution caused by incidents.

If this strategy is to be delivered, there must also be significant benefits to other responding organisations such as improved delivery of their objectives and more efficient use of resources. These benefits must be identified and quantified at each stage of the journey.

Constraints

The HA's role as an incident manager is developing rapidly but there are constraints on how quickly this can be achieved. In the short term, the HA needs to concentrate on embedding our core functions against the immediate targets but there are organisational barriers to that, not least our ability to deliver a consistent service at all times.

There are also external barriers that should be recognised, not least the conflicting priorities and objectives of other responders. For instance, the HA is driven by the commitment to reducing incident-related congestion whereas the police is driven by their law enforcement duties and requirements to investigate incidents on behalf of the coroner. Within the confines of managing incidents, the two are not always mutually compatible. It is therefore vital that compelling benefits are identified for organisations or change will be impossible.

2.1.2 Is there a shared vision?

Beyond aiming to improve general traffic incident management, there is no current shared vision between all responders. All responders have a vision for incident management, but each vision focuses on meeting the organisational objectives of the specific responder.
A shared vision, recently proposed by the HA is:

'To work collaboratively, complimenting one another's skills and knowledge to manage, investigate and recover from incidents safely and effectively and to reduce their impact on road users. In achieving this, our primary focus is, and will always be to make the road network a safer and more reliable place to work and travel.'

2.2 Benefits

2.2.1 How does the HA derive the benefits of planned interventions?

A journey time reliability target will be achieved if the average vehicle delay (AVD)[11] on the 10% slowest journeys is lower than in the reset baseline period (April 2007−March 2008), as outlined earlier in section 1.8.1.

There are multiple sources of analysis on the causes of the 10% slowest journeys, varying from national to regional to route and link specific perspectives. A consideration of all of the reports provides a view that 48% of the delay is caused by incidents, 28% by congestion, 21% by road-works, and 3% by weather. Therefore, traffic incident management is a high profile area of work in terms of improving the AVD measure.

The benefits of all schemes and initiatives implemented are covered by standard cost/benefit ratios using the cost of congestion to the economy as the benefit metric but also by their contribution to AVD reduction.

The cost/benefit calculation uses cost values for congestion that are produced by the DfT to reflect the economic cost of all types of congestion that affect all types of vehicles and trips. The cost of the scheme includes resource and capital costs.

Calculating the AVD savings of an individual initiative, scheme, or project follows consistent formulas regardless of the type or scale of the project.

The calculation considers the following:

- road type to receive benefit
- number of events of relevant type
- proportion of these events impacted by the intervention
- total number of vehicles impacted during event
- total time saved or lost per vehicle per event
- amount of saving that falls to the current worst 10% journeys
- percentage of that saving that translates into a reduction in worst 10% delay

Benefit calculations will also consider the timescales for implementation and what proportion of benefit will be realised throughout the implementation programme.

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[11] The unit of average vehicle delay is seconds of delay per 10 miles

2.3 Budget and resource

2.3.1 Does the HA have the appropriate budget and resources to deliver the plan?

The HA will have the required budget to undertake the activities it deems beneficial and value for money. If the scale of future implementation is significantly greater than currently considered, then the development timescales will lengthen rather than scope reduce.

Traffic incident management within the HA is an emerging area and as such is still demonstrating a fundamental value for money for both the HA and other organisations. Continuing the strategic vision of establishing the Traffic Officer Service as an operational response will be resource intensive with competing demands. Compared to road building schemes, this will be low cost relying more on partnerships.

2.4 Policies and procedures

2.4.1 Does the HA have the relevant policies and procedures in place to deliver the plan?

The introduction of the Traffic Management Act (2004) enabled the HA to deploy traffic officers with the necessary powers to improve network operation. While this act has been instrumental in establishing the HA as an operational service, more is needed to fully exploit the potential opportunities.

A review of the Traffic Management Act is required to enable further change but this should be part of an ongoing process to deliver policy change to support organisational objectives.

2.5 Agreements

2.5.1 Does the HA have formal agreements in place?

The key formal agreements between the HA and emergency responders are covered in section 1.1.

In addition to the agreements with responders, the HA, as part of the Traffic Management Act, has a duty to work with other traffic managers (of local highway authorities) to enable the expeditious movement of people and goods across the road networks of England.

2.5.2 What barriers did the HA have to overcome?

Within the public sector, the introduction of the Traffic Management Act was welcomed, with road authorities and network operators needing greater powers to improve. The public response to the act was also positive due to the duty on road authority traffic managers to work together to tackle road congestion.

There was limited resistance from utility companies and private recovery operators who saw the act as a barrier to commercial operations.

For the HA in particular, the act provided the opportunity to establish a network operator role. This was one part of a considerable institutional shift that took the HA from a roads maintenance organisation to an operational network manager. The procurement and roadworks coordination methods adopted had to change but the most significant challenge was cultural. The HA underwent a considerable restructuring with focus shifting towards meeting the needs and requirements of HA customers; a concept not used previously.
The HA faced three key challenges in changing culture.

Single points of accountability: Clear accountabilities were needed between asset management and the traffic officer service for delivery of performance targets. These need to be clear and unambiguous with individuals objectives linked to delivery

Performance-driven organisation: It was necessary to ensure individual staff understood their role in achieving the HA's new performance agenda and that the area and regional teams understood the contribution they brought to achieving success operations

Integrating the service: Communication links and associated information flows between asset management and the traffic officer service had to be established; likewise interfaces between the regional teams and area teams in each region had to work.

3   What is the future of traffic incident management?

3.1   How incident management may be carried out in the longer term

3.1.1   Incident management in the future

The HA considers that incident management will be carried out differently in the longer term (i.e. 2020 and beyond). Major changes to the travelling environment will present key challenges to the HA and other emergency services but will also present important opportunities that must be understood now in order to be fully exploited.

Crucially, the amount of information available on network conditions, the surrounding environment, and specific incident details will increase considerably. This can be harnessed through changes to operational command and control and a highly integrated response team.

3.1.2   Intelligent infrastructure

Infrastructure will provide a controllable environment that senses disruption and informs responders and road users through appropriate channels while minimising the duration and impact of incidents.

The road network asset will play an increasing role in incident management, increasing the intelligence of the infrastructure. Future functions of intelligent infrastructure will be:

Monitoring and sensing: The infrastructure will continuously monitor conditions on the network for any signals that represent disruption, threats to travellers, or possible causes of incidents.

Notification: Once an incident occurs, the infrastructure will sense the occurrence and 'notify' incident responders.

Verification: Following the notification of an incident, the infrastructure will supply detailed verified information on the incident to enable a tailored response to be initiated quickly.

Access and egress: The infrastructure will offer safe but fast and unhindered access and egress to and from the incident scene.

Scene protection: The infrastructure will play an increasing role in protecting responders, casualties, and other road users from dangers posed during the management of incidents.

Traffic management: The infrastructure will assist network operators in minimizing disruption through flexible demand management, effective traffic management, and information dissemination.

3.1.3   In-vehicle technology

Vehicles will provide a safe environment for all road users and allow information to be passed between vehicles, responders, and the surrounding infrastructure. Although largely out of the HA's direct control, vehicles of the future will provide:

A safe environment: Vehicles will provide a safe environment for all road users by detecting oncoming hazards, guiding the user away from hazards, and actively reacting to prevent incidents or reduce the severity of incidents.

Information dissemination: Vehicles will enable information dissemination in order to reduce the congestion surrounding an incident, provide responding organisations with a channel to inform road users of incidents or provide faster verification data for responders.

Communication between vehicles and infrastructure: Communications between vehicles and infrastructure will increase by generating ad-hoc networks that enable information flow across the road network.

3.1.4   People, organisations, vehicles, and equipment

Responder organisations in the future will be manned by appropriately skilled, experienced, and empowered incident responders that are equipped with suitable vehicles and equipment to enable them to undertake incident management in the most effective and efficient manner.

It is considered that, in the future, the following two changes to the on-road environment will have profound impacts on the way in which responders are organised:

- road congestion will generate significantly heightened social and economic sensitivity;

- the technology systems deployed on the road network and the increased intelligence of its infrastructure will radically enhance the situational awareness that network operators will possess.

It is assessed that these changes could elevate on-road incidents to the status of special cases. This, in turn, is likely to generate the conditions in which substantial changes to the way in which incident responders are organised could be introduced.

