



# **The Marlie Farm Explosion**

**Significant Findings of the Investigation into the  
Fire and Fatal Explosion  
Festival Fireworks Ltd, Marlie Farm, Ringmer, East Sussex, U.K.  
Sunday 3 December 2006**



Photo of accident site on the following morning



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## **RECOMMENDATIONS OF THE ACCIDENT INVESTIGATION TEAM**

The recommendations detailed below are not meant to imply criticism of any one individual or organisation, but to improve safety.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

See pages 140 – 142, recommendation 1 - 5,

#### **Recommendation 1**

Put in place arrangements with SECAmb and Sussex Police regarding the development of contingency plans for all licensed explosives sites.

#### **Recommendation 2**

Make arrangements for effective information exchange with the Sussex Local Resilience Forum, to ensure that it is compliant with both the statutory duty in the Civil Contingencies Act 2004 and the guidance contained therein.

#### **Recommendation 3**

Implement a system for recording all premises that have been considered under Section 7(2)(d) of the Fire and Rescue Services Act 2004, whether risk information is provided to operational firefighters or not.

#### **Recommendation 4**

Review how risk information is stored and shared within the Service and introduce a formal process for regular review and update on risk information held.

#### **Recommendation 5**

Instigate a formal procedure for the sharing of risk/safety information between emergency services at incidents. Examples should include, urgent sharing of risk critical information, information gleaned from occupiers, evacuation distances and routes, as well as location of command points. Any procedure implemented should be disseminated through a formalised training/awareness protocol.

#### **Recommendation 6 (See pages 142 – 143)**

Raise with the Health and Safety Commission a proposed change to the COMAH Regulations, for the regulations to apply to the licensed quantity, not the actual quantity stored on a site.

**Recommendation 7** (See pages 143 – 144)

East Sussex Fire & Rescue Service completes the work on the open water register and considers how this information is made available to crews.

See pages 144 – 145 for recommendations 8 & 9

**Recommendation 8**

Issue guidance to all operational personnel reminding them of the availability of operational guidance on the MODAS system, including aide memoirs, operational guidance notes and premises hazard information, and puts into place such resilience measures as necessary to ensure that in the event of failure or unavailability of the MODAS system, the relevant risk information is still available to operational crews.

**Recommendation 9**

For medium and high risk premises in the Service area, either the relevant risk information should be printed on the mobilising instructions, or there should be a clearly visible prompt for appliance commanders to check MODAS for further risk information.

See pages 146 – 155 for recommendations 10 - 20

**Recommendations 10**

- Issues amended instructions to wearers to reflect the models of Gallet F1 helmet now in use within SEPPEC and the respective methods for securing chinstraps.
- Ensures that MSA Gallet/Cosalt carry out an audit on all Gallet helmets within SEPPEC to verify the correct fitting of inner comfort pads and stopper buckles, as necessary.
- Ensures that all relevant personnel have been issued with a helmet bag and instructed to store their helmet in this when not in use.

**Recommendation 11**

Note the new requirement for side impact protection on firefighters' helmets in accordance with the revised EN443:2008, for the future procurement of PPE.

**Recommendation 12**

Monitor and review implementation of the controls for the use of firefighting PPE during relevant activities, including the wearing of firefighting gloves.

**Recommendation 13**

Monitor and review the correct use of helmets and PPE items at incidents, including through the response audit process.



**Recommendation 14**

Monitor and review the implementation of effective controls for hearing protection/noise at work at incidents.

**Recommendation 15**

Review its policy and procedure for the wearing of fire hoods in the 'up' position at incidents involving a risk of thermal radiation, including at fires where hazardous materials such as acetylene or explosives are involved. This should include clarification of the policy for fires and incidents where breathing apparatus is not worn.

In light of the revised policy and procedures, review the provision of training and awareness for personnel to ensure they comply with the Service policy for wearing of fire hoods at incidents.

**Recommendation 16**

Review policy and procedures for eye protection to provide a single instruction consolidating all previous requirements for such use.

**Recommendation 17**

Review policy and procedures for the use of hearing protection at incidents giving particular consideration to the compatibility of protecting the wearer's hearing while maintaining effective fireground communications, including verbal instructions and the use of fireground radios. The review to include the use of earpieces and the audibility of evacuation whistles to ensure that safety critical instructions, such as evacuation signals, are clearly audible.

**Recommendation 18**

Recommend to CFOA that the research and development is undertaken on the means of sounding the emergency evacuation signal in areas where a standard fire and rescue service emergency evacuation whistle may not be heard.

**Recommendation 19**

Review the provision of training and awareness of hearing protection/noise at work for personnel, to include:

- the responsibility of Incident Commanders to include consideration of hearing protection and fireground communications within their dynamic and analytical risk assessment processes.
- awareness of the range of control measures that should be implemented to control exposure to noise at incidents.

**Recommendation 20**

Ensure that PPE requirements are reinforced through training and actively monitored through routine workplace PPE checks. Review the written checklists for firefighting PPE to ensure all new requirements are included and that periodic checks are recorded.

**Recommendation 21 (See pages 159 – 160)**

Provide branch holders/ground monitors for all major pumping appliances, for use at incidents involving acetylene, explosives etc.

**Recommendation 22 (See pages 160 – 161)**

Amend the relevant Manual note on fireground communications and provide additional training to ensure that the following areas are addressed:

- limit the practice of using mobile telephones for sending command messages.
- encourage the greater use of fireground radios at incidents
- ensure personnel are aware of types of radios and safety features provided
- to cover ICS procedures, such as confirmation of tactical modes and the need to disseminate information to all personnel on the fireground (fireground broadcast).
- develop a procedure to be used in the event of communications equipment failure, including when the equipment works, but messages can't be heard.
- use of electronic communication equipment in hazardous situations, e.g. proximity to explosives, explosive atmospheres

**Recommendation 23 (See pages 162 – 163)**

Review the policy and procedure for the procurement and implementation of new equipment or changes in the use and procedures for existing equipment to ensure that:

- they are subject to a process compliant with the requirements of the Provision and Use of Work Equipment Regulations (PUWER)
- suitable and sufficient equipment and/or activity risk assessments are completed and all other relevant health and safety regulations are considered, such as COSHH, Manual Handling, Noise at Work, Electricity at Work, PPE etc.
- training needs are notified to the Learning & Development department for inclusion into the training plan
- ensure that the concise levels of responsibility for Directors, managers and other personnel are clearly stated
- there is an effective process for establishing the competence of users
- the central recording of user competence is in an auditable format

**Recommendation 24** (See pages 167 – 173)

Provide refresher training for all Level 1, 2, 3 and 4 Commanders in the roles of Incident Commander including communication of the tactical plan, Command Support Officer, Incident Safety Officer and other functional roles within ICS, to include a requirement for Level 2+ officers to participate in a minimum number of exercises per year.

See pages 173 – 176 for recommendations 25 - 32

**Recommendation 25**

Exchange information regarding evacuation signals and procedures (including at other types of risk where whistles are used by other agencies for signals, e.g. in HM Prisons) with SECamb and Sussex Police.

**Recommendation 26**

All Incident Commanders to ensure that any non fire and rescue service persons working in the risk area, e.g. police or utilities, are briefed on the likely risks; the emergency evacuation signal, procedures, evacuation routes and assembly/roll call points.

**Recommendation 27**

Review the Manual Note 'Operational Policy 18:8 'Functional Roles' and associated 'prompt card' to include the responsibility of the Marshalling Officer (where appointed) to inform arriving crews of safety critical requirements including arrangements for emergency evacuations, and that training for personnel likely to undertake the role of Command Support, Marshalling Officer and ICU operators should be undertaken to ensure:

- nomination of a suitable rendezvous point
- awareness of the need to be clearly identifiable to arriving Service and cross-border crews
- awareness of their role in ensuring that appropriate briefings are given to arriving crews, officers and support personnel before they are permitted to deploy

**Recommendation 28**

Produce a formal procedure for tactical withdrawal and emergency evacuation. This procedure should include the following:

- when an emergency evacuation has been initiated, the signal should be sounded and repeated, both by whistle and general fireground radio broadcast.
- confirmation of receipt of the emergency evacuation signal should be sent by all relevant Command personnel. This would include Command Team members, Sector and Appliance Commanders, personnel working in remote locations, e.g. fire investigators, incident safety personnel, pump operators, etc.

- where it is not the Incident Commander who initiates an emergency evacuation, the originator of the emergency evacuation must immediately notify the Incident Commander, Command Support and Sector Commanders by the quickest appropriate means.
- on sounding the emergency evacuation signal, the Incident Commander should send a message to M&CC as follows: '*emergency evacuation in progress*'.
- on receipt of a main scheme radio message stating an emergency evacuation is in progress, M&CC should treat the incident as a '*persons reported*' call and consider appropriate 'make-ups' as in a BA emergency.
- as part of any roll call, persons responsible for that roll call must ensure that all Service personnel, including appliance crews, officers and support personnel are accounted for.
- when other services and organisations are present, they must be informed about the emergency evacuation signal, and in the event of it being sounded, the need for them to carry out a suitable and sufficient roll call of their personnel.
- following the roll call, the Incident Commander should send a message to M&CC stating whether or not all fire and rescue services and other services and organisations' personnel have been accounted for.
- should the Incident Commander need to leave persons in the risk area or recommit personnel for a specific task, such as protecting an escape route, this should only be done following a risk assessment and a thorough crew briefing, detailing the specific reason(s), tasks and any necessary further controls. In this event, working conditions must be monitored constantly. Every effort must be made to withdraw these personnel at the earliest opportunity. Personnel tasked with carrying out the roll call must be made aware of who is still working in the risk area and when they may be expected to leave.

Having produced a formal procedure, the Service must then instigate a system to train operational personnel in the formal procedures for emergency evacuation including refresher training. This training should include roll calls and confirmation to the Incident Commander that all persons in the risk area have been accounted for.

### **Recommendation 29**

Recommend to CFOA that amendments are made to 'Fire Service Manual Volume 4 Fire Service Training, Foundation Training and Development Appendix 7', to enhance the Fire and Rescue Service evacuation procedure to reflect the guidance given in DCOL 5/1994 Item A.

### **Recommendation 30**

Amend the references in the East Sussex Fire & Rescue Service 'Breathing Apparatus Manual Note' with regard to emergency evacuations, to reflect the fact that emergency evacuations are a

general fireground procedure, not specifically for use at incidents involving breathing apparatus.

### **Recommendation 31**

Ensure that whole time and retained duty system trainee firefighters receive input on emergency evacuation procedures before they attend any operational incidents. Initial training in emergency evacuation procedures should include theoretical training and evacuation simulations, including subsequent roll calls. In order to reinforce the importance of emergency evacuation procedures, all East Sussex Fire & Rescue Service trainee firefighters should be issued with a nominal roll tally on the first day of their initial training course. On each subsequent practical training session, there should be a requirement for trainees to pass their tally to the Appliance Commander for insertion into the nominal roll board.

### **Recommendation 32**

Ensure that all appliance nominal roll boards are indelibly marked with the appliance call sign.

See pages 177 – 178 for recommendations 33 & 34

### **Recommendation 33**

Review the procedures and training to deal with incidents where the police have confirmed to the Incident Commander that a request for a cordon and associated removal of members of the public cannot be immediately implemented.

### **Recommendation 34**

Ensure other category 1 responders are aware of the East Sussex Fire & Rescue Service Incident Command System roles and relevant procedures.

See pages 178 – 179 for recommendations 35 & 36

### **Recommendation 35**

Review the training provision for all types of hazardous materials incidents, including those involving acetylene and/or explosives, to ensure that:

- Incident Commanders are aware of operational procedures and control measures to be adopted, and the availability and content of relevant aide memoirs
- the associated training packages/presentations are in accordance with current procedures
- all operational personnel receive periodic training and assessment in procedures for all types of hazardous materials incidents, and this is recorded in an auditable format
- training scenarios should require Incident Commanders to practice applying the relevant procedures and safety controls, and this is recorded in an auditable format

**Recommendation 36**

Make all category 1 responders aware of East Sussex Fire and Rescue Service procedures and associated evacuation distances for incidents involving acetylene and/or explosives.

**Recommendation 37** (See pages 180-182)

Provide a policy for the crewing of the Incident Command Unit (ICU) including:

- minimum crewing levels
- the training of personnel at other stations to provide resilience in the event that trained crews from the home station are already committed or unavailable
- mobilising arrangements for operators from other stations to ensure that the ICU is mobilised to relevant incidents promptly
- identify the competencies and training arrangements for ICU operators
- ensure that competence is established and maintained through initial and periodic workplace training and assessments
- the integration of the ICU into exercises and scenarios wherever possible in order to assist the training and development of new and existing ICU operators in supporting relevant incidents.

See pages 186 – 190 for recommendation 38 & 42

**Recommendation 38**

Review the relevant activity risk assessments for support staff who may be required to attend operational incidents.

**Recommendation 39**

Ensure that Incident Commanders and others who are responsible for the safety of support staff when attending incidents, are made aware of the safety controls required, including which roles are permitted access into hazard areas and that this is incorporated into the relevant Service Manual notes, i.e. Incident Command System, and establish arrangements to ensure that the implementation of safety controls for support staff at incidents is subject to active monitoring, review and audit.

**Recommendation 40**

Implement a system to provide structured training to all support staff who are required to attend operational incidents. Training to be in accordance with national occupational standards where available, and to meet the requirements of relevant activity risk assessments. The training objectives to include:

- their responsibilities within the Incident Command System, including a requirement to report

to the Command Support point or ICU on arrival, and the procedure for the use of nominal roll tallies.

- before being permitted to undertake tasks at the incident, all staff must receive a briefing from the Command Support Officer to confirm their role required at the incident, the nature of the incident and associated hazards, the safety controls in place or to be observed, together with any restrictions on their movement within the incident ground.
- applying the principles of practical dynamic risk assessment when working within inner cordon/hazard areas.
- awareness of fireground communications, including methods for the signalling of emergency evacuations and associated evacuation and roll call procedures.
- initial and periodic continuation training in the use of PPE appropriate for different types of incidents.
- driver qualification and training requirements
- other role related training requirements

#### **Recommendation 41**

Introduces a system of initial and periodic refresher training for support staff who attend operational incidents. This training to cover key health and safety responsibilities, the use of PPE, reporting in/out procedures and emergency evacuation procedures.

#### **Recommendation 42**

Any future video technician, or related role, shall have:

- i a specific written activity risk assessment provided for the role, to introduce controls to reduce the risk to as low a level as is reasonably practicable, covering:
  - attendance at operational incidents
  - safety controls for the range of incidents likely to be attended
  - the potential for working in inner cordon/hazard areas
  - those incidents where the post holder will not be permitted to work within the hazard area/inner cordon areas (e.g. incidents involving hazardous materials)
  - the specific PPE requirements for the range of incidents likely to be attended by the post holder
  - identification of those types of incidents or situations where PPE is not a suitable safety control
  - training requirements for the video technician and his/her supervisor/manager.
- ii Provide a written policy for the role of video technician, including:
  - response to incidents and other events/activities

- definition of the extent and limitations of the video technician's role
  - responsibility of the post holder to comply with health and safety requirements and operational instructions from the Incident Commander and other relevant Incident Command roles when attending incidents
  - subject to compliance with all relevant safety controls, a key role for the video technician is to gather video information on operational procedures across the incident ground, including outside of the inner cordon/hazard areas, to facilitate:
    - a) operational debriefing,
    - b) to assist the development of operational training,
    - c) to aid the gathering of evidence for personal development records, e.g. for the Incident Command Team,
    - d) process video footage including for other agencies, e.g. police and the media.
- iii Introduce a 'memorandum of understanding' between East Sussex Fire & Rescue Service, other emergency services and the media regarding the role, boundaries and access to footage provided by the video technician.

See pages 190 – 192 for recommendations 43 & 44

#### **Recommendation 43**

Review the Health and Safety Risk Assessment Manual and associated process, training and documentation, to:

- ensure that suitable risk assessments are issued to trained generic risk assessors and appropriate guidance is available
- ensure that risk assessments of specialist activities are assessed by sector competent risk assessors and/or relevant specialists are consulted
- ensure that local risk assessments take into account the outcomes of the national generic risk assessments
- ensure that the local risk assessments take full account of the identified training needs and supervisory requirements, for that type of operational incident.
- review the RA1 and RA2 proformas to provide a facility for recording the consultation with specialists
- review the RA1 and RA2 proformas to provide a facility for recording verification as 'suitable and sufficient' by the health and safety section
- review the process for notifying training needs to the Learning & Development department for inclusion into training plans
- review the process for communicating the outcomes of risk assessments to risk groups and



their supervisors/managers and other relevant persons

- ensure that auditable records of the above communications are available

#### **Recommendation 44**

Ensure that a review of the suitability and sufficiency of relevant risk assessments is undertaken as part of the investigation process following significant safety events.

See pages 192 – 195 for recommendation 45 & 46

#### **Recommendation 45**

Review the training provision for all types of hazardous materials incidents, including those involving acetylene and/or explosives, to ensure that:

- Incident Commanders are aware of operational procedures and control measures to be adopted, and the availability and content of relevant aide memoirs
- the associated training packages/presentations are in accordance with current procedures
- ensure that all operational personnel receive periodic training and assessment in procedures for all types of hazardous materials incidents, and this is recorded in an auditable format
- training scenarios should require Incident Commanders to practice applying the relevant procedures and safety controls, and this is recorded in an auditable format

#### **Recommendation 46**

Consider a suitable process to record the names of all persons who attended an incident, to facilitate post incident follow up, in the event of personnel being required to give witness evidence or for health screening purposes.

#### **Recommendation 47 (See pages 195 – 197)**

Raise with the Health and Safety Commission (HSC), Chief Fire and Rescue Advisors Unit (CFRAU) and Chief Fire Officers Association (CFOA) on the absence of a national system to disseminate risk critical information and guidance.

#### **Recommendation 48 (See pages 197 – 199)**

Seek a change to the Manufacturing and Storage of Explosives Regulations 2005, to:

- i) include a statutory requirement for all category 1 responders under the Civil Contingencies Act 2004 to be formally notified of an assent hearing and to receive formal notification of any newly registered or licensed explosive site from the Local Authority. This should include the hazard type and quantity.
- ii) include a statutory requirement for the local fire and rescue service to be notified of shipments/imports of fireworks/explosives received for bulk storage in their area.

**Recommendation 49** (See page 209)

Review training in fireground management of water supplies, to include planning assumptions for the provision of water and likely water usage, pump operation, branch use, water relay and alternative water supplies.

**Recommendation 50** (See page 210)

Review the process and controls for:

- the receipt of information and intelligence regarding new or changed health and safety legislation/regulations into the Service
- how such information and intelligence is evaluated and agreed actions are recorded in an auditable format
- ensuring the implications and agreed actions are promptly communicated to stakeholders
- ensuring effective processes are in place for the prompt exchanges of information to/from all Directorates and Corporate Management Team.
- ensuring that communication of matters relating to new or changed health and safety legislation/regulations to all stakeholders is recorded in an auditable format
- ensuring that the responsibilities of Directorates, managers and others in this process are clearly stated

See pages 211 – 212 for recommendations 51 – 53

**Recommendation 51**

Review ACTIVAT records across the Service to ensure that any slippages in the completion of targets are recovered.

**Recommendation 52**

Review the action plan from the internal business assurance review of ACTIVAT to ensure that the required outcomes have been delivered.

**Recommendation 53**

Review arrangements for the planning and recording of continuation training and the workplace assessments for personnel not covered by ACTIVAT.

**Recommendation 54** (See pages 212 – 213)

Review the adequacy of initial and continuation operator training arrangements for the light portable pump, including emphasis on the procedure for manually priming the pump from open water.

As part of this review, considers the availability of practical training facilities to ensure that

operators are able to maintain pump operator skills, including the priming of pumps from open water, and ensure that suitable written instructions and information is available with light portable pumps

**Recommendation 55** (See pages 213 – 214)

Review the arrangements for the planning and recording of training delivered through presentations available on the intranet and via videos/DVDs issued to workplaces. To include

- the training requirements for station based and other staff groups, including where these are mandatory elements of initial and/or continuation training and assessment in the workplace
- a published inventory of all such materials
- links to related bibliographies
- a process for periodic review of these materials against the requirements of relevant roles
- ensure these comply with current standards, bibliographies, policies and procedures

**Recommendation 56** (See pages 214 – 215)

Review the ACTIVAT continuation training system to ensure that targets are prioritised according to an assessment of risk and an analysis of the requirements for each role. To include those areas not explicitly covered at present, i.e. correct use of PPE, incidents involving acetylene, emergency evacuations, pumping from open water, monitors, types of fireground radios, operating Command Support point, the ICU's role within ICS and inner cordons.

**Recommendation 57** (See pages 215 – 217)

Review the guidance to ACTIVAT users on:

- the performance requirements to be achieved before an individual can be signed off as competent
- planning of training
- resources and facilities required for each training activity
- what underpinning knowledge is required and how this will be assessed.
- availability of relevant bibliographies and training packages cross mapped to meet the required standard
- the recording of operational work as 'training'
- the recording of increased targets/frequencies when agreed by line management
- the need for monitoring and audit by local managers
- the provision of an annual report to Corporate Management Team (CMT) by the Head of Learning & Development.

See pages 217 – 218 for recommendations 58 & 59

**Recommendation 58**

Review arrangements for the management and recording of local training events such as familiarisation on new appliances and equipment, including for personnel on appointment to a new workplace and to include temporary appointments.

**Recommendation 59**

Provide a Learning & Development policy to enable individuals, teams and their managers to identify, plan and review their developmental needs, stating:

- the specific development programmes required and timescales for these to be completed in order to achieve competence within each role
- programmes required for continuous development, including into other roles
- those programmes/requirements that are mandatory in order to meet the safety critical needs of each role
- which programmes will take priority in the Service's Learning & Development plans
- arrangements for the planning and recording of these programmes
- the recording of competence at all stages within a role, in an auditable format

See pages 218 – 219 for recommendation 60 & 61

**Recommendation 60**

Review arrangements for the management and recording of key employment milestones to ensure the Service can readily evidence and audit the competence of all employees at each stage and retain this in accordance with regulatory requirements.

**Recommendation 61**

Undertake a gap analysis to ensure that exceptions in the completion of course based training events, including core external and internal programmes such as MODAS, dynamic risk assessment, analytical risk assessment, Incident Command, first aid/oxygen therapy and IOSH courses are provided for all relevant roles.

See pages 220 – 221 for recommendations 62 – 64

**Recommendation 62**

Review the provision of inter-agency training, exercises and knowledge of the roles of category 1 and 2 responders.

**Recommendation 63**

Implement a system of planning and recording visits and exercises at premises that have been considered under Section 7(2)(d) of the Fire & Rescue Services Act 2004. This should be in such a format so as to be easily interrogated for audit and monitoring purposes. In addition

consideration should be given as to how long such records should be held.

**Recommendation 64**

Review the frequency for exercises at 7(2)(d) sites and also the role of multi agency exercises at Contingency Plan sites in conjunction with the Local Resilience Forum.

**Recommendation 65** (See pages 222 – 223)

Review the policy and process for managing non attendances on core and mandatory safety critical learning and development programmes in order to ensure attendance by those staff nominated to attend.

**Recommendation 66** (See pages 224 – 227)

Contribute to the review of the national generic risk assessments and Service activity risk assessments for incidents involving explosives and for incidents involving acetylene and other activities where there is a projectile hazard. Risk assessments for relevant activities should take into account the specification and limitations of PPE items. Other safety controls should be actively identified and implemented to prevent wearers being exposed to risk of projectiles.

**OTHER RECOMMENDATIONS** (See pages 234 – 236)

**Recommendation**

The following recommendations arise from issues identified in the main Accident Investigation Report and this report should be referenced to understand the background to the recommendations, however they have been included in the Significant Findings Report for wider information.

It is recommended that East Sussex Fire & Rescue Service:

**Recommendation**

Give consideration to providing fireground radios to every operational appliance riding position and to Officers on an individual basis.

**Recommendation**

Fit all flexible duty system officers' cars with main scheme radio sets, to enable them to receive all safety critical informative messages.

**Recommendation**

Include Command Team attendance times as a performance indicator in the Incident Command System Manual note.

**Recommendation**

Amend the 'Flexible Duty System' and 'Officer Attendance at Fires' Manual notes to include a statement that there should be sufficient Officers to enable two simultaneous Level 3 Command Teams to be deployed without specialist officers up to relief stage.

### **Recommendation**

Introduce an annual refresher training programme in dynamic risk assessment for all personnel attending incidents.

### **Recommendation**

Amend the 'Flexible Duty' and 'Officer Attendance at Incidents' Manual notes to reflect the skill sets required by each officer rota group, to include the number of fire investigation officers, HMEPOs and Construction Industry Training Board (CITB) trained officers.

### **Recommendation**

Review the ICS Manual note to include:

- guidance on how to avoid a 'command gap'
- provide criteria to assist Level 1 Incident Commanders with gathering risk information in order that they can carry out a suitable and sufficient dynamic risk assessment, before committing personnel to an incident.
- a formalised system for liaison with other agencies at operational incidents

### **Recommendation**

Review the Incident Command System to require that all Level 2+ Officers at an incident ensure that they have received a handover, assumed command of the incident and carried out a dynamic risk assessment before making command decisions, with the exception of safety critical decisions.

### **Recommendation**

Provide training to all Service Commanders on the advisability of committing to offensive firefighting actions without a secure water supply. Further training should also be given on tactics that can be adopted to prioritise and maximise the available water supply.

### **Recommendation**

Provide training to operational personnel on how to effectively manage incidents involving explosives and in particular bulk firework storage sites.

### **Recommendation**

Provide operational personnel with a programme of updates on how to operate the Incident Command System, reinforcing the need to declare the tactical mode at an early stage, including

the definitions of offensive, defensive and transitional modes. Provide structured training to remind operational personnel of the difference between offensive actions for saveable life as opposed to saveable property.

### **Recommendation**

Provide training to operational personnel to enable them to carry out the role of water resources officer, commensurate with the level of the incident. This training should include:

- operational tactics to be adopted where water resources are scarce
- maximising flow from hydrants
- how to find open water resources in rural areas
- what assistance can be given by water undertakers to increase the flow
- use of firefighting media flow tables
- practical pump operation to maximise delivery against supply
- a formal system for pump operators to inform the Incident Commander/Command Support what delivery can be achieved with the water supply available.

### **Recommendation**

Provide training and guidance for Incident Commanders on how to avoid conflict with aggressive or emotionally distressed members of the public. This training should include when to request that the police remove persons who are interfering with command decision making and/or creating difficulties for firefighting operations.

### **Recommendation**

Ensure that a review of the suitability and sufficiency of relevant risk assessments is undertaken as part of the investigation process following significant safety events.

### **Recommendation**

Verify if the duplicate entries found in ACTIVAT records at stations within the sample extends across the Service, and to take corrective action where necessary.

# **MARLIE FARM ACCIDENT INVESTIGATION**

## **SIGNIFICANT FINDINGS REPORT**

### **Introduction**

This report summarises the actions of the East Sussex Fire & Rescue Service, the significant findings of its investigation, learning outcomes and recommendations further to the investigation carried out by East Sussex Fire & Rescue Service into the incident at Marlie Farm on 3 December 2006. These outcomes and recommendations may impact on Fire and Rescue Services and other relevant stakeholders.

Further reports may be published in the future should further evidence come to light.

The Representative Bodies were embedded in the accident investigation process throughout and contributed at all stages.

### **Scope of the Report**

The accident investigation, and therefore this report, primarily considers the actions of the East Sussex Fire & Rescue Service as a result of the emergency '999' call received reporting an explosion and fire at Marlie Farm, The Broyle, near Ringmer on Sunday 3 December 2006.

This report is split into 3 main sections. The first part details the location of the site, details of explosives and fireworks including their classification, licensing of the site, events leading up to the incident, the Service response, the main explosion and subsequent damage.

The second part of the report is a detailed timeline from the time of the first 999 call to the explosion and brief details of significant actions post explosion.

The third part of the report details the significant findings of the Accident Investigation Team along with their recommendations.

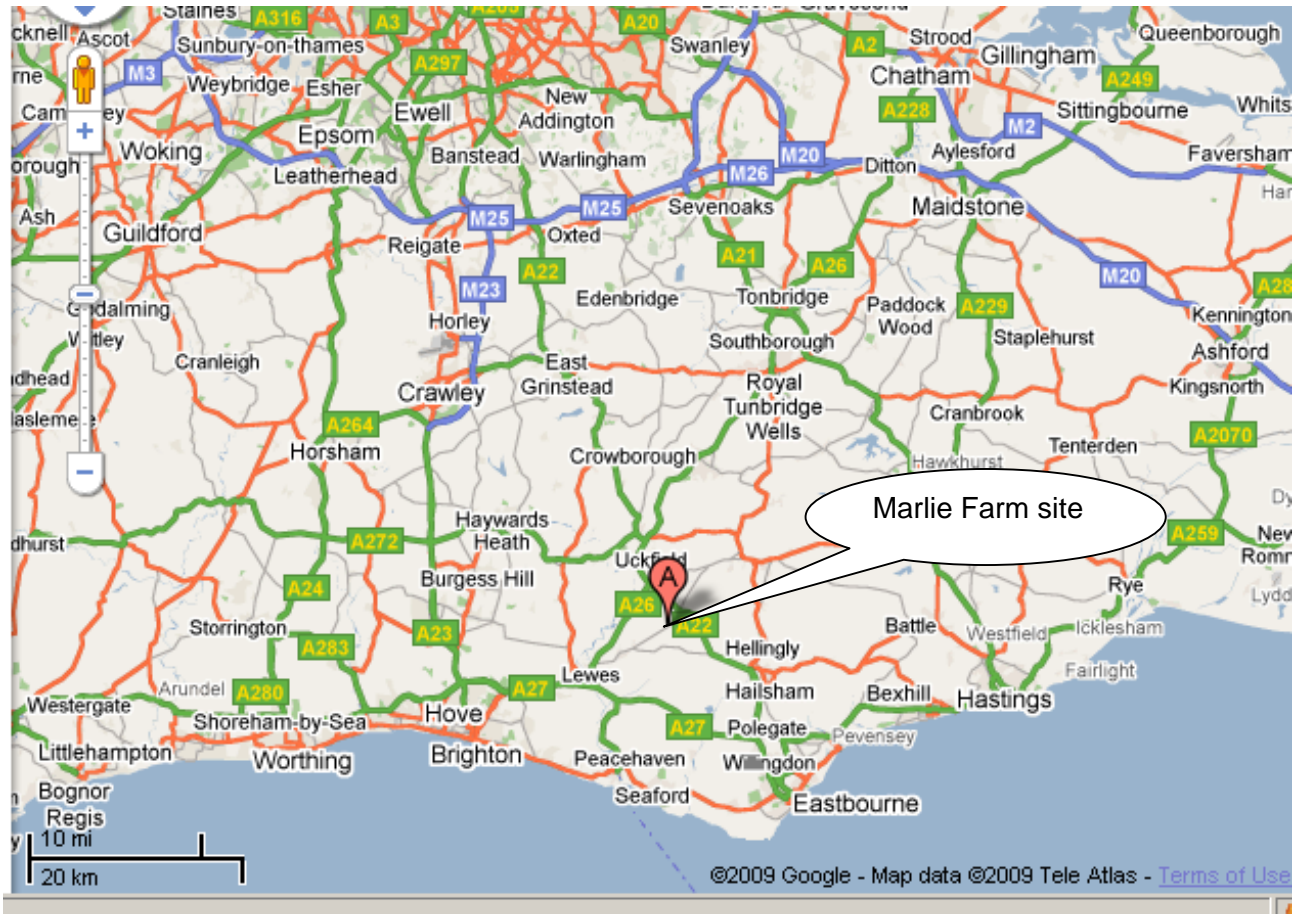


**Des Prichard**  
**Chief Fire Officer & Chief Executive**



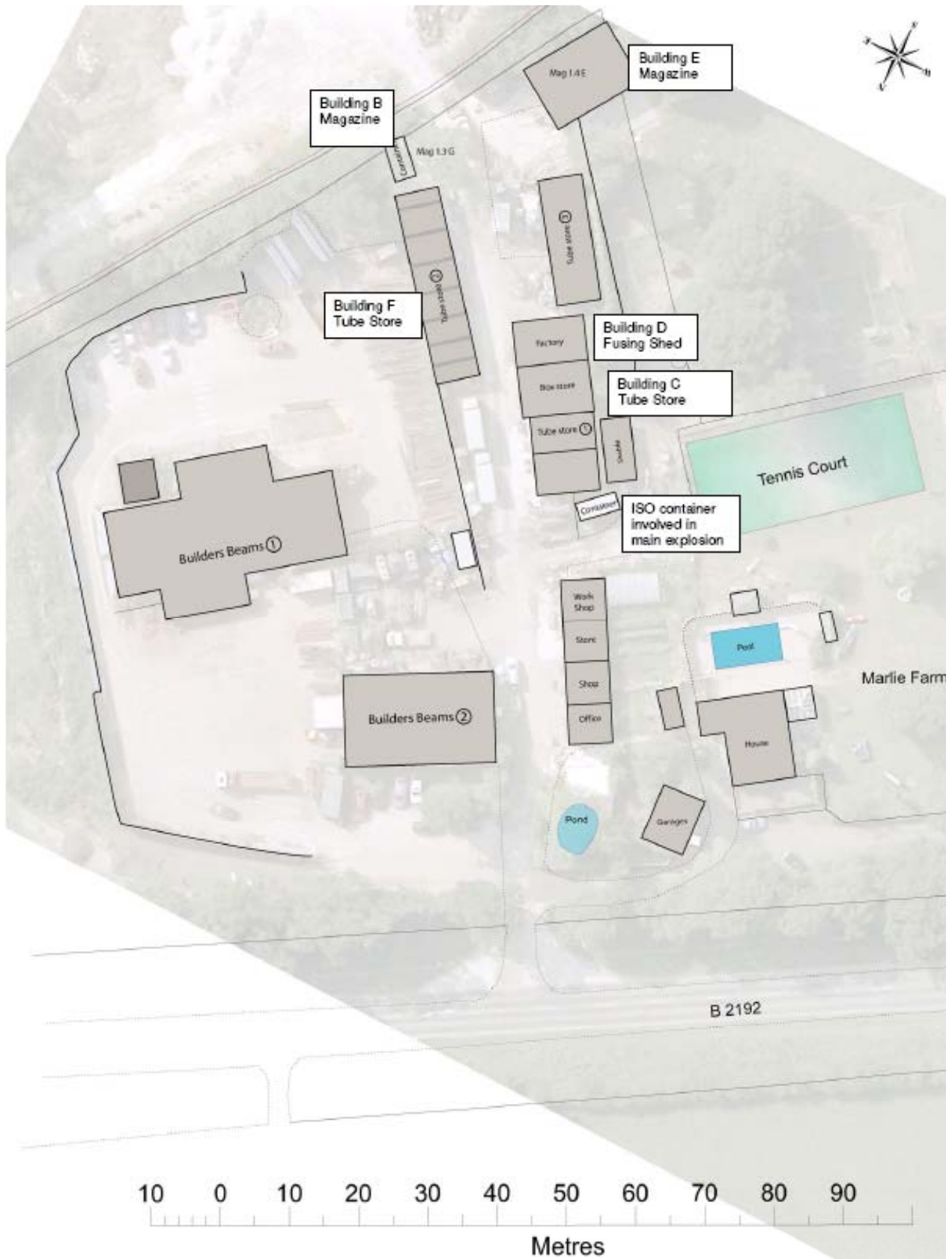
## The Site

Marlie Farm is a small industrial estate located on the B2192 between Ringmer and Halland, approximately 6 miles from Lewes and Uckfield Fire Stations respectively. The site is located in a largely rural area, comprised mainly of open agricultural land, with low-density housing and small commercial properties.



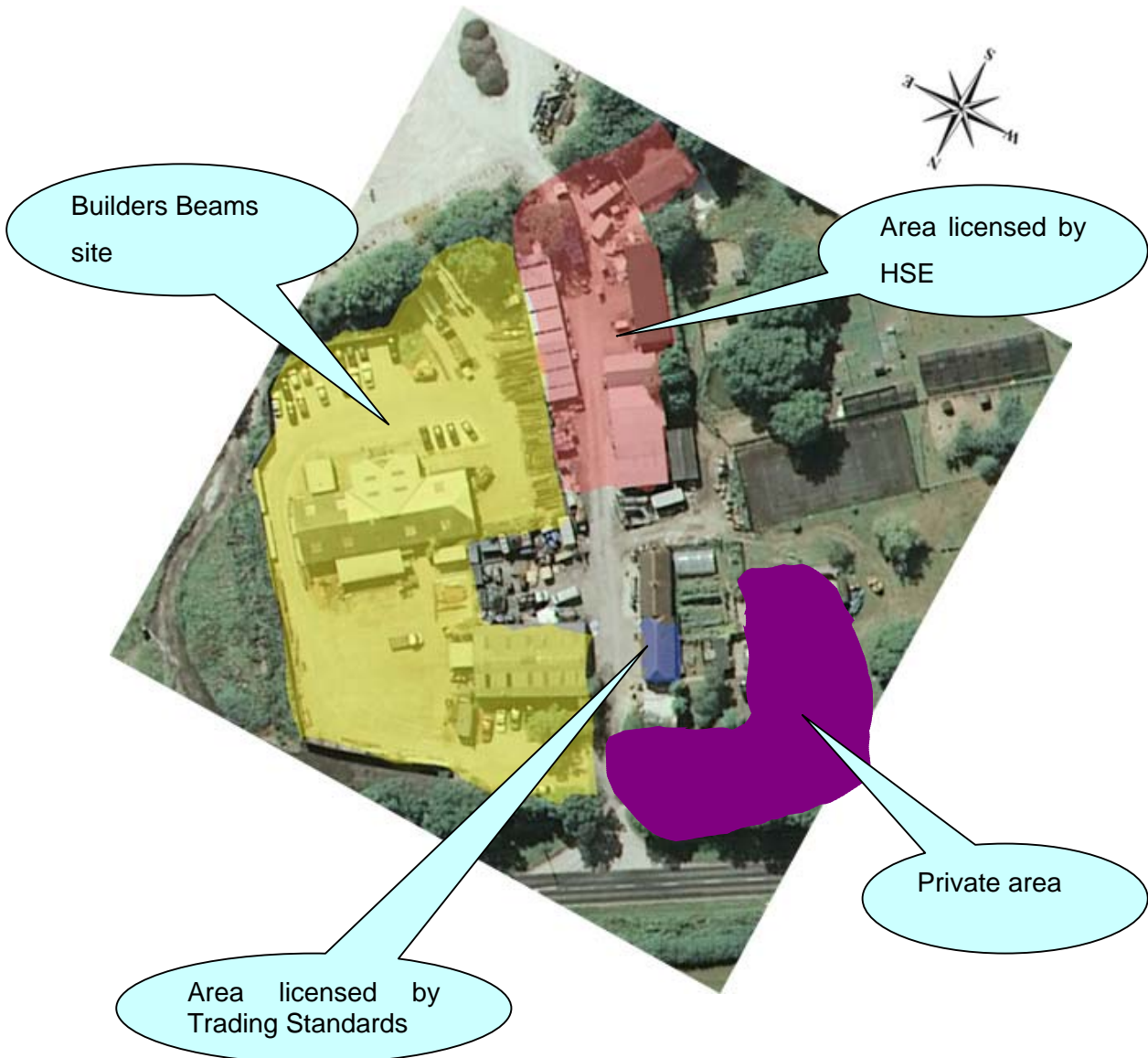


Aerial photograph showing the Marlie Farm site – Ordnance Survey photo taken in July 2006



Plan showing building use within the Marlie Farm complex

The Marlie Farm site is comprised of four main areas: a private detached dwelling and garage used by the owners of the site - who were the Winter Family's Mother and Father, Martin and Julie Winter, two sons, the eldest being Nathan Winter and a daughter; An area licensed by East Sussex County Council (ESCC) Trading Standards for the storage and retail sale of fireworks to Sussex Fireworks & Displays Ltd (Directors Martin and Julie Winter) comprising an office and retail shop; An area licensed by the Health & Safety Executive (HSE) for the storage and preparation of fireworks to Festival Fireworks (UK) Ltd (Directors Martin and Julie Winter) comprising a workshop and a range of further structures; and immediately adjacent, but still contained within the Marlie Farm site, a separate factory premises leased to a separate company, Builders Beams (with no connection to the Winter family), comprising two large detached industrial units used for the fabrication of steel construction beams.



## **Explosive (Fireworks) Legislation in the United Kingdom**

Previously, the basis for explosives legislation in the United Kingdom was the Explosives Act 1875. On April 26 2005, the Explosives Act was superseded by the Manufacture and Storage of Explosives Regulations (MSER) 2005. Along with the regulations, an 'Approved Code of Practice' (ACoP L139) was also produced.

One purpose of Approved Codes of Practice (ACoP) is to give practical advice on how to comply with the law. If the advice is followed then that is sufficient to comply with the law in respect of those specific matters on which the Code gives advice. Alternative methods to those set out in the Code may be used in order to comply with the law.

However, the Code has a special legal status. If, in a prosecution for a breach of health and safety law, it is proved that the relevant provisions of the Code were not followed, then it is for the defence to show that the law has been complied with in some other way, or the court will find in the prosecution's favour.

L139 also includes guidance on some aspects of the MSER. This does not form part of the ACoP. Following this guidance is not compulsory.

Although the Regulations and ACoP came into force in 2005, the development of these new regulations started in 1983.

Under the MSER the 'Local Authority' (except in Metropolitan areas where it is the Fire Authority) are responsible for dealing with sites storing less than 2,000 kg NEQ of explosives. Where less than 250 kg are stored, a Registration Certificate is granted; in excess of this amount a Licence will be issued.

For sites storing more than 2,000 kg or in harbour areas, it is the Health & Safety Executive (HSE) who deals with licensing.

## **UN ADR Hazard Division (UN HD) Definitions**

### **Hazard Division 1.1 (UN No: 0333)**

Explosives that have a mass explosion hazard (a mass explosion is one in which the entire body of explosives explodes as one).

### **Hazard Division 1.2 (UN No: 0334)**

Explosives that have a serious projectile hazard, but not a mass explosion hazard.

### **Hazard Division 1.3 (UN No: 0335)**

Explosives which gives rise to considerable radiant heat OR which burn to produce a minor blast, or projection effects, or both.

### **Hazard Division 1.4 (UN No: 0336)**

Explosives that present only a low hazard in the event of ignition or initiation. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire shall not cause mass explosion of almost the entire contents of the package.

In addition, the UN recommendations define, in the most general terms, the types of packaging that is suitable for the carriage of all dangerous goods, and explosives and fireworks in particular. This leads to the assignment of a UN mark (not to be confused with the UN hazard code) to a particular package that has been tested and deemed to be suitable for transport.

## **Classification of Explosives for Transport**

The 'Classification and Labelling of Explosives Regulations 1983' (CLER) requires that an explosive be classified by the United Kingdom Competent Authority (CA) before it may be kept, supplied or conveyed. The Competent Authority for commercial explosives (including fireworks) is the Health & Safety Executive (HSE). The purpose of classification is to identify the hazard posed by explosive substances and articles, as packaged for transport.

The 'Accord Dangerous Routiers' (ADR) classifies hazardous materials into nine classes. Class 1 substances are exclusively explosive substances and pyrotechnics (including fireworks).

An explosive assigned to Class 1 is accorded an appropriate United Nations (UN) serial number, hazard code and compatibility group, having regard to its composition, type and hazard. The UN

numbers for fireworks are 0333, 0334, 0335 or 0336, depending on hazard sub division.

### **Classification of Fireworks**

The determination of the Hazard Division classification for fireworks was previously based on the results of the classification generated by the UN 6 test series only. These tests were initially developed for the transport classification of high explosives and munitions.

The tests consist of 3 separate tests, (a), (b) and (c), and they are normally carried out sequentially. The (a) test (single package test) is carried out on one transport pack of fireworks, which is placed under half a metre of sand and ignited, and the test is purely to establish whether there is a mass explosion or not. It is a yes/no test, and the things looked for include craters, fragmentation and blast waves. The (b) test (stack test) is where multiple transport packs are tested and the purpose of that test is again to see whether there is a mass explosion or not, but the difference between the (a) and the (b) test is that as multiple packs are used in the test, what is being examined is the transfer of the mass explosion from one pack to adjacent packs and how likely that is to happen; this is also a yes/no test.

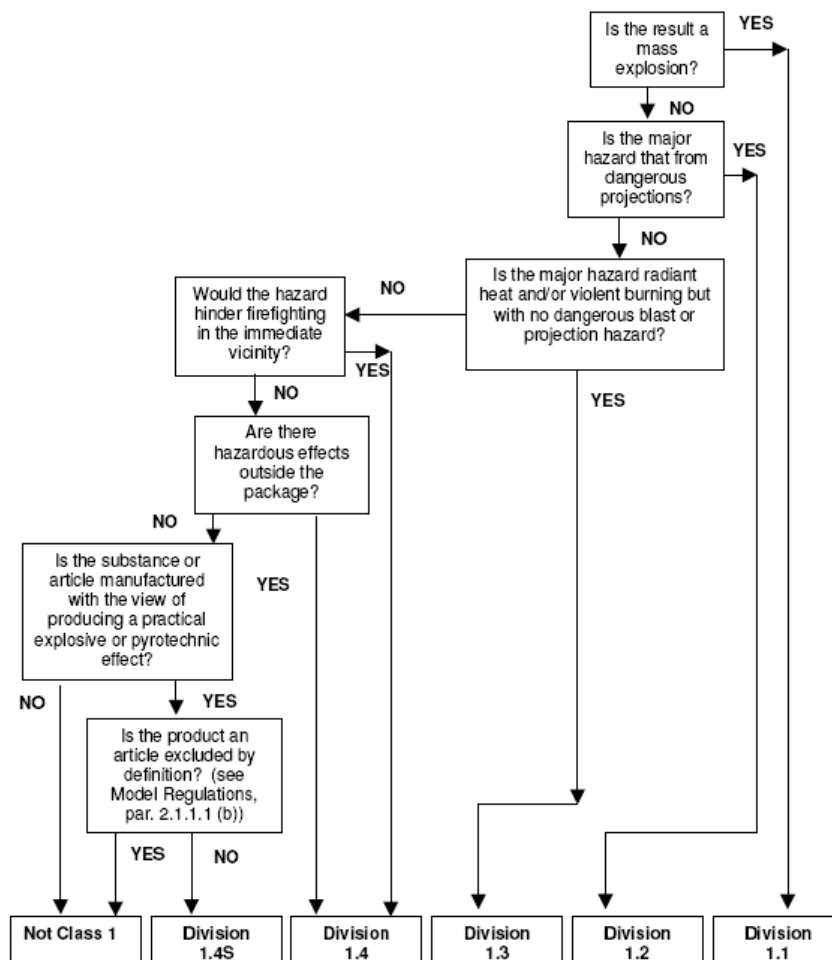
If no mass explosion occurs in these two tests, then the (c) test, (external fire or bonfire test), is carried out. It involves placing three (usually) transport packs on a fire crib of specified size and aluminium sheets (witness plates) are placed at a distance of four metres from the edge of the packs to monitor for projectiles. Enough fuel to keep a fire burning for at least 30 minutes is placed under the crib and ignited. Observations are then made for mass explosion and projectiles.



Image of series 6 (c) test – photo courtesy of BAM

The results of the series 6 tests lead to the classification:

- HD 1.1 – if a mass explosion occurs
- HD 1.2 - if the major hazard is that from dangerous projections, e.g. perforation of any witness screen occurs
- HD 1.3 – if the major hazard is radiant heat and/or violent burning but no dangerous projections, e.g. a fireball or jet of flame extends beyond any witness screen or a fiery projection is thrown more than 15 metres
- HD 1.4 – if the hazard would hinder firefighting in the immediate vicinity, e.g. a fireball or jet of flame extends more than 1 metre from the flames of the fire or a fiery projection is thrown more than 5 metres from the edge of the articles
- HD 1.4S – if none of the above events occur.