Specifically, incident management is likely to be carried out more effectively through the deployment of multi-capable traffic incident responders that are supported by more capable secondary responders. Their deployment will be based on incident, traffic, and roads intelligence; they will be commanded and coordinated in a much more integrated way, and they will be resourced in such a way as to meet the 'incident need'. Despite these possible changes, there will be an enduring need for the emergency services to attend incidents, albeit that this is likely to be on a slightly less frequent basis.

3.1.5   Command, control, scheduling, and despatch systems

Command and control functions within all responders will ensure a consistent approach to planning, deployment, and decision making, thereby enabling a fast, effective response.

To optimise the positioning of the correct level of incident management capability on the basis of intelligence, scheduling and despatch systems will manage resources to meet the prevailing and future requirements of incidents.

Future functions of command, control, scheduling, and despatch systems will include:

- *Strategic and tactical planning,* including contingency planning, equipment control, and resource allocation.

- *Optimized pre-incident positioning of resources and equipment* based on intelligence that predicts the location, type, and severity of incidents.

- *A shared awareness* of each responder resource's level of preparedness, location, and existing and future commitments.

- *Appropriate and targeted deployment of resources,* giving an optimised response of the most capable resource but also reducing the risk of over deployment.

- *Joint decision making* between all incident commanders in support of all common and organisational specific objectives, giving a consistent approach to incidents.

- *Effective communications and information exchange* through open and secure communication channels.

APPENDIX A: Details of the chosen case study

The way in which the Highways Agency seeks to ensure the optimal use of its network capacity through the most effective, efficient, and safe clearance of traffic incidents is illustrated by the incident described below. This incident formed the basis of the case study that was presented to the Task Group O5 on 9/10 January 2007 by the HA representatives.

Safe roads, Reliable journeys, Informed travellers	**INCIDENT DETAILS:** Date: 3 November 2005 Location: Southbound carriageway of the M5 between Junctions 1 and 2 Type: Fatal RTC that also caused damage to the central reservation HA Region: West Midlands

Overview of the incident:

At approximately 02:12 on Thursday 3 November 2005 a fatal RTC occurred on the elevated section of the southbound M5 between Junctions 1 and 2. The incident required the Southbound carriageway to be closed for hours. Because the vehicle collided with the central reservation Lane 3 of the northbound carriageway also had to be closed for a period. The incident involved the Central Motorway Police Group (CMPG), the Ambulance and Fire and Rescue services, On Road Traffic Officers, HA Service Providers and the Recovery Agents.

Junction 1

Junction 2

Road conditions::

- Sunrise: 07:55
- Sunset: 17:33
- Road conditions: wet
- Temperature: N/K
- Weather: wet and windy

Incident timings:

- Length of time that the carriageway was either blocked or closed: 4¾ hours
- Total duration of the incident: 5 hours

Incident involved:	Injuries/ fatalities		Weather/road cond		Fire		Dangerous Subst (incl oil/fuel)		Infrastructure		Debris/ shed load	

Details of the incident

The following activities were extracted from Highways Agency and police command and control logs of the incident:
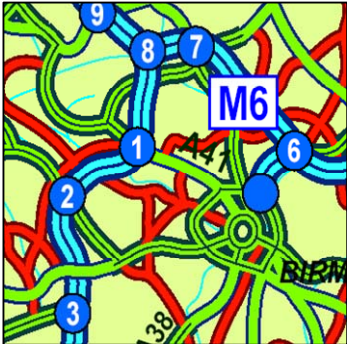
Safe roads, Reliable journeys, Informed travellers — HIGHWAYS AGENCY

INCIDENT DETAILS:
Date: 3 November 2005
Location: Southbound carriageway of the M5 between Junctions 1 and 2
Type: Fatal RTC that also caused damage to the central reservation
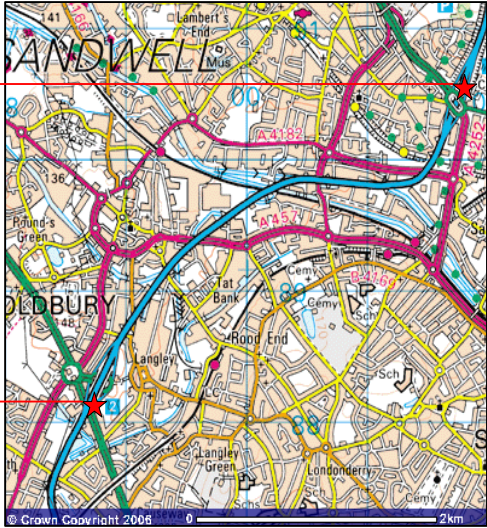HA Region: West Midlands

Serial	Time	On-scene activity	Road state - M5								Junct 1 S'bd
			M5 Northbound				M5 Southbound				
			H/S	1	2	3	3	2	1	H/S	On slip
1	Prior to 02:12	Incident occurs	Open	Open	Open	Open	Open	Open	Open	Open	Open
2	02:12	CPMG inform W Mids RCC of the RTC on the elevated Southbound section of the M5 between Junctions 1 and 2. People are reported as being trapped in the vehicle and it is believed that it could be fatal.	Open	Open	Open	Open	Blocked	Blocked	Open	Open	Open
3	02:12	Traffic Officer WM51 is despatched to the incident.	Open	Open	Open	Open	Blocked	Blocked	Open	Open	Open
4	02:13	CCTV at the scene shows that an ambulance is at the scene.	Open	Open	Open	Open	Blocked	Blocked	Open	Open	Open
5	02:14	Traffic Officer WM55 is despatched to the incident and move to a holding position at Junction 1.	Open	Open	Open	Open	Blocked	Blocked	Open	Open	Open
6	02:14	The RCC set signs to warn drivers that Lane 3 in both directions are closed and impose a speed restriction on the southbound carriageway.	Open	Open	Open	Closed	Closed	Blocked	Open	Open	Open
7	02:15	WM59 (TO Supervisor) deploys to the scene.	Open	Open	Open	Closed	Closed	Blocked	Open	Open	Open
8	02:15	CCTV shows that "a paramedic is standing in lane 1 waving traffic across".	Open	Open	Open	Closed	Closed	Blocked	Blocked	Open	Open
9	02:17	The RCC ask Amey Mouchel (the Area 9 MAC) to send an ISU to close Junction 1 and to divert traffic off [the southbound carriageway] at that junction.	Open	Open	Open	Closed	Closed	Blocked	Blocked	Open	Open
10	02:18	CCTV indicates that FRS and Ambulance are on attendance in Lanes 1 and 2.	Open	Open	Open	Closed	Closed	Blocked	Blocked	Open	Open
11	02:19	WM51 is advised to make their way to the scene. WM55 (at J1) is advised that all traffic needs to be stopped at that junction and that they should not be allowed to access the motorway at that junction.	Open	Open	Open	Closed	Closed	Blocked	Blocked	Open	Open
12	02:22	WM51 arrives at the scene.	Open	Open	Open	Closed	Closed	Blocked	Blocked	Open	Closed
13	02:23	Signs have been set to indicate a total closure of the southbound carriageway at Junction 1.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
14	02:24	The On-Slip has been closed at Junction 1. The RCC updates the NILO on the incident.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
15	02:25	Having been requested to do so by CMPG, WM51 is holding traffic on the carriageway prior to the scene.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
16	02:30	WM59 (TO Supervisor) arrives at the scene.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
17	02:32	WM51 (holding traffic prior to the scene) reports that a HGV with a draw bar is in the trapped traffic and assesses that it will "be almost impossible to turn if a reverse flow is required". They comment that, if this is needed, it will have to be left on the hard	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
18	02:33	WM55 is tasked to move to J1 to assist the ISU with diverting traffic off the carriageway. WM55 arrive at 02:34.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
19	02:36	WM51 asks the RCC to liaise with CMPG about the possible need to conduct a reverse flow in order to remove trapped traffic at the scene. CPMG reply (at 02:38) that this isn't needed at the moment because the traffic isn't that bad.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
20	02:44	RCC have spoken to MAC. They have closed the on-slip at J1 and do not need HA assistance. The MAC ask if a Chapter 8 closure is required on lane 3 of the northbound M5. CMPG confirm that it is.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
21	02:48	CMPG confirm that it is a fatal incident.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
22	02:52	WM59 (TO Supervisor) informs the RCC that they will be carrying out a reverse flow and that the MAC (Amey) should be informed.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
23	02:55	It is confirmed that strategic VMS have been set to inform drivers of the southbound closure.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
24	03:03	CCTV shows that the reverse flow is in progress.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
25	03:08	WM51 reports that all vehicles are being convoyed off at J1. They have been asked by CMPG to move to the northbound carriageway to relieve one of their callsigns.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
26	03:09	CMPG inform the RCC that the accident investigator (AI) will be on the scene very shortly and will probably take at least 1 hour. SOCO Is not yet on the scene.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
27	03:12	WM55 (at J1) reports that all [trapped] traffic has been successfully taken off the motorway.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
28	03:16	WM51 is now on the northbound carriageway and is enforcing a Lane 3 closure there.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
29	03:36	The ISU are hardconing the Lane 3 closure on the Northbound carriageway.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
30	03:37	WM55 confirm that the ISU have coned out the on slip closure at J1 - believed to have been done some time previously.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
31	03:38	With hard coning in place, WM51 and 55 leave the scene.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
32	04:22	WM59 confirms that the incident will be ongoing for at least another 2 hours because the driver's body is still trapped under the vehicle. FRS have been recalled to the scene to assist in the freeing of the body.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
33	04:47	Sandwell council are informed of the closure and its potential impact.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed

Safe roads, Reliable journeys, Informed travellers
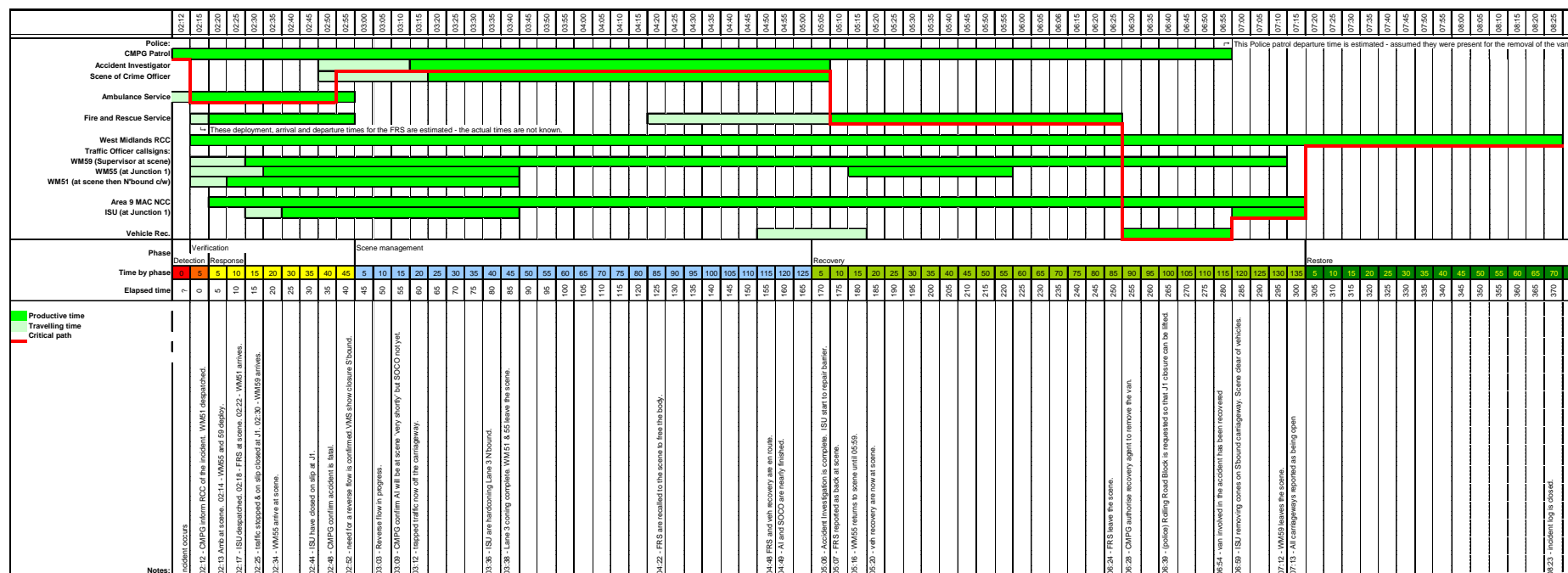
HIGHWAYS AGENCY

INCIDENT DETAILS:
Date: 3 November 2005
Location: Southbound carriageway of the M5 between Junctions 1 and 2
Type: Fatal RTC that also caused damage to the central reservation
HA Region: West Midlands

Serial	Time	On-scene activity	Road state - M5								Junct 1 S'bd
			M5 Northbound				M5 Southbound				
			H/S	1	2	3	3	2	1	H/S	On slip
34	04:48	FRS and vehicle recovery are en route to the scene. May be approx 1 hour until carriageway is reopenned.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
35	04:49	AI and SOCO are nearly finished at the scene.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
36	05:06	WM59 reports that the accident investigation is complete and that the ISU are now repairing the damaged barrier.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
37	05:07	FRS are now back on the scene.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
38	05:16	WM55 returns to the scene and stays in attendance until 05:59.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
39	05:20	Vehicle recovery are now at the scene.	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
40	05:31	FRS are just beginning to lift the vehicle so that the body can be removed	Open	Open	Open	Closed	Closed	Closed	Closed	Closed	Closed
41	06:23	WM59 requests that signals informing drivers of the lane 3 closure on the northbound carriageway can now be lifted.	Open	Open	Open	Open	Closed	Closed	Closed	Closed	Closed
42	06:24	FRS have now departed the scene. The Press Officer is updated so that they can field calls from the Press. The NILO is informed that the Lane 3 closure has been lifted.	Open	Open	Open	Open	Closed	Closed	Closed	Closed	Closed
43	06:28	CMPG confirm that the Recovery Agent can now recover the van.	Open	Open	Open	Open	Closed	Closed	Closed	Closed	Closed
44	06:39	A rolling road block is requested so that the ISU can lift the J1 closure.	Open	Open	Open	Open	Closed	Closed	Closed	Closed	Closed
45	06:54	WM59 confirms that the vehicle involved in the RTC has now been recovered and that the scene is now clear of vehicles.	Open	Open	Open	Open	Closed	Closed	Closed	Closed	Closed
46	06:59	CCTV indicates that as the ISU are removing cones from the southbound closure, cars are already committing through mandatory red crosses.	Open	Open	Open	Open	Closed	Closed	Closed	Closed	Closed
47	07:01	Southbound closure signals are removed from the main carriageway. The on (K) slip remains closed. Closure signs for this are removed at 07:02.	Open	Open	Open	Open	Open	Open	Open	Open	Closed
48	07:06	After a few problems getting through on the mobile phone to ISU control room, the ISU confirm that they no longer need the rolling road block.	Open	Open	Open	Open	Open	Open	Open	Open	Open
49	07:12	WM59 leaves the scene.	Open	Open	Open	Open	Open	Open	Open	Open	Open
50	07:13	RCC inform the NILO that all carriageways are now open.	Open	Open	Open	Open	Open	Open	Open	Open	Open
51	08:23	The incident is closed on the HA log.	Open	Open	Open	Open	Open	Open	Open	Open	Open

A depiction of a notional 'critical path' through the incident

In order to understand which responders played vital roles in the incident during each of its different phases, analysis was undertaken to identify the notional 'critical path' that ran through the incident's activities.

This critical path, which has its origins in the project management discipline, is depicted by the red line in the horizontal timeline below. Where an activity lay on this critical path, this task was deemed to be critical. As such, other tasks that were dependent upon them could not progress until this task had been successfully completed.

APPENDIX B: The top ten incident prevention measures to be undertaken by the Highways Agency

Recent studies conducted by the HA that have sought to identify ways in which the clearance of traffic incidents can be optimised have identified the following ten measures (listed in priority order with the highest priority measure first) as those that they seek to address:

1   Strategic preparation

The HA believes that the following 'strategic preparation' requires to be undertaken in order to support effective incident management:

- the current lack of CCTV across the network should be addressed;
- the lack of information dissemination systems (currently VMS) across the network should be addressed, the number of turnaround points available for releasing trapped traffic in key parts of the network should be increased;
- the number of agreed and viable diversion routes should be increased;
- the knowledge and understanding of other responders' objectives, priorities, and capabilities should be increased;
- best practice should be shared more effectively among responders;
- it should be possible to provide adequate lighting—from a variety of potential sources—at incident scenes.

2   Command, control, and coordination

The HA believes that measures to make command, control, and coordination more effective must be introduced:

- a standard command structure should be adopted across the HA;
- a clearer interface between command structures across all agencies should be introduced;
- commanders should be enabled to formulate and communicate an effective, informed, and forward looking plan;
- a clear means of identifying scene commanders should be adopted.