Flow chart showing how Hazard Divisions are achieved through UN Series 6 tests



This classification only applies if the fireworks are stored in UN standard packaging. If they are stored differently the classification can differ substantially. Rev. Ronald Lancaster, MBE describes in *Fireworks – Principle and Practice* 4<sup>th</sup> edition:

For the same type of fireworks;

- *'If a large number are packaged together, there may be a mass explosion hazard and the resulting package is correctly classified as 1.1G, or*
- *If a small number are packed in a metal box, there may be no mass explosion hazard – but metallic debris from the box may present a 1.2G hazard, or*
- *If a small number are packed individually in a fibreboard box, there may be a “fiery projection” hazard resulting in a 1.3G assignment, or*
- *A single maroon in a fibreboard box may pose a 1.4G hazard, and finally,*
- *A single maroon in a very large box may have effects confined within the box leading to 1.4S hazard.'*

He goes on to warn:

*'The basis of the UN recommendations for fireworks is that if they are packaged in a suitable way, the hazards arising from accidental ignition of a package are reasonably well defined and understood. This is particularly important for the emergency services in case of an accident. They must be able to assess the risk of attempting to control the incident. However, there are anomalies in the UN classification scheme, and there is a danger that the emergency services will not respond appropriately to an event unless there are changes to the UN scheme.'*

*'This is particularly true in the case of explosives presenting a “fiery projection hazard – 1.3”. Strictly applied, any “fiery projection” emanating from a UN series 6c test that passes 15 m must mean that a 1.3 hazard is assigned (presuming that the material is not assigned to 1.1 or 1.2). However, there is a great difference between the occasional Roman candle star being shot beyond this distance over an extended period of time and the short-duration fireball produced by the rapid ignition of 1.3C propellant. There is a danger that a firefighter who has witnessed the former will treat the latter completely inappropriately and be severely injured or killed as a result.*

### **Default Classification Scheme**

As it is expensive and time consuming to carry out these tests for every type of firework, a default classification regime was introduced in the United Kingdom, by which fireworks are assigned a UN HD classification based on the type, size and quantity of pyrotechnic composition. The United Kingdom default scheme was updated in 2003 with a number of changes in light of findings of other firework accidents in Europe, with it coming into force in 2005.

Whilst the UK default scheme was being updated, a similar scheme was to be introduced on a worldwide scale through the United Nations (UN). The UN accepted the default scheme in 2005 and it was implemented with a delay of two years, by the model regulations, for transport, and then the European framework directive.

The UN scheme was due to come in to force in the United Kingdom from 2007, but was used on a voluntary basis from January 2006. Until recently most fireworks were classified as either 1.3G (0335) or 1.4G (0336). However, results of trials conducted to support the development of a UN 'default' classification regime have meant that many larger fireworks, or those containing flash powder, are now classified as 1.1G.

#### **Commentary**

As fireworks are only tested when in their UN approved transport packs, the Hazard Division classification will only apply when a firework is kept sealed within its transport box. For example, fireworks with a HD 1.3 classification, when taken out of transport packaging and stored together on a shelf could become HD 1.1 classification fireworks.

#### **LOCEF**

The List Of Classified Explosives and Fireworks (LOCEF) is a database held by the HSE on all explosives and fireworks that have been classified by the HSE. Every explosive, before it is imported or transported within the United Kingdom, must have a classification, and so should be recorded on this database. The database lists the commercial name, part number, type, manufacturer, UN number, hazard code and competent authority reference for each firework.

With the changes to the United Kingdom default classification table, a reclassification exercise was carried out in 2003. All companies holding a Competent Authority document were notified in writing about the change in classification. If the company then provided information to the HSE to justify a variation to the default scheme, the reclassification did not apply. However, if information wasn't provided or wasn't deemed adequate, the items were classified as per the default table.

With regards to Festival Fireworks (UK) Ltd, as an importer they held a number of Competent Authority documents and for this reason the HSE contacted them in writing.

A number of the fireworks they imported were reclassified as 1.1G as a consequence of the 2003 reclassification exercise. These included 'master pack', 'rocket pack', 'break rocket' and 'cyclone rocket'.

## CHAF

The European Union (EU) had funded a project entitled: 'Quantification and Control of the Hazards Associated with the Transport and Bulk Storage of Fireworks' (CHAF). The CHAF project was partly initiated as a result of the incident in Enschede in the Netherlands in 2000, but also due to other explosions that have occurred in the United Kingdom, Germany and other countries. There was anecdotal evidence that 1.3G fireworks could react as 1.1G when confined in storage. The purpose of the CHAF project was to carry out fundamental research to investigate whether correctly classified fireworks, which were classified as non-mass-explosive (1.3 or 1.4), give rise to a mass explosion (1.1) when present in large quantities.

The CHAF Project involved experts from the Netherlands (TNO), Germany (BAM) and the United Kingdom (HSE and HSL) and was divided up into ten work packages.

Work package 9 was the "instrumented full-scale testing". It involved full-scale tests of fireworks, in 20 ft ISO shipping containers. Each test involved just one type of firework, whereas in normal transport and storage, there would be a mixture of types.

The results of the CHAF project were published on the website [www.CHAF.info](http://www.CHAF.info). Written reports were also posted on the website and additionally reported at the 9<sup>th</sup> International Symposium on Fireworks in Berlin in April 2006.

### Commentary

It is known that both Martin and Nathan Winter attended this symposium.

## Hazard Type

The MSER introduced the concept of a risk-based system for classification that takes into account the extra hazards imposed by the storage and processing of explosives. This is referred to as the '**Hazard Type**' (HT). How the licence holder determines the HT is detailed in the HSE Approved Code of Practice. The Hazard Type system reflects the conditions that are found in storage. This means that in some cases the HT may differ to the UN HD classification for transport, although in the majority of cases they will be the same, for example UN HD 1.1 will be HT 1.

### Hazard Type 1

An explosive, which as a result of, or as the result of any effect of, the conditions of storage or process of manufacture, has a mass explosion hazard.

### Hazard Type 2

Projectile hazard.

### Hazard Type 3

An explosive which as a result of, or as the result of any effect of, the conditions of storage or process of manufacture, has a fire hazard and either a minor blast hazard or minor projectile hazard, or both, but does not have a mass explosion hazard.

### Hazard Type 4

An explosive which as a result of, or as the result of any effect of, the conditions of storage or process of manufacture, has a fire or slight explosion hazard, or both, only with local effect

### **Importation Controls**

Formal importation controls of fireworks into the United Kingdom were abandoned in the early 1990s, following the establishment of the single European market. Before this time each consignment of fireworks arriving in the United Kingdom had to be reported to the HSE, and if necessary tested before sale.

### **Licensing at the Marlie Farm Site**

In 2002 the Health & Safety Executive issued an amending licence (No 7274) to Festival Fireworks (UK) Ltd at Marlie Farm. This licence was issued under the previous legislation, but when the MSER came into force any licence issued under the Explosives Act, was 'deemed to be a licence' under the MSER on 'its existing terms and conditions'. The licence detailed the following:

Building B – Storage of explosives, steel wall and roof, wood floor and internal surface. 600 kg of explosives of Hazard Types 3 and 4 (HT 3 and HT 4). Electric fuses shall be segregated from the explosives in a suitable dedicated container. Maximum number of persons to be in building: 2.

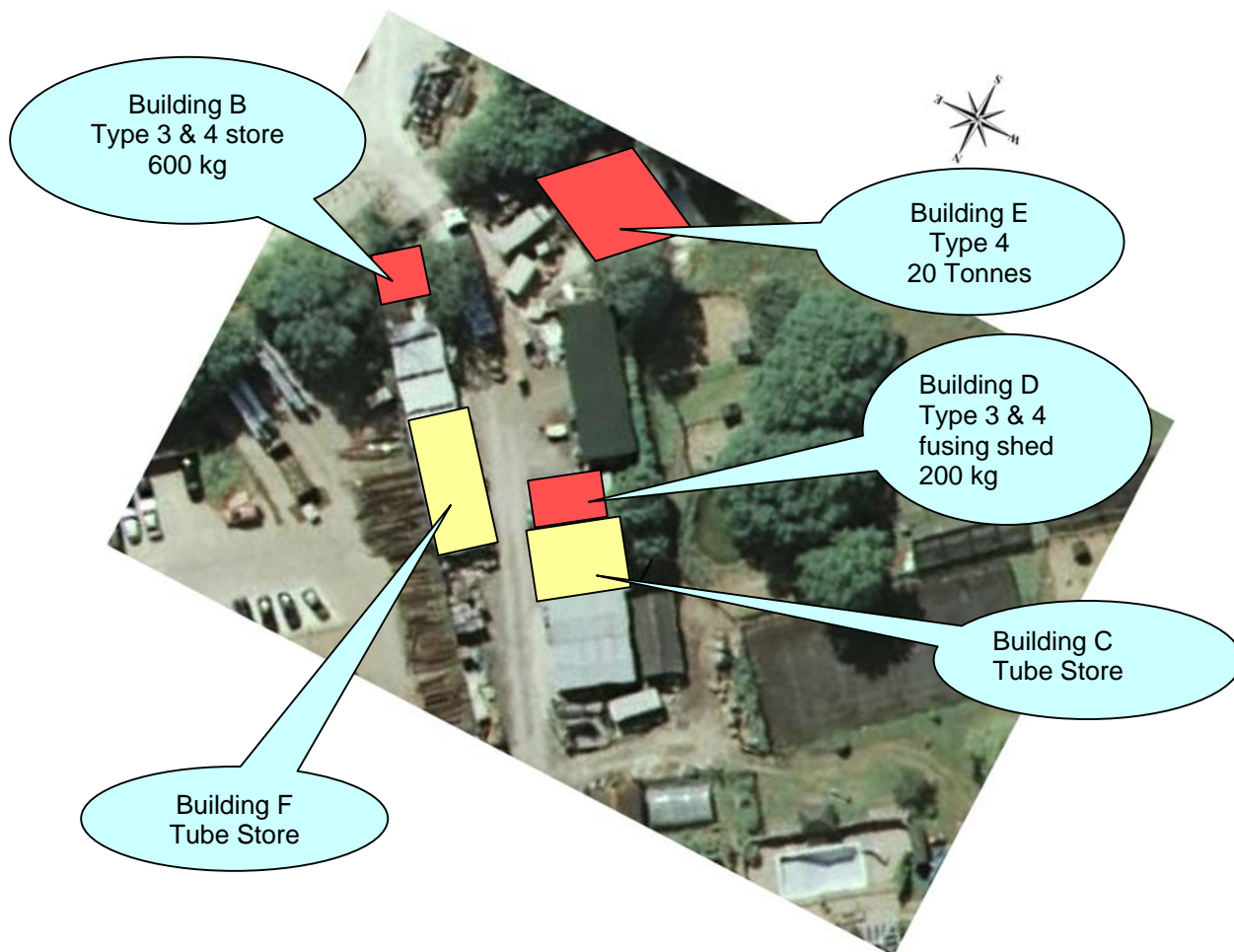
Building C – Storage of non-hazardous material, wooden wall, roof and floor. Non-explosive and non-hazardous materials to be stored. Maximum number of persons to be in the building: 2.

Building D – Wooden wall, floor and roof. Internal surface to be painted wood, finished as to be smooth and free from crevices and grit free. Packing of finished fireworks, 200 kg of explosives of Hazard Types 3 and 4  
or in lieu

Fusing and finishing of fireworks, 100 kg of explosives of Hazard Types 3 and 4. Maximum number of persons to be in the building: 2.

Building E – Storage of explosives, concrete block, steel frame walls, corrugated sheet roof, asphalt floor and painted internal surface. 20,000 kg of explosives of Hazard Types 3 and 4. Maximum number of persons to be in the building: 2.

Building F – Storage of non-hazardous material, wooden wall, roof and floor. Non-explosive and non-hazardous materials to be stored. Maximum number of persons to be in the building: 2.



Buildings Licensed by HSE

Previously, sites could be licensed by the Local Authority for a shop and by HSE for manufacture and storage, and sites like these would often have two licences by two different Authorities. The new regulations (MSER) required that where this was the case, these should become one site, enforced by one Authority.

A query was raised by East Sussex Trading Standards to the HSE regarding the Marlie Farm site,

because Mr Martin Winter had advised them that the shop was owned by one company, Sussex Fireworks and Displays, and the site belonged to another company, Festival Fireworks (UK) Ltd, but that both Martin Winter and his wife were the Directors of both companies. The issue was that there was a Trading Standards licence and also an HSE licence. Under the MSER the whole site should be covered by one licence, However, because there were two companies but effectively one set of Directors, this raised the question of whether this was to be treated as two sites or as one.

The advice from HSE lawyers was that the regulations, where it referred to 'persons', meant the legal entity, and as there were two separate legal entities i.e. two separately registered companies, this allowed the registration for the shop to continue with East Sussex Trading Standards and the licence for the site to remain with the HSE.

On 16 October 2006, East Sussex County Council Trading Standards granted a registration to Sussex Fireworks & Displays Ltd for the storage of 350 kg of fireworks in the shop at the front entrance to the site.

As part of the investigation into the above issue regarding both an HSE and the Trading Standards licence for the same site, an HSE Inspector accompanied by the Sussex Police Explosives and Licensing Officer, carried out a site visit on 11 October 2006. A number of issues were noted during this inspection. The HSE Inspector requested written information from Martin Winter by 5 January 2007, detailing what action had been taken in response to the issues raised in her letter.

The issues included:

- Building B, which had been orientated east to west on the licence plan, was found to be orientated north to south, thereby possibly reducing separation distances to other buildings;
- A box of mixed fireworks was found in Building E;
- A number of damaged boxes containing fireworks and some that had been opened that were not taped down;
- Building E had a mezzanine floor that was accessed by a ladder, showing some signs of damage. The mezzanine floor and a dividing wall had not been mentioned in the Licence;
- The front of Building E contained possible asbestos sheeting;
- No accurate records of stock held were available;
- Fireworks '200 shot song hero' found, which were not classified on the LOCEF database;
- Metal support tubes found to be used for roman candle displays.

### **Events leading up to the Incident**

Festival Fireworks (United Kingdom) Ltd was due to give a firework display in Eastbourne, East Sussex on Sunday 3 December 2006 as part of the Eastbourne Town Centre Christmas light switch-on at 16.30 hrs. The client phoned the company at approximately 13.00 hrs as no one had arrived on site to set up the display and someone from Festival Fireworks advised the client that they would be leaving for Eastbourne shortly.

Martin and Nathan Winter stated that they had spent the morning loading the ISO shipping container with fireworks and bird scarers prior to the container being shipped to the Middle East.

### **Initial Stages of Incident Prior to the Fire and Rescue Service Involvement**

During his interview under caution on 4 December 2006, Nathan Winter stated that he had collected fireworks from Upper Lodge Farm and had taken them to Marlie Farm in order to assemble the items necessary for that Eastbourne display. He parked a Transit van in front of Building D and started placing some cakes (of fireworks) into plastic bags in order to protect them from the effects of the weather at the display site. This was taking place on the veranda of Building D, the factory building, rather than inside. He went on to say that Building D already contained a box of 3-inch shells, four boxes of 4-inch shells and a box of two-and-a-half inch shells that had already been fused.

Having nearly completed the waterproofing of the cakes, he took a bundle of igniters from a lorry that had returned from a previous firework display and carried them down to the area he was working in at Building D. These were in a loose bundle and not packaged. He placed the igniters on top of a box on a chair on the veranda. He states that he then picked the loose igniters up from the chair in order to place them into a box. As he picked the igniters up he alleges that they started to activate. He then describes immediately dropping the bundle of igniters.

These then ignited the boxes of fireworks on the veranda of Building D. The van, containing additional fireworks, had been parked in close proximity to the veranda with its doors pushed to, rather than closed. The fire then spread to the van, activating the fireworks inside.

However, during the court process, Nathan's allegation of the activation of the loose igniters and subsequent ignition of the fireworks, was discounted by scientific tests and expert evidence presented to the court. Nathan's account given in interview on 4 December 2006 to Sussex police differs from his first version of events given to police officers at the time of the incident on 3 December 2006.

Below are two extracts from police officers statements:

PC Simmonds:

*'Nathan Winter told me at the time of the fire "it's my fault. It's my fault. I caused it. I was putting a detonator in and it exploded in my face." His eyebrows and eyelashes were singed'.*

PC Scott:

*'Nathan Winter approached me and when I asked what happened?" he said "I was placing an igniter in a firework and it went off in my face and I ran like hell.'*

**IGNITERS**

Electric igniters, (sometimes referred to as 'match heads'), are used throughout the fireworks industry as a means of setting of charges in fireworks. This is for a number of reasons including allowing the operator to maintain a distance from the firework, better control over the ignition of fireworks and the ability to allow many items to be fired at the same time.

Electric igniters consist of two insulated wires, which at one end terminate in a bridgewire that is coated with a small amount of pyrotechnic material. This pyrotechnic material is sensitive to both heat and friction. To prevent accidental ignition due to friction, the pyrotechnic material is coated with a layer or layers of lacquer. The igniter "head" can also be covered by a protective PVC shroud.

When a small electrical charge is passed down the wire, the bridgewire becomes hot, igniting the pyrotechnic material surrounding it.

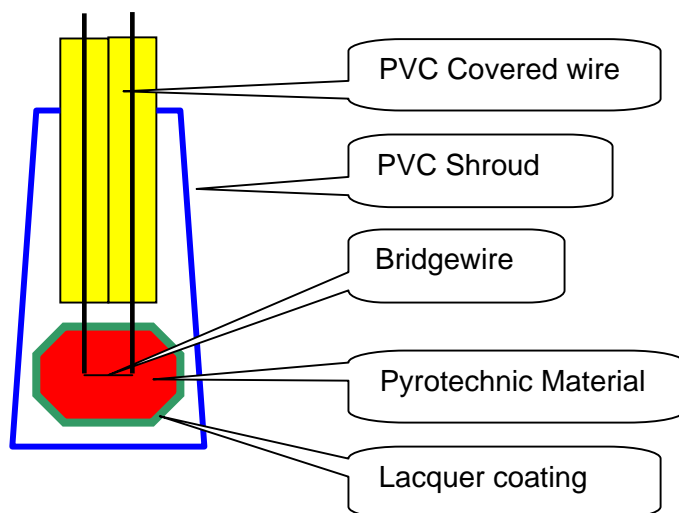
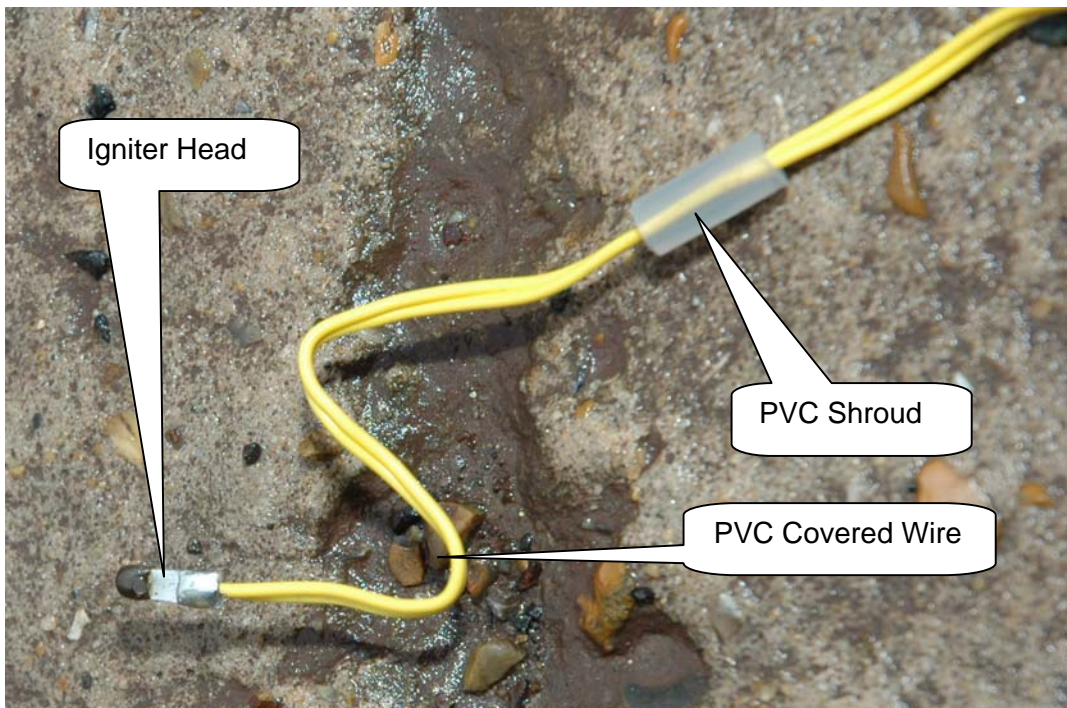


Diagram showing construction of Electric Igniter

Examination of the Marlie farm site post explosion revealed a number of different types of electric igniters some of which were sheathed, and some were not.





Example of Igniter found on Site (Copyright Sussex Police)

In addition loose igniters were found on the blue lorry, in metal paint cans mixed with nails. This is extremely hazardous as it can lead to damage to the protective lacquer, which then makes the Igniter more susceptible to accidental ignition through friction.



Electric Igniters and contents of paint tin on Blue Lorry (Copyright Sussex Police)

### **Commentary**

Expert evidence during the court process stated that it is unlikely that the igniters would activate in the manner described by Nathan Winter and it is also improbable for igniters not in close proximity to activate fireworks. It is known from previous incidents that if the protective lacquer around the match head of the igniter is damaged, then friction created as it is inserted or removed from a firework can cause the igniter to activate.

An eyewitness from Lewes was driving past the Marlie Farm site when his car broke down at the entrance to the site. Whilst awaiting recovery, he noted a white van on the site. He later described: *'I was alerted and startled by the sound of fireworks going off and a big bang. I cannot remember which of these happened first because it was so close... I looked back to the front nearside wing mirror and I saw a person running from the right-hand side of the industrial site to the left.'*

Another eyewitness from a property situated directly opposite Marlie Farm describes: *'at 1.40 to 1.45 p.m. that day I heard the sound of fireworks going off. My wife and I looked out of our house and we saw that there was a fire at the Marlie Farm Estate. Neither of us took much notice initially. After a few minutes my wife became more concerned about the fire on the farm. We could see flames rising from an area behind the big barn on the estate. My wife phoned the Fire Brigade. For the first ten to fifteen minutes fireworks were going off constantly from the fire. Prior to any emergency services arriving, there was a loud explosion, which created movement throughout our house and causing ornaments on our front windowsill to be knocked over. This first explosion sounded like a large amount of the mortar fireworks you get at displays going off at once.'*

### **SUMMARY OF INCIDENT**

At 13.49 hrs on Sunday 3 December 2006, the East Sussex Fire & Rescue Service Mobilising and Communications Centre (M&CC) received a '999' call reporting an explosion and fire at Marlie Farm, The Broyle, near Ringmer.

An initial pre-determined attendance of two pumping appliances (pumps) was mobilised. Repeat '999' calls to M&CC prompted the dynamic mobilisation of a third pump. In total over 25 repeat calls were received between 13.49 hrs and 13.59 hrs.

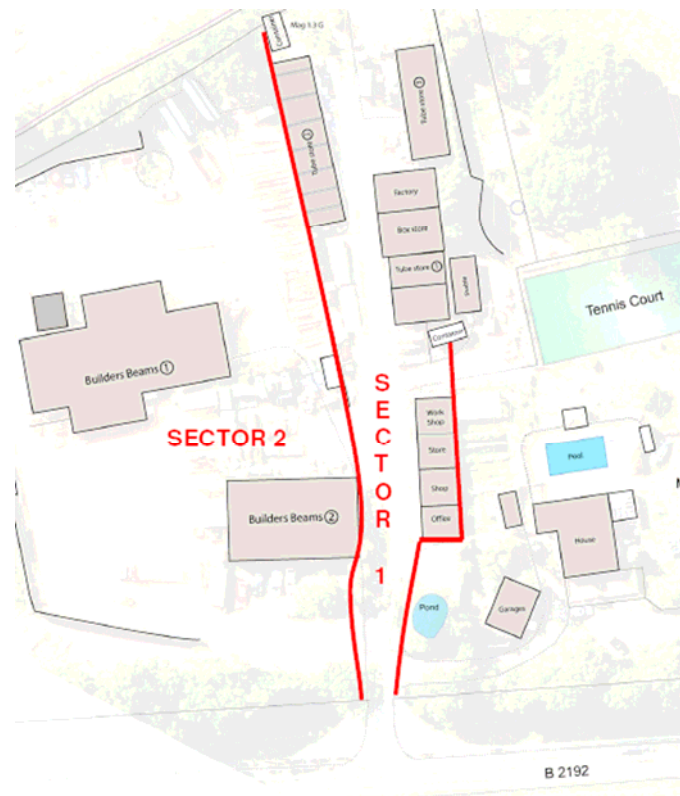
On arrival of the first appliance at 13.59 hrs, the initial Incident Commander (Level 1) observed a well-developed fire involving structures and vehicles either side of the main driveway inside the Festival Fireworks site. Fireworks were issuing from the areas on fire. Sussex Police and site staff were also present on the site. Assistance messages were sent immediately on arrival requesting

additional pumps and special appliances. In accordance with Service procedures, a Level 2 Incident Command Team, consisting of an Incident Commander, Command Support Officer and a Safety Officer, was mobilised.

The initial East Sussex Fire & Rescue Service actions consisted of deploying two main jets, utilising the appliance water tanks. These jets were deployed to boundary cool the ISO container and prevent fire spread to adjacent structures. Later, an additional water supply was secured from a hydrant at approximately ten hose lengths distance (approximately 230 metres) from the entrance to the site. However, the supply from this hydrant was found to be insufficient to sustain the firefighting attack. Personnel and appliances were withdrawn while further water supplies were requested and being established.

At this stage, the Level 2 Incident Commander and Command Support Officer were in attendance. A reconnaissance of the site identified a second fire seen to be involving the office area of the main building on the Builders Beams site. Information received indicated the likely presence of acetylene cylinders within this building. A crew was deployed to extinguish this fire.

At this time the incident was divided into two operational sectors covering the areas of activity in the Festival Fireworks and Builders Beams factory sites.



Plan showing location of Sectors 1 and 2

Working conditions within the Builders Beams sector (Sector 2) then rapidly deteriorated, with the area becoming enveloped by the smoke plume and fireworks from the fires on the adjoining Festival Fireworks site. The Incident Commander instructed personnel to withdraw from the area. As they withdrew, crews identified and removed a number of acetylene and other compressed gas cylinders from a caged store adjacent to the main factory building.

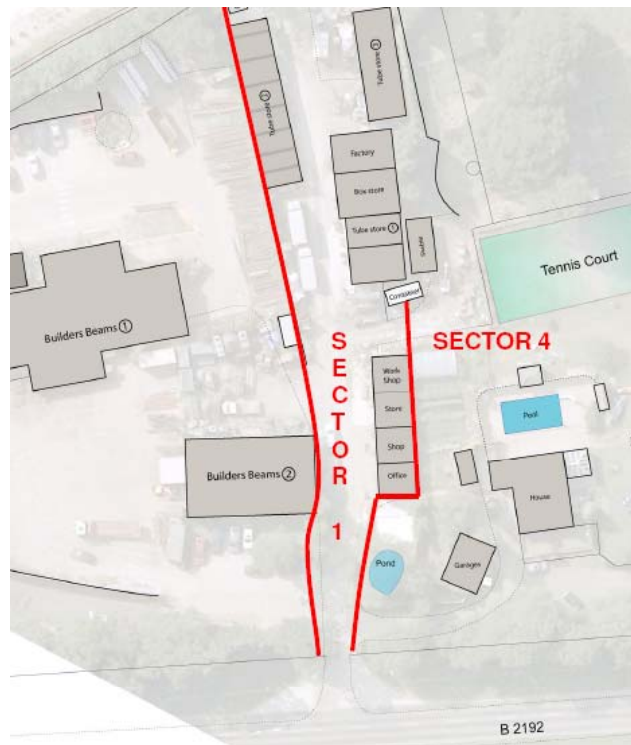
By this time the Level 2 Command Team were now all in attendance and the incident had escalated to a level 3 Incident with eight pumping appliances and five special appliances being requested. In accordance with Service procedures, a Level 3 Officer and additional support officers were mobilised.

At about the time that crews were withdrawing from the Builders Beams site (Sector 2), information was received confirming the presence of fireworks stored in an ISO shipping container on the Festival Fireworks site; this was being threatened by fire spread. The Incident Commander was concerned that members of the public and site staff remained within the risk area and asked the police to establish a 600-metre evacuation zone around the site.



Photo showing location of ISO container

The tactical plan at this stage was to establish two improvised monitors along the main driveway (Sector 1), one to contain the fire involving an oil storage tank and LPG cylinders on the left hand side of the drive and the other to cool the ISO container. Additionally, a new sector was to be instigated (Sector 4) in the area to the rear of the house. An improvised monitor was to be set up specifically to cool the ISO shipping container.



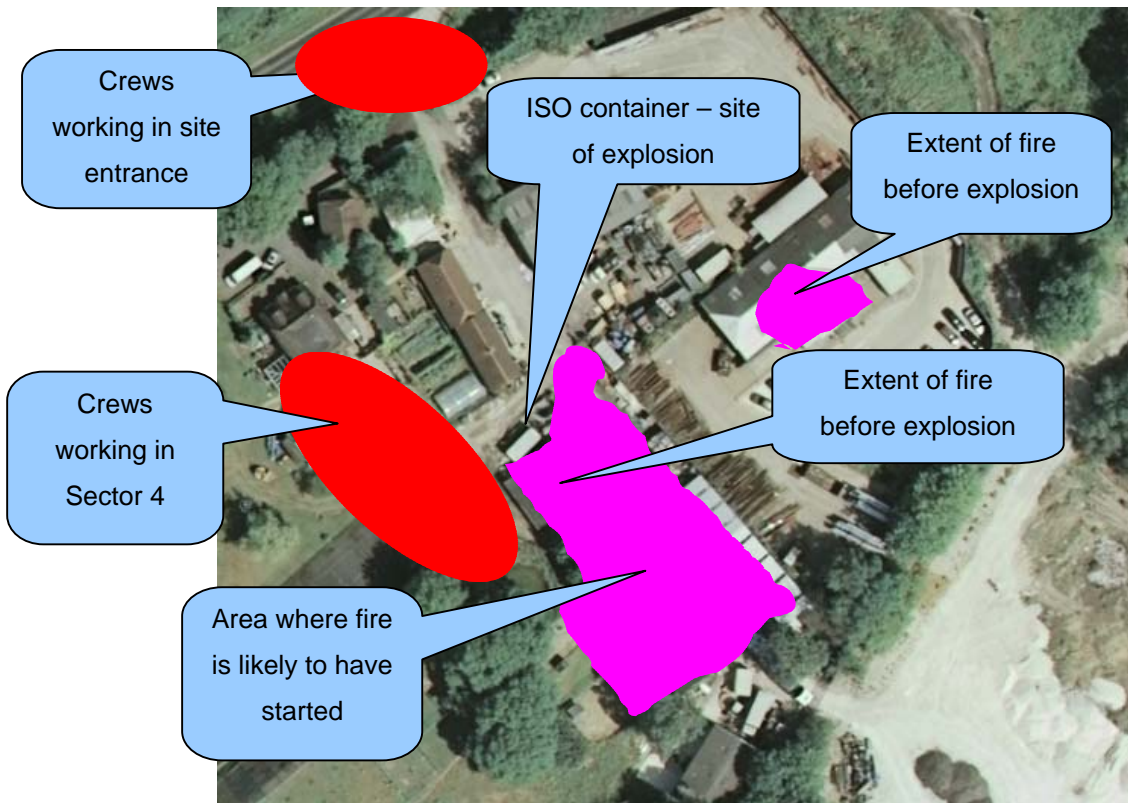
Plan showing location of Sectors 1 and 4

The water supply for this operation was being established from an open water source (swimming pool) in Sector 4 and a water carrier shuttle to reinforce the hydrant supply in Sector 1.

At around this time, additional information was being received about the 'size' of the fireworks stored in the ISO shipping container. Two Command Team members stated that simultaneously but separately a decision was made to evacuate the site. Crews working in Sector 1 were moved to the site entrance.

When the decision to evacuate the site was made, both Command Team members stated that an evacuation whistle was briefly sounded and it is believed that a fireground radio message to evacuate was sent. The Service's procedure requiring a roll call after an evacuation was not implemented.

Crews continued to work in the area of the site entrance, and some crews were recommitted into the main drive for the specific task of implementing the tactical plan of setting up improvised monitors in the driveway. These crews were withdrawn back to the site entrance by the Incident Safety Officer just before the main explosion. However, there is no evidence to suggest that the crews working in Sector 4 were aware of the evacuation, and they continued with their tasks.



Situation as at approximately 14.42 hrs

At approximately 14.42 hrs and 53 seconds a major explosion occurred within the site, involving the previously identified shipping container.



Still image taken from Sky News report showing footage of the main explosion provided by a member of the public



Still image taken from a TV news report showing footage of the main explosion provided by a member of the public who was situated immediately to the rear (south-east) of the Marlie Farm site

As a result of this explosion, Watch Commander Geoff Wicker (Heathfield Fire Station) and Brian Wembridge (Service Headquarters) were fatally injured. Nine other East Sussex Fire & Rescue Service personnel, two Sussex Police officers and two members of the public were also injured. Most of the structures on the Festival Fireworks site and the adjoining factory area were severely damaged by the explosion and fires. A number of secondary fires and explosions occurred across the site, with an ongoing hazard from projectiles, smoke and extensive areas of debris.



Photograph taken by police helicopter approximately half an hour after the explosion

East Sussex Fire & Rescue Service personnel immediately commenced a search and rescue operation, with assistance from the South East Coast Ambulance Service (SECAmb) and Sussex Police officers. All of the casualties were promptly rescued, except for Watch Commander Wicker who was located and confirmed deceased. Crews were then evacuated from the site to allow for a full roll call to take place.

Following an assessment of the scene, an attempt was made to recover Watch Commander Wicker, however it was not possible at that stage.

A defensive tactical mode was then adopted and the fires were allowed burn out under supervision. The presence of hazardous materials, including acetylene cylinders, and the unsafe condition of the structures caused this to become a protracted incident.

Immediately following the main explosion, SECAmb declared a 'Major Incident' and as a consequence Gold and Silver Commands were established.



Photograph of site taken on Monday 4 December 2006

The following day (Monday 4 December), a reconnaissance of the site was undertaken using a military remote controlled robot, as well as aerial observation from the Sussex Police helicopter and



using an Aerial Ladder Platform. The decision was made to leave the acetylene cylinders in place for a 24-hour period, starting from the time when the cylinders were deemed to be no longer subject to heating, to ensure that they were safe and this included maintaining a 200-metre safety cordon.

A decision was made not to enter the site until first light the following day, Tuesday 5 December.

East Sussex Fire & Rescue Service Hazardous Material and Environmental Protection Officers (HMEPOs) then entered the site to check on the condition of the known risks. All damaged cylinders from the Builders Beams site were then removed, including those that were found located within the buildings. One of these buildings first had to be made safe by the West Sussex Fire & Rescue Service Urban Search & Rescue Team.

With all fires now extinguished, the site was handed over to Sussex Police, to enable them to start their on-site criminal investigation.

Sussex Police, in conjunction with experts from the Health & Safety Executive, began clearing potentially unstable fireworks from the access routes onto the site. This allowed the final recovery of Watch Commander Wicker, who was brought out of the site on Tuesday 5 December, past a guard of honour provided by his colleagues.

The East Sussex Fire & Rescue Service 'stop' message was returned at 17.59 hrs on 5 December 2006.

The Health & Safety Executive experts then removed many tonnes of fireworks from the site. This involved a joint agency approach, including issuing licences for the transportation of the fireworks, the building of a temporary road to access the rear of the site and the Urban Search & Rescue Teams shoring up one of the buildings on the Festival Fireworks site.

Fire Investigation Officers and Accident Investigation team members were working on site alongside Sussex Police, until the site was handed back to the owners on 19 January 2007.

Local crews attended on a number of occasions during this period to assist with cutting up metal structures and washing away fire debris to expose areas for forensic examination.

## **THE EXPLOSION**

The main explosion originated from within an ISO shipping container. This is believed to have

contained both fireworks and bird scarers. The ISO container did not form part of either the HSE or Trading Standards licences.

The continued rise in temperature inside the ISO container due to the adjacent fire would eventually lead to the ignition of the contents. This could have occurred through two mechanisms; either other combustible material within the ISO container auto-ignited and this fire then set off the contents; or the contents themselves could have reached their ignition temperature and activated. Previous research, including a number of tests carried out on the sensitivity of pyrotechnics to heat, has shown that ignition occurs in the 220°C-360°C range.

Video evidence shows water intermittently hitting the ISO container from the monitor set up in the driveway and rapidly turning to steam, indicating that the ISO container had become heated. There were no other external signs of heating, fire inside the ISO container or fireworks activating inside the ISO container until approximately one and a half seconds before the explosion, when smoke is seen coming from the door under pressure. Shortly after this, the doors open and the ISO container explodes. There is no evidence that the crews working in the immediate vicinity would have had any physical warning of the impending explosion.

A number of East Sussex Fire & Rescue personnel were working in close proximity to the ISO container when the main explosion occurred. Eyewitnesses describe:

*“a massive ball.... a massive accelerated flame came out of the container... and then the explosion occurred, there was a massive pressure wave.”*

*“was a whooshing, like a sucking sound and then the doors just blew... ...and out of the front of this container just came this fireball. It looked like somebody had got a great big jet and sent it out the doors, massive. I must have turned at that moment when that happened because the next thing I recall there was a big bang and I hit a wall.”*

From witness and video evidence, it appears that overpressure within the ISO container from the activation of its contents caused the doors to open, at this stage a deflagration was occurring. This rapidly changed to a detonation.

As a result of the detonation, the ISO container fragmented and a shock wave was generated, which damaged buildings and vehicles within the vicinity of the site.



Damage on site to Builders Beams 2 building



Damage on site to Builders Beams 1 building

The shockwave caused damage to vehicles on the road and to buildings away from the site.



Damage to fire appliances

One witness describes, *'I would estimate that my house stands about 60 to 70 metres from the entrance way to Marlie Farm. I returned to my home the afternoon of Tuesday 5th December 2006. We were allowed to go in briefly under police escort. I saw that my roof had been badly damaged and that a lot of the windows and frames in my house were smashed, blown out or damaged. I have been informed that there has been movement in the house, primarily in the internal walls, some of which are cracked. Plaster has fallen off some of my ceilings.'*

(actual distance from container 120m)



House 120 metres away from container



House 130 metres away from container

Debris was thrown a considerable distance, some fragments landing hundreds of metres from the point of the explosion.

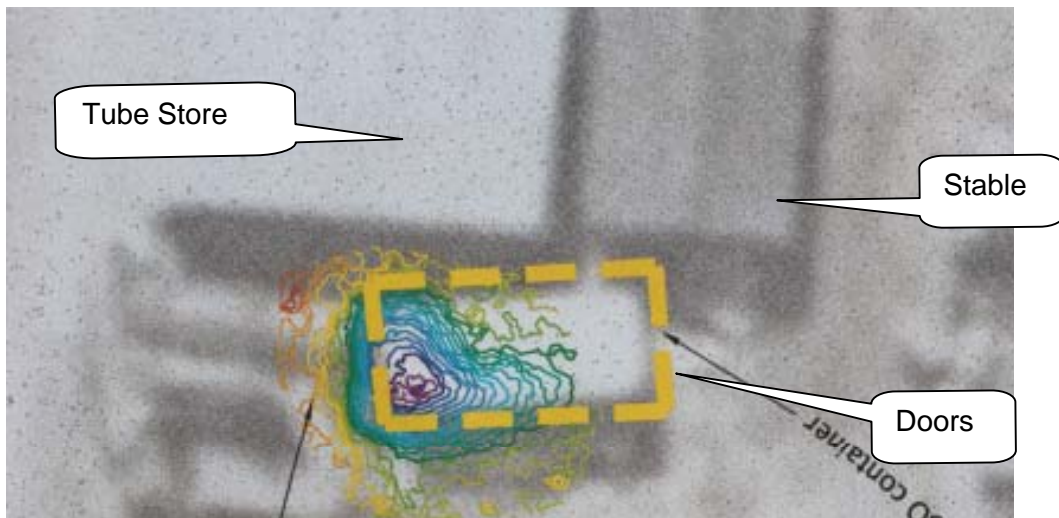


Section of ISO roof in caravan park 270 meters away

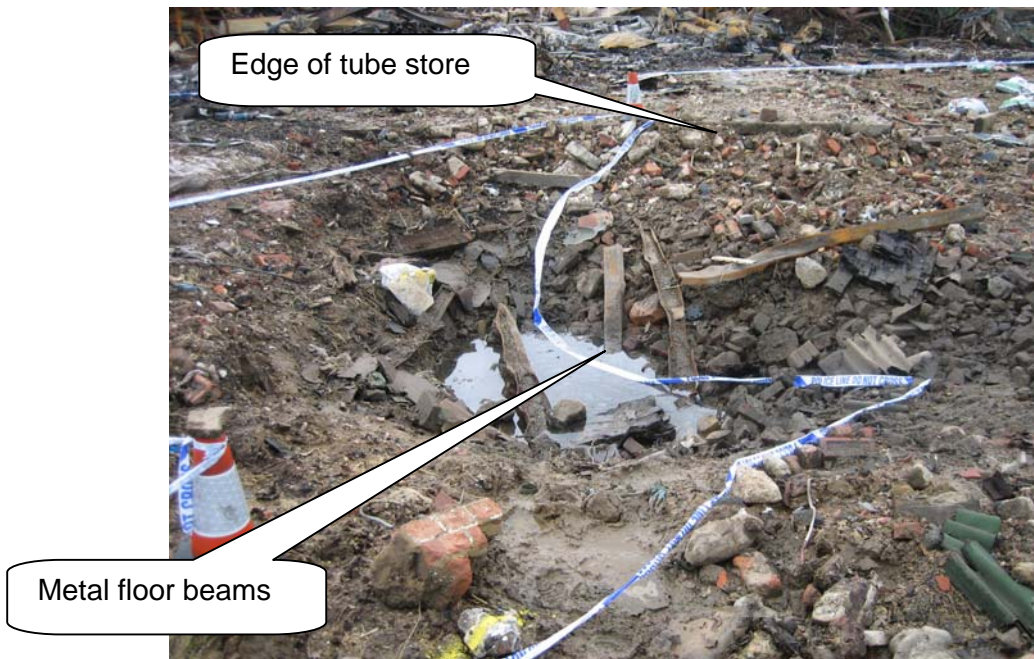
Section of ISO roof recovered 310 metres away from its original position.

### **The Crater**

A crater in the area where the ISO container had stood was formed as a result of the explosion. Subsequent examination of the crater showed that the centre of the explosion was to the rear of the ISO container on the left hand side as viewed from the doors. The crater was approximately 6.3 metres long and 5.2 metres wide and just over 1 metre in depth. It had a volume of approximately 9.5 cubic meters. Following the explosion a LASER scan of the site was carried out and the results of this scan were overlaid onto an aerial photograph of the area. This shows the position of crater and contours of depth in relation to the ISO container.



Scan image showing the position of the crater and contours in relation to the container.



View of crater looking south-east

### Size of Explosion

As part of the investigation, scientists have calculated the approximate size of the explosion using an estimate of the volume of the crater and applying military derived software packages (CONWEB). An estimation of the amount of TNT that would be required to cause such a crater can then be established.

If the explosives were at ground level then the amount of TNT required would be between 35 and

150 kilograms. As there was no way of knowing at what height the explosion within the ISO container had occurred, a calculation with the centre of the explosion at half the height of the ISO container (1.2 metres) gave a range of between 164 and 450 kilograms of TNT.

Other scientists used a different method of calculating the likely amount of TNT. This is based on the research into the damage caused to glazing by shockwaves. This resulted in a range of 190 to 300 kilograms of TNT.

### **Possible Content of the ISO Container**

As part of the police investigation, the owners of the site were interviewed under caution on 4 December 2006. During the course of this interview they alleged that they had loaded the ISO container with fireworks on the Sunday morning, ready for shipping to Oman for a number of firework displays in the New Year.

They stated that they had decided to use the ISO container to ship the fireworks because they had only three days to get the ISO container out. Martin Winter stated that: *'Saturday I knew that we'd got the job, Saturday and it's got to be on the boat on 6<sup>th</sup> of December.'*

Martin Winter stated that they loaded it (the ISO container) with shells, 30 mm candles, 50 mm candles and shells of 3, 4, 5, 6 and 7 inch diameter. The quantity of items put into the ISO container was sufficient for 10 days of displays and shipping had been arranged with the shipping line Maersk. The shipment was due to leave Felixstowe on 6 December, arriving in Oman on 26 December.

Subsequent investigation by Sussex Police showed that Festival Fireworks (UK) had not won the contract in Oman until the 26th December 2006, after the Chinese company that was originally awarded the contract pulled out. No record could be found for any arrangements with shipping companies to transport the ISO container. The ISO container did not have an up to date certificate for transport by sea.

At interview on 8 June 2008, in a prepared statement, Martin Winter described that the contents of the ISO container had been *'a lot of rook scarers'*, 30 mm and 50 mm candles, 60 mm single shot candles, Roman candles, 3, 4, 6 and 7 inch shells and fusing, and the ISO container had been less than half full.

Immediately following the explosion, fireworks continued to activate on the site, indicating that not all the contents of the ISO container had been involved in the initial deflagration/detonation. Post explosion examination of the area in front of the doors to the ISO container found a large number of

fireworks. These are believed to have been ejected from the ISO container at the start of the explosion and is similar to that observed during the CHAF trials.

In addition, exhibit LMB/32 (a report shell) was found just in front of the ISO container. Experts who examined this firework concluded that the plastic bag that it was in had shrunk, which is most likely due to it having been subjected to heat. Also the outer layers of the firework casing, which is made of layers of paper, had distinct blackening at the edges, an indication that the paper has been hot. The conclusion was that this report shell had been ejected from the ISO container during the explosion.

Examination of the site post-incident revealed a large number of unexploded small sub-units scattered throughout the site, which were identified as components of bird scarers. Each of these was found to contain approximately two and a half grams of composition, which is equivalent to one gram of TNT. One of these sub-units was found to have been embedded in a firefighter's helmet. For the unit to have penetrated the outer shell of the helmet, it would have had to have been travelling at substantial velocity, indicating that the unit had been in close proximity to the seat of the explosion.

Examination of the crater revealed *“a range of material: small pyrotechnic units, whose appearance suggested that they were bird scarer units, or similar, fragments of rope, with an appearance consistent with their coming from bird scarer ropes, some pieces of torn plastic that looked to have been in close proximity to an explosion, a large base plug from a (possibly 12 inch) mortar and-wires, consistent with being the remains from electric igniters.”*

### **Criminal Charges**

Following a lengthy and detailed investigation by Sussex Police and HSE, both Martin and Nathan Winter were charged with 2 counts of manslaughter and Alpha Fireworks [the new company name for Festival Fireworks (UK)] were charged with 2 counts of breaching the MSER. See Appendix A for details.

At Lewes Crown Court, in December 2009, a jury returned a guilty verdict on all counts. These were upheld on appeal in 2010

### **Use of ISO Containers**

It is considered that as a steel ISO shipping container was involved, it would have provided a degree of confinement to the contents.