3   Sharing of operational information

The HA seeks to introduce measures that will enable operational information to be shared more effectively, principally in the following ways:

- the introduction of an improved capability to communicate information to the public;
- more effective communications with supporting organisations;
- technology should be introduced to adequately communicate information, decisions and plans at the scene;
- clearer, more accurate, more timely information should be provided to supporting responders before they arrive at the scene.

The communication of timely traffic information from the scene to the RCC/PCO and NTCC should not be neglected.

4 Greater standardisation

There is an aspiration amongst the responder community to achieve greater standardisation of the following:

- common terminology;
- service providers' response times;
- specialist responders' response times or standard tasking procedures;
- consistent ways of working and procedures within and between responders ;
- treatment of loads in recovery contracts.

5 Organisational structure and culture

The HA seeks to implement the following measures to address structural and cultural issues:

- traffic officers should operate on selected all-purpose trunk roads (APTRs);
- the degree of integration of VROs into the wider incident management team should be increased;
- the small number of misalignments of operational boundaries that complicate incident response should be addressed.

6 Capability and powers

The HA seeks to address the following issues relating to capabilities and powers:

- an owner's request for recovery of vehicles and loads should be consistently understood and applied;
- consideration should be given to providing traffic officers with the power to invoke statutory removals;
- it should be easier to make early, reliable predictions of the duration of an incident and the congestion it will cause.

7 Access

The HA wishes to overcome the following problems with responder access to the incident scene:

- ensure effective and timely access to an incident through traffic;
- secondary responders should be able to gain early access to a scene while it is being investigated;
- marshalling areas should be used more widely.

8   Public behaviour

The public's behaviour requires to be influenced in the following regards:

- the public should pull over for blue or amber lights;
- the public should not use the hard shoulder inappropriately thereby causing blockages;
- travellers should be encouraged proactively to use media solutions to plan their journeys;
- motorists should be better prepared for eventualities caused by incidents;
- the public should be enabled to tell better where they are on the network.

9   Resource constraints

The HA seeks to address resource constraints in the following areas:

- VRO resourcing, which is currently being adversely affected by potential problems of profitability and lack of recruits in the industry;
- refinement of the initial (provisional) traffic officer resource allocation is required;
- pressure on traffic policing resources.

10   Equipment

The HA seeks to improve what is currently perceived as being a poor understanding among all responders of the equipment that other responders have available.

APPENDIX C: A Glossary of Terms

The following terms and abbreviations have been used in this document:

Acronym	Term	Explanation
AT	area team	Responsible for the continuous performance of the network assets and the area service providers
ACPO	Association of Chief Police Officers	Leads and coordinates the direction and development of the police service in England, Wales, and Northern Ireland. Can also coordinate the strategic policing response during national crisis
AS	ambulance service(s)	Including ambulance crews, BASICS doctors, and hospital resource
ASCR	Ambulance service control room	Control room for ambulance services
APTR	all-purpose trunk roads	Non-motorway trunk roads that make up the strategic road network
ANPR	automatic number plate recognition	Roadside and vehicle-based cameras used by police and HA that read vehicle number plates.
AVD	annual vehicle delay	Metric of congestion and journey time delay
CFOA	Chief Fire Officers' Association	Official organisation for principal fire officers in the UK
CCTV	closed circuit television	Camera system used by the HA to monitor traffic conditions across the network
DAB	digital audio broadcast	Digital based radio broadcast
DROA	Detailed Regional Operating Agreement	Document outlining regional operating procedures between the HA and police
ECP	emergency contact procedures	Procedures used by the NILO to escalate incident information to senior management
EDC	Emergency Despatch Centre	Resource that deploys ambulance services
ERT	emergency roadside telephone	Roadside telephone system that automatically connects to dedicated operators in the RCC

ETM	emergency traffic manage-ment	Scene protection deployed by traffic officers for short duration incidents
FCR	Fire Control Room	The Fire Control Room refers to the control office responsible for the control and command of regional fire and rescue services
FRS	fire and rescue service(s)	Body responsible for tackling fires and rescuing casualties
HA	Highways Agency	Executive agency of the Department for Transport, responsible for the maintenance and operation of the English strategic road network
HAIL	Highways Agency Information Line	Telephone information service operated by the HA
HAZMAT	hazardous materials	Classification used by emergency services to describe any hazardous substance or materials
HAZCHEM	HAZCHEM Codes	National emergency action codes designed to assist the emergency services in the first few minutes of dealing with a hazardous goods distribution incident
HGV	heavy goods vehicle	Vehicles with a maximum allowed mass of 3.5 tonnes
ISU	Incident Support Unit	Resource supplied and managed by service providers to support HA and emergency services during incidents
LHA	local highway authority	Operator of the surrounding urban and interurban networks not managed by the HA
LGV	light goods vehicle	Goods vehicle with a maximum allowed mass under 3.5 tonnes
MAC	Managing Agent Contract	Type of maintenance contract with the HA
MA-TMC	Managing Agent – Term Mainten-ance Contract	Type of maintenance contract with the HA
MIDAS	motorway incident detections and automated signalling	Control room and road technology used to measure flow on the road and set warning and restrictions signals

MoU	memorandum of understand-ing	Legal document describing a bilateral agreement between parties
NILO	national incident liaison officer	NILOs ensure all incident information collected from responders is consistent and available to all other relevant responders. The NILO is also responsible for escalating incident details to HA senior management and ministers.
NTCC	National Traffic Control Centre	The NTCC delivers information to the media for onward broadcast and sets electronic road signs for strategic purposes (warning road users on unaffected parts of the network of incidents elsewhere, and advising of alternative routes).
NIU	National Intelligence Unit	Department of the HA that uses data to inform operations
NCC	Network Control Centre	Control Centre for maintenance agents
NGF	Network Guidance Framework	Document detailing operating roles and responsibilities between the HA and police
PMC	Patient Management Centre	Resource that decides best course of action for the sick
PCO	Police Control Office (Motorway Control Room, Force Command Room, etc.)	Each police force has a different model for the command and control of its resources and may use different terminology to describe its control room resource. This model uses the term Police Control Office to describe the police command and control capability for motorway policing. This may be located in the RCC or may be a remote PCO within a more general PCO.
PIHC	Police Incident Handling Centre	Centre that receives 999 calls and dispatches to the relevant emergency services control room
PLO	police liaison officer	A PLO may operate from a RCC and act as the communication link to remote PCOs. They will not control or command police resources but will qualify and communicate requests from the RCC.
PPP	public private partnership	Government service or private business venture funded and operated through a partnership of government and one or more private sector companies
RCC	Regional Control Centre	The RCC is the Highways Agency control room for the network and is operated by the Traffic Officer Service. The RCC manages HA-led incidents and will help facilitate police-led incidents. Some RCC are collocated with Police Control Offices for certain police forces, more detail on this can be found in section 1.7.

RIU	Regional Intelligence Unit	Regional department of the HA working towards objectives set by the NIU
SIO	senior investigating officer	Police term for officer commanding an investigation at an incident scene
SOOC	senior officer on call	HA resource at deputy director/director level who is on call to be alerted of critical incidents during non-office working hours
SP and ISU	service provider, and incident support unit	Each asset region outsources the maintenance of the network to a service provider. These can be managing agent contractors, or term maintenance contractors. The network can also be maintained under a DBFO initiative. This is included under 'service provider' in this model. Service providers deploy support units to help manage incidents and recover the network. In the model, this support is referred to as incident support units (ISU), regardless of contract type.
TTM	temporary traffic management	Scene protection deployed by traffic officers for long duration incidents
TO	traffic officer	Traffic officers are the HA on-road resource
VMS	variable message sign	Electronic roadside sign capable of displaying varying messages
VRG	vehicle recovery garage	Depot and control room of vehicle recovery operators
VRO	vehicle recovery operator	Police-contracted vehicle recovery operator
WLO	witness liaison officer	Police officer trained in handling witnesses

Annex E: Case Study – Belgium-Flanders

1   Overview of current traffic incident management programme (happening now)

- **What is your agency's role in incident management?**

    The Flemish Road Administration has no active role in incident management in the field (i.e. it has no 'traffic officers'). Traffic is regulated by the police (federal police on motorways, local police on all other roads). Both in normal operations and in the event of incidents, traffic is managed by the Traffic Centre (TIC-TCC Flanders). The federal motorway police is integrated into this traffic centre (with 24/7 presence of a liaison police officer).

    All traffic data (induction loops, CCTV, aid) as well as the incident information from the police, are collected and distributed (traffic information distribution and traffic management, (VMS, lane control,) as a collaboration between road authority and police) in the Traffic Centre.