The effects of confinement of fireworks in storage containers has been the subject of experiments/tests following a number of serious accidents in European Union countries involving explosions in the large-scale storage of fireworks. Under the full-scale test package, the decision was made to carry out full-scale tests using ISO shipping containers 'since steel containers were likely to provide the maximum confinement (our emphasis) ... ..*Firework storage buildings usually have low failure pressures compared to steel ISO transport containers.'*

The CHAF report goes on to conclude under 'Exploitation of the Results': *'The major accidents with fireworks have illustrated that there are serious problems with the classification of fireworks. Clearly, there can be misclassification due to changes in the fireworks or their packaging not matching the tested articles. Additional confinement, such as found when ISO containers are stacked may also change the hazard of the load due to the reduced venting and the higher pressures achieved. Similarly, the project has identified articles that are correctly classified which on ISO container scale do not perform as expected.'*

### **Summary of Actions by East Sussex Fire & Rescue Service – Post Explosion**

Post explosion, the East Sussex Fire & Rescue Service Corporate Management Team (CMT) instigated business continuity plans that had been drawn up after the floods of 2000.

These plans included business continuity and recovery, family liaison, staff welfare, legal and insurance issues, Corporate and Fire Authority issues, and service delivery requirements.

The results of the CMT meetings were incorporated into a communications strategy for dissemination to all workgroups across the Service.

Business continuity was the key priority to ensure that adequate standards of fire cover were in place. Both during and after the incident all emergency calls continued to be attended by the Fire & Rescue Service with the normal pre-determined attendance.

The second priority for the Corporate Management Team was staff welfare issues, including support to the stations and M&CC who had suffered a loss and/or injuries to colleagues, support to the bereaved families, including assistance with funeral arrangements, and support to staff who were being interviewed by the police. Support from the Occupational Health department, including referral to counselling services was made available to all. These welfare arrangements continue to the present time, some three years after the event, and are expected to be required for the foreseeable future.

The third priority was to ensure operational availability. As a result of the explosion a total of nine pumping appliances, from a front line fleet of 34, suffered serious blast damage. Because of the likely effects of the blast, most of the equipment that was carried on the appliances was also deemed unsafe for emergency service use.

In addition, three specialist vehicles, including an Aerial Ladder Platform (ALP), the Service's only water carrier (WrC) and Incident Command Unit (ICU) were badly damaged, along with nine officers' cars, all of which had to be written off.

The Service insurers required that all of these vehicles were disposed of as a Category 'A' disposal. This means that the whole vehicle (including tyres, battery etc.) and all equipment were totally crushed.

The Service maintains a small number (5) of spare operational pumping appliances, however these are not fully equipped. In order to maintain operational capability, additional spare appliances and equipment were loaned to the Service by a number of other Fire & Rescue Services. For competency and maintenance purposes, all loaned vehicles were similar to those in use within the Service.

Following early agreement of release of funds by the Fire Authority, negotiations took place between East Sussex Fire & Rescue Service, fire appliance builders and other Fire & Rescue Authorities to secure new appliances outside the normal build programme.

This in itself was a major project involving staff from across the Service, to specify, procure, oversee build, train staff and then deliver what was in effect one third of the Service's vehicle fleet.

### **How the Accident Investigation was Carried Out**

In accordance with the laid down protocol for investigating workplace deaths, Sussex Police took the lead, assisted by a number of other organisations, including the Health & Safety Executive, the Health & Safety Laboratories, Home Office Forensic Explosives Laboratory, Highways Agency, Her Majesty's Inspectorate of Fire Service (later Chief Fire and Rescue Advisor Unit) and East Sussex Fire & Rescue Service. Joint meetings involving all interested parties were held on a daily basis during the initial stages of the investigation.

The East Sussex Fire & Rescue Service accident investigation was limited by the fact that Sussex Police, in accordance with its own protocols, had declared the site a major crime scene and commenced an investigation entitled Operation Silverton.

The Service commenced the arrangements for the formation of an accident investigation team and fire investigations on the evening of 3 December 2006 in order to discharge its statutory duties.

As a result an investigation team, which is detailed below, was formed, led by the (then) Assistant Chief Fire Officer. All members of the team were chosen because of their specialist skills and other factors, including the requirement for no previous involvement with the incident prior to the explosion or direct line management of the deceased.

Assistant Chief Fire Officer Gary Walsh  
Group Manager Adrian Brown  
Group Manager Mike Rogers  
Station Manager David Owen  
Group Manager Peter Higgins – Fire Investigation  
Mrs Lena Hughes, Administration Support

During the course of the investigation, additional personnel were seconded onto the team including Area Manager Dave Dowling, Group Manager David Sutton and Ms Felicity Knowlson.

Both the Fire Brigades Union and The Fire Officers Association had a number of different representatives assisting with the investigation

East Sussex Fire & Rescue Service was assisted in areas of the investigation by a number of other Fire & Rescue Services, including West Sussex Fire & Rescue Service, Merseyside Fire & Rescue Service, London Fire Brigade, Hertfordshire Fire & Rescue Service and South Wales Fire & Rescue Service.

A dedicated accident investigation room and secure store was established at Service HQ, to provide the privacy and confidentiality required to complete the investigation whilst working with other agencies.

The Accident Investigation comprised three phases

### **Phase 1 of the Investigation**

Phase 1 was carried out in two stages, the first was the information gathering stage, which included the recording, copying and logging of all information relating to the incident, this was then followed by the Service Accident Investigation Team interviewing staff considered to be 'key' witnesses.

The investigation and interviews were carried out to gather as many facts as possible to help with the investigation. It was made clear that there was no intention to apportion blame or find fault with individuals, but to ensure that an event of this nature does not occur again. The interview was not carried out under caution and was not a discipline interview. It was however recorded, to allow the interview to 'flow'. The transcripts were later turned into statements.

The second stage of phase 1 was the use of the STEP (Sequence Time Event Plotting) process to record on a grid the event as it unfolded minute by minute and to detail the actions of all East Sussex Fire & Rescue Service personnel on the site prior to the main explosion. The STEP process identifies soft or hard evidence, soft being events that the person said they did, saw or heard, with no direct indication of the exact time, and hard where the exact time for the action was known or could be corroborated.

The M&CC incident log and other evidence available initially identified a time span from the first 999 call at 13.49 hrs until the main explosion and subsequent immediate rescue operations were completed, which was taken to be at 14.51 hrs. The purpose of the STEP process is to identify a minute by minute time line of events, movements and actions of some 60 FRS staff in attendance, which has resulted in a grid depicting some 3,780 one minute segments. Taking into account the fact that a number of staff were mobilised later into the incident, the actual number of grid positions to be populated was nearer 1,800.



The STEP chart

The STEP chart was populated using a wide range of information, including mobilising logs,

contemporaneous notes, police statements, East Sussex Fire & Rescue Service statements, video footage recovered from the scene, video footage taken by bystanders and crew based discussions.

This was then used for phase 2 of the investigation.

### **Phase 2 of the Investigation**

This ran concurrently with phase 1, and involved the Investigation Team building a picture of what happened at the incident and how it happened, with the evidence available to the team.

The team followed the methodology given in appendix 5 of HSG 65. Each identified line of enquiry was mapped against the following causes contained within appendix 5. These are Premises, Plant and Substances, Procedures, People, Planning, Assessing Risks, Organisation: Control, Organisation: Co-Operation, Organisation: Communication, Organisation: Competence, Monitoring And Review.

The investigation process examines ESFRS performance against the key elements of the Health and Safety Executive guidance HSG65 successful safety management which are;

- 1. Policy**
- 2. Organising**
- 3. Planning and implementation**
- 4. Measuring Performance (Monitoring)**
- 5. Audit and Review**

Within these key elements the investigation team has considered key areas of concern to the Representative Bodies to find evidence of the 'human factors' that are vital for a successful health and safety culture.

### **Phase 3 of the Investigation**

Phase 3 of the process focussed on causal factors and the lessons learnt to assist in Service improvement.

These are contained in a number of recommendations under the relevant findings.

As the investigation progressed, where a significant issue was identified, which in the opinion of the Investigation team required action that could not wait until publication of the report, then this was

highlighted to the Service Corporate Management Team, through the use of an issues log. The Service then tracked and recorded each identified issue and the actions taken.

As a consequence a large number of the recommendations contained within this report have already been actioned where appropriate by East Sussex Fire & Rescue Service.

### **How the Fire Investigation was Undertaken**

Under the Fire & Rescue Services Act 2004, the Service has the power to investigate the causes of fires. The Service used this power to commence a joint fire investigation with Sussex Police.

The investigation was carried out by one of the Service's Fire Investigation Officers, assisted by a Fire Investigator from West Sussex Fire & Rescue Service.

Sussex Police provided access to the site. Joint scene examinations were carried out in a number of areas of the Marlie Farm site, as prompted by information obtained from initial fire service witness statements.

A number of samples were taken from the site for specialist examination by other agencies.

### **Findings of the Fire Investigation**

During the course of the initial fire investigation, it became clear that witness evidence pointed to involvement of the firework process in the cause of the fire. However, the cause of the explosion of the ISO container could only be determined by detailed forensic explosive investigation.

At that time, due to the pending judicial process, not all the results of the detailed forensic examination were made available to the Service. The Service has a number of staff trained in establishing the cause of a fire. However, the involvement of fireworks (explosives), igniters etc. falls outside the normal area of expertise within the Service.

Sussex Police has carried out a detailed investigation into these matters and with the criminal investigation limiting the Service's access to key witnesses, the Service took the decision not to continue with its fire investigation.

Post trial, with further information released to the Service, the likely sequence of events has been established, but this is not a detailed investigation into how the fire started and why it spread as it did. This is due to the fact that, as previously mentioned, the Service do not have expertise within this area, were not present during the tests and do not have access to all the relevant information.

## 'STEP' Incident Timeline

The Service has used the sequentially timed events plotting (STEP) process to establish what happened at what time. This is populated by the use of radio logs, statements, interview records and video footage taken at the time. This has allowed the Service to plot events against estimated time.

Text in Blue = Police

Text in Green = Ambulance Service

Text in Maroon = Information from Court Process

<b>Time</b>	<b>Event</b>
<b>13.49:32</b>	The first 999 telephone call to the East Sussex Fire & Rescue Service (ESFRS) Mobilising & Communications Centre (M&CC), reported: <i>"a large explosion at the Firework Factory at the end of The Broyle."</i> The caller stated: <i>"we live 400 yards away."</i>
<b>13.49:59</b>	M&CC mobilised a pre-determined attendance (PDA) comprising two Extended Rescue Pumps from Lewes and Uckfield (call signs Echo 01 and Echo 12).  The third 999 caller to M&CC stated: <i>"the fireworks are hitting my house you know the big fireworks."</i>
<b>13.50:47</b>	Incident upgraded by M&CC due to the large number of 999 calls being received. Additional pump mobilised, Echo 03 – Extended Rescue Pump, Barcombe.
<b>13.51:08</b>	E01 (Echo 01) mobile to incident with four riders; Temporary Watch Commander (T/WC) Wells in charge.
<b>13.51:42</b>	E12 (Echo 12) mobile to incident with five riders; Temporary Crew Commander (T/CC) Simpson in charge.
<b>13.52</b>	M&CC passed information to crews en route informing them that multiple calls were being received for this incident.
<b>13.52:19</b>	Golf 12 Temporary Station Commander (SC) Upton (Uckfield) is notified of the incident by M&CC and decides to attend.

**13.53:46** The first entry on the **South East Coast Ambulance (SECAmb) Incident Log:** refers to a *'building fire with persons inside.'*

**13.55:23** SECAMB Incident Log: *'Fire Informed. Log Number 19571.'*

**13.55** En route T/WC Wells on Echo 01: *"I could see a lot of smoke and could see explosions in the smoke from Ringmer village itself."*

**13.55:24** Echo 03 mobile to incident with six riders; Watch Commander (WC) Austin in charge.

**13.56:30** Golf 01 Station Commander (SC) Meik (Lewes) decides to attend and booked mobile to incident.

**13.57:36** Main scheme radio message to M&CC from T/CC Simpson on Echo 12 en route to the incident: *"Smoke visible, fireworks going off."*

**13 59:08** Bravo 01 - Service Media Co-ordinator / Video Technician Brian Wembridge notified of the incident.

**13.59:18** Echo 01 in attendance at the site entrance. T/WC Wells assumes the role of Level 1 Incident Commander (IC).

**13.59:25** Echo 01 was driven into the site and stopped at the outer gate to the main drive of Marlie Farm. T/WC Wells dismounted the appliance to carry out an initial assessment and described: *"I was confronted by what looked like a serious fire at the far end. I had problems making an initial assessment of what was on fire. The smoke was extremely acrid, heavy and dense, there were fireworks going off in all directions."*

Crew members of Echo 01 observed a well-developed fire on either side of the main drive (now identified as the 'Box Store' and 'Tube Store 2'). A van on the drive by these buildings was seen to be well alight and projectiles were discharging from the structures on the right, when looking into the site from the road.

**13.59** **Sussex Police Incident Log:**

*'ES194 – Short ETA, can see fire from some distance.'*

*'HT210 – Fire can be seen from Golden Cross.'*



## 14.00 Sussex Police Incident Log:

### Commentary

It is understood that the duty inspector (not in attendance) was notified and his plan is recorded on the incident log.

*'...Initial plan 1) Sup to scene ASAP to take command 2) Duty Gold to be informed 3) Control Vehicle to be identified 4) Scene Log to be started 5) Fire Liaison Officer identified to ESFRS 6) CHALET to be considered 7) early assessment of need for evacuation and cordons for scene commander.'*

### Commentary

Although these are Police matters, evidence indicates that a Fire Liaison Officer was not notified to ESFRS before the main explosion. The senior Police Officer present stated: *"I did not speak to any fireman about the fire, it was my intention to liaise with senior fire officer on site as soon as I had completed my initial and most important tasks of protecting life, i.e. cordon off the scene and ensure that it is not breached and to evacuate any neighbouring buildings."* He confirms that he did see the fire service incident commander: *"I did not approach him to seek advice or instruction as I had too much to do to protect the scene..."* This was in the 30-minute period from his arrival until the explosion.

- 14.00:14** A first impression and assistance message was sent to M&CC from T/WC Wells: *"Buildings well alight fireworks activating Make Pumps 4."*
- 14.00:56** A further assistance message was sent from T/WC Wells: *"Make Pumps 6"*.
- 14.01** Wells ordered his crew to reverse Echo 01 into the site and to lay out two hose lines. approx.
- 14.01:23** As he approached the incident, T/SC Upton contacted M&CC via his mobile telephone to request the attendance of the police for traffic control and a Water Carrier.
- 14.01:26** Echo 12 in attendance. The appliance was driven into the entrance and sited near to the outer gate.  
T/WC Wells instructed T/CC Simpson to augment the water supply to Echo 01 by transferring the contents of the Echo 12 appliance tank into the tank of Echo 01.

**14.01:45** T/CC Simpson and the crew of Echo 12 assisted the crew of Echo 01 with laying out hose lines, from which two main jets were deployed. T/WC Wells also tasked T/CC Simpson with securing additional water supplies and told Simpson that there was a hydrant located near The Wok Inn.

T/CC Ross and Ff Watson directed the first jet into the Box Store on the right hand side of the main drive. Ff Watson stated this jet was directed to protect fire spread into two unaffected units.

**14.01** During the early stages of the incident and again later, Nathan Winter told crews that they *“had to get the doors open”*. During the criminal trial, the Defence case was that this referred to the doors to Tube Store 1, which the Defence maintained were shut and the purpose of opening the doors was to extinguish any fires in that Tube Store to prevent the fires spreading to the ISO container that later exploded.



### **Commentary**

Examination of the video footage taken later in the incident (14:20:50) shows the door to Tube Store 1 being open. No crews have stated that they opened these doors and in fact the image shows substantial damage to Tube Store 1, with roof and side panels missing and also damage to the door itself, including a metal beam against or through the door. It is likely that this damage occurred during the initial explosion before the Service arrived.

- 14.01:52** The following appliances and officer were mobilised by M&CC:  
Echo 06 – Extended Rescue Pump, Newhaven;  
Echo 04 – Extended Rescue Pump, Brighton;  
Whiskey 04 – Water Tender, Brighton;  
Whiskey 12 – Water Tender, Uckfield;  
Sierra 12 – Water Carrier, Uckfield;  
Charlie 01 – Incident Command Unit, Lewes;  
Golf 06 – Station Commander White, Newhaven.
- 14.01:56** India 05 – the Duty Information and Communication Technology (ICT) Technician mobilised.
- 14.02** Alpha 02 - Area Commander (AC) Ashley who was at Service HQ, was informed by approx. M&CC of the ‘*make pumps 6*’ message and decided to attend M&CC.
- 14.02:50** Echo 06 mobile to incident with five riders; CC Hurst in charge.
- 14.02:54** Whiskey 04 mobile to incident with four riders; CC Howell in charge.
- 14.03** **PC Scott:**  
*“I arrived on site at 14:03. Opposite the driveway there were two persons standing on the verge. One was Nathan Winter, he approached me and said: ‘You need to get a cordon on of at least 300 metres now.’ I said: ‘Why? Who are you?’ He then said: ‘I’m the person who was in the building when it went up.’ I said: ‘Can you tell me what happened?’ and he said: ‘I was placing an igniter in a firework and it went off in my face and I ran like hell.’*  
  
*I told him to go to the Wok Inn and then I updated our control room, timed at 14.05.”*

**Commentary**

Despite being told by the occupier that a cordon of 300 metres was required, this message was not passed to the Fire & Rescue Service. It was passed back to the Police Control Room and is detailed on their log at 14.05 hrs.

**14.03** Ffs Pratt and Portnell describe directing a second jet to protect Tube Store 1 on the approx. right hand side of the main drive.

At about this time, information was received regarding a hazard within a steel ISO shipping container sited adjacent to Tube Store 1 on the right side of the main drive.

**Commentary**

T/WC Wells indicated that the shipping container was directly boundary-cooled by both jets whereas the firefighters operating the two branches state they were preventing fire spread into the adjacent structures.

**14.03:12** Echo 04 mobile to incident with four riders; CC Liszka in charge.

**14.03:24** Golf 01 – SC Meik (Lewes) in attendance.

**14.03:34** Golf 12 – T/SC Upton (Uckfield) in attendance.

**Commentary**

The incident log records T/SC Upton as in attendance at this time however there is no corresponding record in the M&CC transcript of him booking via main scheme radio.

**14.04:02** Golf 41 – Group Commander (GC) Cox mobilised from HQ as Operational Quality Assurance Officer.

**14.05** T/SC Upton described the scene on his arrival: *“I then walked into the mouth of the approx. site. Echo 01 was positioned parallel to the rear of the bungalow. One jet was coming from Echo 01... There were two firefighters on the branch and they were positioned roughly adjacent to a grey freight container. I recall the container was old and rusting and appeared to be part of the fabric of the site. No hazard markings were displayed on it... A number of fireworks were going off.”*

T/SC Upton also stated that he: “noticed main jets were in use and therefore establishing and maintaining water supplies needed consideration.” T/SC Upton states that he asked T/CC Simpson to identify and locate additional water supplies.

**14.05 Sussex Police Incident Log:**

*‘HT 210 – with Occ who was in premises at time of explosion. He was sole occupant. Just taking his details, he is stating 300-metre cordon required. Everyone who was in premises is accounted for. He also believes most of the fireworks went off at the initial explosion.’*

**14.05** SC Meik noted that T/SC Upton was already in attendance. SC Meik assumed the approx. role of Command Support Officer.

**14.05:26** Assistance message from T/SC Upton: ‘Make pumps 8’, transmitted via main scheme radio.

**14.05:56** The following were mobilised by M&CC:  
Mike Charlie 21 – Maxi-Cab Extended Rescue Pump, Heathfield;  
Echo 25 – Extended Rescue Pump, Hailsham;  
Golf 11 – Station Commander Drinkwater, Eastbourne.

**14.05:57** Golf 35 – Temporary Group Commander (T/GC) Easey mobilised from HQ as Fire Investigation Officer.

**14.05:58** The following additional officers were mobilised by M&CC:  
Golf 09 – Station Commander Hobbs;  
Alpha 02 – Area Commander (AC) Ashley.

**14.06:00** Echo 03 in attendance. T/CC Simpson from Echo 12 met and the appliance and instructed WC Austin to obtain water from a hydrant. WC Austin deployed CC Lilley and the Echo 03 crew to deal with this.

**14.06:30** Crew members from Echo 03 state that the mobile data system (MODAS) on the approx appliance was used to confirm the exact location of the nearest hydrant, which was at the Wok Inn public house, approximately 200 metres north-east of the site entrance. The Echo 03 crew assisted by T/CC Simpson, took additional delivery hose from Echo

01 and loaded this onto their appliance, before driving to the Wok Inn.

**14.06 PC Scott:**

approx. *“There were Firefighters there talking to a Martin Winter. Martin Winter was having a heated argument with the fire officers and there was a lot of arm waving going around, but I couldn’t hear what was actually being said.”*

*“I went up to him and said: ‘Get back away from the fire and let the firemen do their job.’ He replied: ‘Fuck off, they don’t know what they’re doing.’ I said: ‘Just do as you’re told and get back because it’s your life and mine that you’re putting at risk.’ He then said: ‘It’s my fucking property, I ain’t going anywhere.’ I replied: ‘You need to get back, you need to speak with the fire officers and let them know what they’re dealing with.’ I don’t recall what he said to me, but then I warned him that he would be arrested for obstructing police if he didn’t do as I told him. His response was: ‘Fucking arrest me then.’*

*I tried to usher him back to the entrance of the farm, when I was approached by another Fire Officer (WM Tim Austin). As he spoke to Martin Winter I could smell Alcohol on his breath.”*

**14.07 PC Paul Coleman:**

approx. *“I parked it (my car) in the entrance to where the factories were. Further in front of me were three fire engines.*

*As I walked to the entrance I saw PC Scott talking to Martin Winter, as PC Scott left to deal with a firefighter Martin Winter was arguing and wanting to go past me, he said: ‘You lot do not know what you’re doing, I know what’s in there.’*

*Shortly after this he was joined by a Gary Weldon and they attempted to get in toward the buildings on the left. He (Martin Winter) was saying: ‘You fucking lot do not know what you’re doing.’ He was quite aggressive in his stance.*

*They came back from trying to break down the fence and Martin Winter went into the shop.”*

**14.07** AC Ashley attended M&CC, where Senior Fire Control Operator Lewis informed him approx. that the incident had now escalated to eight pumps, thereby requiring AC Ashley's attendance at the incident as a Level 3 officer.

**14.07 to 14.15** Echo 03 crew ran out a single line of 70 mm delivery hose from the hydrant to Echo 12 (situated inside the site entrance). The hose line was then charged with water and the pressure from the hydrant was noted to be poor and likely to be inadequate. Ff Coppard from Echo 03 stated that he passed the following fireground radio message to T/SC Upton: "*Water supply established, very poor supply*". The hydrant was left with the valve fully open and the crew of Echo 03 returned to the site entrance.



Photo taken by member of public showing Barcombe setting in to hydrant by Wok Inn

**Commentary**

The distance from Echo 12 inside the site entrance to the hydrant is estimated to have been 230 metres, i.e. approximately ten hose lengths.

**14.07** T/WC Wells realised he would not have a sufficient water supply to maintain two jets, approx. so decided to '*withdraw everything.*'

Ff Portnell (Echo 12) describes that the appliance tank supply was consumed and both jets failed. Wells withdrew the firefighters operating the jets back to the appliances.

**14.07** T/SC Upton made contact with T/WC Wells and was informed by Wells of his decision  
approx. to 'withdraw' due to a lack of water. T/SC Upton stated that Wells confirmed he had not yet carried out a full reconnaissance of the site.

Wells advised Upton that he had received conflicting information regarding the nature and location of the hazards and risks on the site.

**14.08:28** Charlie 01 – Incident Command Unit (ICU) mobile to incident with three riders; T/CC Head in charge.

**14.08** T/SC Upton decided to carry out a reconnaissance with Wells. Wells informally  
approx. handed over control of operations in the main drive to T/CC Ross.

**14.08 - PC Scott:**

**14.29** *"I left Mr Winter and went to deal with the Fire Officer I had spoken to. I took him to one side and explained to him that I could smell intoxicants on his breath, and due to the nature of the incident I felt that it was necessary to obtain a breath test or breath sample from him to see whether he was below the legal limit for driving, as to whether he should be in that site as an officer in command on that day.*

*I walked back with him on to The Broyle, to my car. I carried out a roadside breath test. The word "pass" came up on the machine, which indicates that there is alcohol, but it's below the drink/drive limit.*

*I let him carry on with his duty, updated our control room and went back to the site where I advised another fire officer, another commanding officer, that I'd carried out a breath test on one of his officers."*

#### **Commentary**

It has not been possible to verify the exact timings for this event. It is known that WC Austin did not arrive until 14:06 and the meeting between himself, PC Scott and Martin Winter occurred shortly after this. WC Austin is noted to be visible in video footage



taken at 14.24:35 in the area of Builders Beams and the Sussex Police log at 14.29 hrs records that the fire officer passed the breath test and was allowed to carry on with his duties.

It has also not been possible to ascertain how long WC Austin was absent from the scene of operations to allow the breath test to take place.

**14.09 -** T/SC Upton and T/WC Wells went to the south-east side of the Builders Beams 1  
**14.15** building and then continued their reconnaissance around to the premises boundary as  
approx. far as the east side of Tube Store 2. From this location they observed that the main  
seat of fire appeared to be in the area of Tube Store 2 and a small fire was also noted  
involving the eaves of Builders Beams 1.

Their reconnaissance did not continue past this point. Wells and Upton then returned to the site entrance. While en route they identified a store containing approximately 20 compressed gas cylinders secured in a cage outside the northwest elevation of Builders Beams 1.

Following the reconnaissance, T/SC Upton decided to commit resources into the Builders Beams site to extinguish the fire in Builders Beams 1.

**14.09:08 SECAMB Incident Log:**

*'Z565 on scene. All persons accounted for at present.'*

**14.09:59** Echo 24 – Extended Rescue Pump, Herstmonceux mobilised as 'Command Support Pump'.

**14.10** Whilst the reconnaissance was taking place, activity continued on the main drive. Ff  
approx. Salmon moved Echo 01 to a location 20 to 30 metres back down the drive towards the  
entrance.

SC Meik stated that he obtained the Command Support Officer's tabard and whiteboard from the Command Support wallet and that he requested the site owner to provide a plan of the site and give details of the hazards present. However SC Meik describes that the information received was of little value. The owner implored Meik to put the fire out.

Ff Salmon stated that SC Meik instructed him to set up the Command Support wallet, which he attached to the offside of Echo 01. Salmon stated that the Command Support flag was not displayed but the appliance blue lights were operating.

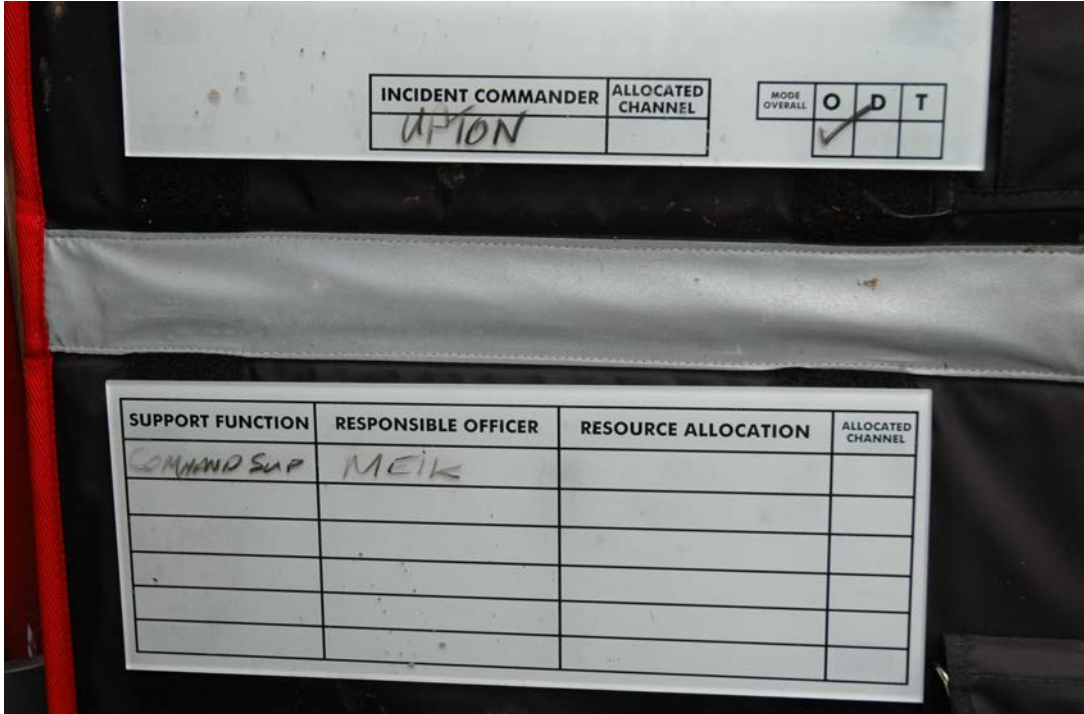


Photo of Command Support Board recovered post explosion



Photo of Command Support Board recovered post explosion

### **Commentary**

The above pictures show a command support wallet that was recovered by Sussex Police after the main explosion.

The boards indicate that three appliances are in attendance, that only one sector had been designated (Sector 1 Location Front Gate), the incident is in Oscar mode, that SC's Upton and Meik had been assigned Command Team roles and that the incident task was 'Boundary' (cooling).

The limited detail and no further updates suggest that the board was as described by Ff Salmon in his statement.

This Command Support board was never updated to reflect subsequent changes including additional appliances, sector changes to tactical mode, etc.

**14.10**  
approx.

SC Meik then carried out a recce of the Main Drive and identified a gap in the structures between Tube Store 1 and the Box Store. SC Meik instructed Ffs Pratt and Portnell (Echo 12) to extend their hose line from the main drive to the rear of Tube Store 1, where he had identified a gap in the structures. SC Meik stated his intention was to provide a covering jet into the gap when the water supply was re-established. Meik noticed that the nearest tube store was starting to smoke.

**14.10:08** Golf 35 – T/GC Easey - mobile to incident.

**14.10:26** Mike Charlie 21 mobile to incident with six riders; WC Wicker in charge.

**14.11:10** Echo 25 mobile to incident with four riders; CC Harvey in charge.

**14.11:46** Golf 11 – SC Drinkwater - mobile to incident.

**14.11:58** Sierra 12 mobile to incident with two riders; Ff Domm in charge.

### **PC Paul Coleman:**

*"Later I went back up the drive and met someone called Nathan Winter I said to him: 'You've got to go' and Nathan Winter replied: 'You do not know what's in there. Everyone has to go. We've got to tell them what's in there.' 'At this, I asked a nearby fireman to listen to Nathan.' 'At this time Martin Winter seemed to be having an argument with some of the fire crew."*

**14.12 Sussex Police Incident Log:**

*'ES194 – Gen Manager is here at scene, will be speaking with ESFB. Blvd nothing malicious at this stage.'*

**14.15** approx. SC Meik ordered personnel in the main drive to withdraw toward the site entrance, due to the water supply issues.

**14.15 – 14.20** approx. WC Austin states that he informed SC Meik he was required to take a breath test. Meik told Austin to go and get it done. Austin describes accompanying a traffic police officer to a police car parked outside the site entrance, where he was breathalysed. The Sussex Police log at 14.29 hrs recorded that the fire officer passed the test and was allowed to carry on with his duties.

**14.15** approx. T/SC Upton returned from the reconnaissance with T/WC Wells and met SC Meik. Upton formally took over from Wells as the Level 2 Incident Commander.

T/SC Upton noticed that Echo 01 had now been repositioned in the site entrance, facing the road, confirming to him that his earlier instruction to withdraw had been carried out.

**14.15** approx. Echo 03 crew returned from the hydrant to the site entrance. Ff Coppard from Echo 03 (a Wholetime Watch Commander in his primary employment) suggested to T/SC Upton that a request should be made for water carriers. T/SC Upton instructed Ff Coppard to send a priority message requesting a second water carrier.

**Commentary**

Although a series of assistance messages had been sent by this time, the travel times for the oncoming pumping appliances and water carrier(s) meant they would not be in attendance for several minutes. There is no evidence during the intervening period of consideration being given to identifying alternative water supplies including open water sources.

**14.15** Bravo 01 – Media Co-ordinator/Video Technician Brian Wembridge in attendance.

**14.16** The following assistance message was sent from T/SC Upton: *'Make Water Carriers 2.'*

Ff Coppard returned from sending the above message and was allocated the role of Marshalling Officer by T/SC Upton.

T/WC Wells instructed that Echo 03 should be driven inside the north-east boundary of the Builders Beams site in order to extinguish the fire on that site. The crew of Echo 03 entered the area on foot, walking next to their appliance, which was reversed to a position at the north corner of Builders Beams 1, making use of the protection afforded by this building.

**14.17:27** A further message was sent from T/SC Upton: *“Make ALPs 2”* (Aerial Ladder Platform appliances).

**14.18** **Sussex Police Incident Log:**

*‘HT210 – Lots of public here, we are trying to move them on, but they are going back trying to do good.’*

**14.18** Having ordered a withdrawal from the main drive, SC Meik moved to the area of approx Builders Beams. He stated that: *“a crew had gone round to the left as you stand on the road so I went round there to tell them we were all pulling out.”*

**Commentary**

It is likely that SC Meik remained in the area of Builders Beams until approximately 14.27 hrs.

**14.18** T/SC Upton gave the order to ‘sectorise’ the incident, with the main drive being Sector approx. 1 and the Builders Beams site as Sector 2.

**Commentary**

Larger incidents may be sub-divided into ‘sectors’ in order to reduce the span of control of the Incident Commander.

**14.19** **Sussex Police Incident log:**

*‘ES194 – Comms terrible due to fireworks.’*

**14.19:04** Charlie 01 – Incident Command Unit (ICU) in attendance.

**14.19:05** Tunbridge Wells (Kent Fire & Rescue Service) aerial ladder platform (ALP) mobilised.

**14.19:22 Video:**

**Commentary**

The digital clock in the first video image shows the time as 14.06 hrs. The Accident Investigation Team believes this time to be incorrect, as it does not correlate with Brian Wembridge's 10:3 time and the activities depicted at the incident. A main scheme radio message from a Kent Fire & Rescue Service appliance booking mobile onto the East Sussex Fire & Rescue Service main scheme radio channel is audible during a later sequence of the video\*. This message has been triangulated with the M&CC incident log and audio tape to estimate the correct time. This indicates that the clock on the video camera is approximately 12 minutes 25 seconds slow. This time difference, when added to the time of the deflagration captured on the video matches the estimated time of explosion from the British Geological Survey (covered later in the report), confirming accuracy of the timing. All times for video footage in this timeline are estimates of the corrected times.

**(\*see note at 14:27:28 hrs regarding corrected times)**

The first images from the video footage taken by Brian Wembridge at the incident are looking into the site from a position adjacent to Builders Beams 2 on the main drive.



The video footage shows a developed fire within the area of the Box Store and Tube Store 1, which consists of a steel framed structure, clad with corrugated sheeting. The wind and smoke direction is from west to east. White coloured smoke is issuing from Tube Store 1 with darker smoke in the background from the area of the Box Store. Tube Store 2 is obscured by smoke.

Fireworks/projectiles are issuing from the area of the Box Store and Tube Store 1. Regular detonations are audible.

No firefighters are visible forward of the camera position, which is believed to be approximately level with the rear of Echo 01 parked near the office building. Hose lines extend up the drive towards the structures but no operating jets are visible.

#### **Commentary**

A return loop in one hose line indicates that this may have been dragged back from a more advanced position, commensurate with the withdrawal mentioned above. Kinks in the hose lines indicate that they are not fully charged at this time. One line of hose has been laid in a south-westerly direction and appears to extend out of sight towards the west side Tube Store 1 and the stables. This likely to be the jet that SC Meik instructed Ffs Pratt and Portnell to extend. A further hose line on left side of the image appears to be partially charged, this may be the incoming supply from Echo 12 and/or the hydrant.

**14.19:28 Video:**

Fire vents through a small opening in the north west wall of Tube Store 1, level with the top of the external steel racking.

**14.19:32** Echo 04 in attendance.

**14.19:34** Burgess Hill (West Sussex Fire & Rescue Service) water carrier mobilised.

**14.19:45** T/SC Upton ordered SC Meik to send an informative message: *"From SC Upton: 'Incident now sectorised. Evacuation in progress. Oscar Mode'."*

M&CC received and repeated this message to the oncoming appliances and officers.

**Commentary**

SC Meik is believed to have sent this message from Echo 03 within Sector 2

**14.19:54** Mike Charlie 21 in attendance.

**14.18 – 14.20** TV news footage, believed to be from mobile telephones, indicates that simultaneous and concurrent activity is taking place around the site entrance and on the B2192. approx. Echo 01 is just visible, facing towards the road from inside the site entrance. A marked police car is visible inside the driveway to the Marlie Farm house.

Also visible are an ambulance, a paramedic car and a police car, all parked to the north of the site entrance. Charlie 01 (ICU) appears to be arriving at the incident, approaching the site entrance from the south.

Another vehicle, possibly an ambulance, is located further down the B2192, near to the site entrance, together with two on lookers. It is unclear if these are Emergency Service personnel or members of the public.

No other passing vehicles are visible in these images, indicating that the B2192 has now been closed to traffic.

**14.20:10** Whiskey 04 in attendance.

Crew Commanders Liszka (Echo 04) and Howell (Whiskey 04) reported to T/SC Upton and SC Meik. CC Howell observed that Upton, the Incident Commander, was: *“calm but extremely overrun with what was happening, he was multi-tasking.”* CC Howell stated that T/SC Upton acknowledged him. CC Howell states he did not see a Command Support point or being met by the Marshalling Officer on arrival.

During this period CC Howell saw Brian Wembridge by the main drive. Howell noted that there were two seats of fire at that time, one to each side of the main drive, and that *‘fireworks were going off at a rate of one every 10 to 15 seconds’*.

**14.20:36** Echo 06 in attendance.



**14.20:50 Video:**

Footage shows the fire involving Tube Store 2 to the left of the main drive approaching a caravan located in the open area nearer to the site entrance. The van on the main drive appears to be severely damaged by fire. No firefighters are visible in this sequence. The video footage ceases at 14.21:44 hrs.



**14.21 -** At about this time T/SC Upton received further information from one of the Winter family on site regarding the hazards on the site. SC Upton states he found this information to be unclear and sought further clarification. This identified concerns regarding the contents of the shipping container, rather than Tube Store 1.

**14.23**  
approx.

Following further clarification SC Upton was told that the container held fireworks and not wood, as previously stated to him.

**14.21:02** Tunbridge Wells 'Rescue Pump Ladder' is mobilised as support pump for the Kent FRS Aerial Ladder Platform.

**14.21** A second sequence of mobile phone footage shows the activities continuing on the approx. B2192 with the ICU and three pumping appliances now parked north of the site entrance. These appliances are likely to be Echo 06, Echo 04 and Whiskey 04, which are recorded as being in attendance by 14.20 hrs.



Image from mobile phone footage showing vehicles parked on the B1292.

The footage then pans up the road to show the ICU. The external door to the command area is open, indicating that that the vehicle is now being set up. An unidentified civilian female emerges from the ICU and crosses the road.



Image from mobile phone footage showing the ICU.

### **Commentary**

This confirms that members of the public are still in the vicinity of fire service operations.

A hose line, which appears not to be fully charged, is visible along the grass verge parallel to the B2192 on the south side of the road and loops into the site. This hose line is likely to be from the hydrant near the Wok Inn, and is supplying Echo 12, which is parked within the site.

A man wearing a yellow hi-viz jacket, possibly an ambulance officer, and a firefighter are standing in the middle of the B2192. The firefighter is facing the camera and appears to be directing people away in a north-easterly direction, towards the Wok Inn.

In the background another person (circled), not believed to be a firefighter but possibly wearing a hi-viz jacket walks in front of Echo 01, from north to south.



Image from mobile phone footage. A person wearing a high viz jacket is walking in front of Echo 01 (circled).

**14.21 Sussex Police Incident log:**

*'HT210 – We are advising these MOPS (members of the public?) they will be arrested if they don't move away.'*

**14.21** approx A hose line had been laid from Echo 03 around the east side of Builders Beams 1, however rapidly deteriorating conditions led to WC's Wells and Austin instructing the crew of Echo 03 to withdraw. T/WC Wells, as Sector Commander for this area, agreed with this decision. Wells states that T/SC Upton was informed.

**14.21:28 SECAMB Incident log:**

*'RVP at the Wok Inn – 200 yard exclusion zone being implemented.'*

- 14.21:53 Video:**  
- Footage shows a rapid escalation of the fire in Tube Store 1 with a significant increase in noise, fireworks and detonations. Projectiles are issuing from the area of Tube Store 1 and ricocheting in all directions. The north-east end of the ISO container is visible, with no obvious signs of fire impingement or heating at this stage.
- 14.22:35**
- 14.22 – 14.23** approx. A series of loud bangs were heard by crews at the site gate on the main drive and larger fireworks were seen activating. One firework hit the Echo 12 appliance, which was supplying water from the area of the gate. At about this time Ff Thomson saw: *“a firework actually hit the offside of the appliance... ...I saw it coming over the top of the building and sort of activating very close to it.”*
- 14.22** approx. CC Hurst from Echo 06 noted that the ICU was not set up and then reported to T/SC Upton at the site entrance. Upton told Hurst: *“we are all backing off, we are all backing off.”*
- 14.22:03 Video:**  
A projectile impacted on the main drive, in the vicinity of a hose line, in the approximate location where firefighters had earlier been operating the main jets.
- 14.22:08 Video:**  
A loop of hoseline parallel to the workshop building on the right hand side of the main drive appears to lie across a section of corrugated cladding. A second hoseline is in the centre of the drive heading towards the area of the Tube Stores, but then loops to the right by the ISO container. Neither hoseline appears to be fully charged, probably having been left in situ when the initial crews withdrew. No operating jets are visible.
- 14.22** approx. SC Upton has stated that: *“after establishing that acetylene cylinders may be present in Builders Beams and that the building was just becoming involved in fire, I remember thinking about the 200-metres hazard zone for acetylene but because of the fire works going off I asked a Police Officer to begin to evacuate members of the public to a distance of 600m.”*

### Commentary

It is likely that SC Upton passed this requirement to the police at approximately this time, once he was informed that the firefighting in Builders Beams had been abandoned and after he received information confirming the presence of fireworks in the ISO container.

**14.22** Ff Skeffington (Mike Charlie 21) describes: *“Fireworks started to explode in our direction. IC (Upton) gave the order to pull back.”* Mike Charlie 21 was moved further along the B2192 by Ff Wood.

**14.22 – 14.26** approx. As the Echo 03 appliance and crew withdrew from Builders Beams, T/WC Wells contacted T/SC Upton to obtain permission to remove the cylinders - previously noted during the reconnaissance - away from the threat of the encroaching fire. Ff Widgery from Echo 03 cropped the cage lock and was assisted by SC Meik, T/WC Wells, T/CC Simpson, WC Austin, CC Lilley and Ffs Marler and Julyan in moving the cylinders. Video footage shows the cylinders being placed on the ground in the open yard between Builders Beams 1 and Builders Beams 2.

**14.22:31** Hotel 04 - Aerial Ladder Platform (ALP) Brighton mobilised with three riders.

**14.22:46** SC White in attendance.

**14.23** **PC Paul Coleman:**

approx. *“Nathan and Stuart Winter then left the property on to the road. Martin Winter went back into the shop and I followed him in. I had been at the site about 20 minutes, the fire appliances were moving back in the driveway.*

*I then spoke to a firefighter and moved my car into the driveway of the house.”*

**14.23:22** A further informative message was sent: *“From SC Upton: Large range of farm buildings well alight. Building containing fireworks and explosives, all involved. Fire fighting being carried out at safe distance. LPG cylinders involved. Crews in Oscar Mode.”*

### Commentary

SC Meik is believed to have sent this message from Echo 03 within Sector 2

#### 14.23:44 **Video:**

In the area between the two Builders Beams buildings WC Austin is moving pallets to make space for cylinders being removed from the caged store. WC Austin and other firefighters visible in this image have their helmet face shields down. WC Austin is wearing a fireground radio.

- 14.23** - Ffs Sweetman and Wood (Mike Charlie 21) attempted to prevent members of the public entering the area of the Marlie Farm house. They did not co-operate. FF **14.24** approx. Sweetman followed then towards the house and was given some dogs to carry out of the site.

#### **PC Paul Coleman:**

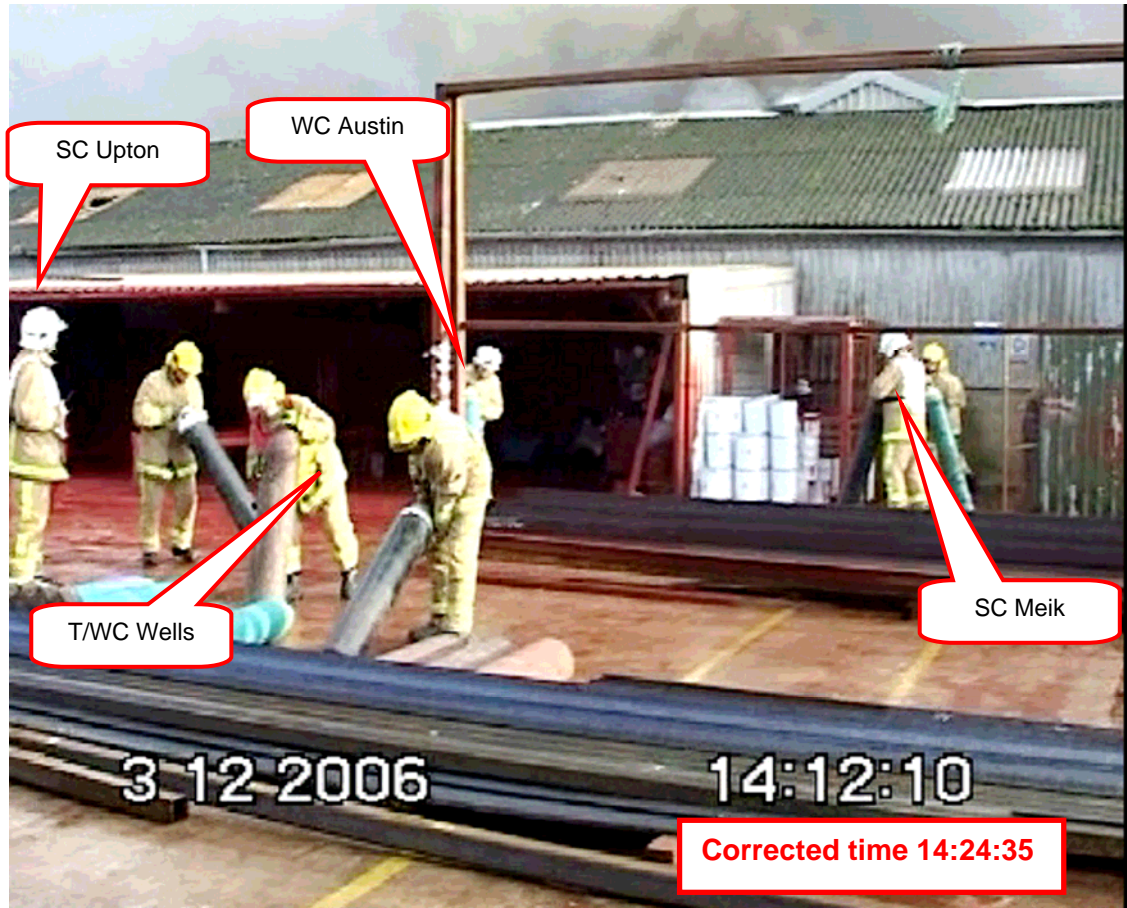
*"I saw a fireman standing near the property and asked him if everyone was of the house. He said that he did not know. So, with that, I decided to go into the property and to search to see if there was anyone in there.*

*The front door was locked, so I went round the back and found a door on the site side of the property. There were two firemen with me now; I went into the house and they stayed downstairs and I went upstairs, but we could not find anyone.*

*There were some dogs inside and I then left, as I came out there were three more firemen coming in with Martin Winter saying they were going to retrieve some puppies."*

- 14.24:28** T/SC Upton is visible with crews removing the cylinders in Sector 2. It is believed to be his voice that is audible on the video saying: *"Come on, we're withdrawing."*

14.24:35



Video image of crews working in Sector 2 by Builders Beams 1

The key command personnel visible in this image are:

SC Upton wearing the Incident Commander's tabard and holding a fireground radio;

SC Meik wearing the Command Support Officer's tabard;

WC Austin wearing a white helmet;

T/WC Wells wearing a Sector Commander tabard. His yellow helmet with a white peak denotes his temporary status.