    The Flemish Road Administration has some specific incident-related management tools:

    i.   FAST
    ii.   'calamity' roads
    iii.   toll-free use of a toll-tunnel (Liefkenshoektunnel)

    Incident management focuses on regional traffic management (re-routing, diversion routes), rather than actual on-the-spot traffic management.

- **Do you have a formalised multi-responder group that meets to discuss policy issues? How does this team work and how often does it meet?**

    Not with regard to traffic management at incidents.

- **Do you have transport management centres or systems to coordinate incident notifications and responses? How do they work? Are they shared with other responders?**

    Yes, the Traffic Centre Flanders (see above). Communication between the field and the traffic centre is assured by the liaison police officer.

- **Do you hold multi-responder training exercises? What form do they take and what benefits have been gained from them?**

    There are multi-responder training exercises, but the focus is on the incident itself rather than on the (management of) the traffic situation.

- **What are your key response and clearance policies and procedures? Do you have different procedures for the clearance of large vehicles?**

  The Flemish Road Administration has contracts with private recovery companies (FAST contracts). The motorway network is divided into sectors. For each sector, there is a recovery company that can be ordered by the police to clear the road within a pre-defined period of time. For large vehicles ($\geq$3.5 t), the network is similarly divided into larger sectors with recovery companies.

- **Do you have different procedures for major incidents? Do you have a different command structure for them?**

  There is a classification of incidents in terms of seriousness of the incident itself (calamities):

  i.   phase I: commander fire department in command
  ii. phase II: mayor in command
  iii. phase III: governor of the province

  This command structure does not interfere with the way recovery is executed (after the vehicle is released).

- **Do you have integrated inter-responder communications? What systems do you use? Who has access to the systems?**

  Yes, a digital radio platform called 'ASTRID' for police and emergency services.

- **What performance measures do you use? Do you have established response and clearance targets?**

  Only for road clearance by the FAST contractor.

- **Do you provide traveller information in relation to incidents and journey times? What systems do you use and how do they work? How does this differ from non-incident traveller information? How do you deal with communications to travellers in queues behind an incident?**

  Basically, the Flemish Road Administration does not differentiate between 'incident' and 'non-incident' traveller information. Information is gained by detection, i.e. by equipment (induction loops, CCTV, AID) and police-information (liaison officer) in the Traffic Centre, which is then distributed to broadcasters, websites, VMS, RDS-TMC.

- **Do you have defined and agreed roles and responsibilities between all incident responders (similar to that demonstrated in the Dutch 'Red Book', *The Roles of the Emergency Services in Incident Management in the Netherlands*)?**

  Not at present. The Flemish Road Administration adopts a more informal collaborative approach.

- **How do you monitor the achievement of continuous improvement in incident management?**

- **What measures do you have in place to help identify trends in incident causation? What incident prevention measures have you implemented? How successful have they been? How do you measure their success/failure?**

  Lane-control signs that gradually lower the maximum speed limit towards an incident/roadworks/queue tail; VMS warnings for incidents/roadworks/queue tails.

2   Overview of what your country is trying to achieve (direction)

- **What is your strategic plan? Is it a multi-responder, multi-year plan? Do you have a shared vision?**

  At the moment, the Flemish Road Administration does not have an overall strategic plan. Instead it seeks to improve incident management by using a pragmatic step-by-step approach.

- **How do you derive the benefits?**
- **Do you have the appropriate budget and resources to deliver your plan? What are they?**
- **Do you have the relevant policies and procedures in place to deliver your plan? What are the main policy changes required?**

  In view of the political and institutional structure of Belgium, there is no evident general policy. Powers and responsibilities for the different fields involved lie at different levels (federal/regional) with no hierarchical structure.

- **Do you have formal agreements in place? What barriers did/do you have to overcome?**

  There is an agreement between the Flemish Road Administration (Traffic Centre) and the federal police (motorway police) concerning cooperation, which results in the presence of a liaison police officer in the traffic centre.

3   The future of traffic incident management (blue sky thinking)

- **What policies/procedures would you like to implement if there were no financial or procedural barriers? What are the benefits that would be gained?**

  In the field of 'on-the-spot' incident management, there is still a lot to be learned about how long it takes to clear the road. Investigation (cause and responsibility of the accident) could be accelerated by AID camera recordings (soon to be implemented) and/or 'black box' in-car registration.

  Also, some method of charging the costs of traffic due to incidents could help to reduce the impact for traffic. This involves insurance matters (damage to vehicles and their loads versus congestion costs), the way lorries are loaded, and the freedom of choice in recovery.

Annex F: Case Study – the Netherlands

1   Overview of current traffic incident management programme (happening now)

As part of the Dutch government, Rijkswaterstaat manages all Dutch national roads. Together with the police, fire service, ambulance service, vehicle recovery companies, insurance companies, and others, Rijkswaterstaat introduced incident management about 15 years ago. The main motivation in doing so was to reduce incident delays and improve incident safety.

Within the Department of Transport, operational incident management is coordinated by the Verkeerscentrum Nederland (VCNL), research and development is coordinated by the Centre for Transport and Navigation (DVS)

Main activities include the operation and maintenance of national policy rules for passenger cars and trucks, which comprise faster vehicle recovery through the dedicated contracting of vehicle recovery companies.

- **What is your agency's role in incident management?**

Rijkswaterstaat's overall objective is to maintain traffic safety, traffic flow, and regularity. The role of Rijkswaterstaat in incident management was in the past limited to securing the work at the scene of the incident, decreasing negative effects on traffic flow, and clearance work. Then, Rijkswaterstaat initiated its current incident management system and is now actively pursuing its improvement. For instance, traffic officers are employed directly by Rijkswaterstaat to perform initial measures upon arrival at incident locations, allowing the police to reduce its activities in this regard. Rijkswaterstaat takes the initiative of drafting guidelines for safety measures at incident locations not only for Rijkswaterstaat vehicles but also for those of the emergency services. Rijkswaterstaat's directing role in incident management is growing.

- **Do you have a formalised multi-responder group that meets to discuss policy issues? How does this team work and how often does it meet?**

Yes, at three levels:
- ➢ IM Council: each member of the IM chain is represented in the IM Council; consultations on a strategic level; medium- and long-term policy directions (SMART Ambitions); implementation and securing of new initiatives within the organisation; three meetings a year.
- ➢ National Platform for Incident Management: each member of the IM chain is represented in the National Platform for Incident Management; consultation on a tactical level; responsibility for the realisation of the ambitions formulated for 2015; coordination of new initiatives; gives account and reports to the IM Council.

> ➢ Regional Platforms for Incident Management: each member of the IM chain is represented in the Regional Platform for Incident Management; operational level; reports to and is informed by the National Platform by the Project Office Incident Management; discusses practical matters.

- **Do you have transport management centres or systems to coordinate incident notifications and responses? How do they work? Are they shared with other responders?**

Rijkswaterstaat operates five Traffic Management Centres (TMCs) that play an important role in incident management. They are the point of contact between traffic operators and traffic officers. The TMCs' main responsibilities are the surveillance/monitoring of traffic and road conditions and traffic control. The TMCs' main sources of information are roadside equipment and cameras. So far, the TMCs have not been shared with other responders. At present, a larger role for TMCs in incident management is being considered, e.g. sharing real-time incident information.

- **Do you hold multi-responder training exercises? What form do they take and what benefits have been gained from them?**

Yes, multi-responder training exercises are held every now and then. They are sometimes executed near tunnels, mainly for reasons of safety exercises. They can also be held at the Rijkswaterstaat Training Centre, where a simulation environment is available. They are considered to be an essential part of operational incident management.

- **What are your key response and clearance policies and procedures? Do you have different procedures for the clearance of large vehicles?**

Key response and clearance procedures are the policy rules for passenger cars and trucks. Trucks (large vehicles) are treated differently, because of the need for different recovery vehicles. These policy rules are the basis for incident management in the Netherlands. They have been developed over the past ten years and are still being fine tuned. This fine tuning concerns the necessary financial arrangements before and after the incidents as well as the operational procedures themselves.

- **Do you have different procedures for major incidents? Do you have a different command structure for them?**

There are specific national guidelines and emergency plans for the handling of major incidents. In these cases, the fire brigades (and above them, the mayor) are in control.

- **Do you have integrated inter-responder communications? What systems do you use? Who has access to the systems?**

A national communication system is now being implemented, with access for emergency services. Although Rijkswaterstaat isn't formally an emergency service, in the short term, Rijkswaterstaat will be able to communicate using the same communication system (C2000).