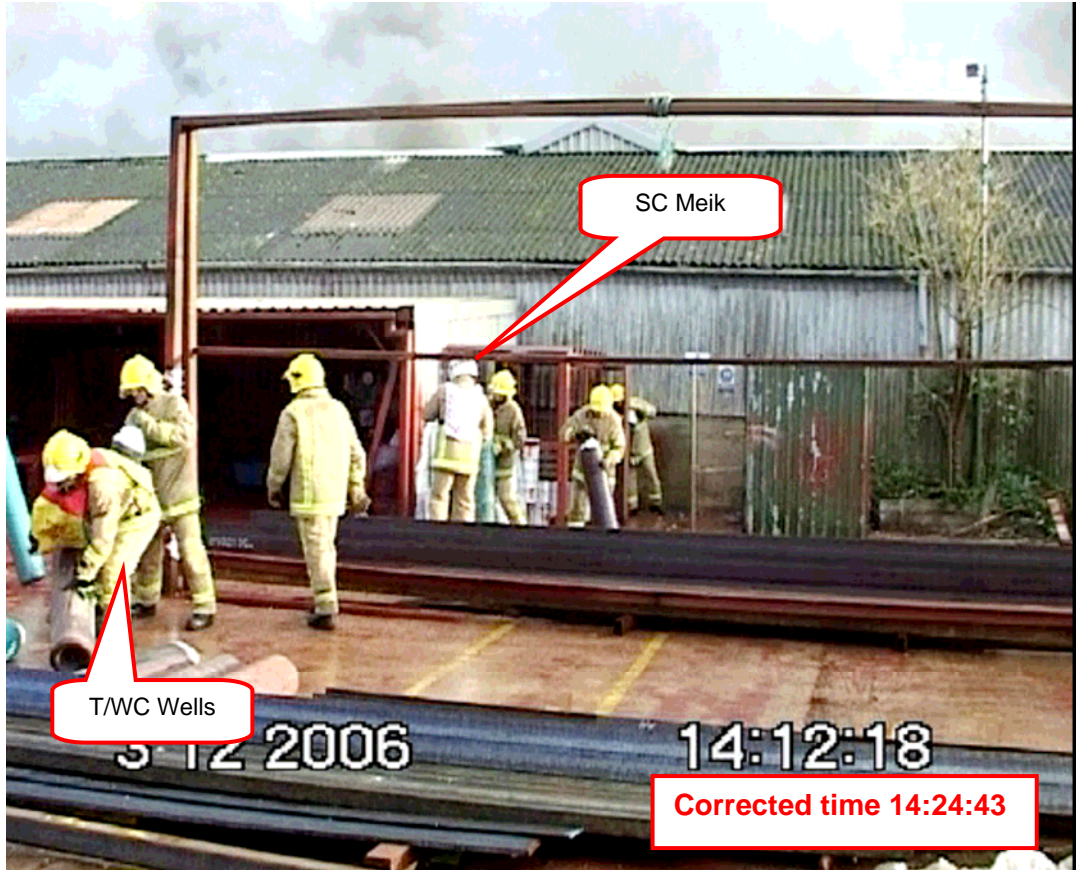
### **Commentary**

The sequence of events described by various witnesses and images on the video in the period prior to 14.24:28 hrs indicates there are now various prompts for the Incident Commander to consider a withdrawal of personnel and appliances i.e. the deteriorating conditions and presence of acetylene cylinders in Sector 2. This is additional to the water supply issues and the barrage of projectiles in Sector 1, and the information received confirming the presence of fireworks in the shipping container. SC Upton's instruction audible on the video at 14.24.28 hrs is confirmation of his decision to withdraw.



At this time withdrawals have been ordered from both Sectors, indicating that a general withdrawal is required from the fireground to the site entrance

14.24:43



Video - showing SC Meik and crews continuing with the removal of the compressed gas cylinders from the caged store. T/SC Upton is no longer visible

The background noise has now significantly diminished since the previous sequence of footage in the main drive at 14.22 hrs, with only occasional detonations audible. A smoke plume is visible on the far side of Builders Beams 1, blowing from the west to east.

14.24:44 Video footage ceases until 14.25:41 hrs.

14.24 approx. Ff Wood describes WC Wicker being shown the location of the pool at the rear of the Marlie Farm house.

**14.25** Ff Thomson has stated that SC Upton verbally ordered the appliances to withdraw to approx. the road. Ff Thomson reported there was a delay in him getting someone to valve the hydrant off so that Echo 12 could be moved.

SC Upton met SC White at the main drive and instructed him *“to carry out the analytical risk assessment (ARA) role.”* SC Upton has stated that he briefed SC White as to the incident and hazards. SC White left to collect the ARA paperwork.

**Commentary**

The full Level 2 Command Team is now in attendance and roles have been allocated to them by the Incident Commander. SC White has stated that he understood his role was to carry out the ARA but does not recall receiving a detailed briefing and did not believe his role extended to ‘Incident Safety Officer’. However SC White stated that he then donned the ‘Safety Officer’ tabard.

**14.25** At about this time WC Wicker is believed to have informed T/SC Upton of the approx. availability of the swimming pool as a potential water supply.

SC Upton then designated WC Wicker to be Sector Commander 4 in the area to the right hand side behind the house and take water from the swimming pool to supply a new monitor to cover the ISO container *“as there are fireworks in there.”* SC Upton states that WC Wicker asks him: *“what do you want me to do?”* SC Upton states that he told WC Wicker: *“we need to secure area as public have not been evacuated, can you go around to the right side of the bungalow and set up a ground monitor to cover the metal container ‘cause I have been told there are fireworks in there. I don’t know how many but there may be some larger fireworks.”*

SC Upton states he told Wicker to set up a single covering/cooling jet to cover the container and that he warned WC Wicker to get himself and his crew out of the area as soon as this had been done.

**14.25** SC Upton tried to gain further clarification as to the exact type and quantity of approx. fireworks stored in the shipping container, but the information given remained unclear.

**14.25:42** GC Cox in attendance.

**14.25:46** Echo 25 in attendance. Ff Holloway, on Echo 25, observed the Mike Charlie 21 appliance being moved to the site entrance at its junction with the B2192, the crew collecting a light portable pump (LPP), suction hose and ancillary equipment from Mike Charlie 21 and carrying this up the driveway.

WC Austin stated that he instructed crew members from Echo 03 to assist the crew of Mike Charlie 21 with setting up the portable pump.

In Sector 2 T/WC Wells (Sector Commander 1) received a message to withdraw via hand-held radio. He contacted T/SC Upton by radio and requested and received permission for a '*couple of minutes*' to complete the relocation of approximately five remaining cylinders, which personnel were in the process of moving.

**Commentary**

T/SC Upton had by this time re-confirmed his instruction at 14.24:28 hrs to withdraw from Sector 2.

**14.26** **Sussex Police Incident Log:**

*\*\*\*\*\* Winter was sole occ of factory, resides at Marley Farm (sic), The Broyle (Location of Incident) tel 01825 \*\*\*\*\*. He states he was putting an ignitor into a firework when it exploded onto him, causing no injuries. He then ran off. Premises belong to his Father. Public have now calmed down, we blv we only have two left here.'*

**14.26** **Video:**

Shows the crews between Builders Beams 1 and 2 completing the removal of cylinders from the caged store and then appearing to withdraw, moving north out of the image.

Direction of image is now looking south-west towards Tube Store 1 from the yard between Builders Beams 1 and 2, showing a developing fire in the area of Tube Store 2.

The next image, looking south-east, shows smoke issuing from a broken roof vent on the northerly roof pitch on Builders Beams 1. Noise from fireworks is now diminished. No FRS personnel are visible.

14.26:20 Mike 05 - duty Fleet Engineer - mobilised.

14.26:32 Sierra 12 - Water carrier - in attendance.

14.27 approx. The Water Carrier pulled up near the entrance to the site. Firefighter Domm saw other appliances withdrawing towards the gate and she was approached by a firefighter who told her: "*We are getting out.*" CC Ash, the driver, then reversed the water carrier 20 metres back to the north of the entrance.

14.27:28 **Video:**

Footage shows WC Austin retrieving the hose line laid on the site road outside the north-west elevation of Builders Beams 1. A heavy, low-level smoke plume is visible in the background obscuring the view beyond the Builders Beams 1 factory. The background noise is diminished, with occasional detonations audible.

**Commentary**

A main scheme radio message from a Kent Fire & Rescue Service appliance is audible on this sequence of video. The acknowledgment of this message by M&CC ends at 14.27:28 hrs. The timing of this message on the M&CC incident log has been used to estimate the corrected time of the video.

14.27 approx. Water supplies to the original handheld main jets on the main drive in Sector 1 remained insufficient. T/SC Upton instructed personnel in the vicinity to withdraw the appliances and themselves to the site entrance. Ff Julyan from Echo 03 described driving the appliance out of Builders Beams.

14.28 approx. Ff Portnell witnessed T/WC Wells talking to a person whom he described as one of the owners, who was asking for his laptop, which was in his office on the site.

14.28:19 **Video:**

Footage is now in the main drive. Firework and projectile activity has now diminished almost completely. There is a severe fire in the area of Tube Store 1, with black smoke issuing. No firefighters are visible forward of the camera and the hose lines on the main drive appear to be uncharged.

14.28:23



14.28:42 TWC Wells and Ff Portnell are seen in the video in the main drive, walking into the site in the direction of the office / shop.

14.28:48 **Video:**

Ceases until 14.29:51 hrs.

14.28:57 While en route to the incident, Area Commander Ashley contacted M&CC via mobile phone requesting an update and is given the last informative message from 14.23 hrs.

**Commentary**

AC Ashley is not made aware of the previous informative message from 14.19 hrs that referred to '*evacuation in progress.*'

14.28 approx. At about this time Ff Kelsey from Echo 04 turned the hydrant valve off.

**Commentary**

It is estimated that walking to and from the hydrant for this task will have taken approximately three to four minutes.

**14.29 -** SC Upton states that he had obtained further information regarding the contents of the  
**14.31** shipping container, which caused him to believe there was now a major hazard to  
approx. firefighters; he then initiated an evacuation by fireground radio for all personnel to  
evacuate.

SC Meik states that at about the same time, he received information regarding the hazard presented by the contents of the shipping container and decided to blow his evacuation whistle. SC Upton stated that he witnessed SC Meik blowing his whistle.

SC Meik stated that he did not blow his whistle for long as an unidentified firefighter reported to him that there *'was no one further forward in the driveway than us.'*

**Commentary**

SC Meik stated that he spoke with SC Upton about moving into defensive mode. SC Meik stated this was not a formal command discussion. SC Upton stated he believed that SC Meik was blowing his whistle in response to his radio message. SC Meik described using his evacuation whistle to attract the attention of personnel in order to reinforce the withdrawal.

**14.29:34** An informative message was sent by Ff Watson: *'From SC Upton fire spreading rapidly. Crews evacuating area. Crews in Transitional Mode.'*

M&CC repeated this message to the other mobiles en route. This was acknowledged by Golf 35, Golf 09, Echo 24 and by the Rescue Pump Ladder (RPL) from Kent Fire & Rescue Service.

Ff Watson moved Echo 01 to the site entrance. Ff Watson understood the reason for this withdrawal to be because of the unreliability of the water supply.

**Commentary**

AC Ashley who was still en route to the incident was unaware of this message referring to an evacuation of firefighters taking place.

**14.29** Ff Thomson moved Echo 12 to a position just north-east of the site entrance on the  
approx. B2192. Having moved Echo 03 from Builders Beams, Ff Julyan described having to negotiate the hose lines and pausing while Echo 12 was being moved from the site. Ff Julyan then parked Echo 03 on the B2192 towards The Wok Inn.

Ffs Oakley-Ives and Streeter, from Echo 04, describe moving towards CC Liszka as he walked back from the site entrance. They saw SC Meik blowing his whistle. They could also see Echo 12 withdrawing. Ff Oakley-Ives assisted by seeing the appliance back to the north-east side of the gate.

Ffs Kelsey and Streeter were instructed to turn the hydrant valve back on.

**14.29:51** Victor 01 – Chief Fire Officer & Chief Executive (CFO & CE) Prichard - was notified of the incident and elected to attend.

**14.29** approx. CC Howell walked towards the location of SC Upton: *“but on reaching the beginning of the driveway there was a series of loud explosions, sounding like fireworks but huge ones, really a lot louder than normal fireworks going off.”* CC Howell stated that he then heard a message: *“evacuate the fireground, evacuate evacuate evacuate.”* CC Howell believes it sounded like SC Upton on the radio. He does not recall hearing an evacuation whistle sound.

CC Liszka stated that SC Upton told him to send a message using the handheld radio ordering crews to ‘withdraw’. CC Liszka says he was asked to send a message for *‘all staff to evacuate’* on his hand-held radio. CC Liszka sent the message: *“All personnel evacuate, repeat all personnel evacuate”* and informed Upton.

**Commentary**

SC Upton cannot recall asking CC Liszka to send this message.

**14.30** approx. Immediately after transmitting the message, CC Liszka states he heard an evacuation whistle sound. At that time he could see fireworks coming from inside Tube Store 1.

### **Commentary**

There are different accounts from some key personnel regarding the timing of the evacuation:

CC Liszka indicated that the evacuation took place shortly after his arrival when he reported to SC Upton, possibly between 14.21 and 14.26 hrs. CC Liszka refers to an appliance then being reversed from inside the site. This is likely to be Echo 12, which was the only appliance facing forward into the site, but which was not moved until slightly later at approximately 14.29 hrs.

CC Howell stated this evacuation may have occurred: "*10 minutes at most after we booked in attendance*" (Whiskey 04 in attendance at 14.20 hours) i.e. up to 14.30 hrs.

The sequence of events described in SC Meik's account implies that the evacuation signal was given before the crews completed moving the cylinders in Sector 2. SC Meik stated that he had originally entered Sector 2 to tell the crews they were "*withdrawing to come away to the road to facilitate the water.*" This appears to relate to the earlier withdrawal from the main drive. Video footage shows SC Meik in Sector 2 at 14.24 hrs. T/WC Wells stated that: "*...Meik and I were I believe the last out of the area...*" this is believed to have been approximately 14.27 hrs.

SC Meik stated that he had become aware that the ISO container had become a risk but refers to the water supply issues as being the reason for the withdrawal when he blew his evacuation whistle.

CC Howell described that, from his position at the entrance to the driveway, he could see an appliance driving out of the site (believes this was possibly Echo 03) and was aware of personnel coming back, but could not be precise about the numbers. Howell was not aware of a roll call being carried out.

**14.30** Ff Thomson reconnected Echo 12 to the hydrant supply and to Echo 01.  
approx.



**14.30** From the site entrance, GC Cox observed a single-storey building to be well alight. Cox spoke to SC Upton and informed him he had been mobilised to carry out a Quality Assurance Audit (QA), but asked SC Upton if he required him to carry out other duties instead. GC Cox stated that Sc Upton told him to proceed with the QA audit. SC Upton states that he told GC Cox not to worry about that as he was initiating an evacuation.

GC Cox also identified SC Meik as the Command Support Officer and SC White as being at the scene.

GC Cox states regarding his brief from SC Upton: *“He did not indicate the tactical plan to me and I don’t recall being told the incident was sectorised. At that point I had no knowledge of a formal evacuation; I didn’t hear any evacuation whistles. I didn’t hear any messages on my handheld radio... ..the only indication that there was any change in the procedure was the conversation with WM Wells in which he said the Crews were pulling back to the road or words to that effect. If there was or had been an evacuation of the site I would say it wasn’t obvious from what I saw of the crews’ actions. Neither was I briefed on any earlier evacuation of the site.”*

GC Cox noted that SC Upton was wearing a fire hood so decided to return to his car to collect and put on his own.

**Commentary**

Both GC Cox and SC Upton give different views of the information exchanged between them. The Accident Investigation team have been unable to establish what was actually said.

**14.30:04** T/GC Easey in attendance.

**14:30:30 Video:**

Footage shows the area behind the caravan on the left of the drive, opposite Tube Store 1, to be alight. Occasional detonations are audible.

**14:30:34** a telephone-type sounder is audible in the background. The sound is similar to that of a fire service evacuation whistle.

Ff Coppard recalled hearing the telephone sounder at the same time as the evacuation whistle: *“I heard a whistle being blown at the same time as the phone was ringing. The whistle stopped, the phone kept ringing and then the phone stopped, then it went bang.”*

#### **Commentary**

It is recognised that the telephone sounder may have operated at other times during the incident which do not coincide with the video recordings. There are various breaks during the sequence of video footage in the main drive from 14.28 to 14.32 hrs

At the start of this sequence, there are no firefighters visible on the main drive. However, during the sequence Sector Commander 1 (T/WC Wells) and Ff Portnell are seen to return along the main drive, having retrieved a computer, and moving out of image towards the site entrance.

**14.30:37**



**14.30:42** Video footage ceases until 14.31:51 hrs.

**14:30** **PC Coleman:**

approx. *“After this I asked Nathan Winter to leave the site, he refused and so was arrested*

and walked up towards the Wok Inn, on route as he had calmed down he was de-arrested, but told to stay behind the barrier at the Wok Inn. At this point he started arguing with two members of the public that were at the Wok Inn taking photographs of the incident.”

**14.30 –** The crew of Mike Charlie 21 positioned a light portable pump (LPP) on the north-west  
**14.34** side of the swimming pool. Ffs Wark and Wilton started to connect lengths of hard-  
approx. suction hose to the pump inlet.

CC Lilley and Firefighters Widgery and Marler, from Echo 03, assist the crew of Mike Charlie 21 with the deployment of hose lines from the LPP at the swimming pool. CC Lilley: *“it seemed that Geoff (Wicker) wanted two jets of forty-five, they’d originally put two lengths of seventy, I changed that to one length of seventy, went back and got a dividing breech and put that into the LPP....”*

#### **Commentary**

SC Upton states that he had instructed WC Wicker to set up one jet.

**14.30** At the entrance to the site SC Upton tasked Ff Domm, from Sierra 12, to set up a  
approx. portable water dam. Ff Domm confirmed with Upton that he wished the dam to be filled from the onboard tank of Sierra 12 and then for shuttle runs to and from a hydrant to be established.

**14.31** SC Upton met CC Howell, from Whiskey 04, at the site entrance and asked him to get  
approx. two lines of hose and set up two monitors, one to work the left side of the fire, the other to cover the container.

CC Howell stated that he briefed CC Liszka, and then returned to Whiskey 04 and briefed his own crew, including that *‘the water supply we’re going to use is Sierra 12 (water carrier) into a dam.’*

CC Liszka stated that SC Meik also spoke to him about getting a monitor to work onto the ISO container.

**14.31** CC Liszka and CC Howell, plus Ffs Oakley-Ives and Watson, began to adapt the  
approx. abandoned hose lines and hand controlled branches to set up the two monitors on the main drive. Howell states that Liszka briefed the crew of Sierra 12.

**14.31** Ff Thomson stated that two hose lines serving the monitors being established in the approx. main drive were connected into the pump of Echo 12. The hydrant was still the main water supply. Echo 12 was no longer supplying water to Echo 01.

**14.31** Crew members from Mike Charlie 21 saw WC Wicker in front of the house talking on approx. his fireground radio.

**Commentary**

The only confirmed evidence of two-way fireground radio communication with WC Wicker is when WC Austin stated that he contacted Wicker to confirm the location of CC Lilley. This is most likely to have occurred once Lilley and some other crew members from Echo 03 were working with Wicker in Sector 4.

**14.31** **Sussex Police Incident Log:**

*'HT394 - I have liaised with RPD at the scene and at present they have enough resources from RPD. He will advise if more RPD req'd for road closures.'*

**14.31 –** Ff Watson set up the first improvised ground monitor (Monitor 1) on the left of the  
**14.40** main drive by Builders Beams 2 and *'directed this towards the buildings in that area approx. that were not yet alight.'*

T/WC Wells moved four propane cylinders from the encroaching fire on the left side of the drive and then assisted Watson.

**14.31 –** CC Liszka and Ff Oakley-Ives, from Echo 04, set up monitor 2 on the right hand side  
**14.41** of the main drive. SC Meik instructed them to direct this monitor onto the metal approx. container in front of *'a barn'*.

**14.32** Firefighters Palmer and Sadler, from Whiskey 04 started to set up a further monitor.  
approx. Ff Sadler stated that this was cancelled and they were told by SC Meik to withdraw and help set up the portable dam.

**14.32** The portable dam from Sierra 12 was deployed on the grass verge, to the left of the  
approx site entrance looking into the site (north-east), on the B2129 by firefighters from Echo 04 and Whiskey 04, T/CC Simpson from Uckfield and the Sierra 12 crew.

An Otter portable pump was then used to pump water from Sierra 12 and deliver it to the portable dam. Hard-suction hose was used to draw water from the dam via Echo 12 and provide it to the monitors via two 70 mm delivery hose lines.

**14.31:51 Video:**

The video footage is now in the area of the polytunnel within Sector 4, looking south-east towards the ISO container which is marked 'SCFU 259 4782' on a white/pale grey coloured background. Some areas of the container appear to be dirty and/or corroded. The container appears well established in that location, with foliage around the base. There is no indication of smoke, heat or steam arising from direct heating of the container.

A developed fire is apparent within Tube Store 1, but it still appears contained within the structure on the north and east elevations, nearest the ISO container.

**14.32:16** Fire can be seen emerging from north end of Tube Store 1, on the elevation behind the steel racking.

**14.32:31** The interior of Tube Store 1 is now fully involved in fire, with flame rapidly propagating indicating that flashover has occurred. There are indications of structural failure on the upper part of the north wall to Tube Store 1, nearest the main drive.

In the background, a further fire is spreading from the direction of Tube Store 2 involving the boundary fence between the main drive and the Builders Beams site, towards the caravan.

Significant smoke plumes are visible blowing in an easterly direction from the fires in Tube Store 1 and the area of Tube Store 2. Both plumes combine to obscure the view towards Builders Beams 1.

A hose line is visible running towards the stable area, but appears to be uncharged. Occasional detonations are audible.

Video footage ceases from 14.32:38 to 14.33:04 hrs.

**14.32** WC Austin was instructed by SC Upton to carry out a reconnaissance. WC Austin approx. and Ff Julyan, from Echo 03, state that they subsequently walked around the perimeter fence on the east side of Builders Beams, looking for water supplies for the monitors and for access. Ff Julyan stated that WC Austin walked on the inside of the fence while he walked on the outside. They kept in touch by radio and met up back where they started, having completed the task. Ff Julyan states that he saw nothing on his side.

**Commentary**

SC Upton stated that he believes he instructed WC Austin to reconnoitre to the right of the main drive looking from the B2192, whereas WC Austin went to the left, indicating confusion as to the area to be searched.

**14.33:24** Echo 24 in attendance. CC Hobden from Echo 24 was met by Ff Coppard (Marshalling Officer) and Hobden advised him that Echo 24 had been designated by M&CC as 'Command Support pump'.

CC Hobden and the crew of Echo 24 reported to an Officer on the ICU, who he identified as T/GC Easey. Shortly after this CC Hobden sent Ff Atkinson back to Echo 24 to collect fireground radios.

**14.33:32** Alpha 02 - Area Commander Ashley in attendance.

**14.33:34 Video:**

Video footage indicates that two areas of flame from Tube Store 1 appear to impinge towards the rear of the ISO container.

**Commentary**

This is the first indication that the exterior of the ISO container is being subjected to radiated and/or direct heating. The degree of impingement to the rear of the container is unclear from this view.

Flame can be seen on the video emerging from:  
two areas on the north east end wall of Tube Store 1;  
at the ridge of Tube Store 1;  
at the ridge of Box Store.

The last image in this sequence is at 14.34:00 hrs.

14.33:40



14.34:32 Golf 11 - SC Drinkwater - in attendance

14.34:48 **Video:**

The video footage is now looking in a south-easterly direction, from within the swimming pool area, showing personnel beyond the pool wall who are moving towards the area of the ISO container. Four personnel are visible, including a Watch Commander (white helmet with WC markings, probably WC Wicker) who is also wearing a fireground radio, a Crew Commander (likely to be CC Lilley from Echo 03, this indicates that members of the Echo 03 crew were now working in that area).

No personnel are visible on the video within the walled area of the pool, but background sounds are audible, possibly of suction wrenches in use, indicating that hard-suction hose is being attached to the LPP at the poolside.

Flame is visible emerging at several points at a high level in the north-east wall of Tube Store 1, facing the workshop.

14.34:56



14.34:52 On the video, a voice in the background says: “we’ll get the dividing breech first.”

**Commentary**

The use of a dividing breeching enables the single hose line from the portable pump to be divided to provide a second monitor.

14.35 **Sussex Police Incident log:**

*‘HT280 – Having problems with MOPS from the Wok Inn. There is a lane at rear of Wok Inn they are using which gets to rear of factory. Does Chief Fire Officer want the Wok Inn evac as it is within 600-metre cordon?’*

**Commentary**

‘MOPS’ is believed to mean ‘members of the public’.

14.36 In the main drive CC Liszka asked for ‘water on’ and with Ff Oakley-Ives directed their approx. monitor towards the metal container. However the water pressure was not sufficient for the jet to reach the ISO container.



**14.36:00 Video:**

The footage is now taken from a position outside of pool area, near the gates between the polytunnel area and the area of the ISO container. The image is looking towards the ISO container from the west.

A poor jet is visible from a monitor in the main drive, which does not reach the ISO container.

**14.36:03 Video:**

Video footage in the area of the polytunnel on the east side of the Marlie Farm house. The image is looking in a south-east direction towards the ISO container. A voice, possibly WC Wicker, can be heard in the background saying: *"We'll have one there and another one through here."*

**Commentary**

This activity appears to reflect the decision by WC Wicker to set up two monitors in Sector 4. This would explain the earlier decision to use a dividing breeching

**14.36:13 Video:**

Two firefighters, likely to be Ffs Skeffington and Wood from Mike Charlie 21, walk in a southerly direction away from the area of the polytunnel towards the area of the ISO container.

**14:36:16 Video:**

Flame is issuing at a high level from the end wall of Tube Store 1, facing the ISO container.

**14.36 approx.**

GC Cox returned to the site entrance and saw a single monitor by the corner of the shop building, being directed at something out of his sight. *"However barely any water/pressure at monitor and it was ineffective."* GC Cox was informed that crews were *"pulling back to the road or beyond."*

GC Cox stated that he spoke to T/WC Wells and was informed that *'the monitor was set up to cool a significant explosion risk in a container just around the corner.'* GC Cox stated that Wells told him the premises explosive risk was well known to the Lewes crews who have carried out 7(2)(d) familiarisation visits at the site. Cox states

that Wells also told him that he had been informed if the container store became involved it would be a major problem/risk.

**14.36:20 Video:**

Fires are now seen venting from several high-level openings on the north elevation of Tube Store 1, plus at low-level and in the ridge area of the roof.

**14.36:32** A fire issuing at low-level from the north-west corner of Tube Store 1 appears to be impinging onto the rear of the ISO container

**14.36:39** The sound of an external telephone sounder can be heard in the background on the video recording. This is a similar sound to that of a Fire Service evacuation whistle.

**14.36:44** A jet is briefly directed towards the north-east corner of Tube Store 1, but ceases.

**14.36 – 14.37** AC Ashley described meeting the Incident Safety Officer (SC White), who told him that T/SC Upton was the Level 2 Incident Commander.  
approx.

**14.36:47 Video:**

A telephone sounder is audible in background. External cladding on the north elevation of Tube Store 1 has distorted and is folding outwards.

Video footage ceases from 14.36:51 to 14.38:35 hrs.

**14.37 Sussex Police Incident Log:**

*'HT210 – S/W Command Support ESFB – The Wok Inn can remain open at this stage. Things are calming down at the scene.'*

**Commentary**

'S/W' is believed to mean 'spoken with'.

**14.37** At the swimming pool, a single line of 70 mm hose was connected to the outlet on the portable pump and run over the top of the east wall surrounding the pool area into the polytunnel area. This hose line was then connected into the hand controlled dividing breaching fitted by CC Lilley.  
approx.

CC Lilley described that at about this time, from his position near the pool, he could see a large box, shaped *“like a shipping container with doors on it”*, up against, and to the side of, a building that was alight.

**14.38 Sussex Police Incident Log:**

*‘One male has been arrested, he was removed from scene and de-arrested. Staff from factory are being aggressive and unhelpful.’*

**14.38:37 Video:**

Footage shows that the caravan, on the left of the main drive, is well alight but the adjacent elevated fuel tank is not involved. A further fuel tank, against the gable wall to the workshop, is not involved.

The sound of an engine running is audible in the background, which is likely to be the portable pump at the swimming pool. Momentary surges of water are visible from both monitors in the main drive

**14.38:40**



**14.38:55 Video:**

Momentary surges of water from one of the monitors in the main drive briefly strikes the top of the north-east corner of the ISO container. Steam is then visible coming from the top of the container.

**14.38:56**



**Commentary**

The fact that the water hitting the top of the container is turning to steam indicates that the metal container is being heated by direct flame impingement and/or radiated heat.

**14.38** approx. SC White approached the crews by the monitors in the main drive and gave the instruction: *“Get it done, then get out.”*

**14.38:59 Video:**

Ff Marler from Echo 03, working approximately five metres away from the container, appears to be laying out delivery hose by the stable. A voice from out of the image asks Ff Marler: *“Will, where does this one go to?”*

**Commentary**

The voice is possibly that of Ff Widgery, who was working with Ff (Will) Marler.

- 14.38-** SC Upton stated: *“I walked to the front of Echo 01, met AC Ashley and started a*  
**14.39** *handover.”* AC Ashley confirmed that he met SC Upton and asked him for an  
approx. appraisal of the situation.

**Commentary**

AC Ashley booked 10:3 (in attendance at incident) by mobile telephone at 14.33:32 hrs, he states this was approximately 1-2 minutes before arriving. He then dressed in PPE by his car before walking towards the site with SC Drinkwater who had arrived at around the same time. Ashley then met SC White and had a brief discussion before finding SC Upton. If five minutes is allowed for this after his 10:3 time, the briefing is not likely to have started earlier than 14.38 hrs.

- 14.38 -** SC Upton stated that he told AC Ashley that the fire had consumed the firework  
**14.42** factory and spread to adjacent buildings. SC Upton explained that they were having  
approx. water supply problems and he indicated that a jet had been secured, but that it was struggling to reach the fire. He said there were now concerns that one of the buildings contained very large fireworks. SC Upton stated that he told AC Ashley that he *‘had initiated a total evacuation and withdrawal’* and *“we had just identified that the metal container actually contained larger fireworks.”*

**14.39:00 Video:**

Footage of the ISO container shows grass either side of a slab in front of the container doors. A stack bales is approximately two metres from the container doors and is adjacent to the north west wall of the stable building. The doors to the ISO container appear to be fully shut with the external latches secured.

- 14.39:02** Ff Marler from Echo 03 can still be seen managing hose, within approximately five metres of the ISO container. Ff Marler has his tunic collar down, does not appear to have a fire hood raised over his head and his helmet chinstrap is loose. He is wearing gloves. His helmet face shield and goggles are not in use.

14.39:02



14.39:12 **Video:**

A voice can be heard on the video saying: *“Pete, don’t turn this right side one on.”*

#### **Commentary**

The voice heard on the video is likely to have been Ff Marler talking to CC (Peter) Lilley.

This is likely to refer to the operation of one of the valves on the hand controlled dividing breeching. This would have been required to be in the open position to allow either, or both, of the hose lines serving the monitors to be charged with water.

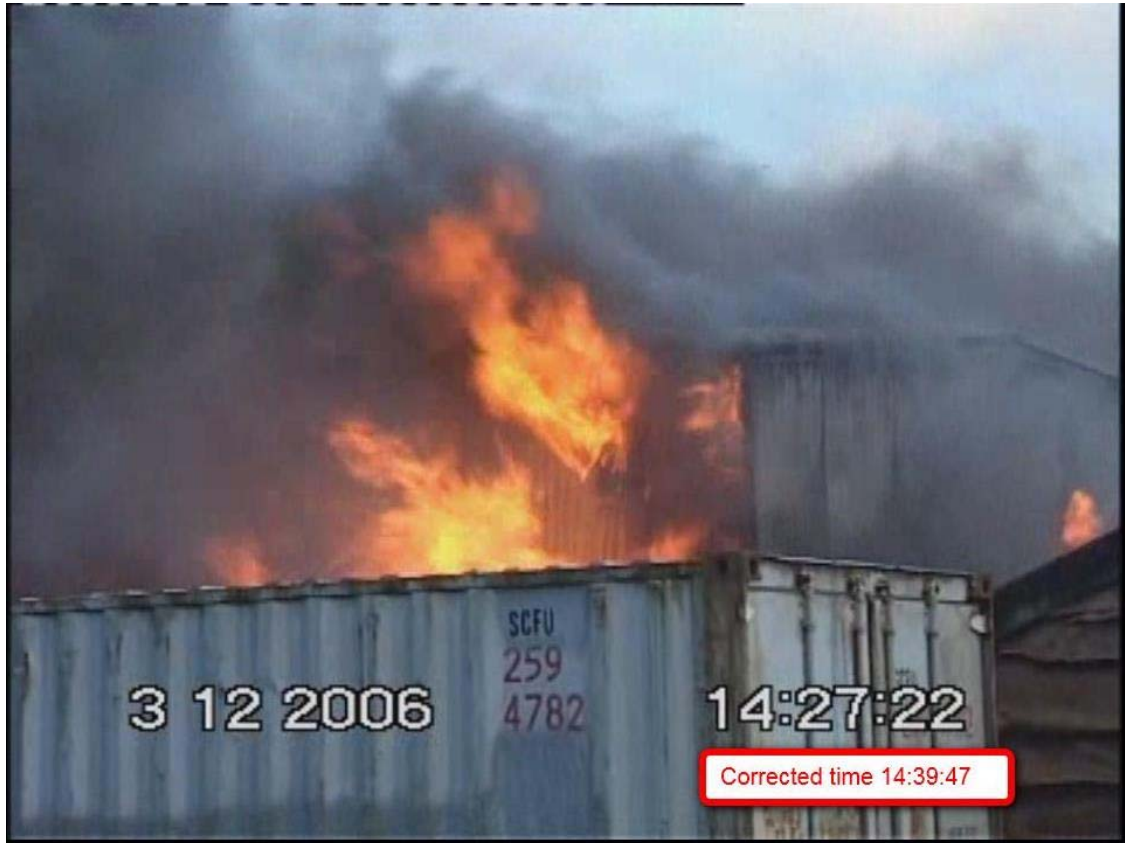
This instruction indicates that the hose line concerned was not ready to be charged at this time. It is likely that the hose line and branch were still being positioned by Ffs Widgery and Marler.

**14.39** **Sussex Police Incident Log:**

*‘HT280 - north of scene by The Wok, we have 30-plus MOPS coming down from Wok.’*

**14.39:47 Video:**

Fire is seen emerging from the north end of Tube Store 1, and appears to be directly impinging onto the south-east side of the ISO container.



**14.40:28 Video:**

The construction of improvised monitor 3 is being completed by Ff Wood, who is assisted by Ff Skeffington. This comprised of a hose line and 'Unifire' hand controlled branch tied to a section of ladder, which is braced against a pallet of paving stones.

Ff Skeffington is wearing firefighting gloves, but the front flap of her tunic is not secured. Ff Skeffington's hair is visible between her tunic collar and helmet indicating that her fire hood is not being worn raised over her head. Ff Wood is not wearing gloves. Neither appear to be using their helmet face shields or goggles.

14.40:28



**14.40** Monitor 4 was constructed by Ffs Marler and Widgery from Echo 03, by securing their approx. line of hose and an 'AWG' hand controlled branch to a rail and post fence by the gate on the south-east side of the tennis court. This fence and gate divided a small paddock and pond, to the south of the stables. Ff Widgery stated that during this task WC Wicker gave him a wooden pallet to stabilise the improvised monitor. He saw WC Wicker return to the other monitor (monitor 3).

**Commentary**

Ff Widgery's observation confirms that WC Wicker was aware of and approved the establishment of an extra monitor additional to that required by SC Upton in Sector 4.

**14.40** SC White gave the instruction to CC Liszka and Ff Oakley-Ives: "*Leave it. Come approx. back.*" They walked briskly to the main entrance of the site, where they spoke to Ff Thomson, pump operator of Echo 12, about the lack of water pressure.

**14.40** TWC Wells and Ff Watson, from Echo 01, finalised the positioning of Monitor 1 before they withdrew towards Echo 01 at the site entrance. SC White stated that he told Wells to: "*get out now.*"



**14.40:33 Video:**

A firefighter, possibly Ff Marler, is managing hose in the vicinity of the ISO container, then heading out of view towards the area of the stable block.

**14.41**  
approx.

Ff Skeffington from Mike Charlie 21: *"I noticed that the metal container, which was about twenty by ten feet in size in front of the burning building had white smoke coming from the bottom of it. I said to Geoff 'What is in that container?'. I cannot remember his reply exactly, but it was something like 'there are the big fireworks in there'. Geoff said this in a half joking voice and I thought perhaps he was being sarcastic. I took it that it was safe, even though I felt that something was wrong, but Geoff had thirty years experience and I didn't want to question him. I also saw that Brian Wembridge was at this location, videoing everything."*

**14.41:02** Golf 09 - SC Hobbs - in attendance.

**Commentary**

All officers mobilised to the incident were now in attendance.

**14.41:36 Video:**

WC Wicker and a Crew Commander, believed to be Lilley from Echo 03, head north together out of the image towards the polytunnel area.

14.41:36



Screen shot showing WC Wicker (2<sup>nd</sup> from left) wearing a red & yellow Sector Commander's tabard, and helmet with WC role markings.

**Video:**

In the foreground, firefighters Skeffington and Wood are visible at monitor 3. The hose line serving the monitor does not appear to be charged at this time.

The fire in Tube Store 1 continues to impinge on to the rear elevation of the ISO container. The jet in the background is from a monitor in the area of the main drive.

**Commentary**

None of the personnel in the image appear to be monitoring the development of the fire and its impingement onto the ISO container.

14.41

**PC Pitcher:**

onwards *“Having closed the roads in the area, I went to the Wok Inn. I was approached by a male who was representing EDF Energy and he stated he needed to speak to the senior fire officer as there were 15,000 volts within the factory complex. At this point I updated the control vehicle that I would bring EDF Energy rep to the fire control*

*vehicle and I started to walk with the male on the grass verge towards the fire control vehicle. PC Upjohn was with me on my right-hand side but slightly behind me. As we walked pass one of the houses on the left hand side there was a massive explosion.”*

**14.41 Sussex Police Incident Log:**

*‘HT280 – EDF Energy at scene. Significant danger of 15,000 volts in the site – they need urgent message to Fire Incident Officer. Message passed. EG99 aware. EDF coming straight to scene’*

**Commentary**

CC Head confirmed that an EDF Energy employee entered the ICU, asking for ‘the boss’. CC Head didn’t know who the boss was and cannot recall at what time this occurred. No evidence has been found that the information regarding the electricity risk was passed to East Sussex Fire & Rescue Service before the explosion.

SC Upton has stated that he spoke to an EDF Energy representative at some point, but cannot recall when.

From the police statements it would appear that the EDF representative and police officer never got as far as the ICU when the explosion occurred.

PC Pitcher decided to escort the EDF employee to the ICU, knowing that a cordon was put in place, (see 14:35) and did not contact the Fire and Rescue Service first to see if it was appropriate to go to the ICU.

**14.41 Video:**

Intermittent water jets can be seen from the monitors in the main drive. A brief jet - probably from monitor 1 - is visible, directed towards the area of the caravan from the area of the main drive.

**14.41:47 Video:**

Rapid fire development can be seen from the apparent failure of the centre part of the north-west wall to Tube Store 1, impinging towards the rear end of ISO container.

**14.41:48 Video:**

Ffs Skeffington and Wood leave the monitor and head north out of the video image towards the polytunnel area.

No other fire and rescue service personnel are visible in the video image; therefore it is unclear if anyone else, other than the Video Technician, remains in the immediate area at this time.

In the background an intermittent jet from a monitor, likely to be monitor 2 on the main drive, does not appear to reach the ISO container.

**14.41:54 Video:**

Fires venting from the end wall of Tube Store 1 have now merged to form a single large fire and continues to impinge on the ISO container.

No significant smoke can be seen from the fireball. Flame is also visible in background at the ridge level of Tube Store 1 and towards the box store.

**14.41** Ff Sweetman stated that he saw WC Wicker give a hand signal for 'water on' at approx. monitor 3. Ff Sweetman then walked from the LPP to inform WC Wicker that there '*was a problem priming the LPP*'. Ff Wark, from Mike Charlie 21, described having started the LPP using the pull cord but then needing longer than normal to prime the pump, using the hand operated stirrup style primer. Ff Wark confirmed that once it was primed the LPP operated at four bars pressure for a few seconds before the explosion.

Ff Wood stated that he obtained permission from WC Wicker before returning to Mike Charlie 21 to wash his hands, which were soiled with dog mess.

**14.42** Ff Thomson (pump operator of Echo 12) who supplied the two monitors on the main approx. drive, states that he was "*very nearly at the point of getting water out of the dam in order to feed the appliance when the explosion happened.*"

**14.42** Ff Skeffington stated: "*I was then told by Peter Lilly (sic) to go and check the approx. adjustments on the light portable pump, which I did and I made my way back to where Geoff and the monitor were and Brian and his video camera were.*"

**14.42** The improvised ground monitors supplied from the swimming pool were directed onto approx. the top of the container. The water pressure from the swimming pool was low and the jets issuing were described as '*like a garden hose*'.

**14.42 PC Coleman:**

approx. *“After dealing with this I went to walk back down towards the site when the large explosion occurred.”*

**14.42:50** Ff Widgery stated that he used an arm signal to CC Lilley at the hand controlled breeching for ‘water on’. Water started to appear at the monitor and Ff Widgery aimed the jet at the stable block, as it had just started to ignite from radiated heat.

**14.42:52 Video:**

The footage resumes after a gap of 58 seconds. This sequence lasts for approximately two seconds.

The video image is now looking south-east towards the ISO container from a position inside the chain link fence surrounding the poly tunnel area, and approximately four to five metres north west from monitor 3. This position now allows a view of the gap between the south-west elevation of Tube Store 1 and the rear of the stable building.

A Watch Commander wearing a Sector Commander’s tabard is seen stood at the north side of monitor 3, facing away from the camera, towards the ISO container (image obscured).

1. Monitor 3 is charged with water and is producing a continuous jet, which appears to strike the south-west area of the ISO container roof;
2. Small fires are venting at high level along the roof of Tube Store 1 and the box store;
3. Steam or smoke is visible along the roof of the ISO container;
4. White smoke is coming out of the container along the base and top of the doors and,
5. An uncharged line of delivery hose is lying on the ground by the stack of bales. A hand-controlled branch appears to be inserted into the female coupling.

14.42:52



### Commentary

The Watch Commander in this sequence of video is wearing a Sector Commander tabard and is believed to be WC Wicker.

The continuous jet from monitor 3 indicates that the light portable pump at the swimming pool is primed, the delivery hose line is charged and the relevant control valve on the dividing breeching is open. The throw from the monitor is only sufficient to reach the roof of the ISO container, suggesting that the hand controlled branch has been partially opened, possibly to prevent the full jet from overshooting the container. The portable pump is not audible in this sequence.

The line of uncharged hose is likely to be the second of the original firefighting jets, which was subsequently extended toward the rear of Tube Store 1 by Ffs Pratt and Portnell. The image of the hand controlled branch is not clear, but this is possibly of the 'AWG' type.

This confirms that a total of three hand-held jets and four improvised monitors had been deployed at the incident before the main explosion. Three of the monitors are charged at this time and the jets and monitors are available for use once the water supplies were established.

With WC Wicker appearing to head away from monitor 3 toward the polytunnel area, personnel had now withdrawn from all of the jets/monitors except for monitor 4, which Ffs Widgery and Marler state was in the final stages of being established.

Brian Wembridge has now moved a few metres north to within the chain link fenced area enclosing the polytunnel.

It is likely that WC Wicker would have passed Brian Wembridge when he returned to monitor 3. Therefore it is likely that WC Wicker was aware of Brian Wembridge being present within Sector 4.

**Video:**

1. A jet of water is seen just appearing from the right hand side of the image, the source of this water is not seen but is consistent with coming from monitor 4;
2. White smoke or fumes are visible at high levels around the door frame on the ISO container with a small flame or orange coloured smoke visible at the centre top of the doors to the ISO container;
3. Smoke is also coming from around the edge of the doors by the hinges and,
4. Smoke appears to be coming out under pressure at the bottom of the doors of the ISO container as small items of debris appear to be disturbed.

14.42:53



#### Commentary

The disturbance of debris from around the vicinity of the ISO container doors indicates the possibility of increased pressure within the container.

14.42:53 **Video:**

WC Wicker has turned to his left, and is now facing away from the monitor and ISO container. The aerial on his fireground radio is protruding from under the right arm opening of his Sector Commander tabard. He has his tunic collar turned up. He does not appear to be wearing his fire hood in the raised position over his head and the helmet face shield is not in use.

1. The door on the ISO container nearest the camera is shown to be open at approximately right angles to the container. It is possible that the door furthest away from the camera is also open, but this is partially obscured by:
2. Orange-coloured smoke or a large flame rapidly emerging toward the stack of bales in front of the stable. A rapid increase in noise is audible.



14.42:53



#### Commentary

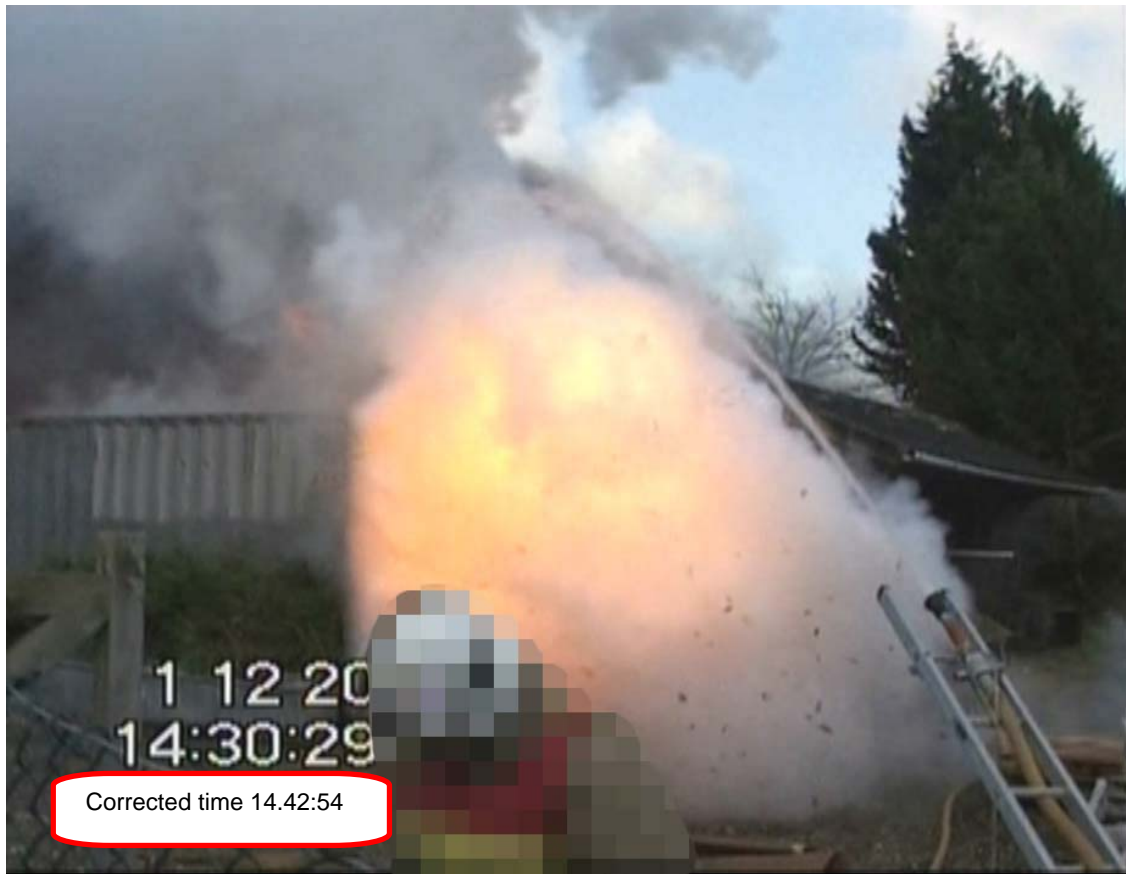
The rapid propagation of flame or smoke appears to originate from within the ISO container, which indicates that a deflagration is occurring.

14.42:53 **Video:**

The last frame of the video shows WC Wicker, now approximately two to three metres away from the monitor and approximately three to four metres from the camera. He is continuing to walk away from monitor 3 and is looking towards the ground between himself and the chain link fence surrounding the polytunnel area. The ISO container is now behind WC Wicker's right shoulder. Although the clock shows 14:30:29, it has only one frame into this sequence and with approximation of the corrected time of 12 minutes and 25 seconds the actual time of explosion is likely to be between 14.42:53 and 14.42:54

The jet from monitor 3 is still directed toward the roof of the ISO container. However the impact point from the jet is now obscured by a cloud of smoke and/or steam, with a considerable amount of debris picked up by the jet of smoke. The camera image remains steady

14.42:54 The Video image then ends



**Commentary**

It is likely that the end of the video coincides with the contents of the ISO container moving from deflagration to detonation and rupture of the steel container within the next second. This detonation is the main explosion as described by various witnesses.

The timing of this video image corresponds with the estimated time of the main explosion as identified by the British Geological Survey, i.e. 14.42:53.1 hrs (+/- 5 seconds).

14.42:55 AC Ashley states that as T/SC Upton continued his briefing to him, there was “an approx. *almighty bang as the fireworks factory exploded.*”

**Commentary**

AC Ashley stated that he had not taken over as Incident Commander at this time.

The following are descriptions of the explosion given by some of the casualties from Sector 4.

**Ff Sweetman:**

*“As soon as the jet of water hit the steel container I saw a burst of steam or smoke issuing from the gap at the top of the container door frame. ...accompanied by a sound like a loud hiss. Moments later there was a sucking sound. The smoke and steam were sucked back into the container, immediately after this there was a loud bang, and I saw the container doors fly open, followed by a vast fireball. It came out about 10 feet. ...After the fireball there was a massive explosion.”*

**Ff Skeffington:**

*“I had just gone through the archway to get back to Geoff and was about five to six feet away from him, he was at the branch which is the nozzle end of the hose in order to get the angle of the water correct. He was directing the flow of water onto the roof of the container when I felt that something was going to happen. I may have seen the container suck in. I cannot be sure. I turned to my left in order to run back the way I had come, but I heard a loud explosion which took me off my feet and threw me about three or four feet into a brick pillar.”*

**CC Lilley:**

*“The container was not giving indication of heat, i.e. glowing. There was nothing melting near or on it. I could not see anything to say what was in it... .... The next event I describe I can say happened in a split second. I saw from the centre and top of the container the doors start to flex. As they flexed I could see a flame appear from inside. At that moment I heard and felt an enormous explosion. I was literally blown off my feet backwards and into the air.”*

*“I believe I was about eight metres from the container when it exploded, maybe two paces, three paces in front of the dividing breeching, because I'd been at the hand controlled dividing breeching and I remember I walked forward to get a slightly better view of the container and Geoff was just in front of me and Geoff was down fiddling with the branch and I was looking at the container... Looking at it and then obviously flame came out the top, the doors flew open and I turned. Geoff was just in front of me, to my right, maybe three or four metres in front of me, and Brian had gone off to my right and Julie last I'd seen, Julie had gone behind me and I could still see the helmets of Will and Clive on the other side of Geoff to the right.”*

*“Standing upright the flames came out, the doors flew open, I turned and then as I was either travelling through the air, or at some point standing like that, then that’s when all the bits of metal hit me. A lot of flame came out the top of the doors, I mean this is all fraction of a second here; the doors came open and the way I would best describe it was like looking at the bottom of a space rocket, just about to take off from the burners at the bottom. You know that massively accelerated flame, it could be described as that.”*

*“The doors flew open and then when the explosion occurred there was a massive pressure wave. You only ever feel the pressure wave you don’t actually hear the explosion.*

*The doors flew open, a massive ball, a massive accelerated flame came out of the container, like...a super charged back draft for want of a better word....”*

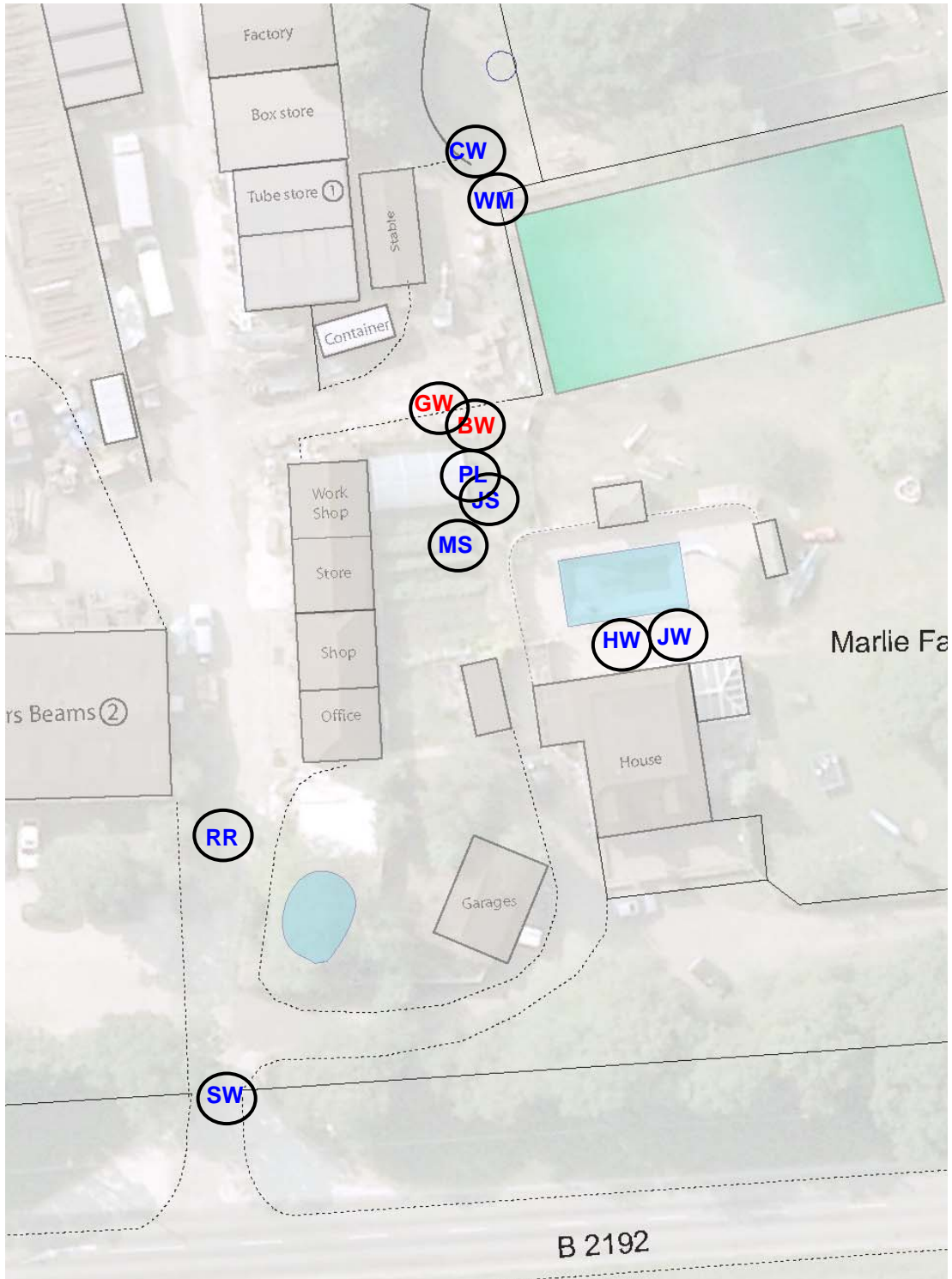
**14.42:53 Main explosion occurs at 14.42.53.1\* hours (+/- 5 secs), as determined by the British Geological Survey.**

\*

#### **Commentary**

Statements from various other East Sussex Fire & Rescue Service personnel at the incident describe seeing or feeling a pressure or shock wave and observing flying debris. SC Drinkwater, who was on the ICU, described feeling the pressure wave, a skylight in the roof of the ICU shattering and a cabinet door lifting off its hinges. He then emerged from the ICU and observed various items of debris and shrapnel lying on the main road (B2192) between the site and the ICU. SC Meik, who was also on the ICU described the windscreen breaking and the roof vents being blown off. Meik then made his way back towards the site, seeing *‘huge lumps of metal landing all around.’*

The following site plan shows the location of the East Sussex Fire and Rescue Service casualties at the time of the explosion, as indicated by witness statements.



Plan showing location of casualties at the time of explosion.

<b>East Sussex Fire &amp; Rescue Service casualties* from the main explosion at 14.42:53 hours</b>			
<b>(*subsequently reported under RIDDOR)</b>			
<b>Role &amp; Name</b>	<b>Station / Appliance</b>	<b>Last known location before explosion</b>	<b>Casualty Status</b>
WC. G. Wicker (GW)	Heathfield 'Mike Charlie 21'	Sector 4 near Mr. Wembridge & monitor 3	Fatally injured.
Mr. B. Wembridge (BW)	Service HQ	Sector 4 near WC Wicker & monitor 3	Fatally injured
CC P. Lilley (PL)	Barcombe 'Echo 03'	Sector 4 near dividing breeching	Injured
Ff W. Marler (WM)	Barcombe 'Echo 03'	Sector 4 near Monitor 4	Injured
Ff C. Widgery (CW)	Barcombe 'Echo 03'	Sector 4 at Monitor 4	Injured
Ff J. Skeffington (JS)	Heathfield 'Mike Charlie 21'	Sector 4 In polytunnel area	Injured
Ff M. Sweetman (MS)	Heathfield 'Mike Charlie 21'	Sector 4 In polytunnel area	Injured
Ff H. Wark (HW)	Heathfield 'Mike Charlie 21'	Sector 4 by LPP in pool area	Injured
Ff J. Wilton (JW)	Heathfield 'Mike Charlie 21'	Sector 4 By LPP in pool area	Injured
T/CC R. Ross (RR)	Lewes 'Echo 01'	Sector 1 On main drive between Office & Echo 01	Injured
Ff S. Wood (SW)	Heathfield 'Mike Charlie 21'	Sector 1 Site entrance by Mike Charlie 21	Injured

<b>Other known non-East Sussex Fire &amp; Rescue Service casualties from the main explosion at 14.42:53 hours</b>			
<b>Name</b>	<b>Role</b>	<b>Location at explosion</b>	<b>Casualty Status</b>
Sergeant Simmonds	Sussex Police	Sector 1 Near Police car in Main drive	Injured
Mr. B. Keeys	Members of the public	Rear of site south-east of Marlie Farm	Injured
Mr. R. Keeys			

### **Geoffrey Wicker**

There was extensive tearing and damage to the outer clothing that was also contaminated with soil, vegetation and glass fragments.

#### Cause of death

Geoffrey Wicker died as a result of injuries caused by an explosion. He had suffered extensive injuries.

### **Brian Wembridge**

There was extensive tearing and damage to the outer clothing that was also contaminated with soil and vegetation debris.

#### Cause of death

Death had resulted from the effects of an explosion.

#### **Commentary**

The accident investigation has focused on those Service casualties reported under RIDDOR.

It should be noted that following the incident, three other personnel formally reported physical injuries and the four crew members from Echo 01 reported verbal and attempted physical abuse as 'near misses'.

#### **14.43 Sussex Police Incident Log:**

*'HT204 – Massive explosion heard.'*

*'HT206 making to scene.'*

**14.43** Witness statements describe the injuries to the casualties including some reports of approx. the *'ground on fire'* and *'fire works alight on and around them.'*

**14.43** Several officers and firefighters describe the operation to rescue casualties from within approx. the site.

#### 14.44 Sussex Police Incident Log:

*'Explosion heard in Uckfield by Rodney Ash.'*

*'Lots of debris – Police vehicles likely to be damaged.'*

*'ES194 – PS Simmonds has been injured – he is walking.'*

The Police Sergeant *'...was about 10 metres from the warehouses with fencing between him and warehouse'. 'Then a large explosion occurred and he was thrown from his feet. He then crawled behind his Police car where he found an injury to his leg'.*

CC Liszka and T/WC Wells found the injured police officer, who told them he believed firefighters were inside the site.

#### **Commentary**

The circumstances of the injured Police Sergeant were subsequently provided to the AI team by Sussex Police.

14.44:46 Assistance message sent by CC Harvey of Echo 25: *"Make ambulances. Firefighters injured."*

14.44 approx. Brian Wembridge was found by firefighters outside the wall on the south-east side of the swimming pool. Personnel from Echo 12 and Echo 04 report giving first aid and then carrying Brian to an ambulance, using a section of ladder as an improvised stretcher.

14.44 approx. Geoff Wicker was discovered by firefighters outside the south-east corner of the swimming pool wall, adjacent to Brian Wembridge, as Brian was being removed by the same crews.

14.44 approx. WC Austin stopped personnel from going further into the site. CC Howell found Ffs Streeter and Pratt and CC Liszka with others carrying Brian Wembridge out of the site on a section of ladder being used as an improvised stretcher. Howell states that Ff Pratt was saying *'he's alive, he's alive, he is breathing'*. Howell took the head end of the ladder and states that Brian was not breathing when he joined them. CC Howell stated that Brian was carried to an ambulance where he was handed to paramedics and laid inside on a stretcher.



**14.44** AC Ashley's contemporaneous notes state: *"Aware of firefighters running into site. Concerned if second explosion occurred there would be casualties among these firefighters.....I followed them as they had taken a pathway to the right of the main drive."*

*AC Ashley met T/GC Easey: "who said that there were casualties in the site, he looked stunned."*

AC Ashley continued and met someone who he believed to be the Watch Commander from Echo 03: *"who was holding some firefighters back for safety reasons. He confirmed that there were casualties."*

**14.44** *"Knowing that I had to take control of the situation"* AC Ashley returned to the road and met T/SC Upton and told him to commence a roll call.

**14.44 - 14.48** SC Hobbs and Ffs Chart and Armstrong, along with two police officers, rescue two injured members of the public from the wooded area at the rear of the site. SC Hobbs stated that he encountered several other members of the public in the wooded area and reported their presence to the police.

**14.47** **Sussex Police Incident Log:**

*'EG99 – Two Fire Officers being treated by Paramedics, still not clear if everyone is accounted for. As far as we are aware – all Police accounted for. Wok Inn to be evacuated ASAP – this is happening, road being closed from Blackboys.'*

**14.50** CC Liszka, from Echo 04, was instructed by WC Austin to re-enter the site and check for further casualties. CC Liszka carried out a sweep of the site before withdrawing.

Ff Oakley-Ives describes WC Austin instructing him to leave WC Wicker in situ.

SC White ordered T/WC Wells out of the site. White remained in the vicinity to guard WC Wicker and prevent further access into the site.

**14.48** **Sussex Police Incident Log:**

*'EL153 – have MOP (member of public) by the path needs a Paramedic ASAP at Wok Inn.'*

- 14.48:26 SECAMB Incident Log:**  
*'Further call from Fire requesting as many crews as possible due to an explosion firefighters have been injured. Dispatcher and DCM made aware.'*
- 14.48:38 SECAMB Incident Log:**  
*'Z699 2nd large explosion, make AMBS x3, now make AMBs x6.'*
- 14.49** A first mention of a possible fatality occurs on the **Sussex Police Incident log:**  
*'HT210 – Sgt Simmonds had puncture wound to leg – he is otherwise ok.'*  
*'HT210 – Unconfirmed reports of ESFRS fatality.'*  
*'HT210 – Five Fire officers injured, it is possible that the most serious inj may be a civilian.'*
- 14.50:11 SECAMB Incident Log:**  
*'There is a PT by the Wok Inn who has been hit by debris - alloc aware.'*
- 14.50:26** Informative message from AC Ashley to M&CC: *"Make Pumps 10. Major Explosion involving many casualties, involving firefighters. Area being evacuated. Now moving into Transitional Mode."*
- 14.50:54** Echo 14 (Mayfield) and Whiskey 06 (Newhaven) mobilised to incident.
- 14.51** **Sussex Police Incident Log:**  
*'HT280 with ESFB – we are trying to locate injured persons.'*
- 14.51:58** Informative message from the Incident Command Unit (Charlie 01): *"Explosion, FFs injured unknown numbers. Efforts being made to rescue, crews being withdrawn."*
- 14.52:04** Victor 01 (Chief Fire Officer & Chief Executive Prichard) in attendance.
- 14.52:04 SECAMB Incident Log:**  
*'Major inc declared by 699, 4 to 5 fire staff casualties, confirmed 1 fatal.'*

**Commentary**

SECAMB Officer Borthwick has stated to the AI Team that he sent this message following Brian Wembridge being recovered to an ambulance, where he was formally pronounced as deceased

**14.53:35 SECAMB Incident Log:**

*'Update from Police require more ambulances for more pt 2x firefighters down with blast injuries and police with leg injuries and shock.'*

**14.57:03** Echo 02 - Extended Rescue Pump, Hove mobilised.

**14.58:15** Informative message from AC Ashley: *"Major Incident."*

**15.02:35 SECAMB Incident Log:**

*'2 x Fatalities confirmed.'*

**15.11:19** Victor 03 – Assistant Chief Fire Officer (ACFO) Walsh is mobilised.

**15.15** AC Ashley stated: *"The CFO (sic) then stated to me that he wanted to brief all fire crews. All crews were moved to the Wok Inn. By the time the briefing took place a roll call had ascertained that all personnel were accounted for, this included those who were casualties. What was not certain were casualties amongst members of the public."*

**15.22:57** From CC Head, Charlie 01: *"Request Ambulance Control how many Ff injured and where have they gone. Roll call taking place."*

**Commentary**

Indicates that the full list of casualties was not yet known.

**15.34:54** ACFO Walsh in attendance at the incident.

**15.35:52** GC Brown in attendance at the incident.

**15.36:17** Informative message from AC Ashley: *"5 Fire Service personnel taken to hospital, 1 Police Officer taken to hospital, 2 members of public taken to hospital. All persons not yet accounted for, Crews withdrawn to a safe distance. Delta (mode)."*

- 16.30:21** From Area Commander Ashley: *"Make OSUs 2."*
- 16.30** approx. Mr. Lock, Duty ICT Technician, described retrieving his vehicle: *"At that time ....the firework explosions had died down."*
- 16.32:24** Informative message from AC Ashley: *"Whole site involved in fire, crews still withdrawn to safe distance. Delta Mode. All persons not yet accounted for."*
- 16.53:11** M&CC message: *"GM Scott has been designated Gold Command at Police HQ. Silver Command will be dealt with from the incident."*
- 17.00** approx. Chief Fire Officer & Chief Executive Prichard, GC Brown, T/GC Easey and FBU Secretary Mr. S. Huggins approached from the Wok Inn and entered the Marlie Farm site from the main entrance to attempt the recovery of WC Wicker's body.

On reaching WC Wicker's location, the decision was made, in the circumstances, that it was not appropriate to attempt to recover him. WC Wicker was then covered with a salvage sheet weighed down with bricks from the debris on site. CFO & CE Prichard and colleagues then paid a brief tribute to WC Wicker, prior to withdrawing.

T/GC Easey described there were *'further loud explosions'* as they returned to The Wok Inn. SC White stated that shortly after this a *'medium sized explosion'* occurred on site.

Mr. Lock described reporting to the ICU at approximately this time: *"By the time I returned to the scene the fireworks had increased again."*

This explosion was described as *'sufficient to rock the ICU'* vehicle parked near the junction of B2192 and Shortgate Lane. A decision was made to withdraw everyone; fire & rescue service personnel, police, ambulance and Marlie Farm site staff from the Wok Inn to the junction of the B2192/Shortgate Lane.

- 17.39:18** **Informative Message From Charlie 01:**  
*"ACFO Walsh now en route to Gold Command to act as Fire Service liaison."*
- 17.49:26** **Informative message from AC Ashley:**  
*"Whole site involved in fire, crews still withdrawn to safe distance. Delta Mode. All*

*persons not yet accounted for.”*

**18.38:35 Informative message from GC Scott:**

*“Marshalling point is being set up. Approach from north via Halland Roundabout. Junc. Wood Farm Raystead. RVP Junc Shortgate Lane and Broyle. Police sending refreshments from West Sussex. FV01 and FV02 attending with 3 crews F06 in attendance at incident (sic) with toilets and air support.”*

**20.24:39 Informative message from AC Ashley:**

*“Site being allowed to burn under supervision of crews. Exclusion zone set up to 200 metres. TIC in use. Hotel 900 required to allow Fire Officer to survey scene from air. Crews in Delta mode. All civilian personnel not accounted for.”*

**21.12:00 Informative message from Charlie 01:**

*“Area Commander Reynolds now in charge of incident.”*

**21.48:55 Informative Message from AC Reynolds:**

*“Silver Command meeting taking place, next Silver Command meeting at 2300. Delta Mode.”*

**23.26:54 Message from AC Reynolds:**

*“Silver Command meeting held on site confirmed several acetylene and mixture of other cylinders in fire area. 200m hazard zone set up. Crews in Delta Mode. Further multi agency meeting at 0600hrs.”*

**MONDAY 4 DECEMBER 2006**

**03.11:33 Message From Charlie 01:**

*“GC Pearson now Incident Commander.”*

**05.50:20 Message From Charlie 01:**

*“AC Reynolds now Incident Commander.”*

**07.38:07 Message From Charlie 01:**

*“EOD (Military Bomb Disposal team) now in attendance.”*

**08.18:56 Message From Charlie 01:**

*“From AC Reynolds Inf – Crews still in Delta mode awaiting outcome of Silver Command meeting at 08:30.”*

**10.38:21 Message From Charlie 01:**

*"Request ALP with Faiross camera."*

**11.01:32 Message From Charlie 01:**

*"From AC Reynolds Inf – Crews still in Delta mode awaiting ALP for remote observation of cylinders ALP will be deployed when forensic search of access route is complete. Further Silver Command meeting at Ringmer programmed at 12:00 hrs."*

**12.32:01 Message From Charlie 01:**

*'ALP in use for remote observation Delta mode'*

**14.54:34 Message From Charlie 01:**

*"From AC Reynolds Inf – sight survey now completed by EOD who have now withdrawn, a quantity of acetylene cylinders confirmed involved in fire and a quantity of fireworks unexploded that cannot be confirmed at this time. Crews in Delta mode incident being scaled down to 1 pump and 1 level 2 officer overnight."*

#### **TUESDAY 5 DECEMBER 2006**

**08.15:18 Message From Charlie 01:**

*"From AC Reynolds Inf – Silver agency meeting completed. Minimal number of Fire Service personnel to be deployed into hazard zone to carry out risk assessment and confirm condition location and number of acetylene cylinders and to identify location and quantity of unexploded fireworks in hazard zone Oscar mode."*

**09.47:56 Message From Charlie 01:**

*"From AC Reynolds Inf – Crews completed assessment of cylinders and quantities as follows, 9 Argon, 13 oxygen 1 acetylene cylinder subject to heat and shock damage. Minimum Fire Service personnel now committed to hazard area assessing condition and quantity of unexploded fireworks Oscar mode."*

**11.03:24 Message From Charlie 01:**

*"From AC Reynolds - Assessment of unexploded fireworks complete. Hazard zone now declared safe by Fire Service. Silver meeting complete and action plan agreed. Strict control on site access until Forensics Completed by SOCO officers next silver meeting at 13:00 hrs."*

**12.50:47 Message From Charlie 01:**

*"From AC Reynolds - Inf Crews deployed to isolate LPG tank on request of HSE."*

**14.08:24 Informative message from Area Commander Reynolds:**

*"All Fire Service personnel accounted for."*

**Commentary**

This message reflected that Watch Commander Wicker had been recovered from the site past a guard of honour formed by East Sussex Fire & Rescue Service personnel.

**16.52:19 From GM Scott:**

*"Gold Command now closed down."*

**17.59:15 Stop message:**

*"From Area Commander Reynolds - Stop – Area of approx 1500 sq metres containing range of buildings used for fireworks storage and steel fabrication. Several buildings destroyed by fire and explosion. Remainder of buildings suffering extensive damage and structure unsafe. Ten acetylene (sic) cylinders, thirteen argon cylinders, nine oxygen cylinders, and unknown quantity of propane cylinders involved in fire and explosion declared safe. A large quantity of unexploded fireworks left in situ declared safe in current location. Following analysis via Environmental Health have confirmed no blue asbestos present on site. Three (sic) members of public, nine Fire Service personnel and two Police Officers conveyed to hospital by Ambulance. All Fire Service personnel accounted for. A number of deep seated fires still remain in open. One pump and one Level Two Officer required for tomorrow at 0800 hours. A number of Service vehicles damaged by fire and explosion currently impounded by Police."*

**Commentary**

The 'stop' message refers to three injured members of public. However information received from Sussex Police regarding the identities of casualties only refers to two injured members of the public.

Over the next 3 days, crews continued to be on site dealing with a number of small fires and Urban Search and Rescue Crews, from West Sussex Fire & Rescue Service, were deployed to shore up an unsafe building and assist with removal of further cylinders. Crews also stood by whilst explosives were removed from site.

During the course of the whole incident, 50 Fire Appliances, 18 special appliances and 29 Officers and support staff attended the scene.

**SATURDAY 9 JANUARY 2007**

**10.32**

**From GC Sutton:**

*"Incident now closed."*



## **FINDINGS AND RECOMMENDATIONS OF THE ACCIDENT INVESTIGATION TEAM**

This section of the report details the findings of the Accident Investigation Team. They are grouped under areas as detailed in Appendix 5, 'analysing the causes of accidents and incidents', of HSG 65 Successful Health and Safety Management.

There are 12 headings within Appendix 5, and are as follows;

Premises, Plant and Substances, Procedures, People, Planning, Assessing Risk, Organisation: Control, Organisation: Cooperation, Organisation: Communication, Organisation: Competence, Monitoring and Review.

Within each heading are a number of findings, for ease of reporting each finding has only been included under one heading, not withstanding that it may well be relevant within other areas as well.

For example, the finding that there was no 7(2)d card for the Marlie farm site is included under the Premises section. Although there could also be issues with regard to Procedures, Planning, Assessing Risk, Organisational Control, & Communication.

Detailed alongside some of the findings are a number of recommendations. The purpose of these recommendations is not only to seek improvement for East Sussex Fire & Rescue Service, but the wider Fire & Rescue Service community and ultimately improve the safety of firefighters and the community they serve.

The findings and recommendations are not meant to imply criticism of any one individual or organisation, but to improve safety.

The final two sections of Appendix 5 Monitoring and Review, is how the East Sussex Fire & Rescue Service will implement, the recommendations contained within this report and, monitor and review the actions taken. This will be through the normal Health, Safety and Welfare processes and committees. These details are not included within this report.

A complete list of recommendations of the Accident Investigation Team can be found at the front of the report

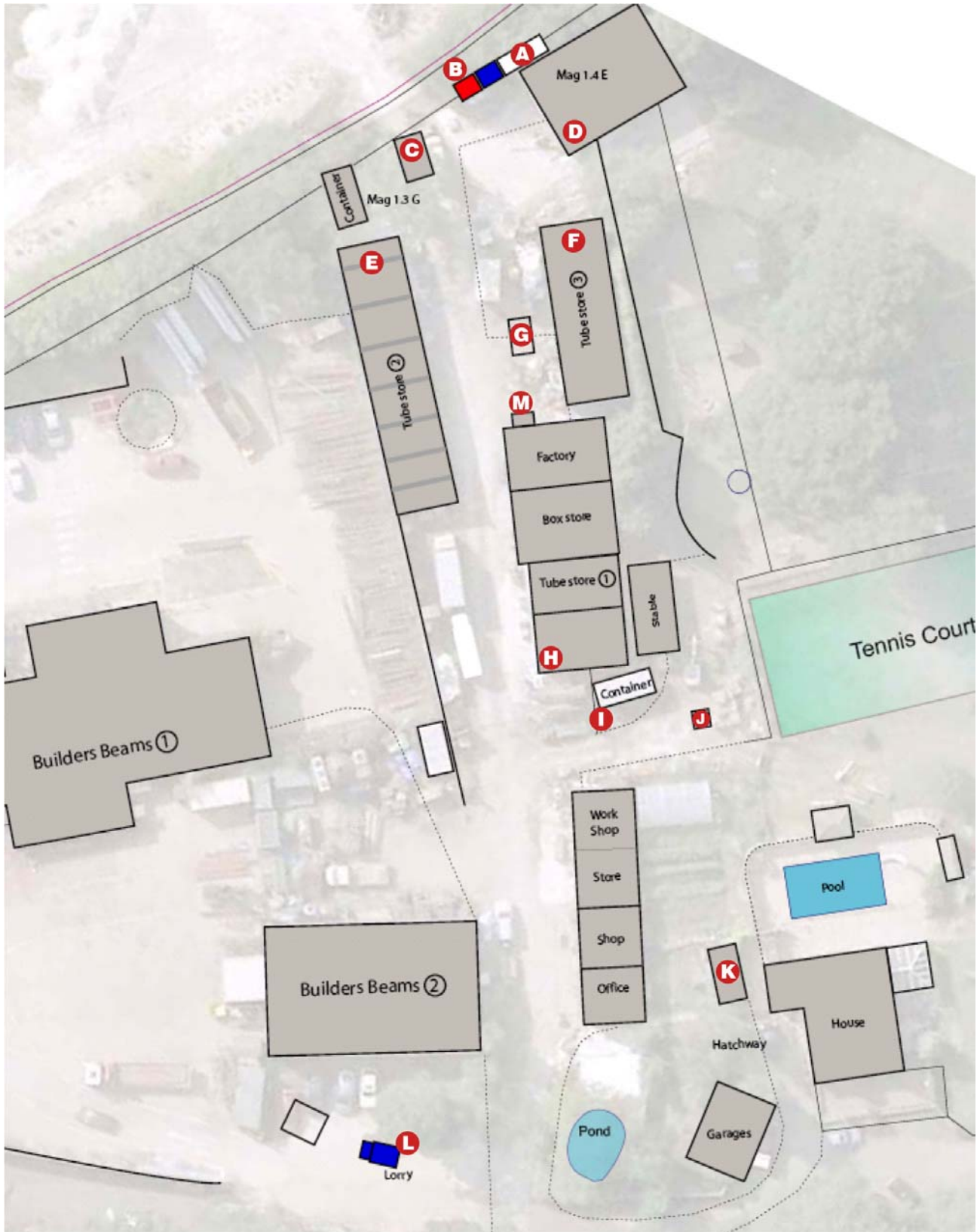
## **PREMISES**

### **Location of Fireworks Post Explosion**

During the investigation of the site, fireworks were found of a higher Hazard Division than were permitted and fireworks being kept in locations that were not permitted by any of the licences. In addition to actual fireworks noted on site, other evidence such as craters were found, elsewhere than in the location of the licensed explosives areas. This indicates that explosive material had been in areas not permitted by any of the licences.

#### **Commentary**

Evidence from this incident and inspection of other firework storage sites indicates that there is an ever present risk of explosives being found either of a different classification or in areas not expected and this should be taken into consideration when attending any incident at an explosives site. This was reflected in the revised National Fire & Rescue Service Generic Risk Assessment 5.7 'Explosives' version 2 August 2008.



Plan showing location where fireworks found during the site investigation  
(Locations A-M.)

### Location A – White Container

The white container appeared to be the body from a lorry located next to magazine E and not forming part of the HSE Licence. Inside were found numerous fireworks including: three 200 mm shells, one ground maroon containing 290 g of flash powder, one 100 mm mine, one titanium maroon and two boxes of 125 mm shells with lift charges removed.



Boxes of fireworks found in white container post explosion

### Location B – Red Container

This was a trailer located near to magazine E and not forming part of the HSE Licence. A mixture of boxes and fireworks, some loose, some packed, including: chained 3 inch shells, one 75mm report shell, one Galaxy salute and bird scarers, were found inside the trailer.



Fireworks found in red container post explosion

### Location C – Dumper Truck

A number of cakes, various calibre roman candles and fountains were found in the front bucket of the dumper truck. A number of these were complete with fuses, indicating that they were not spent cases. At the time of the investigation the front bucket was full of water. It is not known if this was being used as some form of soak tank, for movement of fireworks prior to the incident or for storage.



Bucket of dumper truck filled with fireworks post explosion



Fireworks after being removed from bucket, note fuses still attached

### Location D – Magazine E

Magazine E did form part of the HSE licence and storage of explosive material was permitted within the building, but only of the Hazard Type 4 (HD 1.4). Detailed below is a list of fireworks found in the Magazine that were outside of the permitted type.

Name	Quantity	HD
Break Rockets	loose rockets	1.1*
Cyclone Rockets	10 boxes	1.1*
Master Pack (Rockets)	162 cartons	1.1*
Rocket Packs	6 cartons	1.1*
Star Creation Rockets	144 cartons	1.3#
Star Explosion Rocket Pack	22 cartons	1.3#
Black Magic	16 cartons	1.3#
300 mm shell	1	1.1^

\* These were labelled as 1.4 but had been reclassified under the default scheme of 2003 as 1.1

# These were labelled as 1.4 but had been reclassified under the default scheme of 2003 as 1.3

^ This was labelled as 1.3



Cartons of fireworks in magazine E



Master Pack rockets labelled as 1.4 but had been reclassified under the default scheme of 2003 as 1.1



Mock up of 300mm shell found in magazine E post explosion (photo from HSE)

### Location E – Tube Store 2

Tube Store 2, which was Building F on the HSE licence, was for the storage of non-explosive and non-hazardous materials only. The metal walls of the store were found to have blown outwards

and they also showed signs of a high velocity object penetrating through the walls, known as “petalling”, which occurs from projectiles from an explosion. In addition a large depression was found in the concrete base, approximately 750 mm in diameter and 150 mm deep. The expert evidence present during the recent court case indicated that: *'This is consistent with a substantial explosion occurring in this area.'*



### Location F – Tube Store 3

Tube Store 3 was a building which was not shown on the HSE licence. Remains of marine flares were found in Tube Store 3.

### Location G – Transit Van

The Transit Van was being loaded with fireworks ready for a display later that afternoon when the fire occurred. The damage to the van, including severing and flattening of the prop shaft is consistent with the activation of high-energy fireworks.



### Location H – Tube Store 1

Tube Store 1, which was not shown as the same size and location on the HSE licence, was for the storage of non-explosive and non-hazardous materials only. Evidence from video footage of the incident taken by Brian Wembridge shows fireworks activating from Tube Store 1.



### Location I – Main Crater (location of ISO container)

Expert evidence presented during the court case included the description: *“In the bottom of the crater, remains of rook (bird) scarers, including sub units, rope and a base plug for a 12 inch (300 mm) mortar tube were found.”*

### Location J – Pallet of paving slabs

Large fireworks were found next to a pallet of paving slabs, which was located in front of the doors of the ISO container, including ‘some sort of five/six inch cylindrical shells’ and exhibit LMB/32, a report shell. *“This is consistent with them being ejected from the ISO container during the explosion.”*

### Location K – Hatchery

This was in an area outside of the HSE licensed area. Inside the building, four modified 66.7 mm report shells, two 47 mm modified report shells, “hundreds” of two different types of spinners (not illegal to possess but prohibited for retail sale) and titanium salute shells with lift charge removed, were found.



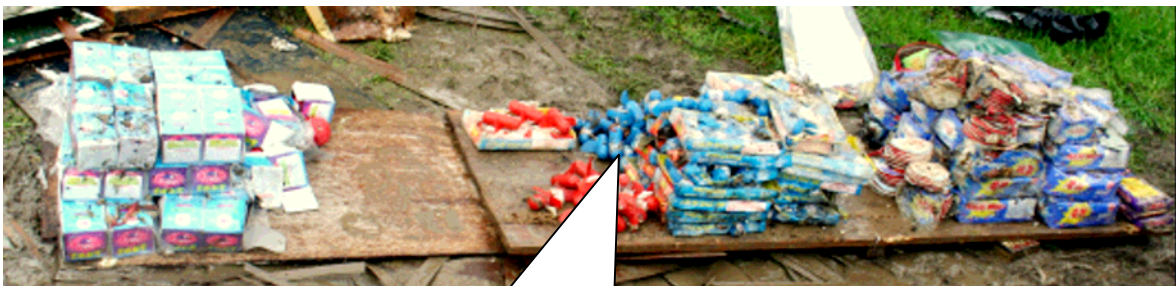
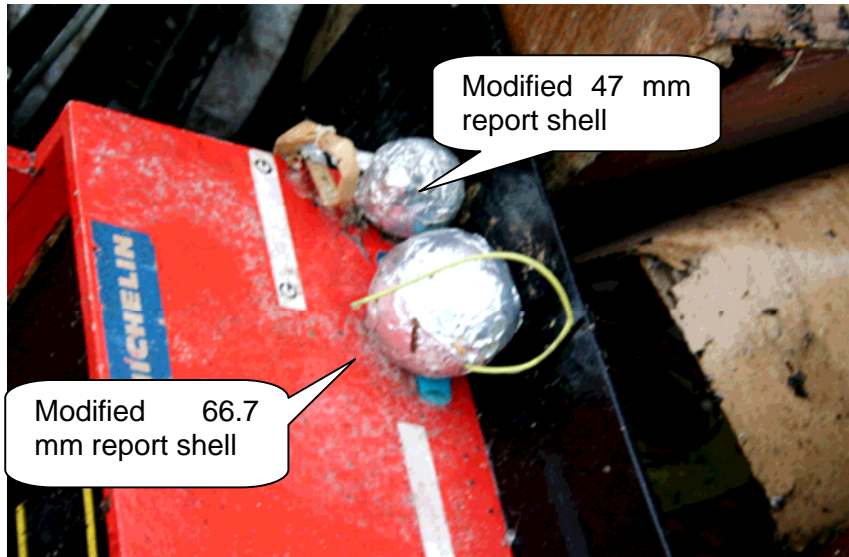


Image above shows fireworks found in the hatchery with close up of spinners.

### Location L – Curtain Sided Lorry

The Curtain Sided Lorry is known to have returned from a display on the previous Friday. It had been parked within the main site operated by Festival Fireworks and was moved to the location next to Builders Beams once the fire started but before the arrival of the Fire & Rescue Service. One 65 mm report shell (HD1.1) and a number of other fused fireworks were found on the lorry.



Fireworks found in curtain sided lorry

### **Location M – Concrete Walkway Adjacent to Factory D**

Building D was the factory building, which was licensed and used for the preparation of fireworks. Outside of the factory and hence outside of the licensed area was a concrete walkway. It was in this area that Nathan Winter has stated he was preparing the cakes of fireworks when the fire started. Examination of the walkway revealed *'cracks in concrete and depression, consistent with an explosion taken place involving large fireworks.'*



Image showing depression and cracking in concrete walkway.

### **Contingency Plan / 7(2)(D) Process**

The Service has a duty under section 7(2)(d) of the Fire & Rescue Services Act 2004, to make arrangements for obtaining information needed for the purpose of extinguishing fires, protecting life, property and the environment in the event of incidents within its area. This duty is discharged

by carrying out inspections and exercises and by acquiring and disseminating risk-based information. Additionally, there is a requirement under the Civil Contingencies Act to assist in the production of multi-agency contingency plans.

The Service had prior intelligence that both the Marlie Farm and Upper Lodge Farm sites were under the same ownership, and used for bulk storage of fireworks. These sites are approximately 1 km apart. The Service had a risk card for the Upper Lodge Farm licensed explosives storage site, but not for the Marlie Farm licensed explosives storage site. East Sussex Fire & Rescue Service crews had previously attended the Marlie Farm site on 19 May 2004 to deal with a fire involving a tractor.

The existing 7(2)(d) information gathering and risk card procedure did not record premises that had been inspected but were not considered to meet the criteria for the production of a risk card.

Under the Civil Contingencies Act, Category 1 and 2 responders have a duty to share information with other Category 1 and 2 responders. There is no evidence to show that relevant agencies disseminated risk information on known licensed explosives storage sites through the Sussex Local Resilience Forum.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 1**

Put in place arrangements with SECAmb and Sussex Police regarding the development of contingency plans for all licensed explosives sites.

#### **Recommendation 2**

Make arrangements for effective information exchange with the Sussex Local Resilience Forum, to ensure that it is compliant with both the statutory duty in the Civil Contingencies Act 2004 and the guidance contained therein.

#### **Recommendation 3**

Implement a system for recording all premises that have been considered under Section 7(2)(d) of the Fire and Rescue Services Act 2004, whether risk information is provided to operational firefighters or not.

#### **Recommendation 4**

Review how risk information is stored and shared within the Service and introduce a formal process for regular review and update on risk information held.

## **Recommendation 5**

Instigate a formal procedure for the sharing of risk/safety information between emergency services at incidents. Examples should include, urgent sharing of risk critical information, information gleaned from occupiers, evacuation distances and routes, as well as location of command points. Any procedure implemented should be disseminated through a formalised training/awareness protocol.

## **The Control of Major Accident Hazards Regulations 1999, as amended 2005.**

The Control of Major Accident Hazards Regulations 1999, as amended 2005 (COMAH), regulations require two levels of duty on-site operators to prevent and mitigate major accidents involving hazardous materials. The duties are classified as lower tier and upper tier. The determination of whether a site is an upper or lower tier site is based on the threshold quantities of the hazardous substances stored or in use. Guidance on the threshold quantities of substances is contained within Schedule 1 of the regulations.

If a premises is likely to exceed the storage thresholds for dangerous goods, as defined in the schedules of COMAH, the duty is on the site occupier to inform the notifying authority that the site is now subject to the COMAH regulations.

### **Commentary**

#### Explosives classifications

It should be noted that COMAH regulations and explosives licenses issued under the Manufacture and Storage of Explosives Regulations 2005 (MSER) use different classification systems.

COMAH uses the United Nations Dangerous Goods (orange book) classification system known as the United Nations Hazard Divisions (UNHD). This system classifies all explosive materials as Class 1; materials are divided into six sub-groups, with 1 being the most dangerous and 6 the least. These sub-groups are abbreviated as UNHD 1.1 to UNHD 1.6.

The MSER classification system is known as the Hazard Type (HT). This extends the UNHD category to take into account any increase/decrease in risk created by the conditions of storage and use. This system classifies all explosives into four categories, known as Hazard Types (HT) with 1 being the most dangerous and 4 the least. These sub-groups are abbreviated as HT 1 to HT 4.

The storage quantity thresholds for explosives as defined under the COMAH regulations are:

10,000 kg UN Hazard Division (HD) 1.3 net explosive quantity (NEQ) for the lower tier and 50,000 kg NEQ for upper tier.

Upper Lodge Farm had an explosives licence issued by the HSE permitting storage of 40,000 kg NEQ of Hazard Type 3 and 4 explosives. If the full licensed quantity of UN HD 1.3 explosives allowed under the explosives licence for Upper Lodge Farm was kept or was anticipated to be kept on site, then the site would fall within the COMAH regulations.

The threshold quantities permitted for HT4 is 50,000 kg NEQ for the lower tier and as such if all explosives stored at Upper Lodge Farm were HT 4, the site would not be subject to the COMAH regulations.

There is no evidence to show that the explosives licence holder for Upper Lodge Farm has ever notified the enforcing authority that the COMAH threshold had been reached. However, under COMAH it is the quantity stored rather than the quantity the site is licensed for which determines whether the regulations apply.

The licensed quantity for storage at Marlie Farm does not exceed the lower tier threshold for the COMAH regulations. As such the site would not be subject to these regulations.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 6**

Raise with the Health and Safety Commission a proposed change to the COMAH Regulations, for the regulations to apply to the licensed quantity, not the actual quantity stored on a site.

### **Open Water Supplies Register Not Completed**

Difficulties in securing a reliable water supply led to delays in establishing improvised monitors. However, there were a number of open water sources in the area and after some time, a swimming pool on site was identified and this was utilised before the main explosion.

During the drought of 2005, water undertakers raised issues regarding continuity of a water supply from fire hydrants in times of extreme drought. East Sussex Fire & Rescue Service recognised this matter as a corporate risk and this was duly entered into the Service Corporate Risk Register. Part of the control measures, suggested by the Service Corporate Management Team to reduce the risk, was the creation of an open water register.

This register was to provide M&CC with a list of secure and accessible open water sources. The criteria for acceptance as a suitable open water source were as follows:

- *'Substantial size or fast replenishment, the aim is to supply 6 main jets @ 450 litres per minute, making a running requirement of 162,000 litres per hour, therefore a minimum capacity of 250,000 litres would be required.'*
- *'Access for appliance, or more probably LPP transport, within an acceptable (subject to local DRA) ground distance.'*
- *'Likely to remain secure in drought conditions'.*

A response was requested on the above information from fire stations during March 2006, this work was not complete as of 3 December 2006.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 7**

East Sussex Fire & Rescue Service completes the work on the open water register and considers how this information is made available to crews.

## **PLANT, EQUIPMENT AND SUBSTANCES**

### **MODAS**

The Service has fitted Mobile Data Terminals (MDTs) into all operational appliances. These contain risk information, guidance notes (including an aide memoir for explosives incidents) and maps showing the location of hydrants etc.

*All the MDT's were examined to identify if any information had been accessed by any of the attending crews. With the exception of E01, which was too badly damaged to recover any data, no MDTs had been used to gather information.*

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 8**

Issue guidance to all operational personnel reminding them of the availability of operational guidance on the MODAS system, including aide memoirs, operational guidance notes and premises hazard information, and puts into place such resilience measures as necessary to ensure that in the event of failure or unavailability of the MODAS system, the relevant risk information is still available to operational crews.

## **Recommendation 9**

For medium and high risk premises in the Service area, either the relevant risk information should be printed on the mobilising instructions, or there should be a clearly visible prompt for appliance commanders to check MODAS for further risk information.

### **Support from Other Fire and Rescue Services**

#### **i.e. Appliances and Experts from London, Merseyside and West Sussex**

Immediately after the explosion, offers of assistance were received from other fire and rescue services including spare appliances and equipment - which were loaned to East Sussex Fire & Rescue Service to temporarily replace those that had been damaged. In the initial hours after the incident fire cover and support were provided by both Kent and West Sussex Fire and Rescue Services. Further support was provided during both funerals, allowing as many East Sussex Fire & Rescue Service personnel as possible to attend.

With the loss of the Service's Incident Command Unit and Water Carrier, operational cover at relevant incidents was provided by West Sussex and Kent Fire & Rescue Services for a significant period after the event.

To assist with the investigation, London Fire Brigade provided officers to assist with the accident investigation processes in the early stages and provided continuing support as a critical friend.

As the Chief Fire Officers Association (CFOA) lead Service for fireworks and explosives, Merseyside Fire & Rescue Service provided two members of personnel to give technical advice to the accident investigation team.