- **What performance measures do you use? Do you have established response and clearance targets?**

Currently, arrival times measured from the moment of warning are used for traffic officers. Also, the percentage of incidents attended is used as a performance indicator. The indicator used depends on the region. Traffic officers must be present within 15 minutes in so called IM+ regions. In other regions, they must be present within 30 minutes. For (commercial) recovery companies the situation is different since they have contracts detailing targets, specifically for arrival times. As far as the emergency services are concerned, general (public) targets specify their arrival times.

- **Do you provide traveller information in relation to incidents and journey times? What systems do you use and how do they work? How does this differ from non-incident traveller information? How do you deal with communications to travellers in queues behind an incident?**

On about 50 per cent of our national highway network we use signalling systems to inform travellers that traffic speed is slow because of incidents or traffic jams downstream. Procedures for traveller information in relation to incidents do not differ from non-incident traveller information. Information channels like VMS, RDS-TMC, radio bulletins or a combination of channels are used. Travellers in queues behind incidents can also be informed by mobile information panels (on trailers or on the traffic officers' pick-up cars)

- **Do you have defined and agreed roles and responsibilities between all incident responders (similar to that demonstrated in the Dutch 'Red Book', *The Roles of the Emergency Services in Incident Management in the Netherlands*)?**

Yes, see our 'Red Book'! *(summary later in Annex H)*

- **How do you monitor the achievement of continuous improvement in incident management?**

For a number of years, an extensive monitoring project has been underway, collecting data from traffic officers, vehicle recovery companies, and traffic control centres. This data mostly concerns times of arrival, clearance, and departure. The aim of this project is to organise the monitoring of incident management. Regular reports are distributed throughout the organisation. The data is now also used for service level agreements with Rijkswaterstaat and for research purposes.

- **What measures do you have in place to help identify trends in incident causation? What incident prevention measures have you implemented? How successful have they been? How do you measure their success/failure?**

Trends in incident causation are not systematically investigated. Only when there is an urgent need, such as public attention to accidents caused by trucks. In these cases, monitoring data (mentioned above) is used. Incident prevention has not so far been actively pursued.

2 Overview of what your country is trying to achieve (direction)

The Netherlands is striving to improve its incident management, in particular in terms of improved coordination with the emergency services. To this end, a common organisation is now being set up with all our partners. This follows a common trip to the USA, where good examples of cooperation were found. This organization will be composed of different parts, addressing both strategic and tactical levels. Existing regional cooperation will deal with the operational level.

- **What is your strategic plan? Is it a multi-responder, multi-year plan? Do you have a shared vision?**

In our SMART Ambitions, we formulated the goals for 2015. The main goal is to reduce total incident duration by 25%.

- **How do you derive the benefits?**

Benefits have been calculated (indicative) for the reduction of delay by incident management (reduced society costs). This is found to be quite substantial: current incident management is reducing the amount of delay caused by incidents by half, compared to the (hypothetical) situation without current incident management. In view of the fact that several assumptions had to be made, these results should be regarded with caution.

Benefits in terms of safety are much harder to identify. The contribution of incident management (better procedures leading to more safety, swifter response leading to less queuing and thereby improved safety) can be argued, but are much more difficult to prove and quantify.

- **Do you have the appropriate budget and resources to deliver your plan? What are they?**

So far there are no evident budget constraints. The total budget for central coordination and operations of incident management amounts to several million euros. The total budget for operational incident management including all regional operations (including staff and equipment) is not available.

- **Do you have the relevant policies and procedures in place to deliver your plan? What are the main policy changes required?**

The main procedures involve the role of recovery companies, including financing, notification protocols, and restrictions. These provide most of the benefits of incident management in the Netherlands. These procedures are nationally accepted and implemented, albeit not by law. A required change would be to make them law. A recent change relates to traffic officers, whose role increases as the police withdraw.

- **Do you have formal agreements in place? What barriers did/do you have to overcome?**

Formal agreements include the national acceptance of procedures for the role of recovery companies. Barriers have mainly been of the administrative kind, but are not fundamental.

3   The future of traffic incident management (blue sky thinking)

- **What policies/procedures would you like to implement if there were no financial or procedural barriers? What benefits that would be gained?**

The following improvements in particular are desired:
- improved coordination in incident detection and verification, faster sharing of information between all agencies, and improved use of existing (and sometimes operational) technology
- improved on-the-spot process management with more clarity about the party organizing scene management, possibly supported by extensive multi responder training
- more integrated command and control, possibly by all agencies involved using the same communication technology and control room
- improved and extended incident information dissemination to the public
- more broadly supported common goals, at operational and policy levels, across all agencies involved
- for the NRAs to be seen as an emergency service
- total implementation of cross-training programmes
- implementation of faster incident scene investigation
- real-time information sharing
- ultimate IM monitoring system

Annex G: Case Study – Norway

1 Overview of current traffic incident management programme (happening now)

Background

The Norwegian Public Roads Administration (NPRA) is responsible for the planning, construction, and operation of the national and county road networks, vehicle inspection and requirements, driver training, and licensing. The responsibility for the national road and county road networks also includes responsibility for the operation of ferry connections.

The NPRA is under the leadership of the Directorate of Public Roads, which is an autonomous agency subordinated to the Ministry of Transport and Communication. The NPRA encompasses five regional offices. There is a traffic management centre (TMC) in each region.

In relation to incident management, there was in the past a need for a common framework and harmonisation between the NPRA's regions and for an improvement of the cooperation between the police, emergency services, and road authorities. As a result, the NPRA developed in 1994/95 National Guidelines for Incident Management. The work was carried out by a NPRA project group and a steering committee, which also included police representatives. Due to a major re-organisation of the NPRA in 2002-2003, these guidelines were revised in 2005.

The guidelines cover 'everyday' incident management on roads (closures and obstructions due to traffic accidents, landslides, avalanches, flooding etc. and planned events like roadworks, sports events, and planned rescue operations). A different set of guidelines covers 'crises' and major emergency situations.

- **What is your agency's role in incident management?**

    The NPRA's overall objective is to maintain traffic safety, traffic flow, and regularity. Its role in incident management is to secure the scene of the incident, decrease negative effects on traffic flow, and inform the road users about delays and diversions etc. The NPRA is also responsible for clearance work and assisting the police in technical investigations of vehicles, and technical matters related to road traffic in order to establish the cause.

    The police have the main responsibility at the scene of the incident. According to Norwegian law, both the police and the NPRA have the authority to close a road.

- **Do you have a formalised multi-responder group that meets to discuss policy issues? How does this team work and how often does it meet?**

  The guidelines require that regular meetings are held between the NPRA, the police, emergency services, and other involved parties in the regions. Representatives from the traffic management centres should also be present at these meetings. Experience shows that personal contact is important in order to achieve successful cooperation. As a result, meetings should be organised at regional level.

  According to the guidelines, the NPRA should in cooperation with the police, emergency services, and local authorities (councils) develop emergency plans describing the following:

  - different parties' roles and responsibilities in incident management
  - routines for alert and information dissemination
  - plans for re-routing (including temporary sign-posting or use of VMS)
  - plans for specific actions when incidents occur (e.g.: temporary ferry connections)
  - plans for communication (e.g. for areas with no telephone coverage)

  Specific emergency plans for tunnels and road sections with high risks of landslides and/or avalanches should also be developed.

- **Do you have transport management centres or systems to coordinate incident notifications and responses? How do they work? Are they shared with other responders?**

  The NPRA's 5 traffic management centres (TMCs) play an important role in incident management. They are the main point of contact between the NPRA, the police, and the emergency services, and they also play a crucial role when it comes to information dissemination (both internally within NPRA and to the road users).

  The TMC's main responsibilities are the surveillance/monitoring of traffic and road conditions, traffic control, and the provision of traffic information. The TMC's main sources of information are roadside equipment and cameras. The police, emergency services, contractors, ferry companies, media, and the road users all report valuable information regarding incidents and traffic conditions to the TMCs. The 5 TMCs are connected to a common database where all information regarding incidents and road conditions is registered. Information regarding traffic and road conditions affecting the road users is distributed from the database through a number of channels like VMS, RDS-TA, automatic and manual telephone service, the Internet (www.vegvesen.no/trafikk), and teletext.

  The TMCs are not shared with other responders; the only exception is TMC Oslo, where the police have staff during work hours.