West Sussex Fire & Rescue Service seconded an officer to the team to assist with the fire investigation. This was beneficial, particularly as the officer was already familiar with Sussex Police procedures.

All the above Services provided assistance freely and timely support to support East Sussex Fire & Rescue Service with its business continuity and the accident investigation.

*The personnel of East Sussex Fire & Rescue Service would like to formally acknowledge the assistance given by other fire and rescue services*

## PERSONAL PROTECTIVE EQUIPMENT (PPE)

### PPE Afforded Some Protection against Blast, Sound and Projectiles

The firefighting PPE used within East Sussex Fire & Rescue Service complied with relevant EN standards for firefighting and general operational activities. It was provided in 2003 by Cosalt (known as Cosalt Ballyclare at that time) on a 'managed service' basis through a collaborative contract with three other fire and rescue services.

Each user was subject to a personal fitting as part of the initial issue process. A comprehensive support package was issued to each workplace, for access by users on an ongoing basis.

In accordance with the agreed procedure, a system was in place whereby 'pool stock' items of PPE were available to users when items of personal issue PPE were sent away for cleaning or repair. Some personnel were wearing pool stock items at the Marlie Farm incident. This is not considered to have been a factor in the performance of the PPE.

### Helmets

Firefighters in the immediate vicinity of the explosion lost their helmets and in addition one helmet sustained damage from the penetration of a firework.



Firework impact damage to helmet

In order to confirm that the PPE was of the required standard, a range of tests and/or inspections have been conducted on samples of firefighting PPE, including some worn by casualties at the Marlie Farm incident.



These tests were conducted in liaison with the relevant contractors, manufacturers and other stakeholders. The fire helmets were verified by the relevant independent notified authorities as having generally performed in accordance with the relevant EN standards.



Impact testing of Gallet F1S/F1A helmet

The Gallet F1 fire helmet was required by the EN standard (in place in 2006) to detach from the wearer when subjected to a pre-determined pressure/force, in order to prevent neck injuries. The evidence indicates that the helmets tested performed to the required specification in this respect.

The helmets are designed to withstand both a blunt impact and sharp penetration. The evidence indicates that the helmets performed to specification in this respect, and the firework penetration was as a result of the forces involved being outside the design limitation of the EN Standard.

Evidence from other Emergency Service personnel in similar locations to firefighters at the time of the explosion indicates that in addition the helmet may have provided a degree of hearing protection for some wearers.

#### Other PPE

In addition, other PPE - including gloves, boots, over-trousers and tunics - worn by firefighters who were in close proximity to the explosion also sustained damage, for example penetration by projectiles.



Penetration site of right leg of over-trousers



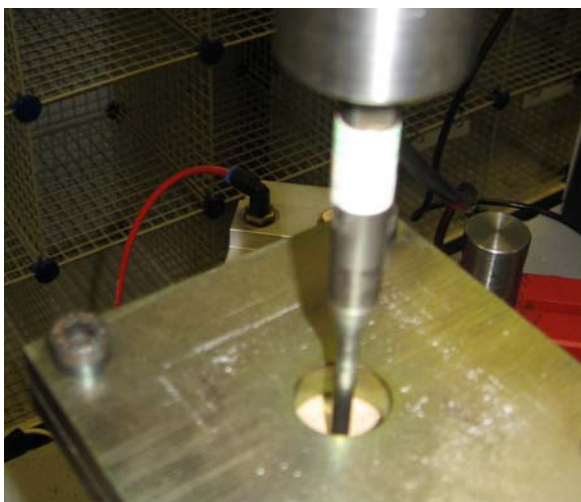
Metal fragment that penetrated overtrouser and subsequently removed from Firefighter's thigh in Hospital



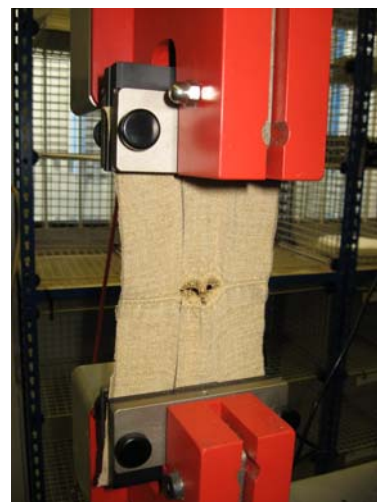
Damage to Tunic, note damage to Zip and total loss of covering flap

In order to confirm that the PPE performed to the required standard, a range of tests and/or inspections have been conducted on samples of firefighting PPE, including some worn by casualties at Marlie Farm.

These tests were conducted in liaison with the relevant contractors, manufacturers and other stakeholders. The tunics and over-trousers were verified by the relevant independent notified authorities as having generally performed in accordance with the relevant EN standards.



Puncture resistance test



Grab Tensile test

Evidence indicates that the trousers and tunics performed to specification, the penetration and/or

damage to the garments was as a result of them being subject to forces outside the design limitation of the EN Standard.

It has been established that the firefighting PPE was not designed, or required by EN standards, to protect against the forces of explosions, the associated overpressures, or high velocity projectiles.

The findings from the tests and inspections have been actively shared with the PPE contractor and other members of the South East Personal Protective Equipment Consortium (SEPPEC).

### **Commentary**

The National Generic Risk Assessment (GRA) in force at the time (GRA 5:7) indicated that "for the task of firefighting with explosives involved in storage facilities, one of the control measures is PPE". As can be seen above the firefighting PPE will not provide protection in the event of an explosion and on no account should this be used as a control measure where explosives are involved. No reference is made to PPE in the updated GRA for explosives (GRA 5.7 version 2 Aug 2008).

### **Misunderstanding Capability of PPE**

The firefighting PPE generally performed in accordance with the relevant EN specifications, as verified by independent inspections and tests. However, the conditions experienced by the casualties during the main explosion, including from overpressures and projectiles, were likely to have exceeded the performance requirements for firefighting PPE.

#### Fire Boots

A firefighter was injured by a small projectile that penetrated the upper of his fire boot. Fire boots constructed to BSEN 345:2:1996 are not required to have penetration resistance to the upper part of the boot.

#### Fire Helmets

Four firefighter casualties reported that their fire helmets became detached during the main explosion. Watch Commander Wicker's helmet is also believed to have become detached at this time.

The EN443:1997 standard requires the chinstraps on fire helmets to allow the helmet shell to

detach from the wearer's head when subjected to a pre-determined force or pressure.

The manufacturer's guidance to the wearer states that helmet chinstraps must be correctly adjusted at all times to meet the performance criteria in the EN standard and to ensure that the helmet is retained during normal use. Video footage shows a firefighter casualty that lost his helmet in the main explosion did not have his helmet chinstrap fully secured a few minutes before the explosion occurred.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendations 10**

- Issues amended instructions to wearers to reflect the models of Gallet F1 helmet now in use within SEPPEC and the respective methods for securing chinstraps.
- Ensures that MSA Gallet/Cosalt carry out an audit on all Gallet helmets within SEPPEC to verify the correct fitting of inner comfort pads and stopper buckles, as necessary.
- Ensures that all relevant personnel have been issued with a helmet bag and instructed to store their helmet in this when not in use.

#### **Recommendation 11**

Note the new requirement for side impact protection on firefighters' helmets in accordance with the revised EN443:2008, for the future procurement of PPE.

### **Firefighting Clothing and Gloves**

Three firefighters sustained injuries from small projectiles, which had penetrated their firefighting clothing.

Two firefighters reported that their firefighting gloves were blown off during the explosion.

Video footage at various stages indicates that some firefighters did not have their tunic collars raised and secured or were not using firefighting gloves at all times.

#### **Commentary**

Research from previous explosion incidents indicates that the loss of clothing items, including firefighter PPE, is a known phenomenon.

### **Consideration of PPE Requirements Within the Dynamic Risk Assessment Process**

The Service Manual Note requires Incident Commanders to consider PPE requirements as part of

their dynamic risk assessment at incidents. *'It is the responsibility of the Incident Commander (IC) to carry out a Risk Assessment and determine the correct level of PPE to be worn. This must be communicated with personnel on the incident ground. Personnel on the incident ground must ensure that they wear the correct level of PPE as directed by the IC.'*

There is no evidence of Level 1 or 2 Incident Commanders at the incident formally considering full PPE requirements as part of their dynamic risk assessment, or reviewing this as the incident progressed. However, SC Upton stated that shortly after his arrival he gave instructions for fire hoods to be worn in the 'up' position, i.e. over the wearer's head.

There is no evidence to show that this instruction was conveyed to all other personnel entering the risk area. Evidence indicates that a number of firefighters, including casualties, were wearing their fire hoods in the lowered position.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 12**

Monitor and review implementation of the controls for the use of firefighting PPE during relevant activities, including the wearing of firefighting gloves.

#### **Recommendation 13**

Monitor and review the correct use of helmets and PPE items at incidents, including through the response audit process.

#### **Recommendation 14**

Monitor and review the implementation of effective controls for hearing protection/noise at work at incidents.

### **Use of Fire Hoods**

The Service Manual Note for incidents involving acetylene states: *'personnel required to carry out tasks within the inner cordon.....full PPE should be worn including gloves, flashoods (sic) and eye protection.'*

On questioning, some personnel were unclear as to the Service's policy for the wearing of fire hoods at incidents involving explosives and/or incidents involving acetylene and indicated that the wearing of fire hoods in the 'up' position only applies when breathing apparatus is being worn.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 15**

Review its policy and procedure for the wearing of fire hoods in the 'up' position at incidents involving a risk of thermal radiation, including at fires where hazardous materials such as acetylene or explosives are involved. This should include clarification of the policy for fires and incidents where breathing apparatus is not worn.

In light of the revised policy and procedures, review the provision of training and awareness for personnel to ensure they comply with the Service policy for wearing of fire hoods at incidents.

### **Eye and Facial Protection**

A medical report states that some firefighter casualties sustained eye and facial injuries. There is evidence from witness statements and from video footage of some personnel wearing eye protection, principally in the form of the helmet face shield.

One witness (who was also a casualty) states that a fireground order was given to use the integral helmet face shields. However there is no evidence to confirm that this order was received by all others entering the risk area and if so whether it was adhered to. Video footage at 14.23 hrs, and shortly after the escalation in projectiles, indicates that some personnel were wearing face shields in the down position while others in their vicinity were not. Later video footage shortly before the explosion is inconclusive regarding the use of face shields by personnel in the images. In the final sequence of video WC Wicker does not appear to be wearing his face shield in the lowered position.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 16**

Review policy and procedures for eye protection to provide a single instruction consolidating all previous requirements for such use.

### **Hearing Protection**

A medical report states that several firefighter casualties sustained hearing injuries. Disposable earplugs were carried on appliances. The Service Manual Note 'Control of Noise at Work' states: *'Noise considerations should always form part of the OiC's dynamic (incident site) risk assessment.'*

SC Upton indicates that he weighed up the need to maintain communication versus the occasional noises from the incident, and decided not to give instruction for the use of additional hearing protection.

### **Commentary**

In addition to those casualties with injuries reported under RIDDOR, it is noted that two further firefighters subsequently formally reported hearing injuries. These firefighters were working in the area of the main drive and site entrance at the time of the main explosion. Research and investigations into other explosion events indicates that hearing injuries from overpressures and noise are known phenomena.

It is noted that some other firefighters working in close proximity to those that sustained hearing injuries have reported no ill effects. This suggests that the orientation of personnel at the time of the main explosion was a factor and that the side protection on the fire helmet was effective in reducing the effects of the noise.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 17**

Review policy and procedures for the use of hearing protection at incidents giving particular consideration to the compatibility of protecting the wearer's hearing while maintaining effective fireground communications, including verbal instructions and the use of fireground radios. The review to include the use of ear pieces and the audibility of evacuation whistles to ensure that safety critical instructions, such as evacuation signals, are clearly audible.

#### **Recommendation 18**

Recommend to CFOA that the research and development is undertaken on the means of sounding the emergency evacuation signal in areas where a standard fire and rescue service emergency evacuation whistle may not be heard.

#### **Recommendation 19**

Review the provision of training and awareness of hearing protection/noise at work for personnel, to include:

- the responsibility of Incident Commanders to include consideration of hearing protection and fireground communications within their dynamic and analytical risk assessment processes.
- awareness of the range of control measures that should be implemented to control exposure to noise at incidents.



### **PPE Item Not Worn by Correct Wearer**

A Crew Commander casualty was found to have been wearing a fire helmet marked with a colleague's identity markings. This arrangement had been in place before the incident and is believed to have related to the recent change of role markings and helmet colours across the Service.

Records indicate that some local reallocations of PPE items had been authorised by Cosalt, but it is unclear if this particular arrangement had been approved.

### **Routine PPE Checks**

A system for periodic PPE inspections by local supervisors was in place, but evidence indicates that these were not being conducted on a regular basis or recorded at all workplaces.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 20**

Ensure that PPE requirements are reinforced through training and actively monitored through routine workplace PPE checks. Review the written checklists for firefighting PPE to ensure all new requirements are included and that periodic checks are recorded.

### **Audits by Firefighting PPE Contractor**

A system was in place for periodic audits of firefighting PPE by Cosalt. A sample of audit reports from 2005 and 2006 indicate issues reported from Cosalt to East Sussex Fire & Rescue Service relating to:

- the tracking of items on loan as 'pool stock',
- items of PPE that were not readily available for inspection by the contractor,
- some items deficient or in excess of the standard allocation,
- some items in use by individuals carrying ID markings for another user. Records indicate that some of these items had been re-allocated by Cosalt.

Records indicate that Cosalt had a process for reporting these issues to East Sussex Fire & Rescue Service for local information and action.

### **Maintenance Records for Firefighting PPE Items**

Records for the cleaning and repair history of several PPE items worn by the casualties provided by Cosalt indicate that no defects were on record for relevant PPE items prior to the incident. However it has not been possible to verify the detailed history of all PPE items, as the relevant identification markings had been damaged or faded through use and washing. In addition, some PPE items from the casualties could not be accounted for following the incident.

### **Use of PPE by Media Co-ordinator When Attending Incidents**

Brian Wembridge had been issued with a range of PPE items for use when attending operational incidents. His line manager has stated that following a 'near miss' safety event at an incident in Hastings on 1 June 2006, Brian Wembridge had received verbal instruction to use his provided PPE at future incidents.

Examination of the items worn by Brian Wembridge - held by Sussex Police - show that he was wearing an orange coloured fire tunic and a yellow high visibility tabard at the Marlie Farm incident. Enquiries have confirmed that the fire tunic was to 'A26' specification and was not a Service issue PPE item.

Witnesses from the incident describe Brian wearing a construction industry style 'bump' hat. Sussex Police recovered a similar bump hat from the Marlie Farm site, which is likely to have been that issued by the Service to Brian Wembridge. The AI team has not been able to examine this item.

Various other PPE items were subsequently found stored in Brian Wembridge's office at Service Headquarters. These items included a Cairns 'Metro' style firefighter helmet with chinstrap and face shield, two one-piece coverall style suits and a pair of work wear boots.

When examined, the above mentioned items appeared to be in new or near new condition with little or no sign of use.

The AI team has been advised that due to changes in the Service's procurement system it has not been possible to verify if these PPE items were officially provided, as records are not now available for the relevant period.

PPE was listed as a control measure in the risk assessment for non-operational personnel attending incidents, but no evidence could be found that a) supervisors (i.e. Incident

Commanders) and b) the risk group concerned, including Brian Wembridge, had been formally made aware of this requirement.

The 'existing controls' section of the old style Stage 1 risk assessment indicated that training would be required, however no evidence has been found of a completed Stage 2 risk assessment.

No evidence has been found of the risk assessment having given consideration to types of incident where PPE is not a primary control measure (for example incidents involving explosives).

#### **Commentary**

The need to make users and their supervisors aware of the controls in the risk assessment and ensuring these are complied with at incidents are a requirement of the employer's duties under the PPE regulations.

#### **Performance of Operational Equipment**

Witness statements indicate that operational equipment used at the incident performed satisfactorily. The Rosenbauer 'Otter' portable pump was successfully used to pump water from the swimming pool to supply two monitors immediately before the explosion. The pump continued to operate after the main explosion.

However, comments were noted from personnel regarding their perception of a delay in achieving a prime of the Otter pump. In view of these comments, the Accident Investigation team decided to examine the performance of the pump.

The Otter pump remained in situ at Marlie Farm during the police forensic investigation and was subsequently impounded by the AI team and placed in secure storage. The pump was subjected to a safety inspection at the Service workshops. This identified that the pump had sustained damage from radiated heat. The pump started successfully, was allowed to run for a short period, then primed from an open water supply and delivered a single main jet. It was considered sufficiently serviceable to enable more thorough testing.



The light portable pump in situ at Marlie Farm on 15 December 2006

The pump was subsequently taken to a fire appliance manufacturer's site, where full vacuum and output tests were completed using their deep lift facility and hydraulic test rig. Tests verified that the pump could maintain a maximum output of 1,000 litres per minute at one-bar pressure and up to 810 litres per minute at four bars.

The pump was taken to a local reservoir, where the pumping conditions at the Marlie Farm incident were recreated. Two successive tests established that the manual priming of the pump using hard-suction hose submerged at a shallow angle would take 42 and 59 strokes respectively, to achieve a prime. The time taken was 1 minute exactly for the first test and 1 minute 25 seconds for the second. A further test with the hard-suction hose fully submerged and already partially filled to the surface height of the water required only 17 strokes to prime the pump. The pump was connected to identical combinations and types of delivery hose and hand-controlled branches to those used at the incident. All of these tests showed that the pump could successfully provide two main jets with an approximate throw of 30 to 33 metres each.

It was concluded that the Otter pump had no operating defect. The reported difficulty in achieving a prime was most likely due to the number of lengths of hard-suction involved and that without it being partially filled, for example by cracking a delivery, then a greater number of strokes would be required.

A documented service history is available for the Otter pump from the Service's 'TRACE' Asset Management system. No outstanding defects were on record at the time of the incident.

Equipment log sheets show that station personnel had recorded routine weekly checks regularly during the period up to and including November 2006.

### **Correct Equipment not Available, i.e. Improvised Monitors Being Used**

Firefighting monitors are used when it is necessary to apply large quantities of firefighting media. They are either freestanding or attached to a firefighting appliance and can be left unattended to reduce the number of personnel committed to a risk area or incident.

At the time of the explosion, the operational sectors were involved in establishing improvised 'branch' holders (monitors). An improvised 'branch' holder allows firefighters to deploy standard firefighting equipment by securing a standard branch (nozzle) to an immovable object, thus allowing the firefighting media to be deployed whilst the branch is left unattended.

Under established procedures, specialist firefighting monitors are available on request from the fireground. Purpose made monitors can be either freestanding or permanently mounted on aerial ladder platform appliances (ALPs). Freestanding monitors were available on request from the fireground and located in non-mobile stores at Hove, Newhaven and The Ridge Fire Stations. At the time of the Marlie Farm incident, the ALPs were based at Brighton (Preston Circus), Eastbourne and Hastings (Bohemia Road) Fire Stations.

On receipt of a request, M&CC would order monitors to be transported from the holding station's non-mobile store to the fireground by the most appropriate means.

#### **Commentary**

It should be noted that SCs Upton and Meik's decision to change the hand-held firefighting branches to improvised monitors was a positive decision to increase safety at the incident.

The number of fixed monitors required by Upton, two in the main drive, one in the swimming pool area and WC Wicker's decision to deploy an additional (second) monitor in the swimming pool area, severely stretched the available water resources. As a result of the delays in deploying the additional equipment required and securing sufficient water supplies, personnel were exposed to increased risk by being in the proximity of the ISO container for longer than would have been necessary if Upton and Meik had ordered less monitors to be deployed.

SC Meik prevented firefighters who were in the process of establishing a third monitor on the main drive and redeployed these personnel to assist with establishing a secure water supply

## **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

### **Recommendation 21**

Provide branch holders/ground monitors for all major pumping appliances, for use at incidents involving acetylene, explosives etc.

## **COMMUNICATIONS EQUIPMENT**

### **Use of Fireground Radios**

Fireground radios are issued to every appliance and to every Level 2 officer. There is evidence of the Level 1 Incident Commander (T/WC Wells), WC Austin, WC Wicker, the Level 2 Incident Command team and GC Cox using fireground radios at the Marlie Farm incident.

There is evidence of some appliance commanders giving their fireground radios to crew members to assist them with specific tasks, which then meant they had no radio.

It is believed that additional radios were available on appliances and on the ICU, but there is no evidence to show these were used by personnel prior to the explosion.

### **Types of Fireground Radios**

Three types of handheld radio are in use within East Sussex Fire & Rescue Service.

The main type of radio issued to all operational appliances for use at incidents is the ICOM 1C F41GS. In 2004/05 this replaced the Kenwood TK350 radio, which was allocated to Level 2 officers. The third type were intrinsically safe radios carried only on the Chemical Incident Unit (CIU) based at Eastbourne.

The fireground radio used by Watch Commander Wicker was an ICOM 1C F41GS handheld radio. When channel 1 is selected (normal fireground communication channel), the position indicator on the rotary channel selector is at its closest proximity to the rotary volume switch and the distance between the channel selector and the volume switch is less than 1 cm.

It is possible to inadvertently change channels on the ICOM 1C F41GS due to the close proximity between the channel selector and volume control. In order to prevent inadvertent changing of radio channels these radios have a facility to electronically 'lock' a selected channel.

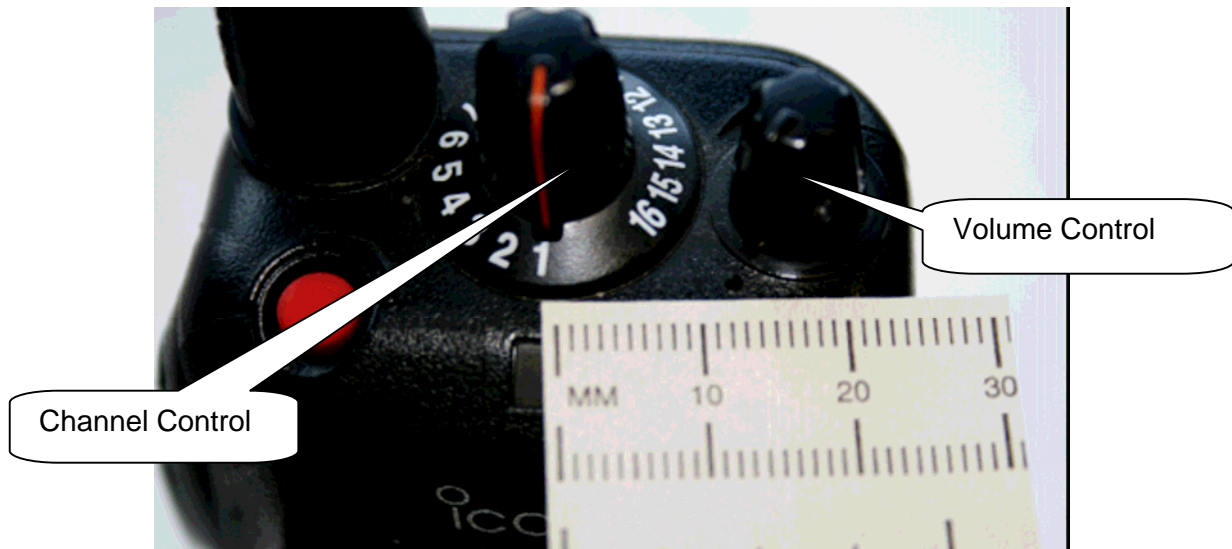


Image showing an Icom fireground radio. Note the close proximity between the channel selector and volume control.

The channel lock facility on the ICOM 1C F41GS radio has a different channel lock operation to that of the Kenwood TK350, also used within East Sussex Fire & Rescue Service.

It would appear that the channel lock facility is not widely used, as locking the ICOM radio on one channel will prevent users from readily monitoring more than one channel, e.g. main fireground and breathing apparatus channels.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 22**

Amend the relevant Manual note on fireground communications and provide additional training to ensure that the following areas are addressed:

- limit the practice of using mobile telephones for sending command messages.
- encourage the greater use of fireground radios at incidents
- ensure personnel are aware of types of radios and safety features provided
- to cover ICS procedures, such as confirmation of tactical modes and the need to disseminate information to all personnel on the fireground (fireground broadcast).
- develop a procedure to be used in the event of communications equipment failure, including when the equipment works, but messages can't be heard.
- use of electronic communication equipment in hazardous situations, e.g. proximity to explosives, explosive atmospheres

## **ICOM Fireground Radio**

A Manual Note was available at the time of the incident and records show this had been revised since the original publication, in 2004 and 2007. The note identifies relevant matters relating to the channel lock function and also stated that: *'radios must not be used in a potentially explosive atmosphere.'*

No written equipment risk assessment has been found to show that all relevant safety controls had been identified. The absence of a risk assessment means that training provided to users may not have identified all relevant safety controls before the radios were issued for operational use.

It is unclear if a formal training programme was included in the roll out of these radios and if so, how this was recorded. No record of training is available on PS Enterprise. However records do exist indicating that extensive evaluations were conducted before the ICOM radio was purchased, and of the intention to conduct a post roll-out review. Records indicate that these radios had been in operational use for approximately two years prior to the Marlie Farm incident.

No written statements have been found giving the concise levels of responsibility of Directorates to comply with the process for the introduction of all new items of equipment.

An internal audit report on the Service's health and safety management system in 2006 identified that: *'limited evidence was found to indicate the existence of a policy or procedure to enable ESFRS to demonstrate that it had discharged its duties under the Provision and Use of Work Equipment Regulations 1998.'* The action plan arising from this audit included the production of a relevant Manual Note.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 23**

Review the policy and procedure for the procurement and implementation of new equipment or changes in the use and procedures for existing equipment to ensure that:

- they are subject to a process compliant with the requirements of the Provision and Use of Work Equipment Regulations (PUWER)
- suitable and sufficient equipment and/or activity risk assessments are completed and all other relevant health and safety regulations are considered, such as COSHH, Manual Handling, Noise at Work, Electricity at Work, PPE etc.
- training needs are notified to the Learning & Development department for inclusion into the



training plan

- ensure that the concise levels of responsibility for Directors, managers and other personnel are clearly stated
- there is an effective process for establishing the competence of users
- the central recording of user competence is in an auditable format

### **Audibility of Fireground Communications**

Some witness statements refer to difficulties with the audibility of fireground communications at the incident due to high background noise levels from firework activation, combined with the wearing of their fire helmets and fire hoods

There is evidence that personnel were withdrawn from proximity to the noise sources and that limited numbers of personnel were re-committed for later operations in the risk area. There is no evidence that the use of hearing protection was formally considered for personnel re-entering the risk area and whether any time limit was placed on their entry, in order to limit the duration of exposure.

The Service had issued earpieces for use with fireground radios located on appliances, however the scale of issue or their frequency of use is unclear and the AI team has been unable to establish how many earpieces were available for use at this incident. There is no evidence that the use of radio earpieces was actively considered to aid communication while personnel were working in close proximity to noise sources whilst wearing full firefighting PPE.

No evidence has been found that an assessment had been carried out by the Service regarding the use of communications equipment (radio earpieces) and hearing protection (earplugs) with full firefighting PPE, including fire hood and helmet, taking into account the potential attenuating effect on the audibility of evacuation signals given by an evacuation whistle.

#### **Commentary**

These findings reinforce the need for Incident Commanders a) to consider noise levels within their dynamic risk assessment and b) for emergency evacuation signals to be repeated across the fireground until it is confirmed that all personnel in the risk area have received this and are withdrawing.

*See previous recommendation 18*

### **Use of Mobile Telephones for Formal Messages from the Fireground**

The Level 2 Incident Commander telephoned M&CC by mobile telephone shortly before his arrival at the incident and requested the attendance of the police for traffic control and a water carrier. (Although Sussex Police were already in attendance). Unlike messages transmitted via the main scheme radio, oncoming appliances and officers would be unable to hear calls made from a mobile telephone, therefore the Level 2 Command Team would not have been able to hear this message.

See previous recommendation 22

### **Main Scheme Radios in Officers Cars**

The Level 3 officer mobilised on the 'make pumps 8' message at 14.05 hrs did not have a main scheme radio fitted in his car. While en route to the incident he contacted M&CC by mobile telephone at 14.28 hrs and received the latest informative message sent at 14.23 hours.

He did not however receive the previous informative messages timed at 14.19 hrs and 14.29 hrs, which both included references to 'evacuations' taking place. The earliest he could have been aware of an evacuation was following his arrival at the incident at 14.33 hrs, when he met the level 2 Incident Commander for a briefing. This briefing is estimated to have commenced at no earlier than 14.36 hrs.

### **Use of Radios and Other Communication Devices in Proximity to Explosives**

Technical Bulletin 1/1992 for 'Explosives' provides guidance on not using fireground radios and mobile telephones within 10 metres, and main scheme radios within 50 metres of explosives.

The Service Manual Note 'Classification, Labelling and Carriage of Explosives' available at the time of the Marlie Farm incident, did not reflect the guidance on use of communications equipment contained in TB 1/1992. However, the operational aide memoir relating to incidents involving explosives did refer to the 50-metre separation distance for main scheme radios, but did not include the 10-metre distance required for handheld radios.

A Service training presentation entitled 'Explosives', available at the time of the incident, included both a procedure and a diagram reflecting the separation distances between communications equipment and explosives.

There is no evidence of any such controls being considered and/or established at the incident.

See previous recommendation 22

## **Communication Difficulties**

Personnel reported difficulty with the audibility of some fireground radio communications at the incident, due to the high background noise from fireworks.

Earphones are available within the Service for use with the ICOM and Kenwood radios to improve audibility, particularly in noisy environments. It is unclear whether earphones were available at the incident and whether any consideration was given to their use.

There is no evidence of consideration being given to using alternative means of communication, e.g. the use of personnel as 'runners' to ensure that fireground messages were received and acknowledged, either during periods when there was a high background noise level and/or in areas where radio communications were prohibited due to the proximity of explosives.

It is noted that there is an entry on the Sussex Police incident log at 14.19 hrs: *'we cant hear anything comms terrible due to fireworks.'*

*See previous recommendation 17, 19 & 22*

## **Process for the Provision and Use of New Operational Work Equipment**

Evidence exists of a policy and comprehensive arrangements in place for the introduction of specific new items of operational equipment, including new appliances, portable pumps and branches.

However there is a lack of evidence to show that these procedures were applied in respect of all new items of operational equipment. As a result, training needs and other safety controls were not identified and addressed on some items e.g. the ICOM fireground radio.

## **PROCEDURES**

### **Speed and Weight of Response in Accordance with IRMP**

The Service, in its 2005/06 Integrated Risk Management Plan (IRMP), laid down the speed and weight of attendance at fires. The response target is eight firefighters to life threatening calls within eight minutes on 50% of occasions and 13 minutes on 90% of occasions.

The first 999 call to the Marlie Farm incident required the dispatch of two pumping appliances that were mobilised from the two nearest stations and arrived at the incident at 10 and 12 minutes respectively after the first 999 call. The nearest flexible duty officer (Level 2) was notified and

decided to attend; this is in accordance with standard procedures.

Due to the volume of 999 calls and reports that an explosion had occurred, the Mobilising & Communications Centre (M&CC) increased the initial attendance by one pumping appliance. This is in accordance with standard procedures. An additional flexible duty officer was also mobilised.

The Service has a policy of mobilising a Command Team of three Level 2 officers to any incident of four pumps or more.

The attendance times for the Incident Command Team met the local performance indicator for Level 2 Incident Command Team attendance times. This required the first arriving Level 2 officer to be in attendance within 20 minutes and the second and third officers within 30 minutes of the incident escalating to Level 2.

Once the incident had escalated to a Level 2, the first two officers arrived within three minutes and the third within 23 minutes.

In accordance with Service procedures, a Fire Investigation Officer and a Response Quality Assurance Officer were also mobilised.

Once the incident escalated to Level 3, in accordance with Service procedure, a Level 3 officer was mobilised and the Level 4 officer was notified.

### **Proactive/Early 'Make-ups'**

The first pumping appliance was in attendance at Marlie Farm at 13.59 hrs. On arrival, the Level 1 Incident Commander recognised the need for further resources and sent an assistance message: *'make pumps four'* at 14.00:14 hrs, followed by *'make pumps six'* at 14.00:56 hrs.

In accordance with established Service Incident Command and mobilising procedures, the *'make pumps four'* message escalated the incident from Level 1 to Level 2 and automatically attracted a Level 2 Incident Command Team. The *'make pumps six'* message also attracted a Water Carrier, the Incident Command Unit, a command support pump plus additional specialist officers and support staff.

The Level 2 Incident Commander relayed an assistance message *'make pumps eight'* within two minutes of his arrival at 14.03 hrs. This escalated the incident to Level 3 and a Level 3 officer was

mobilised. Further assistance messages were sent: *'make water carriers two'* and *'make aerial ladder platforms two'* at 14.16 hrs and 14.17 hrs respectively.

### **Incident Command System**

East Sussex Fire & Rescue Service reviewed its Incident Command procedures during 2004 and 2005, following publication of the Fire Service Manual 'Incident Command 2<sup>nd</sup> Edition', updating previous Service risk assessments, and the move to a regional system of work for Incident Command within the fire and rescue services in the south-east region.

Training in Incident Command was carried out Service wide using trainers from both East Sussex and Kent Fire & Rescue Services.

During 2005, all operational workgroups received non-assessed familiarisation training in dynamic risk assessment and the Incident Command System.

During 2006, following roll out of the familiarisation package, a two-year programme of formal training and competence testing in Incident Command was instigated. This was to a standard assessed and accredited by the Institute of Leadership and Management (ILM).

Existing Level 1, 2, 3 and 4 officers who had experience of Incident Command in their substantive roles were deemed competent to continue in that role. All new officers were assessed before undertaking an Incident Command role.

<b>Level of Command</b>	<b>Total number of personnel 03/12/2006</b>	<b>Competent in ICS via accredited training as of 03/12/2006</b>	<b>Personnel assessed as competent in ICS in attendance at Marlie Farm</b>
1	173	70	10 of 12
2	28	15	3 of 7
3	10	1	0 of 1
4	3	1	N/a

Table Showing number of staff assessed as competent as at 3 December 2006

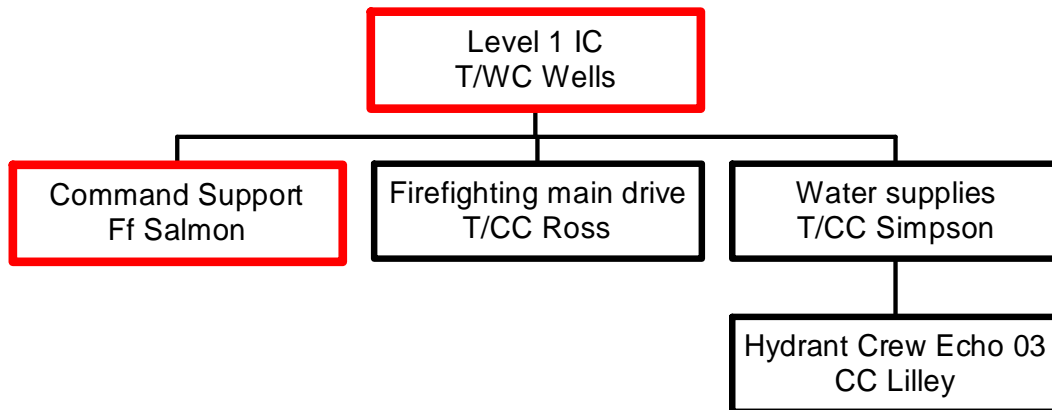
### **Commentary**

Both the Level 1 and Level 2 Incident Commanders at Marlie Farm had been formally assessed and had demonstrated competence in Incident Command at their appropriate level. The remaining officers, although programmed to attend assessment, had not yet completed their formal assessment, however they were deemed competent through their previous roles

### Appropriate Command Teams Established at Level 1, Level 2 and Level 3

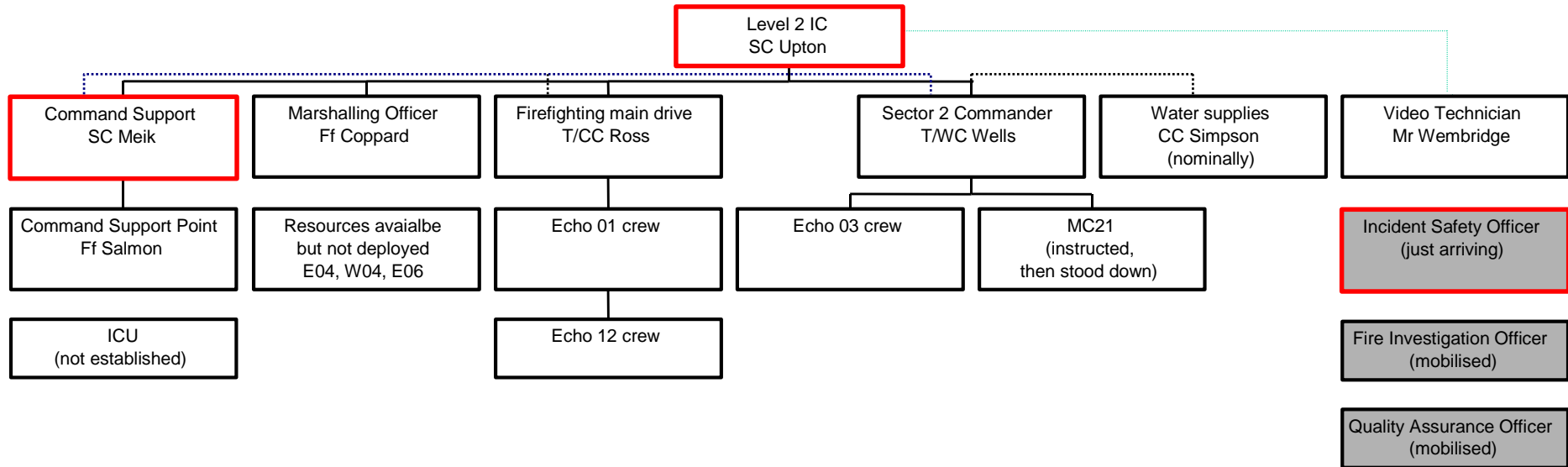
Before the explosion occurred, in accordance with Service procedures, the following Command Structures were established:

#### LEVEL 1 (1 – 3 Pumps) INCIDENT COMMAND SYSTEM STRUCTURE IN PLACE AT 14.10 HRS



Note; red box indicates command team

**LEVEL 2 (4 – 6 Pumps) INCIDENT COMMAND STRUCTURE AT 14.22 HRS APPROX.  
(AS INDICATED BY STATEMENTS)**



Note;

Red box indicates command team.

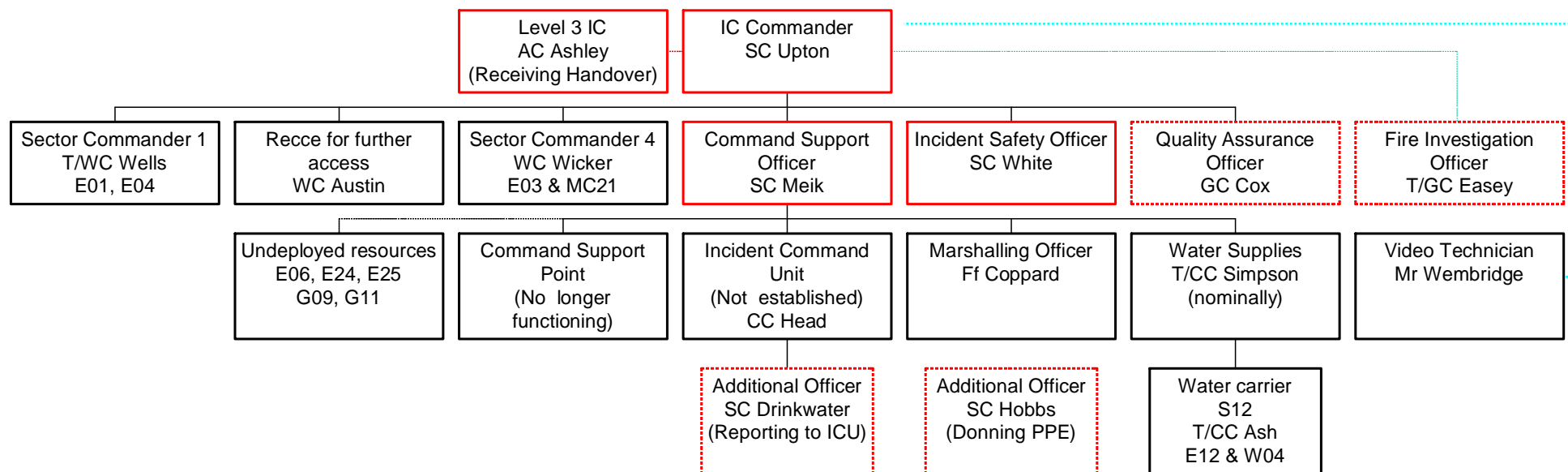
Grey box indicates Officers mobilised to incident but have not yet arrived.

Although undertaking the role of Command Support Officer, SC Meik assisted in directing firefighting operations in the Main drive and then Sector 2 and as such this is indicated by the blue dotted line.

Although nominated to “sort out water supplies” CC Simpson assisted in firefighting operations in Sector 2. This is represented by a black dotted line.

Video Technician Brian Wembridge was in attendance and although he should have reported to the incident commander, there is no evidence that this formally took place. This is represented by the green dotted line

**ICS STRUCTURE AT TIME OF EXPLOSION  
(AS INDICATED BY STATEMENTS)**



Note;

Red box indicates command team.

Dotted red box indicates additional Officers mobilised to the incident in support of command team.

Fire Investigation Officer T/GC Easey although on fireground had not reported to Incident Commander and as such is indicated by a green dotted line.

Video Technician Brian Wembridge was in attendance and although he should have reported to the incident commander, there is no evidence that this formally took place. This is represented by the green dotted line



### **Appropriate Command Teams Established at Level 3 and Gold Command**

The Level 3 Command Team was established immediately following the explosion. As this Command Team had been present at the time of the explosion, relief officers were considered a priority. The Command Team were stood down from the site, and a replacement Level Command Team were in place by the use of recall to duty by 17.00 hrs on 3 December 2006, with the exception of the Level 3 commander who was relieved at 21:12 hrs.

Gold Command was established once the incident had been declared a Major Incident, in accordance with the Sussex Major Incident Linking Document. A Level 4 Officer attended Gold Command with a support officer.

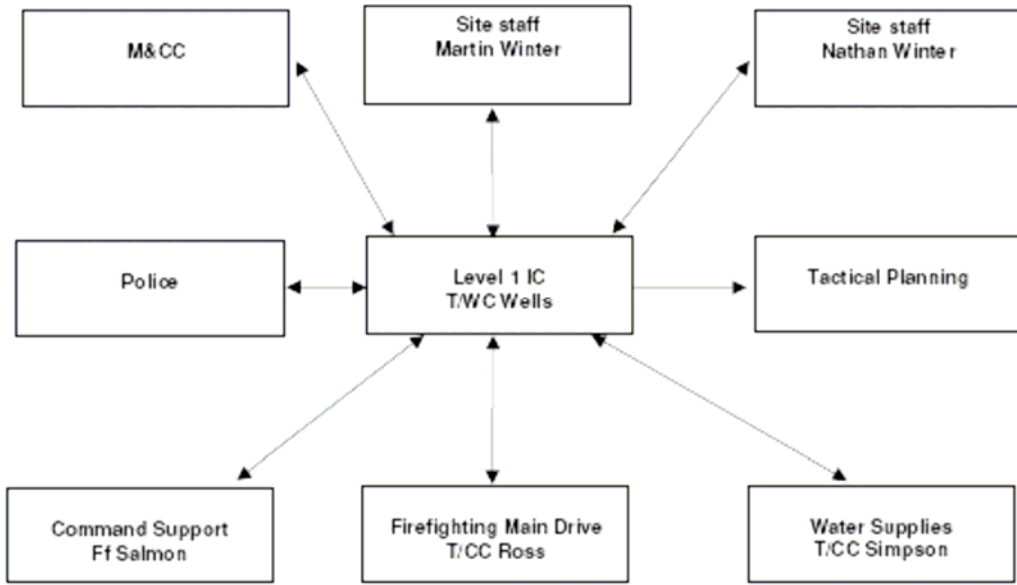
### **Span of Control and Lines of Communication Excessive**

The Incident Commander has much to consider when dealing with an emergency and this becomes even more complex with increased scale and duration of an incident. The Incident Command System provides a framework, which ensures manageable 'spans of control'. This is essential to ensure that the Incident Commander is able to effectively cope with the information flow at the incident ground.

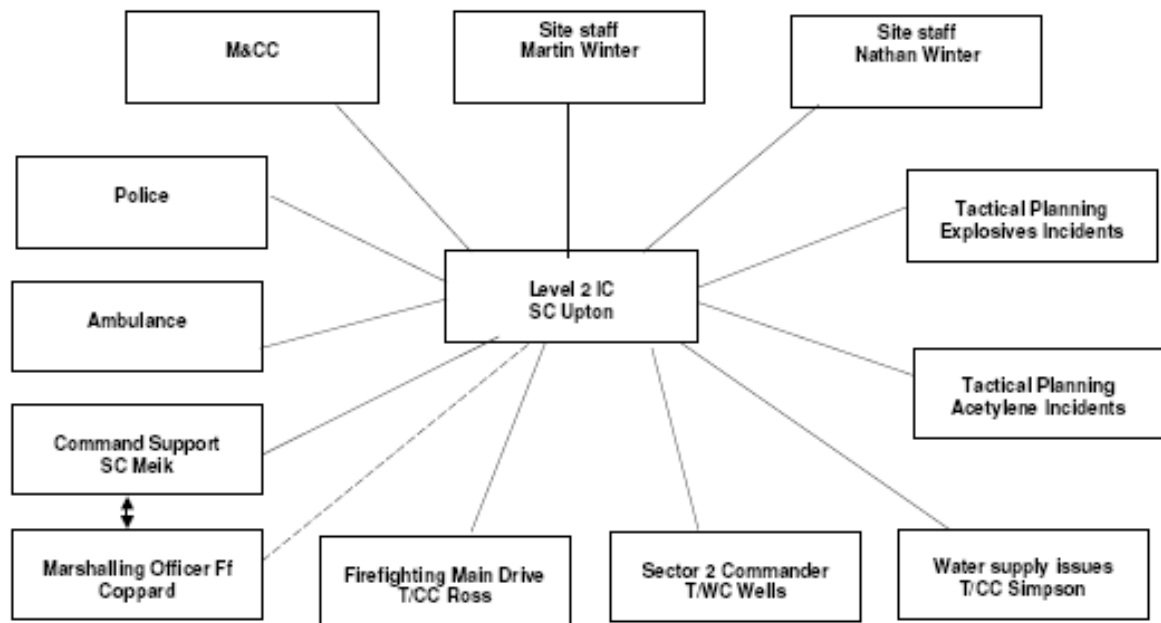
A manageable 'span of control' is achieved by dividing larger or more complex incidents into smaller areas of responsibility, referred to as sectors.

The span of control for tactical roles should ideally be limited to five lines of direct communication, thus ensuring that Incident Commanders do not become overburdened. It is accepted that in a stable situation, six to seven lines may be acceptable.