- **Do you hold multi-responder training exercises? What form do they take and what benefits have been gained from them?**

  Yes, multi-responder training exercises are held regularly. As the 'infrastructure owner', the NPRA is responsible for initiating exercises. However, the police and fire service may sometimes take the initiative too. All involved parties must participate. Most exercises are 'full-scale', i.e. a major incident on the road or in a tunnel is simulated. Some exercises emphasise cooperation at management level where both technical and human aspects of communications are important. In these types of exercises, there may be less focus on practical aspects. Practical aspects may be the main focus of other exercises.

  The following benefits have been gained:

  - the need for improvement of routines is identified;
  - knowledge about a particular tunnel, road section etc. which has been the focus of the exercise, is gained;
  - the need for action (administratively or financial) is identified;
  - personal contact is improved.

- **What are your key response and clearance policies and procedures? Do you have different procedures for the clearance of large vehicles?**

  According to Norwegian legislation, the police have the authority to decide that a vehicle should be removed if it obstructs traffic flow. The TMCs may contact the police and request that a decision regarding clearance is made. There are no specific procedures for the clearance of large vehicles.

- **Do you have different procedures for major incidents? Do you have a different command structure for them?**

  There are specific national guidelines and emergency plans for the handling of major incidents. In these situations, the managers of the NPRA's regional offices make a decision regarding establishment of an emergency organisation in accordance with the guidelines.

- **Do you have integrated inter-responder communications? What systems do you use? Who has access to the systems?**

  In general, mobile phones are used as communication system between TMC and the police and emergency services at the scene of the incident. In tunnels, however, there is a common telephone system (FAS alarm) between ERT (Emergency Roadside Telephones), TMC and the police and emergency services.

- **What performance measures do you use? Do you have established response and clearance targets?**

  There are no performance measures or exact response and clearance targets established.

- **Do you provide traveller information in relation to incidents and journey times? What systems do you use and how do they work? How does this differ from non-incident traveller information? How do you deal with communications to travellers in queues behind an incident?**

  Procedures for traveller information in relation to incidents do not differ from non-incident traveller information. The most suitable information channel is used, whether it be VMS, RDS-TA, radio bulletins, or a combination of channels. General guidelines for traveller information are followed. For further details, see the bullet point on traffic management centres.

- **Do you have defined and agreed roles and responsibilities between all incident responders (similar to that demonstrated in the Dutch 'Red Book', *The Roles of the Emergency Services in Incident Management in the Netherlands*)?**

  The National Guidelines for Incident Management describe in particular the NPRA's roles and responsibilities and also the role of the police or the fire service at the scene of the incident (the police have main responsibility; the fire service takes charge if it is at the scene before the police).

- **How do you monitor the achievement of continuous improvement in incident management?**

  Through continuous evaluation of incident handling and exercises.

- **What measures do you have in place to help identify trends in incident causation? What incident prevention measures have you implemented? How successful have they been? How do you measure their success/failure?**

  According to the guidelines, the NPRA's regions should carry out risk analyses of the TERN. The NPRA has also established a central accident database where all incidents with casualties and/or fatalities are registered. Based on information in the accident database, analyses of the number of accidents on specific road sections before and after—e.g. physical improvement or implementation of ITS applications—will be carried out in order to measure success or failure.

2   Overview of what your country is trying to achieve (direction)

The NPRA is currently working on the implementation of the strategy and procedures developed in 2005. As a result, there is no ongoing work on a new strategic plan.

Annex H: Tabular summary of Task O5 questionnaire returns

The Task O5 questionnaire responses are highly varied both in length and content. Although they provide a lot of information, this can make comparison difficult. This is why a summary table has been compiled (see below and next page). This table mirrors the structure of the questionnaire but interprets the responses in highly abbreviated form to facilitate like-for-like comparison.

Question	Austria	Denmark	England	Flanders	Netherlands	Norway
0a NRA organisation	ASFiNAG	DRD	HA	FRA	RWS	NPRA
0b Leading role	Province	Police	Yes: TOS	Police	Yes	=Police
1 Incident managem't						
1a Responsible for	federal M&X	main roads	strategic	motorway+	national	nat/county
- monitoring	●		●	●	●	
- safety		●	●		●	●
- congestion/flow		●	●		●	●
- reporting	●		●		●	
- driver information	●	●	●	●	via private	
- coordination	X	≈	●	X	●	
- clearance	X	≈	●	X	●	●
- diversion/events			●	●		●
1b Multi-responders	periodical	by case	regular	No	meetings	regular
1c TMCentres/role:	local auths	1 TIC	7 RCC	1 TIC-TCC	VN, 5 MMC	5 TMC
- monitoring	●		●		●	●
- safety		●	●			
- congestion/flow		●	●			
- emergency calls		●	●			
- driver information	●	●	●		via private	●
- coordination	X	≈	●	●	●	●
- clearance	X	≈	via police	via FAST	via private	
- automatic control			CM/ATM		MTM	
1d multi-rsp training	national	tunnels,m3	simulation	by case	occasional	regular
1e key procedures:	prioritisation	some private		private	via private	police
- monitoring	●		●			
- driver information	●		●			
- response	X		●	●	●	
- clearance	X	3 levels	●	●	●	
- special for HVs			45 mins		yes	
1f major incident proc	province	police	3 levels	3 levels	national	national
1g integrated comms	access	UHF chans	govt std	radio	national	GSM
1h KPIs and targets:	ask police?					
- safety	X	●	PSA			
- congestion/flow	X	●				
- journey times	X	M3,M10 only	AVD			
- response	X	●		●	≈	X
- clearance	X	●		●	≈	X
1i traveller info:			NTCC			
- web	●	●	●	●		●
- VMS	●	M3,M10 only	●	●	●	●
- broadcast	●	●	●	●	●	●
- journey times	X	M3,M10 only				
- in queues						
- automatic collection			MIDAS		MTM	
1j defined roles	'Yes'	guidelines	NGF	informal	Red Book	guidelines
1k improvement	meetings	debriefing	debrief/IUs	pragmatic	monitoring	evaluation
1l causes/prevention	Stats Ös/KfV	Acc investig'n	research	video AID	by case	strategy

2a strategic plan	+coverage		five steps	pragmatic	+SMART	2005 plan
2b deriving benefits	Avoid/clear		AVD	clearance	estimated	
2c resources	€350M (15y)		Yes v. Time		enough	
2d relevant policies	ITS master pln.		TMA 2004		recoverers	
2e formal agreement	legislation		TMA 2004	with police	procedures	
2f barriers	provinces		commercial		temporary	
3 Future						
3a policies	automation,	analysis	+Standards,	Black box,	Coordination,	2005 plan
3b benefits	Euro stds	document	CCTV, VMS	charging	integration	only

Notes

- The table mirrors the questionnaire in that it makes a distinction between the responsibilities of the NRAs and traffic management centres.

- Organisations other than the NRA may have precedence, as indicated in 'leading role' and 'major incident procedure'.

- The Netherlands has 5 traffic management centres (from Task O5 Report) and 9 regional offices (international comparisons).

Meaning of marks and symbols used in the Summary Table

Symbol	Meaning
•	NRA/TMC has full responsibility for this area
≈	Responsibility for this area is implied by context but not stated
X	Definitely NO responsibility for this area
via *agency*	A separate agency is instructed or informed to take action
= *agency*	Responsibility shared equally with agency named
agency	Responsibility is held by the separate agency named
private	Responsibility is outsourced to a private contractor
(Blank)	Unspecified and can be assumed to mean 'No responsibility'
area +	Responsibility includes or may include other areas not specified
+ *output*	Activity or plan will add or add to the output named
(Other)	Brief descriptive text

Glossary of abbreviations and terms used in the Summary Table

ATM	active traffic management (UK)
AVD	average vehicle delay (90th percentile JTR measure used in UK)
CM	controlled motorway (with mandatory variable speed limits)
FAST	Flanders private recovery contracts
JTR	journey time reliability
MIDAS	motorway incident detection and automatic signalling (UK)
MTM	motorway traffic management (NL)
NGF	National Guidance Framework (UK)
NTCC	National Traffic Control Centre (UK)
RCC	Regional Control Centre (UK)
Red Book	Roles of Emergency Services in Incident Management in the Netherlands
SMART	Formal technique for setting measurable achievable objectives
TCC	Traffic Control Centre
TIC	traffic information and control
TMA	Traffic Management Act (UK)
TMC	traffic management and control
TOS	Traffic Officer Service (UK)
VN	Verkeerscentrum Nederland

Annex I: Summary of handbooks published for the Netherlands

The Dutch 'Red Book' has been cited as an example in the case study questionnaire and in the response from the Netherlands (see Annex F), so it may be useful to summarise its contents and those of other handbooks published (in English) by the Rijkswaterstaat and its Verkeerscentrum Nederland branch.

The 'Red Book': *The roles of the emergency services in incident management in the Netherlands*

The handy 19-page document defines the roles of five groups of responders: police, fire brigade, ambulance, public works, and recovery, and finishes with a glossary of terms. Each section is structured as a page of actions followed by a page of phases:

Control centre action	Responder phase
Ask (location and details of incident)	Alerting
Dispatch (surveillance and responder units)	Response and Arrival
Consult with TMC (actions and precautions)	Action (treatment and coordination)
Communicate (to relevant bodies)	Action (recovery and clearance)
Record and Evaluate	Normalisation

Each paragraph gives instructions such as precautions to ensure worker safety or protection of the scene, information to be collected, or situations to be controlled (e.g. fire, medical).

Incident management handbook

This is a more descriptive document of about 41 pages in report format with appendices containing instructions and flow diagrams for actions. The main text describes the organisations involved in IM, including the composition of the governing 'platforms' and agenda for regular reporting. It goes on to describe control centre actions in a more narrative style than the 'Red Book', and the sequence of communications during an incident.

Initial safety measures for incidents on motorways in the Netherlands

The purpose of this 25-page document is to reduce secondary accidents to emergency workers. It is described as a 'directive' and contains instructions on how to specify the location of an incident unambiguously, how to position a buffer vehicle, safety zones, methods of directing traffic, high visibility clothing, and how to close lanes.

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Annex J: Article from ITS International magazine

http://www.itsinternational.com/features/article.cfm?recordID=2969

The Leading Website and Magazine for Traffic Management and Urban Mobility

ITS INTERNATIONAL

feature article

Monday 15 October 2007
Soft sell
The Highways Agency's Mike Wilson discusses the influence of cultural and institutional issues on the choices of technology for detection and monitoring, and in particular for incident management

The Confederation of European Directors of Roads (CEDR) was set up in 2003 as a non-profit organisation. Operating under French law and headquartered in Paris its purpose, at the European level, is to facilitate the exchange and discussion of experience and information relating to all aspects of roads and their more efficient operation.

CEDR's Task 05 Group's aim is to 'Optimise capacity of the road network'. In recent work, it has taken a particular interest in incident management, the policy issues which influence both day-to-day operations and their longer-term evolution, and how this all should drive the choices of technology used along the incident management chain.

🔍click image to enlarge

Congestion management may not be a core issue for all organisations involved in network operations

The Group, which has been in existence for about a year, is chaired by Mike Wilson, Group Leader, Network Policy, Traffic Operations, of the Highways Agency (HA), the organisation responsible for managing England's motorways and trunk roads.

Evolving roles

The organisational changes which the HA has undergone in recent years and its particular interest in incident management and journey time reliability resulted in it taking the lead in Task 05, says Wilson.

Specifically, the 2003 Roles and Responsibilities Review, which was produced by the HA in cooperation with England and Wales's Association of Chief Police Officers (the police having historically been responsible for the management of strategic roads), looked at aligning stakeholder organisations' responsibilities with business drivers. It led to the HA evolving from being solely an asset manager to a network operator and taking on responsibility for traffic management, with the specific aims of improving journey time reliability and safety and reducing the impact of roads on the environment.

Since then, other national roads authorities in Europe have either considered or started to move down the same path – for instance, in conjunction with the roll-out of new Regional Control Centres, the HA established the Traffic Officer on-road service. The Netherlands has had an analogous service for several years and Denmark is also now considering implementation of something similar.

click image to enlarge

Stakeholding organisations need to be fully aware of both their roles and those of others'

The trend was discussed in a November 2004 CEDR report *The move of the European road administration towards network operations* which was produced by the Confederation's Telematics sub-committee and included a look at what was originally termed 'The Big Shift' and later became known as Network Operations in the US.

The diversification of responsibilities is an important development, says Wilson, not least because with the realisation that it is simply impossible to build our way out of congestion has come an interest in finding more diverse ways of offering or maintaining a given level of service.

The operational role, meanwhile, has brought with it the opportunity to influence a wider variety of aspects including value for money.

"Previously, that meant investment tended to go into improving the asset, not affecting how it was operated," Wilson continues. "Now, however, there are just as likely to be investments in procedural or network operational areas."

Before and after the fact, a large proportion of congestion, particularly non-recurrent congestion, is incident-related. Faster, more effective incident management can therefore have a major impact on improving journey reliability. None of this thinking is new but Wilson says that the combining of the asset management and operational roles means that the handling of incidents is now more likely to be addressed from a number of different angles. It offers the ability to be proactive, rather than just reactive.

"The asset manager's traditional role, after an incident, was a restorative one – repairing any damage done to the road and its associated infrastructure. That has very little to do with affecting an incident's duration, however," he says.

"But there is a lot that can be done by the network operator before something happens. Accident black-spots can be re-engineered so that the likelihood of an incident occurring is reduced, for example.

"Incident prevention and management need to be focused at congestion and not just safety. There are jurisdictional issues here that need to be addressed, and funding and support of non-traditional items and services comes into play.

"For example, the majority of accidents are non-injury, slow-speed shunts which nevertheless take time and effort to resolve. The police in England will tend to be less concerned over the time element of incident clearance, as congestion reduction is not a core objective for them as it is for the HA. In fact, in the event of a more serious collision the police will want to investigate thoroughly just what has gone on as there may be a potential criminal investigation, and the longer the investigation takes the worse the congestion which results can be.

"There is equipment available which can help reduce the time taken to carry out accident investigations but there is little incentive for the police to invest in it because it doesn't help to meet their core objectives. As a result the HA is now funding and supplying the police with GPS-equipped theodolites and other equipment. Early results are showing up to a 60 minute improvement in investigation times.

"Similarly, because we in the UK drive on the left, there is a fair problem with side-swipe accidents involving foreign lorries. At the port of Dover, we've been giving foreign lorry drivers Fresnel lenses which aid visibility and so reduce the potential for side-swipes.

These cost very little, about £1 each (approx. US$1.50/€1.10 at Jan 2009), which is an almost inconsequential cost when balanced against that of a major accident. This trial has proved very successful and we're looking at wider roll-out this year."

Having a national road agency finance equipment procurement for an outside entity highlights one of the softer policy issues which needs to be addressed, he notes.

"Incentives might be required. Especially where agencies don't share common core tasks or aims, there is often a need to demonstrate the benefits of what's being done or proposed. It's not about getting the kit, so much as gaining buy-in in terms of support."

Command and Control: "Speed is of the essence in incident management but each organisation involved in managing and operating roads needs to be clear as to what its responsibilities are and what the others are doing. This is where the Command and Control issues need to be ironed out. In terms of using technology to do this, the UK is just scratching the surface in many respects.

"The institutional issues are very similar country to country however and Sweden has a technology-based solution which pulls off key data for each of the relevant agencies.

Again, that's just one example of the potential for cross-fertilisation and the Task 05 Group has not just restricted itself to Europe. The US Federal Highways Administration (FHWA) came over to Europe in 2005 and wrote a report on the state of the incident management art. That was a document which proved very useful. And, of course, there are similar programmes going on elsewhere, such as the FHWA's Traffic Incident Management Enhancement programme."

Avoiding repetition: "A big part of what we're looking to do is find equipment and systems that are fit for purpose, driving selection from the policy end. That potentially means adopting something new – there's some interesting work going on at the moment in The Netherlands which is looking at the use of radar, for example. But there are a lot of non-technical factors involved in incident detection and verification and a better understanding of these would help.

"What, for instance, are the operational and psychological factors associated with use and operation? We can use loop systems and the information they gather on traffic speeds to gain an inkling that something might have occurred. But when one is looking to respond quickly, are they the way forward? A police or other on-road resource has to be despatched to identify the specific location and nature of an incident. That takes time.

Then, when the police or operatives arrive at the scene, they have to assess what's happened and make a judgement on what's happening and what resources are needed to deal it. That adds even more time to the overall response cycle.

Cameras are perhaps more useful because the users can see what is going on – and in psychological terms there's also a greater level of trust in being able to see what's going on and not having to try and infer. An associated issue is that as camera technology proliferates, there may in fact be a need for more technology to help monitor the greater numbers of images generated and flag any problems to control centre operators.

"There's already a lot of work that has gone on which looks at such issues. What we're trying to avoid going forward is repeating work which has already been undertaken elsewhere and to find where any future work can be most effectively targeted."

Forward actions
The Task 05 working group has now completed an initial scoping exercise. A decision with respect of future studies and work for the group then rests with CEDR's governing board. ·
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