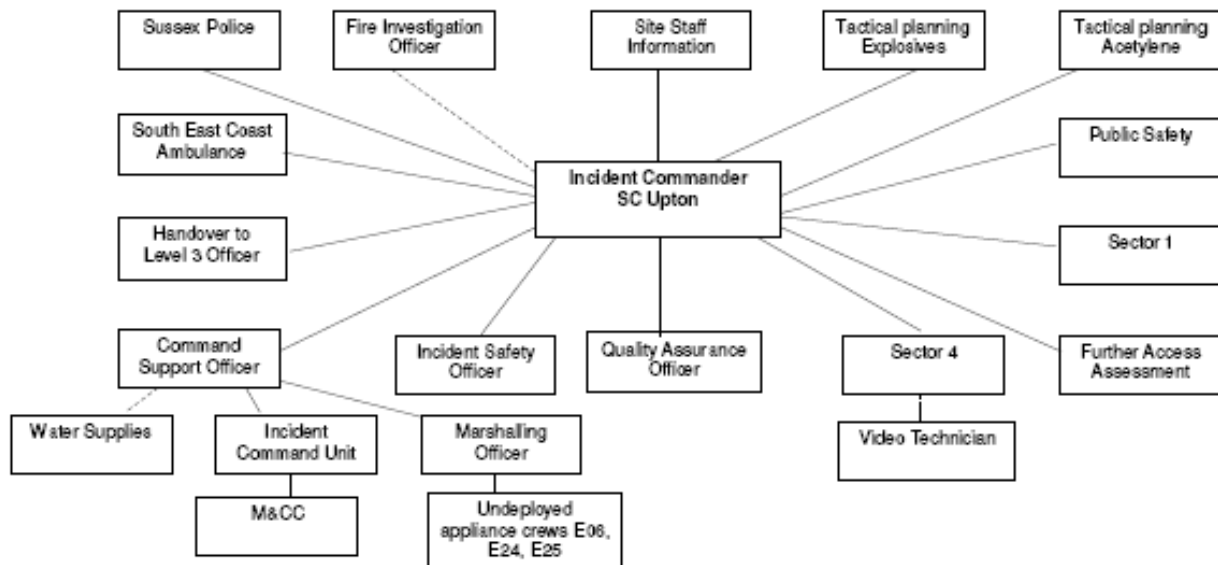
**LEVEL 1 SPAN OF CONTROL AND DECISION MAKING AT 14.08 HRS APPROX.**



**LEVEL 2 SPAN OF CONTROL AND DECISION MAKING AT 14.22 HRS**



## SC UPTON'S SPAN OF CONTROL AND DECISION MAKING AT TIME OF EXPLOSION



Note: Video Technician and Fire Investigation Officer, whilst present at the incident, are not shown as direct span of control due to the undirected nature of their work activities.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 24**

Provide refresher training for all Level 1, 2, 3 and 4 Commanders in the roles of Incident Commander including communication of the tactical plan, Command Support Officer, Incident Safety Officer and other functional roles within ICS, to include a requirement for Level 2+ officers to participate in a minimum number of exercises per year.

### **Evacuation Procedures and Roll Call**

East Sussex Fire & Rescue Service uses the standard UK Fire and Rescue Service procedure of repeated blasts on an Acme Thunderer whistle for emergency evacuation of personnel who are committed into a risk area.

Following the sounding of the emergency evacuation signal, all supervisory personnel on the fireground should have repeated the emergency evacuation signal on their personal issue whistles. Other personnel could have repeated the evacuation signal using whistles provided on BA boards or in command support wallets, issued to every major pumping appliance.

No evidence has been found to show that **any** personnel repeated the evacuation signal using the provided whistles.

East Sussex Fire & Rescue Service procedures state: *'Whenever an emergency evacuation signal is sounded, the Incident Commander will ensure that a roll call of all personnel is implemented. All personnel are accounted for.'*

No evidence has been found of any implementation of a fireground roll call before the main explosion.

After blowing his evacuation whistle the Command Support Officer states that he was informed that there was nobody further into the site than him. The Command Support Officer states that he was not informed of the decision to establish the Sector where the fatal injuries occurred and as such may not have been aware of their presence in the risk area.

Both wholetime and retained duty system (RDS) trainee firefighters received initial training in emergency evacuation procedures as part of their basic breathing apparatus training module. Anecdotal evidence suggests that some firefighters were under the impression that the evacuation signal only applied to incidents where breathing apparatus is in use.

Examination of the video footage recorded by Brian Wembridge has confirmed that the site telephone sounder is similar to the noise made by an evacuation whistle. Some East Sussex Fire & Rescue Service personnel may have confused the sound of the external bell sounder with the sound made by the evacuation whistle.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 25**

Exchange information regarding evacuation signals and procedures (including at other types of risk where whistles are used by other agencies for signals, e.g. in HM Prisons) with SECamb and Sussex Police.

#### **Recommendation 26**

All Incident Commanders to ensure that any non fire and rescue service persons working in the risk area, e.g. police or utilities, are briefed on the likely risks; the emergency evacuation signal, procedures, evacuation routes and assembly/roll call points.

#### **Recommendation 27**

Review the Manual Note 'Operational Policy 18:8 'Functional Roles' and associated 'prompt card' to include the responsibility of the Marshalling Officer (where appointed) to inform arriving crews

of safety critical requirements including arrangements for emergency evacuations, and that training for personnel likely to undertake the role of Command Support, Marshalling Officer and ICU operators should be undertaken to ensure:

- nomination of a suitable rendezvous point
- awareness of the need to be clearly identifiable to arriving Service and cross-border crews
- awareness of their role in ensuring that appropriate briefings are given to arriving crews, officers and support personnel before they are permitted to deploy

### **Recommendation 28**

Produce a formal procedure for tactical withdrawal and emergency evacuation. This procedure should include the following:

- when an emergency evacuation has been initiated, the signal should be sounded and repeated, both by whistle and general fireground radio broadcast.
- confirmation of receipt of the emergency evacuation signal should be sent by all relevant Command personnel. This would include Command Team members, Sector and Appliance Commanders, personnel working in remote locations, e.g. fire investigators, incident safety personnel, pump operators, etc.
- where it is not the Incident Commander who initiates an emergency evacuation, the originator of the emergency evacuation must immediately notify the Incident Commander, Command Support and Sector Commanders by the quickest appropriate means.
- on sounding the emergency evacuation signal, the Incident Commander should send a message to M&CC as follows: *'emergency evacuation in progress'*.
- on receipt of a main scheme radio message stating an emergency evacuation is in progress, M&CC should treat the incident as a *'persons reported'* call and consider appropriate 'make-ups' as in a BA emergency.
- as part of any roll call, persons responsible for that roll call must ensure that all Service personnel, including appliance crews, officers and support personnel are accounted for.
- when other services and organisations are present, they must be informed about the emergency evacuation signal, and in the event of it being sounded, the need for them to carry out a suitable and sufficient roll call of their personnel.
- following the roll call, the Incident Commander should send a message to M&CC stating whether or not all fire and rescue services and other services and organisations' personnel have been accounted for.
- should the Incident Commander need to leave persons in the risk area or recommit personnel for a specific task, such as protecting an escape route, this should only be done following a risk assessment and a thorough crew briefing, detailing the specific reason(s),

tasks and any necessary further controls. In this event, working conditions must be monitored constantly. Every effort must be made to withdraw these personnel at the earliest opportunity. Personnel tasked with carrying out the roll call must be made aware of who is still working in the risk area and when they may be expected to leave.

Having produced a formal procedure, the Service must then instigate a system to train operational personnel in the formal procedures for emergency evacuation including refresher training. This training should include roll calls and confirmation to the Incident Commander that all persons in the risk area have been accounted for.

### **Recommendation 29**

Recommend to CFOA that amendments are made to 'Fire Service Manual Volume 4 Fire Service Training, Foundation Training and Development Appendix 7', to enhance the Fire and Rescue Service evacuation procedure to reflect the guidance given in DCOL 5/1994 Item A.

### **Recommendation 30**

Amend the references in the East Sussex Fire & Rescue Service 'Breathing Apparatus Manual Note' with regard to emergency evacuations, to reflect the fact that emergency evacuations are a general fireground procedure, not specifically for use at incidents involving breathing apparatus.

### **Recommendation 31**

Ensure that whole time and retained duty system trainee firefighters receive input on emergency evacuation procedures before they attend any operational incidents. Initial training in emergency evacuation procedures should include theoretical training and evacuation simulations, including subsequent roll calls. In order to reinforce the importance of emergency evacuation procedures, all East Sussex Fire & Rescue Service trainee firefighters should be issued with a nominal roll tally on the first day of their initial training course. On each subsequent practical training session, there should be a requirement for trainees to pass their tally to the Appliance Commander for insertion into the nominal roll board.

### **Recommendation 32**

Ensure that all appliance nominal roll boards are indelibly marked with the appliance call sign.

### **Communication of Tactical Plan – Driven by Events**

Deployment of Fire and Rescue Service assets at an incident is the sole responsibility of the Incident Commander. This authority can be devolved to Sector Commanders where these have

been established and appropriately briefed.

The Marlie Farm incident was extremely dynamic. The Level 1 and 2 Command Teams were confronted with many simultaneous and concurrent demands that severely stretched their spans of control. This was compounded by a lack of definitive information regarding the nature and location of the hazards at the site.

As the incident developed, the respective Incident Commanders were driven by the escalating nature of the incident to change or adapt their tactics to suit the changing dynamics of the fire and the associated hazards and risk.

Whilst command structures were established at both Levels 1 and 2 and roles allocated, the lack of effective communication and clear briefings did not allow the formation of a cohesive tactical plan with understood objectives. This would have enabled key personnel to benefit from a reduced span of control. The absence of this led to several areas of simultaneous event-focussed activity, some of which was outside the control of the Incident Commander(s).

There is evidence to suggest that the lack of formal briefings led to misunderstandings of the objectives of the tactical plan/s, resulting in crews acting on their own initiative. This had consequences for the overall incident strategy, e.g. how long the initial firefighting attack could be maintained, due to depletion of the available water resources.

*See previous recommendation 24*

### **Joint Agency Control of Members of Public, Personnel and Cordon Procedures**

Throughout the incident, members of the public continued to be present on and around the site. Two members of the public were subsequently injured in the explosion. They have stated that they visited the site having heard about the explosion and seeing the smoke. This involved travelling a number of miles by car to get to the site and then walking across private land to get to the rear of the site, which is where they were when the main explosion occurred.

The Incident Commander cited presence of members of the public in the risk area as one of the deciding factors in adopting offensive (Oscar mode) operational tactics. He states that he requested that the Police instigate a 600-metre cordon, but was told this was not easily achievable with the resources available.

East Sussex Fire & Rescue Service did not restrict access to the site following withdrawal from

the Builders Beams site. Not all of the Command Team were aware of the extent of the deployment of Service personnel within the site.

Other emergency service personnel were present in the risk area. It is known that one Police Officer was injured in the main explosion. No evidence has been found of an agreed procedure existing between emergency services on how to carry out an emergency evacuation and roll call.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 33**

Review the procedures and training to deal with incidents where the police have confirmed to the Incident Commander that a request for a cordon and associated removal of members of the public cannot be immediately implemented.

#### **Recommendation 34**

Ensure other category 1 responders are aware of the East Sussex Fire & Rescue Service Incident Command System roles and relevant procedures.

*See previous Recommendations, 25 & 26*

### **Acetylene Risk and Service Procedure**

East Sussex Fire & Rescue Service has an operational procedure in place for dealing with incidents involving acetylene gas cylinders, in the form of an operational Manual Note and an operational aide memoir.

Manual Notes are issued in hard copy to every fire station and are available electronically on major pumping appliances. Hard copy aide memoirs were also provided on every fire appliance and a set was issued to every response officer.

Key parts of the procedure for acetylene cylinders involved in fire require establishing an appropriate safety cordon distance (normally 200m) and if safe to do so, cylinder cooling.

The safety cordon distance required primarily depends on whether or not cylinder cooling can be undertaken.

The Incident Commander identified several acetylene cylinders at the incident. Most of these



were located outside a building used for the fabrication of steel construction beams (Builders Beams 1). This building was subjected to a developing fire and the Incident Commander believed that there was also a high likelihood of the presence of acetylene cylinders inside the burning structure.

No evidence has been found of any communication of the acetylene risk to personnel or other emergency services on the fireground, nor of an attempt to establish an appropriate safety cordon for emergency services personnel, although a request was made to the police to establish a safety cordon of 600-metres.

The South East Coast Ambulance service (SECAmb) log of the incident states: *'14.16 hrs Crew of 341 spoke to ESFRS Officer in white helmet without tabard at the site entrance at point B on the plan. The same officer declared 200 m exclusion zone slightly after.'*

#### **Commentary**

It is not clear if this 200 m exclusion zone is related to the acetylene cylinders or who the officer referred to was.

#### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

##### **Recommendation 35**

Review the training provision for all types of hazardous materials incidents, including those involving acetylene and/or explosives, to ensure that:

- Incident Commanders are aware of operational procedures and control measures to be adopted, and the availability and content of relevant aide memoirs
- the associated training packages/presentations are in accordance with current procedures
- all operational personnel receive periodic training and assessment in procedures for all types of hazardous materials incidents, and this is recorded in an auditable format
- training scenarios should require Incident Commanders to practice applying the relevant procedures and safety controls, and this is recorded in an auditable format

##### **Recommendation 36**

Make all category 1 responders aware of East Sussex Fire and Rescue Service procedures and associated evacuation distances for incidents involving acetylene and/or explosives.

And previous recommendation 15

### **Crewing of the Incident Command Unit**

The Incident Command Unit (ICU), call sign C01, was mobilised on the 'make pumps 6' message and responded from Lewes Fire Station with a crew of three. The other personnel on duty at Lewes Fire Station had already responded to the incident on the E01 appliance as part of the initial pre-determined attendance (PDA). The ICU had been in attendance at the incident for 23 minutes and was still being established at the time of the main explosion. The ICU did not formally declare to M&CC that it was taking over as the contact point for the fireground command and control function.

No evidence has been found of a formal crewing policy for the ICU existing. However the established practice on mobilisation of the ICU was for it to respond with a crew of five.

Evidence has been found of Lewes personnel having received training in the operation of the current ICU vehicle. However no evidence has been found of a formal policy for the minimum training requirement for ICU crews. It is noted that one of the three crew members attending Marlie Farm was a retained duty system firefighter with less than one year's service and no record has been found of him receiving formal training as to his role on the ICU at incidents. This firefighter was allocated a role that required him to enter risk areas alone on the fireground to gather information regarding the incident, the deployment of crews, appliances and equipment and to gather nominal roll boards and tallies.

Records show that personnel at Newhaven and Crowborough Fire Stations had received familiarisation training on the operation of the ICU. This was to act as relief operators for protracted incidents, in order that Lewes personnel could be relieved after a suitable period or to crew the ICU for other incidents where Lewes personnel were already committed on other appliances.

Evidence has been found of personnel from Crowborough being mobilised to Lewes Fire Station to crew the ICU at operational incidents. However no evidence has been found of a formal mobilising policy, and it is understood that these examples were only prompted on request from the fireground, rather than as a standing mobilising action, with potential for consequent delay in the attendance of the ICU.

While en route to the incident the Crew Commander of the ICU contacted M&CC to ask: *'if a support pump had been allocated for the Control Unit for assistance.'*

E24 from Herstmonceux was mobilised 'as Command Support to C01.' This suggests some

confusion as to the role of the Command Support pump. There is no record of personnel on E24 other than the Crew Commander having received Level 1 Incident Command awareness training.

### **Commentary**

The lack of a mobilising and crewing policy created a delay in the ICU being established at the Marlie Farm incident.

The radio message from the ICU whilst en route was not a clear request for additional trained ICU operators to be mobilised and M&CC did not interpret this as such.

It is likely that the crew of E24 had very limited experience of undertaking the Command Support role at Level 2 and 3 incidents. They would not have received specific training for supporting the operation of the ICU.

Evidence indicates a lack of understanding as to the differing roles of the Command Support pump and the need to mobilise either Newhaven or Crowborough to provide trained ICU operators to crew the ICU.

SC White states that he recognised that the Newhaven (E06) crew in attendance were trained in the operation of the ICU and could have provided assistance to the ICU. He states that he intended to suggest this to SC Meik (CSO), but there is no evidence to confirm that this took place. SC White also states that he had experience of a similar situation at a fire in Lewes High Street, which occurred a short time before the Marlie Farm incident, when Lewes personnel were already committed to firefighting at an incident on their own station ground.

SC Meik states that he attended the ICU just prior to the explosion in order to carry out Command Support duties.

In the immediate post explosion phase of the incident, additional personnel were instructed to assist the ICU and subsequently Crowborough personnel attended as a relief crew.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 37**

Provide a policy for the crewing of the Incident Command Unit (ICU) including:

- minimum crewing levels

- the training of personnel at other stations to provide resilience in the event that trained crews from the home station are already committed or unavailable
- mobilising arrangements for operators from other stations to ensure that the ICU is mobilised to relevant incidents promptly
- identify the competencies and training arrangements for ICU operators
- ensure that competence is established and maintained through initial and periodic workplace training and assessments
- the integration of the ICU into exercises and scenarios wherever possible in order to assist the training and development of new and existing ICU operators in supporting relevant incidents.

### **Recall to Duty Procedure**

During weekends and public holidays the Service risk assessment indicates the number of flexible duty officers that should be on duty at any one time to manage two simultaneous Level 3 incidents. Procedures exist whereby should additional officers be required, they can be recalled to duty. Immediately following the declaration of the Major Incident, it became apparent that additional officers would be required and recall to duty was implemented.

## **PEOPLE**

### **ACTIONS BY M&CC THROUGHOUT THE INCIDENT**

M&CC answered the initial incoming call within 1 second, which is within the Service's performance indicator target of 'answering emergency calls within 3 seconds'.

The call was then processed and the correct two pump pre-determined attendance (PDA) was mobilised within 27 seconds of the M&CC operator receiving the address of the incident. This is well within the Service's local performance indicator for 'the handling of calls and despatch transmitted within 60 seconds.'

Within one minute of receipt of the original 999 call, M&CC enhanced the PDA to three pumps due to the number of repeat 999 calls being received.

M&CC operators also gave active 'fire survivor' advice to several of the 999 callers:

*"Stay well clear of it, stay indoors, keep your windows..."*

*"Stay well clear of it Madam, we are on our way we will be with you very shortly."*

*"Keep away from it Sir, stay well away from it, we're on our way, we'll be with you in a few minutes."*

*“Could you remain in your property, don’t go outside...we need you to remain in your property... move away from the windows.”*

M&CC personnel worked to support the incident as it escalated to Level 2, Level 3 and facilitated the transition to Major Incident, as well as dealing with 13 other emergency incidents during the period from 13.59 to 18.00 hrs. In addition, they arranged covering moves to maintain operational availability across the Service, notified other officers and liaised with the control rooms of police, ambulance and neighbouring fire and rescue services.

M&CC staff continued their duties, including liaison with other emergency services and handling press enquiries, as the nature of the incident became clear and news of casualties began to emerge prompting significant media and personnel enquiries.

### **SUPPORT STAFF ATTENDING INCIDENTS**

The Service had established criteria and procedures in place for the attendance of specialist technical support staff at operational incidents.

These procedures applied to specific roles, including the on-duty Fleet Engineer, Information and Communication Systems (ICT) Technician, the Fire Engineer and the Media Co-ordinator/Video Technician (Brian Wembridge).

The risk assessment for non-operational personnel attending incidents identified that only the Media Co-ordinator/Video Technician (Brian Wembridge) was permitted to enter inner cordon areas during the dynamic phase of incidents, but only with the express permission of the Incident Commander.

Support staff were identified as a risk group within the activity risk assessment for ‘incidents involving explosives.’

Brian Wembridge was allowed discretion in attending incidents, including outside of his normal working hours. There is evidence of informal instruction from his line manager reinforcing that Brian should exercise discretion regarding the types and frequency of incidents attended.

Brian Wembridge was a former long-serving firefighter and junior officer before he retired and was re-employed in the Media Co-ordinator/Video Technician role. He subsequently gained several years experience of gathering video footage at operational incidents and other events.

At the time of the Marlie Farm incident, a formal review of the Media Co-ordinator/Video

Technician role was in progress and a report had been prepared for the Service's Corporate Management Team (CMT) seeking direction for the future of the role. GC Scott confirmed that Brian Wembridge was consulted regarding aspects of his role for the report to CMT.

The on-duty Fleet Engineer and ICT Technician were mobilised to the incident on receipt of the 'make pumps six' message, in accordance with agreed criteria. Brian Wembridge was notified of the Marlie Farm incident and elected to attend. He was the only support staff member in attendance at the time of the major explosion.

There is evidence of support staff attending incidents and complying with agreed procedures, such as reporting to the Command Support point and/or Incident Command Unit, where this had been established.

During the Marlie Farm incident Brian Wembridge was instructed by a Sector Commander, and by a member of the Level 2 Incident Command team, to withdraw from Sector 2. The sequence of events in his own video footage indicates that shortly after receiving this instruction, at approximately 14.27 hrs, he promptly returned to the main drive where his next sequence of footage commenced at 14.28 hrs.

### **ROLE OF DUTY OFFICER**

Within the Service rota for the flexible duty system, a Level 2 or 3 officer is designated as the 'duty officer' for each 24 hour period. The duty officer is responsible for dealing with significant managerial and operational matters arising across the Service, giving advice to M&CC and where appropriate informing the duty Principal Officer. Although duty officers had been identified for the preceding 6 days on both the printed copy of the rota sheet and the MIS system, no duty officer was designated for Sunday 3 December 2006.

The mobilising system includes lists of notifications that are required to be made by M&CC in the event of an incident escalating or other significant occurrence. The M&CC incident log shows that prompts to notify the duty officer were recorded at 14.02 hrs, shortly after the incident escalated to 4 and 6 pumps; and at 14.06 hrs following the 'make pumps 8'. At 14.36 hrs the log shows: '*G41 Duty Officer attending.*' As mentioned above, no duty officer had been designated for the Sunday but G41 (GM Cox) was the duty officer for the previous day.

A facility also existed for M&CC to mobilise an 'M&CC liaison officer.'

Records show that another Level 2 officer was notified of matters as replacement duty officer and

that a further Level 2 officer was recalled to duty to act as M&CC liaison officer.

### **MOBILE DATA TERMINALS**

The Service has Mobile Data Terminals (MDTs) on all front-line appliances; the system is known as MODAS within the Service. The MDTs have a multi-purpose function of allowing the crews to notify status changes to M&CC without using the main scheme radio. It also provides operational risk information, including copies of contingency plans, 7(2)(d) information, aide memoirs and operational procedures, Chemdata (chemical information database) and a Geographical Information System (GIS), which shows the location of the incident, maps of the area of an incident, including an overlay showing the hydrants in the area.

The crew that had been tasked to set into the hydrant reported that they used the MDT to ascertain the location of the nearest hydrant to the site.

### **WELFARE ARRANGEMENTS**

Due to the number of casualties from Marlie Farm, several hospitals were put on alert. Officers were dispatched to these hospitals to act as liaison officers for injured fire and rescue service personnel. These officers then dealt with notification of injured personnel to M&CC, liaison with the Incident Commander, notification to next of kin and transportation of injured personnel home, once they had been released from hospital.

In addition the South East Coast Ambulance Service (SECAmb) provided pastoral support at the incident to comfort Service personnel on site and the Sussex Red Cross mobilised their fire victim support unit to the site to provide additional welfare facilities.

Two of the Service's critical incident debriefers were recalled to duty and sent to a nearby station, where all crews who attended the incident immediately prior to the explosion were taken, prior to being sent home or to their home stations.

The Service's medical advisor attended to provide medical support and advice. Over the following days welfare support was provided by the Service's Occupational Health department. Ongoing support was given by the East Sussex County Council confidential counselling scheme and, where necessary, professional mental health support was given.

This welfare support continues for personnel affected by the incident, some years after the event.

## **FAMILY LIAISON**

Once the identity of the deceased was known, the next of kin were informed in a joint operation with Sussex Police, the Chief Fire Officer and both Sussex Police and Service family liaison officers.

Service liaison officers were also involved in assisting the families with funeral arrangements. Both funerals took place with full Fire Service honours.

Service liaison officers continue to provide support and act as single points of contact for the families, for all Fire Service related matters, again continuing some years after the event.

## **ASSESSING RISK**

### **IMPLEMENTATION OF CONTROLS FOR SUPPORT STAFF ATTENDING INCIDENTS AND ENTERING RISK AREAS**

An activity risk assessment was available for non-operational staff attending incidents. However no evidence has been found that the 'risk groups' covered by this risk assessment, and those responsible for their supervision and control at incidents i.e. Incident Commanders, had been made fully aware of the specific control measures identified.

The risk assessment stated that only the video technician was permitted to enter inner cordon areas at incidents, and only with the permission of the Incident Commander. No evidence could be found that Brian Wembridge formally reported to the Incident Commander on his arrival at Marlie Farm, and therefore he would not have received permission from the Incident Commander to enter the risk area.

There is no evidence to show that Brian Wembridge reported to the Command Support point or Incident Command Unit at any stage or that he had formally confirmed his presence at the incident to them. His tally was found in his car after the incident.

However the Command Support point was only partially established and the Incident Command Unit arrived after Brian Wembridge and was not yet fully established before the main explosion occurred.

T/CC Ross and Ffs Watson and Lazenby state that they were concerned for Brian Wembridge's safety when he was filming. Evidence has been obtained confirming that repeated instructions were given to Brian to withdraw from the following areas:



- the main drive during the first sequence of filming,
- Builders Beams,
- the main drive during subsequent filming.

Evidence shows that Brian Wembridge promptly complied with these requests to withdraw.

It is noted that no fire and rescue service personnel are visible forward of Brian Wembridge in Sector 1 (the main drive) during his first video sequence from 14.19 hrs, when there is a rapid escalation in projectiles issuing from the area of the tube and box stores. This indicates that he was at least level with and possibly further into the risk area than other personnel at this time.

Witness statements and video footage indicate that from approximately 14.32 hrs Brian Wembridge was filming within Sector 4. No witness evidence has been found to confirm that Brian Wembridge sought or received permission to enter that area.

The final sequence of video taken by Brian Wembridge shows the deflagration occurring within the ISO container and Brian is in close proximity to WC Wicker at monitor 3.

No evidence could be found that SC Upton, as the Incident Commander, was aware of Brian Wembridge's presence within Sector 4 when he initiated the evacuation message.

#### **Commentary**

The final sequence of video footage indicates that WC Wicker and Brian Wembridge had changed positions from the previous sequence of filming. The layout of the site in this area suggests it is likely they had passed each other before arriving at the locations in the final sequence. Therefore it is likely that WC Wicker was aware of Brian Wembridge's presence.

It is recognised that Brian Wembridge may have sought permission to film in this area from WC Wicker, who was the Sector Commander for this area (Sector 4). Conversely WC Wicker may have instructed Brian Wembridge to leave the area. In the final video image WC Wicker appears to be moving away from monitor 3 toward the gate into the polytunnel area.

All of the available images from the East Sussex Fire & Rescue Service video of the incident appear to have been taken from positions within the operational sectors and are looking further into the site. There are no images showing activities within the support sector, such as Incident Command, the establishment of the Command Support point, liaison with other agencies, provision of water supplies, evacuations, withdrawals or appliance marshalling.

No evidence has been found of a Service policy regarding the priorities for video coverage at incidents.

### **Commentary**

A sample of video footage from other operational incidents indicates that the emphasis appeared to have been on capturing images that were looking forward at operational work, rather than images looking outward at supporting activities. This focus would not have optimised potential opportunities to assist the debriefing of incidents, to inform operational improvement or to aid organisational and personal development.

Brian Wembridge was a former long serving operational firefighter and junior officer, ceasing his operational service in 1994, i.e. some 12 years before this incident. Brian subsequently gained very extensive experience of attending incidents to gather video footage and was periodically involved in organising and delivering operational training events for officers. However no evidence has been found that Brian Wembridge received formal training regarding his responsibilities at incidents, including dynamic risk assessment, reporting procedures, use of appropriate PPE and awareness of emergency evacuation signals and procedures.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 38**

Review the relevant activity risk assessments for support staff who may be required to attend operational incidents.

#### **Recommendation 39**

Ensure that Incident Commanders and others who are responsible for the safety of support staff when attending incidents, are made aware of the safety controls required, including which roles are permitted access into hazard areas and that this is incorporated into the relevant Service Manual notes, i.e. Incident Command System, and establish arrangements to ensure that the implementation of safety controls for support staff at incidents is subject to active monitoring, review and audit.

#### **Recommendation 40**

Implement a system to provide structured training to all support staff who are required to attend operational incidents. Training to be in accordance with national occupational standards where available, and to meet the requirements of relevant activity risk assessments. The training

objectives to include:

- their responsibilities within the Incident Command System, including a requirement to report to the Command Support point or ICU on arrival, and the procedure for the use of nominal roll tallies.
- before being permitted to undertake tasks at the incident, all staff must receive a briefing from the Command Support Officer to confirm their role required at the incident, the nature of the incident and associated hazards, the safety controls in place or to be observed, together with any restrictions on their movement within the incident ground.
- applying the principles of practical dynamic risk assessment when working within inner cordon/hazard areas.
- awareness of fireground communications, including methods for the signalling of emergency evacuations and associated evacuation and roll call procedures.
- initial and periodic continuation training in the use of PPE appropriate for different types of incidents.
- driver qualification and training requirements
- other role related training requirements

#### **Recommendation 41**

Introduces a system of initial and periodic refresher training for support staff who attend operational incidents. This training to cover key health and safety responsibilities, the use of PPE, reporting in/out procedures and emergency evacuation procedures.

#### **Recommendation 42**

Any future video technician, or related role, shall have:

- i a specific written activity risk assessment provided for the role, to introduce controls to reduce the risk to as low a level as is reasonably practicable, covering:
  - attendance at operational incidents
  - safety controls for the range of incidents likely to be attended
  - the potential for working in inner cordon/hazard areas
  - those incidents where the post holder will not be permitted to work within the hazard area/inner cordon areas (e.g. incidents involving hazardous materials)
  - the specific PPE requirements for the range of incidents likely to be attended by the post holder
  - identification of those types of incidents or situations where PPE is not a suitable safety control
  - training requirements for the video technician and his/her supervisor/manager.

- ii Provide a written policy for the role of video technician, including:
  - response to incidents and other events/activities
  - definition of the extent and limitations of the video technician's role
  - responsibility of the post holder to comply with health and safety requirements and operational instructions from the Incident Commander and other relevant Incident Command roles when attending incidents
  - subject to compliance with all relevant safety controls, a key role for the video technician is to gather video information on operational procedures across the incident ground, including outside of the inner cordon/hazard areas, to facilitate:
    - b) operational debriefing,
    - b) to assist the development of operational training,
    - c) to aid the gathering of evidence for personal development records, e.g. for the Incident Command Team,
    - d) process video footage including for other agencies, e.g. police and the media.
- iii Introduce a 'memorandum of understanding' between East Sussex Fire & Rescue Service, other emergency services and the media regarding the role, boundaries and access to footage provided by the video technician.

### **RISK ASSESSMENT PROCESS –ALLOCATION AND INTERNAL VETTING**

Evidence has been found of an extensive programme of activity risk assessments being allocated to, and undertaken by, risk assessors trained in generic risk assessment. However, there is no formal evidence of consideration that risk assessors should possess relevant sector competence and underpinning knowledge in that activity.

It is unclear if the allocation of risk assessments required the risk assessor to consider matters in relevant national generic risk assessments (GRAs). It is unclear whether there was sufficient local availability of copies of the national GRAs.

Some, but not all, activities listed within the suite of national generic risk assessments had been allocated and subjected to local activity risk assessments

The Health and Safety Risk Assessment Manual Note states: '*specialist/complex risk assessments shall be completed by suitable competent persons and / or a team of appropriate stakeholders.*' There is no evidence to show that this was considered before allocating the risk assessment for 'incidents involving explosives' to a generic risk assessor.

Similarly there is no evidence to show that consideration was given to the competencies of the 'safety representative' and 'manager responsible' who are required to be consulted and countersign draft risk assessments.

A separate guidance note on the 'Risk Management Control Process' in the support pack issued at the risk assessor training workshops states: *'the competent risk assessor will work closely with an appropriate safety representative and where necessary seek assistance and advice from personnel with specialist knowledge.'* However, no examples are given as to the range of specialists available e.g. Hazardous Materials Environmental Protection Officer (HMEPO).

Generic 'risk groups' identified within risk assessments do not clearly state exactly which roles the assessments, and therefore the safety controls, will apply to.

The title(s) given to some risk assessments were ambiguous and so were not readily recognisable by all risk groups and their supervisors/line managers.

There is no formal recording facility on the risk assessment documentation to provide an audit trail of verification of the draft risk assessment by relevant specialists, where these have been consulted.

There is no facility on the RA1 risk assessment proforma to confirm whether the relevant national GRA has been adequately considered.

Evidence has been found of counter signatures from the health and safety team on draft risk assessments received at Service HQ. However, there is no formal recording facility on risk assessment documentation to provide an audit trail of verification and overview by the health and safety team, in particular to record that the risk assessment is considered 'suitable and sufficient'.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 43**

Review the Health and Safety Risk Assessment Manual and associated process, training and documentation, to:

- ensure that suitable risk assessments are issued to trained generic risk assessors and appropriate guidance is available
- ensure that risk assessments of specialist activities are assessed by sector competent risk

assessors and/or relevant specialists are consulted

- ensure that local risk assessments take into account the outcomes of the national generic risk assessments
- ensure that the local risk assessments take full account of the identified training needs and supervisory requirements, for that type of operational incident.
- review the RA1 and RA2 proformas to provide a facility for recording the consultation with specialists
- review the RA1 and RA2 proformas to provide a facility for recording verification as 'suitable and sufficient' by the health and safety section
- review the process for notifying training needs to the Learning & Development department for inclusion into training plans
- review the process for communicating the outcomes of risk assessments to risk groups and their supervisors/managers and other relevant persons
- ensure that auditable records of the above communications are available

#### **Review of Risk Assessment Following Safety Event**

There is evidence of a formal investigation and follow-up actions relating to a safety event involving Brian Wembridge in June 2006. However, there is no evidence that this event caused a review of the suitability and sufficiency of relevant activity risk assessments and the associated safety controls, e.g. working at height, PPE, and the supervision, control and monitoring of the Media Co-ordinator at incidents.

This event was recorded as an action point and subsequently signed off as 'complete' on the CPD action matrix for matters arising from incident debriefs, quality assurance monitoring at incidents and safety event investigations.

#### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 44**

Ensure that a review of the suitability and sufficiency of relevant risk assessments is undertaken as part of the investigation process following significant safety events.

## ORGANISATION: CONTROL

### TRADITION AND EXPERIENCE OF FIREWORKS IN EAST SUSSEX:

#### Failure to Recognise Fireworks as Hazardous Substances - HSG 48

There are many bonfire societies in East Sussex and each year they become involved in processions through town centres and local villages.

The processions often culminate in bonfire and firework displays, which attract large numbers of people. Large tableaux or effigies containing pyrotechnics are constructed in advance and paraded through the streets before being activated at fire display sites.



Fireworks being let off as part of the bonfire night parades through the streets of Lewes

Despite repeated attempts of public safety enforcement by Sussex Police and the organisers of these events, there are recorded incidents of fireworks being thrown by both those involved in the processions and spectators. Incidents of this nature are treated as public order offences by Sussex Police. There is evidence of similar incidents during the build up to, and during, the bonfire season. In the period surrounding these events the Service attends numerous secondary fire incidents relating to the unsafe use of firework materials.

Competition between different bonfire societies has led to a degree of secrecy regarding the storage of fireworks; as a result some bonfire societies have been known to store fireworks and bonfire display materials in private residential properties. The Service has attended serious fires at domestic properties where it has become known that the occupiers were storing a considerable quantity of fireworks. Some of these incidents have occurred outside the bonfire season.

Witness statements indicate that previous exposure to large-scale public firework events caused

the risk perception of firefighters to be lowered with regard to fireworks. These public events take place in open air. There is limited local experience of the effects of fireworks when involved in fire within confined spaces.

In his book *“Fireworks Principles and Practice 2006”* the Rev. Ronald Lancaster warns of the danger of firefighters witnessing single roman candle type activations (HD 1.3) previously and treating other explosives with the same Hazard Division *‘Completely inappropriately and be severely injured or killed as a result’*.

It is possible that the risk perception of firefighters who attended this incident was influenced by the activation of a large number of fireworks in the smoke plume, mimicking that of a large firework display. For this reason, some firefighters may not have fully recognised the hazard and risk arising from the bulk storage of commercial fireworks, and not recognised that fireworks are explosives.

This was reflected in the sentencing judgement, where His Honourable Justice Cooke made the following comments: *‘the vast majority of them (the firefighters) did not regard fireworks as explosives capable of causing a large explosion. They thought only of individual fireworks detonating and causing the sort of explosions that fireworks ordinarily cause when fired.’*

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 45**

Review the training provision for all types of hazardous materials incidents, including those involving acetylene and/or explosives, to ensure that:

- Incident Commanders are aware of operational procedures and control measures to be adopted, and the availability and content of relevant aide memoirs
- the associated training packages/presentations are in accordance with current procedures
- ensure that all operational personnel receive periodic training and assessment in procedures for all types of hazardous materials incidents, and this is recorded in an auditable format
- training scenarios should require Incident Commanders to practice applying the relevant procedures and safety controls, and this is recorded in an auditable format

### **Commentary**

There have been a number of research projects looking at the way Commanders make decisions on the fireground. These are detailed in Appendix 3 of the Fire Service Manual *“Volume 2*



*Incident Command*". One of these processes is recognition primed decision making (RPD). Research has found that Fireground Commanders assessed and classified the situation before them. Once they recognised, *based on previous experience*, that they were dealing with a particular type of incident, it would then be tackled in the same way as previous incidents of that type.

### **POST INCIDENT RECORD OF ATTENDANCE**

Whilst the Service has procedures for carrying out a roll call at an incident, it does not have a policy for recording who attended an incident. Accounting for Service personnel who attend an incident may prove important in the event of there being a requirement for health screening or a subsequent need to interview personnel.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 46**

Consider a suitable process to record the names of all persons who attended an incident, to facilitate post incident follow up, in the event of personnel being required to give witness evidence or for health screening purposes.

## **ORGANISATION: CO-OPERATION**

No Identified issues

## **ORGANISATION: COMMUNICATION**

### **PROCESS FOR SHARING INTELLIGENCE REGARDING INCIDENTS INVOLVING BULK STORAGE OF FIREWORKS**

There have been a number of serious incidents involving the storage of fireworks - both in the UK and worldwide - notably at Enschede in the Netherlands on 13 May 2000; Carmel, Australia on 6 March 2002; and Kolding, Denmark on 3 November 2004. Both the Enschede and Kolding explosions resulted in firefighter fatalities.

Within the UK there have been major fires involving bulk firework storage, notably at Uffculme, Devon on 7 November 1998, which resulted in a series of explosions. At Firework Magic, Clevedon, Somerset on 17 October 2006, bulk storage containers of fireworks exploded, injuring members of the public.

These incidents have been referred to in both the national press and industry related publications. No evidence has been found to show that the relevant findings and any lessons learnt were formally brought to the attention of the UK Fire and Rescue service in order that the any necessary changes to operational procedures could be made. There is some evidence that the findings of the investigations were used to drive further research and subsequent changes to classification schemes etc.

In approximately 2002, the Health & Safety Laboratory was commissioned by the Health & Safety Executive to carry out research into the effects of external fires on the bulk storage of fireworks stored in steel ISO containers. The findings of this research appear to have only been published in firework related media. No evidence has been found to show that the research findings, including issues for the fire service, were brought to the attention of the relevant fire authorities.

These findings were however, used as part of the CHAF project and led to changes as contained within the Manufacturing and Storage of Explosives Regulations.

The EU funded a project on the effects of confinement on bulk storage of fireworks in ISO containers involved in fire. This project was known as 'Quantification and Control of the Hazards Associated with the Transport and Bulk Storage of Fireworks' (CHAF). The UK Health & Safety Laboratory was a partner authority in the project. The findings of the research were published on a dedicated web site: [www.chaf.info](http://www.chaf.info).

The provisional results of this research indicated that bulk storage of fireworks with a high degree of confinement, e.g. in full ISO containers, can result in the fireworks behaving in a similar fashion to fireworks of a higher UN classification. For example, a mass detonation occurred as a result of a fire in a container fully loaded with fireworks of UN class 1.3.

#### **Commentary**

Relevant UN explosive classes are:

- 1.1 Substances with a mass explosion hazard;
- 1.2 Substances which present a projection hazard but no mass explosion hazard;
- 1.3 Substances which present both a fire hazard and a minor blast or projection hazard (or both) but not a mass explosion hazard.

The results of these tests were also announced at the Ninth International Symposium on Fireworks, held in Berlin in April 2006. A number of the presenters were from the UK. During the

course of the recent criminal trial, one of the points raised by the prosecution was that both Martin and Nathan Winter had attended this symposium and should have been aware of the risks presents by the storage of fireworks in ISO containers.

There is evidence that a number of individual fire officers from individual Services (not East Sussex) were aware of the CHAF project and witnessed some of the experiments. There is no evidence that this information was brought to the attention of the Fire and Rescue Service in the UK more widely.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 47**

Raise with the Health and Safety Commission (HSC), Chief Fire and Rescue Advisors Unit (CFRAU) and Chief Fire Officers Association (CFOA) on the absence of a national system to disseminate risk critical information and guidance.

### **Interface Between Fire & Rescue Service and Other Enforcement Agencies Pre-Incident**

In August 1993, a licence under the Explosives Act 1875 was granted to Sussex Fireworks & Displays, Marlie Farm by the Health & Safety Executive; Licence No 00632. No records exist to indicate that East Sussex Fire & Rescue Service was made aware of this licence or notified of the existence of the site at this time. The licence was granted for two ISO storage containers in an earth bund.

The licence for the storage of explosives at the Marlie Farm site was amended following an assent hearing in September 2002. The minutes of that assent hearing record no comments received from the Fire Service. A check of Service records has revealed no evidence that the Service was consulted. No evidence has been provided from the licensing authorities to indicate that (the then) East Sussex Fire Brigade was notified. Under the (then) assent process there was no statutory requirement to consult with the fire and rescue service.

Under the explosives regulations, buildings licensed for the storage of explosives do not require building regulations approval. Magazine E at Marlie Farm was a large single storey building licensed for the storage of explosives, and as such was not covered under the fire and rescue service/building control consultation process. Therefore, the fire and rescue service did not have the opportunity to comment on any general fire precautions matters, nor was it able to enforce the East Sussex Act, 1985 regarding access for the fire service.

Under the previous explosives legislation, local authorities and metropolitan fire authorities were responsible for the licensing of registered explosives stores. When the 'Manufacturing and Storage of Explosives Regulations 2005' came into force, there was a requirement in the legislation for all Fire and Rescue Authorities (which all Fire Services had become under the Fire & Rescue Services Act 2003) to be responsible for the licensing of registered stores not enforced by the Health & Safety Executive (HSE). This was an error in the regulations, meaning that the Local Authorities, including East Sussex County Council, licensed registered explosives stores - including the store at Marlie Farm (shop) - despite the legislation not allowing it. The legislation was subsequently amended after 3 December 2006 to allow metropolitan fire authorities to continue at this level of licensing and enforcement, however in non-metropolitan authorities this duty passed to Local Authority Trading Standards departments.

In October 2006, East Sussex County Council Trading Standards department issued a licence to Sussex Fireworks & Displays Ltd on the Marlie Farm site and the HSE, following their inspection and identification of a number of issues amended the explosives licence for Festival Fireworks, reducing the quantity of explosives that could be stored due to safety concerns.

Under the requirements of Article 42 of the Regulatory Reform (Fire Safety) Order 2005, both licensing authorities were required to consult with the fire and rescue service, but neither did so. However, the Order, had only come into force from the beginning of October 2006 and the relevant protocols were still in the process of being implemented.

There is no legal requirement for the fire and rescue service to take part in joint inspections, and as such East Sussex Fire & Rescue Service did not take part in, or have knowledge of, the inspection of the site carried out by the licensing authorities in October 2006.

Under the Regulatory Reform (Fire Safety) Order 2005, the Fire and Rescue Service has responsibility for enforcing general fire precautions on all licensed explosives sites. East Sussex Fire and Rescue service was not notified of the outcome of the HSE site inspection. However, the Order had only come into force from the beginning of October 2006 and the relevant protocols were still in the process of being implemented.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

### **Recommendation 48**

Seek a change to the Manufacturing and Storage of Explosives Regulations 2005, to:

- i) include a statutory requirement for all category 1 responders under the Civil Contingencies Act 2004 to be formally notified of an assent hearing and to receive formal notification of any newly registered or licensed explosive site from the Local Authority. This should include the hazard type and quantity.
- ii) include a statutory requirement for the local fire and rescue service to be notified of shipments/imports of fireworks/explosives received for bulk storage in their area.

## **LIAISON BETWEEN EMERGENCY SERVICES**

Requests for the establishment of safety cordons at the Marlie Farm incident are recorded on other emergency services' incident logs. The police log recorded that a cordon distance of 300 metres was requested early in the incident, timed on the Police log at 14:05 hours. This was information received by a Police Officer on scene from one of the site's responsible persons. There is no evidence to indicate that this cordon requirement was communicated to the East Sussex Fire & Rescue Service Incident Commander.

The Incident Commander has stated that despite a formal request to the Police to evacuate the area, the continued presence of members of the public entering and re-entering the risk area necessitated him, whilst not formally declaring it a 'persons reported' incident, to deploy Fire and Rescue Service resources to protect saveable life and therefore, he adopted an offensive tactical mode.

The Level 2 Incident Commander requested that the Police instigate a 600-metre cordon at some time before the main explosion. However, the Police reported that they were unable to action this request due to insufficient resources. This request was not made to the Police On-scene Incident Commander as he has stated that he did not liaise with the Police.

There is no reference to a request for a 600-metre cordon from the Fire & Rescue Service on the Police log, but the log does show at 14.35 that the question of an evacuation of the Wok Inn is raised '*as it is within the 600-metre cordon*'.

According to the Sussex Police log, the strategy for the incident timed at 14:00 hrs included an "early assessment of need for evacuation and cordons", the B2192 road, which goes past the entrance to Marlie Farm, was closed in the vicinity of the site to all non-emergency vehicles.

Of the two main responsible persons on site, Martin was warned about being arrested and Nathan

Winter was arrested and de-arrested. On being de-arrested, Nathan Winter was taken to the Wok Inn and told that if he went onto the site again he would be arrested. This all occurred during the incident prior to the explosion.

There is no indication that the fact that the site personnel had been arrested or that their location, away from police and fire control points, was communicated to the Fire & Rescue Service.

All the emergency services set up command points: The Fire & Rescue Service initial command point was the Lewes Appliance within the site, later the Incident Command Unit arrived and started to set up out on the main road, approximately halfway between the Wok Inn and the entrance to the site. The Police strategy for the incident, timed at 14:00, included 'control vehicle to be identified' and 'Fire Liaison Officer identified to ESFRS'. It is believed the Sussex Police used one of their cars at the entrance to the site as their command point, but this was not communicated to East Sussex Fire and Rescue Service, nor was a Fire Liaison Officer identified.

See previous recommendations 3 & 33

### **Effectiveness of Process for Communicating Findings of Risk Assessments to Significant Risk Groups and their Supervisors**

The Risk Assessment Manual Note current at the time of the incident gave guidance on the management control process, but did not specify how the outcomes and safety controls required in risk assessments would be communicated to relevant risk groups, their supervisors and/or line managers. The Head of Health and Safety has stated that the principal means of communicating the existence of new risk assessments was via notification to relevant committees and via their publication on the risk assessment database on the intranet. He went on to state that personnel were expected to read this.

No evidence has been found that Brian Wembridge's line manager was consulted regarding the risk assessment for non-operational personnel attending incidents, or was made aware of the findings of these risk assessments.

See previous recommendation 43

## **Equipment Risk Assessment for Firefighting PPE**

A generic risk assessment is available from the pre-contract phase of the SEPPEC firefighting PPE project. This states that: *'safe systems of work, operational procedures and incident command management must be available to ensure that the PPE is not used in situations that may compromise the wearer.'* There is no evidence of a specific East Sussex Fire & Rescue Service risk assessment determining the range of incidents and associated hazards and risks that the firefighting PPE was designed for, and conversely those types of incident the PPE was not designed to provide protection for, and should not be a primary safety control.

### **Commentary**

It is unclear what, if any, instruction was given to firefighters regarding a) the limitations of the PPE and b) types of incidents where it is not considered an adequate control measure, thereby requiring additional primary controls, such as hazard cordons.

Therefore firefighters may have mistakenly believed their PPE could provide protection for hazards encountered beyond general firefighting work.

## **ORGANISATION: COMPETENCE**

### **TRAINING**

#### **Incident Command**

Following the UK fire service migration to the integrated personal development system (IPDS), all East Sussex Fire & Rescue Service Incident Commanders in their substantive roles were deemed to be competent to command incidents at their level, and to command an escalating incident until the arrival of the appropriate level of Incident Commander.

#### Priority for Level 2 Courses – New Promotees

Following implementation of the Incident Command System, there was a Service requirement to formally validate all Incident Commanders with accredited assessments. From 2004/2005 all new promotees at Level 1 were required to demonstrate competence in Incident Command at Level 1, before undertaking temporary/substantive promotions to Crew Commander.

Existing Level 1 Incident Commanders were programmed for assessment by attendance on either an East Sussex Fire & Rescue Service, or Kent Fire & Rescue Service course.

All Level 2+ Commanders received non-assessable training in Incident Command and dynamic risk assessment during 2005.

All Level 2+ Incident Commanders were programmed for formal Incident Command training and assessment with Kent Fire & Rescue Service, with priority given to new appointees.

The Incident Command System training courses were validated and accredited by the Institute of Leadership and Management (ILM).

### **Station-Based Training Activity for Firefighters, Crew and Watch Commanders**

The ACTIVAT station-based training recording system was introduced by East Sussex Fire & Rescue Service in October 2005. Training records exist for all casualties and other key station-based personnel who attended prior to the main explosion. The training records for personnel who arrived at the incident after the main explosion have not been examined as part of this investigation.

The ACTIVAT system was supported with a Manual Note and a suite of tip sheets, available on the Service intranet. Records show that a programme of training for the introduction of the ACTIVAT recording system was delivered to each watch from May 2005.

Codes are available within ACTIVAT for activities relevant to this incident, including:

- Incident Command (Level 1),
- dynamic risk assessment,
- communications and radio procedures,
- branches and hose running/laying,
- main pumps from pressure/tank supply,
- portable pump from pressure/static supply,
- water carrier,
- Incident Command Unit.

ACTIVAT records for personnel, including the casualties, generally indicate that the targets have been met or exceeded across the range of relevant activity codes, including:

- Incident Command Level 1,
- dynamic risk assessment,
- water carrier operation,
- communications and radio procedures,
- pump operation,
- hose running / laying,



- branch operation.

Exceptions are noted later in the report, along with information regarding training on explosives.

The following tables show the training records in relation to the main activities undertaken by each of the initial crews at the Marlie Farm incident. This includes the firefighter casualties:

<b>Relevant ACTIVAT Training activities records Oct 2005 - Dec 2006 (target in brackets) # = Casualty</b>								
<b>Name &amp; Role</b>	<b>ICS Level 1 (2 yearly)</b>	<b>Dynamic Risk Assessment (2 yearly)</b>	<b>Hose running / laying (Quarterly)</b>	<b>Branch operation (Quarterly)</b>	<b>Main pumps from pressure tank/static supply (Quarterly)</b>	<b>Water Carrier (Quarterly)</b>	<b>Portable pump pressure / Static supply (Quarterly)</b>	<b>Comms &amp; Radio procedures (Quarterly)</b>
<b>E01 - Lewes</b>								
T/WC Wells	9	137	22	18	27			132
T/CC Ross #	5	140	23	18	42			143
Ff Salmon	8	151	24	18	39			148
Ff Watson	6	151	21	16	45			125
<b>E12 – Uckfield</b>								
T/CC Simpson	2	3	4	5	5	4		2
Ff Lazenby	2	1	5	7	10	6		2
Ff Thomson	3	1	5	8	12	5		3
Ff Portnell	3	3	6	8	10	6		4
Ff Pratt	3	1	6	7	9	5		2
<b>S12 – Uckfield</b>								
CC Ash	0	1	27	26		5	3	6
Ff Domm	0	1	27	28		5	4	27
<b>E03 – Barcombe</b>								
WC Austin	4	1	11	15	3		0	16
CC Lilley #	6	0	7	8	5		2	16
Ff Marler #	4	1	10	13	4		3	16

Ff Widgery #	4	1	8	6	6		1	9
Ff Coppard	3	1	10	11	3		0	10
Ff Julyan	4	1	9	10	6		0	11
<b>E04 &amp; Whiskey 04 – Brighton</b>								
(OiC of W04 only)								
T/CC Liszka	3	8	11	10	18			9
Ff Oakley-Ives	2	7	11	11	15			25
Ff Streeter	2	2	16	13	30			32
Ff Kelsey	3	3	15	11	25			28
CC Howell	8	28	10	14	23			63
<b>MC21 - Heathfield</b>								
WC Wicker #	1	2	1	1			0	2
FF Sweetman #	1	1	1	1			0	1
Ff Skeffington #	2	5	1	1			0	2
Ff Wark #	1	3	2	2			1	2
Ff Wood f#	2	3	2	2			0	2
Ff Wilton #	2	3	1	1			0	2
<p>SC Upton - A record is available from Heathfield Fire Station for SC Upton. This record is believed to relate to his previous RDS role and includes entries for DRA training on 20 February 2006 and for ICS Level 1, DRA, explosives and communications &amp; radio procedures training, all on 10 July 2006.</p>								

## **Course-based Training for Personnel**

East Sussex Fire & Rescue Service introduced the PS Enterprise human resource management system in the early 2000s. A training module was added circa 2003/04 to record course-based training for all personnel. Records of course-based training are available for all relevant personnel who attended the Marlie Farm incident.

Records available on PS Enterprise indicate that personnel in attendance at the incident before the main explosion had completed the following relevant training courses:

### Incident Command System – Level 1

33 of the 34 firefighters who attended the incident had received training in the Incident Command System.

All of the 13 Level 1 Crew and Watch Commanders (wholetime and retained duty system) in attendance had received Incident Command Level 1 training and except T/CC Ross all had been formally assessed as 'competent' at Level 1.

### Incident Command System - Level 2

All 7 Level 2 officers who attended the incident had received Incident Command Level 2 awareness training. Of these three Level 2 officers, including the Level 2 Incident Commander, had been formally assessed as competent at Level 2.

### MODAS Training

28 of the 34 firefighters had received training in the use of MODAS.

Except for WC Austin and CC Lilley, all Level 1 Crew and Watch Commanders had received training on the use of MODAS.

Except for GC Easey and SC Drinkwater, all Level 2 Officers had received MODAS awareness training.

### Dynamic Risk Assessment (DRA) Training

T/WC Wells and SC Upton (the Level 1 and Level 2 Incident Commanders), and two further Level 1 Crew Commanders, had received specific dynamic risk assessment (DRA) training in addition to that included in the Incident Command training and assessment programme.

Nine firefighters had attended specific DRA training in addition to that included in trainee and Incident Command training courses.

The Level 3 Incident Commander, AM Ashley, had attended a specific DRA training course.

#### Analytical Risk Assessment (ARA) Training

Six of the Level 2 officers had attended internal operational risk assessment training, including SC Meik, SC White, GC Cox and T/GC Easey. This allowed them to undertake the role of Incident Safety Officer and was additional to that received in Incident Command training and included the Service's analytical risk assessment process. SC Upton achieved this required competency as part of his Incident Command training and competency test Level 2.

#### Health and Safety Risk Assessor

GC Cox, T/GC Easey, SCs Upton, White, Drinkwater and Hobbs, six Crew and Watch Commanders (including WC Wicker and T/WC Wells) and six firefighters were trained health and safety risk assessors.

#### Institute of Occupational Safety and Health (IOSH) 'Working Safely' award

T/CC Simpson, Ffs Allen, Armstrong, Chart, Kelsey, Lazenby, Portnell, Pratt, Sadler and Streeter were trained and qualified to the IOSH Working Safely standard.

#### IOSH 'Managing Safely' Award

SC White, WC Wicker, CCs Howell, Hurst, Ross, Simpson, Harvey and Ffs Coppard, Holloway, Palmer, Sweetman and Watson were trained and qualified to the IOSH Managing Safely award standard.

#### NEBOSH General Certificate in Occupational Health and Safety

AC Ashley, GC Cox, T/GC Easey, SCs Upton, Meik, Drinkwater, White, Hobbs and Ff Parrott were trained and qualified to this standard.

#### **Training for New Firefighters**

New firefighters are subject to a firefighter induction programme before they commence operational duties. For wholtime firefighters this consists of a single integrated course before being posted onto station. For new retained duty system (RDS) firefighters there is an initial induction period on station, followed by an initial trainee course at the Service Training Centre that must be completed before being permitted to undertake operational duties. For all staff, a series

of further training modules are required to be completed over the first two years of service. These are acquired on an incremental basis as skills and experience develop.

### Syllabus for Trainee Firefighter Programmes

The basic syllabus for trainee firefighter programmes was provided by the Home Office during the 1970s. East Sussex Fire & Rescue Service has regularly reviewed the syllabus, developing the programme to give emphasis on health and safety, 'the safe person concept', and included new skill areas around tactical ventilation, compartment fires and special rescues, the appliances and equipment in use and the scenarios encountered at operational incidents, to reflect the requirements of modern roles.

Records from trainee firefighter courses completed in the mid-2000s confirm that the following elements relevant to this incident were included: pump operation, hose and branches, first aid, Incident Command system and emergency evacuations.

### Competence Following Induction

The competence of new firefighters, following completion of the initial trainee programme, was achieved through either: the completion of the nationally accredited NVQ Level 3 'Operations in the Community' award in the case of wholetime firefighters, or a two-year progress report book for RDS firefighters.

Wholetime firefighters who enrolled prior to the Level 3 award becoming mandatory, and not having passed the Leading Firefighters exam by 2004, had been subject to the traditional two-year probationary system and a qualified firefighter assessment carried out after four years service. In accordance with IPDS this ceased in 2004, at which time relevant existing firefighters were deemed 'competent' for pay purposes. The Level 3 award then became mandatory for new wholetime firefighters.

One wholetime firefighter in attendance at Marlie Farm was registered and working towards completion of the Level 3 award, and one RDS firefighter was subject to the two-year RDS progress report system. A report on file confirms satisfactory progress at 18 months service.

### **Commentary**

No wholetime recruits courses were run in 2005, which is why there is a discrepancy between the old scheme ending and the new scheme starting.

## **Assessment and Development Centres (ADC)**

Prior to 2004, wholetime firefighters seeking further advancement were required to gain the relevant statutory promotion examinations or an equivalent internal process for RDS firefighters.

East Sussex Fire & Rescue Service adopted the principles of the Integrated Personal Development System (IPDS) in 2004. Following the discontinuation of the statutory promotion examinations in 2004, the Service introduced the interim and full national assessment and development centre (ADC) toolkits.

Personnel were required to pass these assessment centres in order to be eligible for promotion. The Service subsequently added operational criteria to the process, including the requirement for an Incident Command assessment.

## **Continuous Development**

The Service provided a range of learning and development opportunities for personnel within their role and where appropriate to assist their further development.

Personnel from the Marlie Farm incident had attended the following internal and external core training programmes prior to the incident:

### Crew Commander Courses

All of the wholetime and RDS Level 1 Crew and Watch Commanders had attended either the internal 'Pre-Crew Commander' course or an external 'Crew Commander' course, except for T/CC Liszka who had passed the Leading Firefighters Exam and the Service's internal ADC for Crew Commanders.

All of the Level 2 officers had attended external Crew Commander or equivalent courses.

### Watch Commander Courses

All of the Level 2 officers, except for SC Upton had attended external Watch Commanders or Station Commanders, or equivalent, courses.

### Retained Duty System 'C' Module – Hazardous Materials Incidents

Both of the substantive RDS Watch Commanders in attendance (Austin and Wicker) had attended the Fire Service College Hazardous Materials module. Records indicate that this included input on explosives, albeit the courses will have pre-dated the Manufacture and Storage of Explosives Regulations 2005.

### Pre-Crew Commander Course (PCCC)

The internal Junior Officers' Introduction (JOI) and Retained Junior Officer (RJO) courses were replaced in the late 1990s with the introduction of a new programme for firefighters and M&CC operators, either newly promoted or eligible for temporary promotion to Crew Commander (formerly this role was known as the leading firefighter rank).

At that time, nominees would have been qualified to attend the course as a result of attaining either the statutory promotion exam for leading firefighters (wholetime) or the Service examination for leading firefighters (RDS). This examination process included theoretical knowledge and practical skills.

The programme included a range of role-related topics, including: leadership module, health & safety responsibilities, dynamic risk assessment, Incident Command familiarisation, 'VECTOR' simulations and table-top scenario-based exercises and fire safety.

This programme was intended to provide initial awareness and skills to undertake the role in the period prior to attending the relevant core modules at the Fire Service College.

The following staff attended one of these courses: CC's Simpson, Head, Lilley and Hobden.

### **Training for Specialist Officers, e.g. Water Officer**

At many rural fires, water resource management is key to ensuring the success of a tactical plan.

At Level 2+ incidents, the water resources sector, being a support function, is usually managed by the Command Support Officer. Whilst formal training and assessment in Command Support was part of the Incident Command training and assessment package outsourced to Kent Fire & Rescue Service, this training did not cover water management.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 49**

Review training in fireground management of water supplies, to include planning assumptions for the provision of water and likely water usage, pump operation, branch use, water relay and alternative water supplies.



## **Training Needs Identified by Risk Assessment**

A model process for the planning of training delivery was available on the intranet at the time of the Marlie Farm incident and this indicated that the conduit for new training matters, including those identified as '*organisational training need requests*', were to be forwarded to the Workforce Learning and Development Group for consideration and inclusion into the annual training plan. However this model does not indicate any explicit relationship between training requirements identified as control measures within risk assessments.

There is limited evidence of formal processes to communicate training issues identified as control measures in risk assessments to the learning and development department (L&D).

There is limited evidence of a process being followed to formally identify training needs, and for the delivery of training and assessment to risk groups and their supervisors.

Some risk assessments are ambiguous, e.g. they state under existing controls that '*training will be required*', but this is not being followed up with a risk assessment action plan (RA2), and therefore was not considered by the relevant committee, consequently it was unclear to those responsible that training was required.

## **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

### **Recommendation 50**

Review the process and controls for:

- the receipt of information and intelligence regarding new or changed health and safety legislation/regulations into the Service
- how such information and intelligence is evaluated and agreed actions are recorded in an auditable format
- ensuring the implications and agreed actions are promptly communicated to stakeholders
- ensuring effective processes are in place for the prompt exchanges of information to/from all Directorates and Corporate Management Team.
- ensuring that communication of matters relating to new or changed health and safety legislation/regulations to all stakeholders is recorded in an auditable format
- ensuring that the responsibilities of Directorates, managers and others in this process are clearly stated

And previous recommendations 15, 30 & 45

### **Shortfalls in the Achievement of Targets for Station-Based Continuation Training**

The 'ACTIVAT' recording system was introduced in October 2005. Records show that a watch-based familiarisation programme took place across the Service prior to the go-live period. The system provides a range of operational activity headings and minimum target frequencies to be achieved by individuals. The system only applies to station-based personnel at Firefighter, Crew and Watch Commander levels.

#### **Commentary**

As ACTIVAT is only used by watch based personnel, it has not been possible to ascertain what training the Station Managers and above (including the command team) had undertaken.

Several targets have monthly or quarterly minimum frequencies. Others are yearly or two-yearly. However no evidence has been found to confirm that the priorities are based on a formal analysis of risk, i.e. with a higher priority given to higher risk activities.

The following shortfalls were noted against the relevant targets for station-based training in the records available on ACTIVAT:

- Portable pumps (quarterly minimum target) – only one member of the Heathfield crew (E21) had a record of having attained a quarterly training target during the period October 2005 to December 2006.
- No record of 'explosives' training during the review period for the crews of E03, S12 and one crew member from E04, although it should be noted that this is a 2-yearly target and ACTIVAT had been in use for less than two years at the time of the incident.
- No record of Incident Command Level 1 training for the crew members of the Incident Command Unit although it should be noted that this is a 2-yearly target and ACTIVAT had been in use for less than two years.
- No record of ICU 'equipment technical knowledge' training (quarterly minimum target) for the crew members of the Incident Command Unit.

#### **Commentary**

Some minimum target frequencies specified in ACTIVAT (including for 'explosives') are on a 2-yearly frequency. At the time of the incident only 13 months of the training cycle had passed since the system went 'live'. Therefore the minimum number of training frequencies may not have been achieved. However it is understood that local supervisors and managers had discretion to increase these frequencies to meet individual or Service needs.

Although activity codes exist, it is unclear from records what actual training was required to be provided for activities such as 'Incident Command Level 1' and for 'incidents involving explosives'.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 51**

Review ACTIVAT records across the Service to ensure that any slippage in the completion of targets are recovered.

#### **Recommendation 52**

Review the action plan from the internal business assurance review of ACTIVAT to ensure that the required outcomes have been delivered.

#### **Recommendation 53**

Review arrangements for the planning and recording of continuation training and the workplace assessments for personnel not covered by ACTIVAT.

### **Portable Pump Operator Training**

No evidence has been found of suitable guidance as to the minimum content to be covered in the activities covered by ACTIVAT. For example, what minimum performance and range of tasks would be expected to maintain operator proficiency in the priming of an 'Otter' portable pump when working from an open water supply using multiple lengths of hard-suction hose.

Additionally, it is unclear if this included the benefits of allowing the suction hose to part-fill with water in order to reduce the manual priming requirement on Otter portable pumps.

Opportunities for continuation training in priming pumps from open water sources had been substantially reduced when the use of underground water dams at fire stations ceased in the late 1990s due to the health and welfare concerns surrounding the potential growth of micro-organisms in static water.

Following this, station-based training targets continued to be required for portable pumps used from static supplies.

Evidence from witnesses, and minutes of meetings, indicates that stations have made use of local open water venues for pump training to replace the training facility previously provided through station static tanks.

Item 127/05 entitled 'Open water pump operation training' in the minutes of the Community Protection Directorate (CPD) Management Team (DMT) meeting on 9 January 2006 reported that: 'Station Managers had been asked to provide information about the skill levels, the training venues used and any risk assessments of open water supplies. They had reported that some training is done at outside venues, few of which had been risk assessed. It was felt there had been a skills decay since the removal of the open water facility on stations.' The minute also stated: 'some outside venues have low water levels that are unsuitable for suction hose training.' The minute indicated that CPD would seek the modification of a limited number of existing dams at fire stations.

Minutes of the CPD DMT meeting in March 2006 stated that this matter would be taken forward by the CPD representative to the Workforce Development Group (WDG). However the subsequent minutes of the WDG do not refer to this issue being raised at meetings prior to this incident.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 54**

Review the adequacy of initial and continuation operator training arrangements for the light portable pump, including emphasis on the procedure for manually priming the pump from open water.

As part of this review, considers the availability of practical training facilities to ensure that operators are able to maintain pump operator skills, including the priming of pumps from open water, and ensure that suitable written instructions and information is available with light portable pumps

#### **Training Packages/Presentations to Support Continuation Training at Station Level**

Records show that a range of training packages, presentations and training manuals (national and local) had been issued to stations in video and DVD format. Video and other presentation equipment had been provided to deliver these. Stations had also been provided with access to electronic presentations via the intranet.

However no explicit links can be found between ACTIVAT to relevant training packages and supporting guidance documents, nor any indication that these were elements of the required activity. The majority of training packages available on the intranet relate to those used in programmes at the Service Training Centre. Some were provided from a collaborative

arrangement with other fire and rescue services. One of the packages was for 'incidents involving explosives.'

No evidence has been found that these packages had been mapped across to meet the current knowledge requirements of continuation training for relevant operational roles, or had been reviewed on the introduction of ACTIVAT in 2005.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 55**

Review the arrangements for the planning and recording of training delivered through presentations available on the intranet and via videos/DVDs issued to workplaces. To include

- the training requirements for station based and other staff groups, including where these are mandatory elements of initial and/or continuation training and assessment in the workplace
- a published inventory of all such materials
- links to related bibliographies
- a process for periodic review of these materials against the requirements of relevant roles
- ensure these comply with current standards, bibliographies, policies and procedures

#### **Operational Activities not Covered by ACTIVAT**

No explicit activity code or frequency target is listed for other activities relevant to this incident and therefore it is not possible to ascertain if these areas were being covered routinely during on-station training, e.g. firefighting PPE, acetylene, ground monitors, types of fireground radios, emergency evacuations, operating a Command Support point, the Incident Command Unit's role within the Incident Command System and inner cordons.

It is unclear whether these activities are included within other activity codes.

The absence of a specific activity code for 'acetylene' means no records are available to confirm that continuation training had been received by the personnel from Echo 03 tasked with extinguishing the fire in Builders Beams, where it was believed acetylene cylinders were present.

Multiple entries for activities recorded as having taken place on the same date indicate that combined training sessions or scenarios were being conducted across several activities.

The planning facility within ACTIVAT allows for some local customisation of activities, however

the codes cannot be removed or minimum frequencies reduced.

The ACTIVAT records do not indicate what role the individual actually took within the activity/training session or whether these reflect participation as a crew member.

There is no guidance available to define the minimum performance requirement to be achieved by individuals in these training sessions and what, if any, underpinning knowledge should be assessed regarding the individual's understanding of technical and procedural matters.

ACTIVAT is not intended to record formal assessment of an individual's competence against prescribed performance standards.

ACTIVAT does not record whether the training was observed and/or assessed by an accredited workplace assessor and/or judged against prescribed performance standards.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 56**

Review the ACTIVAT continuation training system to ensure that targets are prioritised according to an assessment of risk and an analysis of the requirements for each role. To include those areas not explicitly covered at present, i.e. correct use of PPE, incidents involving acetylene, emergency evacuations, pumping from open water, monitors, types of fireground radios, operating Command Support point, the ICU's role within ICS and inner cordons.

### **Excess Entries and/or Deficiencies Against ACTIVAT Targets**

Records indicate that the volume of entries for some activities are significantly in excess of the prescribed target frequency and other targets are deficient or have no activity recorded. For example, a quarterly activity had 26 entries in one quarter for one person. Another activity requiring a minimum of a two-yearly target has more than 150 entries within a thirteen month period for one person. This appears to be particularly prevalent in the records for personnel from E01.

A number of entries on individual records across several stations were found to be duplicates, thereby contributing to excess activity totals for the period and giving an inaccurate picture of training history. It is unclear if this is a technical issue with the ACTIVAT system or due to duplicate entries being made. However, this does not account for all of the excess entries against some codes.

Some training activities have no record of activity for the period under review. Excess activity in other activity areas may have been at the expense of these training targets.

The Manual Note allows targets for individuals to be increased to meet training needs, subject to approval by local line management. If this is actioned, a comment should be inserted into the relevant record explaining why this has been necessary.

An enquiry of the ACTIVAT database held by the Information Management section at Service HQ has identified that: *'The system currently holds 1.3 million attendances at some 27,460 training sessions from late 2004 to date (June 2009). A short check reveals that no adjustment of target for individuals has been recorded.'*

#### **Commentary**

The frequency and number of excess entries for some individuals indicates that activities are potentially being included irrespective of the detail of that training, or unnecessary training has taken place as the minimum training target has been achieved. There is no evidence to show that these excess activity levels reflect additional training needs agreed by supervisors/line managers.

This suggests that time and resources available for operational training was not being used effectively or prioritised to meet areas of need.

The presence of significant numbers of duplicate records appears to be a separate issue, which does not give an accurate picture of completed and outstanding training requirements for those individuals. It should be noted that this finding is based on a sample of key personnel from this incident and, therefore, it is possible that these issues may extend across other areas of the Service.

[See previous recommendations 51 & 52](#)

#### **Recording of Operational Activity as Training**

The Manual Note explicitly states that with the exception of driver training, operational activity is not to be included into the ACTIVAT training records. However the volume of entries for some individuals indicates that activity from operational incidents has been included by some, but not all, stations/watches.

### **Commentary**

This indicates an inconsistent level of understanding as to what is/is not acceptable to record as training activity.

The ACTIVAT system is a frequency-based system focused on the achievement of targets rather than an assessment of individual competence against agreed performance standards for that role and/or task.

It does not provide adequate evidence to verify that the employer's duty to ensure the competence of employees is being met.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 57**

Review the guidance to ACTIVAT users on:

- the performance requirements to be achieved before an individual can be signed off as competent
- planning of training
- resources and facilities required for each training activity
- what underpinning knowledge is required and how this will be assessed.
- availability of relevant bibliographies and training packages cross mapped to meet the required standard
- the recording of operational work as 'training'
- the recording of increased targets/frequencies when agreed by line management
- the need for monitoring and audit by local managers
- the provision of an annual report to Corporate Management Team (CMT) by the Head of Learning & Development.

### **Exceptions in Records of Training for Specialist Appliances and Operational Equipment**

Comprehensive records exist for training on most new appliances and equipment, especially where these are managed and recorded as formal training events. However, records are not available on PS Enterprise (PSE) to verify whether new operators for either the water carrier or the Incident Command Unit had received initial training (except for driver training). Similar exceptions appear to exist for the initial training on the ICOM fireground radio.

Local awareness training carried out on special appliances and equipment at station level, for



example when personnel are newly appointed to a different station, does not fall within the scope of ACTIVAT and does not always appear to have been managed as formal training events recorded on PSE. Therefore, no central records appear to exist and it is not possible to confirm when new operators and/or supervisors were deemed competent.

In addition there is a lack of clarity as to the requirement for personnel on appointment or transfer (including on a temporary basis) to receive familiarisation training on special appliances and equipment based at their new work location. This includes Crew, Watch and Station Managers, who may need to supervise the safe and effective deployment of such equipment at incidents and in training.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 58**

Review arrangements for the management and recording of local training events such as familiarisation on new appliances and equipment, including for personnel on appointment to a new workplace and to include temporary appointments.

#### **Recommendation 59**

Provide a Learning & Development policy to enable individuals, teams and their managers to identify, plan and review their developmental needs, stating:

- the specific development programmes required and timescales for these to be completed in order to achieve competence within each role
- programmes required for continuous development, including into other roles
- those programmes/requirements that are mandatory in order to meet the safety critical needs of each role
- which programmes will take priority in the Service's Learning & Development plans
- arrangements for the planning and recording of these programmes
- the recording of competence at all stages within a role, in an auditable format

### **Exceptions in Records of Significant Employment Milestones**

Exceptions were found in the central recording of some significant employment milestones, for example when RDS firefighters completed their initial development phase and the associated progress book was signed off as complete. Hard copy evidence, such as periodic probation reports, are available on many personal record files, however, in many cases these are incomplete, including dates for when initial probationary/development periods should have been

completed.

Exceptions have been found for events occurring before and after the introduction of PS Enterprise (PSE).

These exceptions partly appear to reflect the various methodologies used by the Service over the last 35 years, i.e. wholetime and retained duty system probationary booklets, NVQ awards, and the now discontinued qualified Firefighter tests. Some were managed within Directorates or at more local level (e.g. practical assessments) and not regarded as formal training events.

Therefore, these were not always formally reported to Learning and Development or the Human Resources departments, for addition to their central records. As a result the AI team has not been able to verify when all firefighters at the incident were deemed competent.

The Service has a duty as an employer to evidence that it has established the competence of its employees. This will also aid future audit trails and accident investigations.

### **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 60**

Review arrangements for the management and recording of key employment milestones to ensure the Service can readily evidence and audit the competence of all employees at each stage and retain this in accordance with regulatory requirements.

#### **Recommendation 61**

Undertake a gap analysis to ensure that exceptions in the completion of course based training events, including core external and internal programmes such as MODAS, dynamic risk assessment, analytical risk assessment, Incident Command, first aid/oxygen therapy and IOSH courses are provided for all relevant roles.

### **Shortfalls in Records for Course-Based Training**

Records of course-based training are available on the electronic PS Enterprise system for all relevant personnel. Evidence has been found of a range of basic and specialist training delivered through courses and other formal events for most personnel. However there are some specific variations and exceptions:

### Incident Command System

No record has been found of formal Incident Command awareness training for the firefighters attending the incident from Herstmonceux (E24), who were allocated the Command Support role when mobilised to the incident.

See previous recommendations 24

### Training of Hazardous Materials Environmental Protection Officers (HMEPOs)

None of the Level 2 officers attending the incident before the main explosion were trained HMEPOs. The Service has trained a number of officers, but this is not a requirement of all Level 2 officers. There were no qualified HMEPOs on duty on 3 December 2006.

The minutes of Community Protection Directorate (CPD) DMT May 2006 report that six places had been booked on HMEPO training courses. Records show that four new HMEPOs were trained in the period from September 2005 to November 2006 and two further places were allocated on HMEPO courses for the balance of the 2006/07 training year.

The Level 3 Officer mobilised on the 'make pumps 8' was a trained hazardous materials officer in his previous roles, but as an Area Commander he was no longer a designated HMEPO and not required to maintain competence. Therefore his qualification was no longer considered current.

## **Evidence of Training Exercises at Risk Premises**

### Annual Exercise Schedule

The Training Delivery Manager published an annual exercise schedule for 2006/07 on the Service intranet. This specified the number and scale of exercises to be undertaken across the Service, but not the premises. Responsibility for planning and implementation primarily rested with local stations.

Limited evidence of exercises taking place at known risk sites has been found.

### Station Action Plans

Station Action Plans (SAPs) include a range of local performance targets set against the corporate objectives of East Sussex Fire & Rescue Service. These include targets for personnel competency. The 2005/06 SAPs from a sample of relevant stations include specific targets for the production of local contingency plans, but not for conducting training exercises at local risk premises.

## **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

### **Recommendation 62**

Review the provision of inter-agency training, exercises and knowledge of the roles of category 1 and 2 responders.

### **Recommendation 63**

Implement a system of planning and recording visits and exercises at premises that have been considered under Section 7(2)(d) of the Fire & Rescue Services Act 2004. This should be in such a format so as to be easily interrogated for audit and monitoring purposes. In addition consideration should be given as to how long such records should be held.

### **Recommendation 64**

Review the frequency for exercises at 7(2)(d) sites and also the role of multi agency exercises at Contingency Plan sites in conjunction with the Local Resilience Forum.

## **Monitoring of the Exercise Schedule**

Centralised monitoring of the exercise schedule took place by the Community Protection Directorate (CPD). Item 09/06 in the minutes of the CPD Management Team meeting on 9 January 2006, reviewed the initial outcomes from a major exercise at SRM in Rye in December 2005 and also considered matters arising from the major incident at Buncefield, Hertfordshire.

See previous recommendation 63

## **Venues for Exercises - 2006**

The minutes of the CPD Management Team meeting on 9 January 2006 state that: *'the Deputy Chief Fire Officer (DCFO) had recently tasked CPD with arranging a number of exercises in this county'* and an action point stated that *'CT (C. Thomson - DO Intervention) to discuss with AW (Stn O A. White - Intervention) the possible vulnerable sites for such an exercise, which could be done quarterly in each area of the county and repeated several times.'* The minutes also record a discussion as to potential exercise venues, including the Royal Pavilion and the Brighton Centre, both in Brighton.

In May 2006 it was reported back that Eastbourne, Shoreham Harbour and the Brightling Mine had been identified as priority sites for exercises.

Minutes of meetings during the intervening period reported back on outcomes from major

exercises that had taken place at Newhaven Harbour and an exercise involving a tanker and additionally planning for participation in a regional exercise in West Sussex.

There appears to be little evidence of any link between the exercise venues and whether the premises had risk information under 7(2)(d) of the Fire and Rescue Services Act 2004.

See previous recommendations 63 & 64

### **Recording of Training at Exercises**

ACTIVAT includes activity codes and minimum frequencies for recording topography, water supplies and 1 (i)(d) (replaced by 7(2)(d) under more recent legislation) risk visits, but no specific facility for planning and recording training exercises at risk premises. The absence of an activity code target in ACTIVAT means no minimum target exists for that activity. The absence of an equivalent planning and recording system for non watch-based operational roles means there is no formal process for identifying how many training exercises Level 2+ officers should attend.

See previous recommendation 6337

### **Availability of Defined Learning and Development Requirements for Each Role**

A workforce development strategy was published in the Fire Authority Member's Handbook for 2005/06. The Head of Learning & Development has stated that when he entered the post in December 2005, he was informed by his Director that his department was working to this Strategy, which was supported by a workforce learning and development guidance Manual Note. Evidence has been found of previous training strategy documents providing definitive statements of Service training policy, the concise levels of responsibilities and the range of programmes to be completed for each role. However since the adoption of the IPDS framework, these documents have not been reviewed and their status is unclear.

Therefore no single current document was available concisely stating the specific development programmes and courses that are required to be completed to achieve a) competence within each role in East Sussex Fire & Rescue Service, and b) for further development, including into other roles. Therefore there is no definitive point of reference to assist individuals, teams and managers to evaluate and plan for their developmental needs.

It is unclear which programmes are mandatory requirements in order to meet the critical safety needs of each role and whether these should take priority in the Service's learning and development plans.

## **Recommendations**

It is recommended that East Sussex Fire & Rescue Service:

### **Recommendation 65**

Review the policy and process for managing non attendances on core and mandatory safety critical learning and development programmes in order to ensure attendance by those staff nominated to attend.

## **ISSUES REGARDING EXPLOSIVES ARISING DURING THE LEGAL PROCESS**

The following section of findings and recommendations deals with issues regarding explosives that arose during the trial of the Festival Fireworks (UK) and Martin & Nathan Winter, and is separate to the HSG 65 accident investigation process.

### **PROCEDURES FOR DEALING WITH EXPLOSIVES INCIDENTS**

#### **Central Guidance to UK Fire Services**

At the time of the Marlie Farm incident, the principal guidance on firefighting procedures for incidents involving explosives available to fire and rescue services was the Home Office 'Manual of Firemanship Part 6C Practical Firemanship – III 2<sup>nd</sup> edition', originally published in 1971, with the 10<sup>th</sup> Impression published in 2001. This impression included updated explosives guidance, but did not reflect the guidance contained in the Home Office Technical Bulletin on explosives (TB1/1992) and 'GRA 5.2 Incidents involving Explosives', published in 'A guide to operational risk assessment' in 1998.

Dear Chief Officer letter (DCOL) 4/89 Item A gave advice on the 'Classification and Labelling of Explosives Regulations', and gave interim operational guidance on incidents involving explosives, pending definitive guidance being issued in the form of a technical bulletin. This DCOL was published as a direct result of the Peterborough explosion on 22 March 1989, when one firefighter was killed and more than 100 persons injured as a result of a fire and subsequent explosion in a van carrying explosives.

The guidance in DCOL 4/89 was superseded by the issue of 'Technical Bulletin 1/1992 Explosives Guide' published in 1992.

The Home Office published 'A Guide to Operational Risk Assessment' in 1998. This document contained supporting guidance and a set of 35 generic risk assessments (GRAs). The guidance states this was intended to assist fire services with their own risk assessment strategy, but was not designed to be an alternative or substitute for it. GRAs were available for a range of activities, including GRA 5.2 'incidents involving explosives'. In paragraph 3.7 'Explosives Stores' it gives the following guidance: *'The pre-determined firefighting plan should be put into operation and advice obtained from site specialists. The protection of adjoining buildings stores and magazines should be given early consideration in view of the likely number of small fires which may occur following an explosion. Specific guidance on safe distances and suitable cover for firefighting personnel should be treated as a priority.'*

The 'List of Considerations for Incident Commanders at Explosive Incidents' included:

- Liaise with site management;
- Implement pre-determined firefighting plan;
- Consider protection of adjoining buildings stores and magazines;
- Minimum safe distance for personnel and public is 600 metres;
- Take advantage of protective mounds or barriers;
- Use minimum number of personnel in risk area.

'The Fire Service Risk Assessment Summary sheet' details two tasks, 'Fire-fighting with explosives involved in storage facilities' and 'Dealing with Explosives in Transit.'

### **East Sussex Fire & Rescue Service Risk Assessment for Explosives Incidents**

This National GRA was used to populate an East Sussex Fire & Rescue Service-specific risk assessment for Explosives incidents, which was completed on 22 August, 2005. No specific mention was made of any requirement to evacuate to 600 metres, but one of the control measures stated was the Operational Aide Memoir, which does include the guidance: '*If fire established and involves explosives or threatens to spread to them evacuate to a distance of 600m.*'

Both the national GRA and the local risk assessment refer to the use of PPE as a control measure.

### **Previous Incidents Involving Fireworks**

Several major explosions at premises with bulk firework storage have occurred worldwide, notably at Enschede in the Netherlands on 13 May 2000; Carmel, Australia on 6 March 2002; and Kolding, Denmark on 3 November 2004. Both the Enschede and Kolding explosions resulted in firefighter fatalities.

No further central government guidance was issued to UK fire and rescue services, on how to resolve incidents involving explosives or bulk storage of fireworks, as a result of the above incidents.

### **The Manufacture and Storage of Explosives Regulations 2005**

The 'Manufacture and Storage of Explosives Regulations' (MSER) came into force in April 2005. Along with the regulations, an 'Approved Code of Practice' (ACoP L139) was also produced.



Included in the ACoP is a list of persons and organisations that were involved in its production. At paragraph 3, the ACoP poses the question as to who the publication is for, which it states is: *'anyone involved in any of the activities described in paragraphs 1-3.'* No reference is made in paragraphs 1 – 3 of organisations dealing with fires, i.e. the Fire & Rescue Service. Yet the MSER provides Guidance to “fire services” at paragraph 221, including the guidance that: *'If there is any doubt about the nature or location of the explosives involved, the fire should not be fought and the fire service should withdraw to a safe distance. Fires that have spread to buildings or areas holding Hazard Type 1, 2 or 3 explosives must not be fought.'*

There is evidence that a number of individual fire officers from individual Services, primarily those involved in licensing explosive stores (not East Sussex) assisted in the drafting of the Regulations.

Other Officers produced guidance on fire protection matters with regard to the storage of fireworks in retail outlets. This was titled “Fire Precautions Workplace Regulations 1997 & Manufacture & Storage of Explosives Regulations 2005 Retail Storage of Fireworks, Fire Precautions Note” and was published by the Chief Fire Officers Association in September 2005.

This guidance makes no reference to the information regarding firefighting at Explosive sites.

East Sussex Fire & Rescue Service was aware of this fire protection note.

There is no evidence that those involved with the Manufacture & Storage of Explosives Regulations from the Fire Service had brought to the attention of the Fire and Rescue Service in the UK more widely, the guidance regarding firefighting at explosives sites, and the issues around Hazard Divisions and Hazard Types.

No further operational guidance was issued to fire and rescue services by the lead Government departments as a result of this change of legislation.

#### **Commentary**

During the Court case a number of Fire Service witnesses confirmed that they were not aware of the guidance contained within the MSER ACoP, which is unsurprising as the Fire Service nationally had received no notification or guidance.

In addition, during the court process a number of Fire Service witnesses confirmed that they had not seen a copy of the National GRA 5.7 on explosives. Although copies of the *'Guide to*

*Operational Risk Assessment'* would have been available on station, it is a document to be used to develop the Service's own risk assessment process. This is confirmed as the correct approach in paragraph 1.3.2 of Guide.

Regardless of this, without any updated guidance to Fire & Rescue Services in light of both the CHAF research and the changes brought about by the MSER, the GRA did not reflect the latest guidance.

### **Recommendation**

It is recommended that East Sussex Fire & Rescue Service:

#### **Recommendation 66**

Contribute to the review of the national generic risk assessments and Service activity risk assessments for incidents involving explosives and for incidents involving acetylene and other activities where there is a projectile hazard. Risk assessments for relevant activities should take into account the specification and limitations of PPE items. Other safety controls should be actively identified and implemented to prevent wearers being exposed to risk of projectiles.

### **Liaison with Occupiers**

Technical Bulletin 1/1992 requires fire service personnel to seek: *'guidance from those responsible at an explosives installation, whenever they are engaged in firefighting at such premises, in order to avoid being exposed to any unforeseen risk from the dangerous materials present.'*

MSER paragraph 228 states: *'Information on the buildings where explosives are present, and the explosives are involved, should be prepared in advance and be provided to the fire services in the event of a fire. Fire services should be contacted and may wish to undertake familiarisation visits to explosives sites. A competent person should be appointed to advise the fire service, in the event of an incident. On arrival the fire service should be told where the fire is located and the hazards involved.'*

Some confusion exists over what information was passed; during the trial both Nathan and Martin Winter alleged that they tried to pass information to the fire service.

On arrival WC Wells did speak to both Martin and Nathan Winter regarding what was involved and received conflicting information from the Winters. *"A young man (Nathan) explained what was in each unit to the best of his knowledge and was extremely concerned that we stop the fire spreading to a smaller metal container. He said to me (T/WC) Wells 'if it gets to that, run like*

*fuck'. He pointed to a large shipping type container which had smoke coming from it and a smaller one just before it."*

At this stage Martin Winter, who was with two police officers, said: *'that's not the problem its full of wood.'* At no stage was definitive information given as to the layout and storage within the site. The Command Support Officer did ask Martin Winter to draw a plan of the site on a board, but this was not clear.

Later Nathan Winter was approached and gave more information about the container; but again there is conflicting information as to whether this included reference to 1.2 fireworks or not, although he did later report the storage of 'loaf sized' fireworks. Whilst this was ongoing and before the main explosion, Martin Winter was warned by Sussex Police Officers at the scene, about being arrested because of his behaviour and Nathan Winter was arrested by Sussex Police Officers at the scene because of his behaviour. On being arrested, Nathan Winter was taken to the Wok Inn de-arrested and told that if he went onto the site again he would be arrested again. This all occurred during the incident prior to the explosion.

The Judge in his sentencing made reference to the fact that:

"The gross negligence established against you relates to... ..., including the failure to give the Fire Services proper information about the nature and Hazard Type of the fireworks on the site, the risks they posed and the places in which they were then located.

Martin Winter you failed to give full and accurate information to the fire officers as to what explosives and fireworks were located where and what the firemen therefore had to contend with in seeking to control the fire and to protect people and property. In particular, you did not tell the firemen that there were HT1 fireworks in the ISO container and elsewhere on site, or that there were fireworks there which were, to your knowledge, potentially liable to give rise to mass explosion and endanger life.

To the contrary, Martin Winter, you appeared to be have been about as obstructive and objectionable as it was possible to be and to have misled more than one fire officer by referring to the contents of the container in which the mass explosion later occurred, or Tube Store 1, or both, as "wood", when both contained fireworks and the container contained HT1 fireworks. You wanted them to fight the fire, when you knew that the risk of mass explosion meant that everyone should have evacuated the site and moved to a considerable distance away.

Whilst you, Nathan, told many officers that they did not want to be anywhere near the

container should fire reach it because of the risk of explosion, and told them of larger fireworks in it, even then you never told them what the real issue was. Whereas they were thinking of detonation of larger fireworks and hazards posed by individual fireworks igniting, the very thing they could see happening already all over the site, they were not thinking in terms of a mass explosion with the fatal consequences that such an explosion presented.

When asked what was in the container, you did not do the honest and straightforward thing of telling the fire officers that you had HT1 fireworks in it and that you knew there was a propensity for mass explosion... .. You were not prepared to admit that you had been acting in breach of the licence and you ran the risk that there would be no adverse consequences from not telling them the full position, however hard they made it for you to speak to them.”

## Training

With regards to training for incidents involving explosives, the following training records were noted.

### Continuation Training – Explosives

<b>Relevant ACTIVAT Records for key personnel</b> <b>Explosives Training activities recorded during Oct 2005 - Dec 2006</b> (Code & target in brackets) # = Casualty					
<b>E01 - Lewes</b>		<b>E12 - Uckfield</b>		<b>S12 - Uckfield</b>	
<b>Name &amp; Role</b>	<b>Explosives (HZ05 2 yearly)</b>	<b>Name &amp; Role</b>	<b>Explosives (HZ05 2 yearly)</b>	<b>Name &amp; Role</b>	<b>Explosives (HZ05 2 yearly)</b>
T/WC Wells,	7	T/CC Simpson	2	Ash CC	0
T/CC Ross #	9	Ff Lazenby	2	Dommm Ff	0
Ff Salmon	7	Ff Thomson	3		
Ff Watson	9	Ff Portnell	2		
		Ff Pratt	1		
<b>E03 - Barcombe</b>		<b>E04 &amp; Whiskey 04 – Brighton</b>		<b>MC21 - Heathfield</b>	
<b>Name &amp;Role</b>	<b>Explosives (HZ05 2 yearly)</b>	<b>Name &amp;Role</b>	<b>Explosives (HZ05 2 yearly)</b>	<b>Name &amp;Role</b>	<b>Explosives (HZ05 2 yearly)</b>
WC Austin	0	T/CC Liszka	1	Wc Wicker #	1
CC Lilley #	0	Ff Oakley-Ives	0	Ff Sweetman #	1
Ff Marler #	0	Ff Streeter	2	Ff Skeffington #	1
Ff Widgery #	0	Ff Kelsey	3	Ff Wark #	1
Ff Coppard .	0	CC Howell OIC W04	1	Ff Wood #	1
Ff Julyan	0			Ff Wilton #	1

It is noted that Lewes personnel (E01) recorded training for 'explosives' in November 2005, including on 5 November. However it is unclear from the ACTIVAT records what form this training took or whether this reflected the recording of operational work undertaken for the event itself.

### **Commentary**

Although the ACTIVAT system had only been in place for 13 months, the period did cover two annual bonfire celebration periods. The ACTIVAT target (code HZ05) for training on 'explosives' is 2-yearly. However it is reasonable to expect that the frequency of relevant station-based training may have been increased in order to meet local needs, such as familiarisation with relevant Service procedures and contingency plans, especially at stations providing operational cover for the large bonfire events.

### **External Courses - Wholetime**

End-of-course reports for relevant personnel completing the core courses attended at the Fire Service College indicate that training on explosives was part of the course syllabus for the following core courses:

#### Crew Commander Course

An end-of-course report for T/WC Wells from 1995 states the syllabus included:

- *Explosives*

An end-of-course report for SC Hobbs from 1996 states: '*Studies included ...*

*Explosives and transport of hazardous materials..'*

An end-of-course report for SC Upton from 2002 states that the syllabus included:

- *Explosives*

#### Experienced Junior Officer Course

The Fire Service College introduced this course to meet the needs of established junior officers.

The end-of-course report for CC Hurst from 1997 states that the course syllabus included:

- *Operational Command*
- *Hazardous materials*

#### Watch Commander Course (WCC)

Records show that SC Meik attended a WCC course in 1991. The end-of-course report indicates that the syllabus included '*operations*' but no further detail is on record.

A course note on 'explosives' is available from a WCC attended in 1994 (Robinson) and end-of-course report are available from WCC courses attended in 2000 (SC Hobbs), 2001 (SC Drinkwater).

Both the 1994 and 2001 explosives courses content appear to be based on the current Home Office Technical Bulletin, arising from the Peterborough incident.

Chapter 6 of the 1994 WCC course note gives operational considerations at transportation incidents and states that: *'the primary consideration at all incidents involving Division 1.1, 1.2, 1.3 and 1.5 explosives must be to evacuate the public to at least 600 metres.'*

A 2001 WCC course report (SC Drinkwater) outlines the syllabus and areas subject to assessment:

- *'Candidates undertake role of Incident Commander or Sector Commander at two simulated incidents subject to formal assessment. A range of 14 indicators and 48 sub criteria are assessed';*
- *'Technical knowledge';*  
*'Hazardous materials incidents assessed through a series of floor plan exercises simulating incidents, followed by a written assessment paper.'*

#### **Commentary**

Course records show that personnel had received training in relevant operational areas. However the level of detail within the end of course reports provided to East Sussex Fire & Rescue Service was generally insufficient to verify whether the student was formally assessed in a specific scenario involving explosives.

#### **External Courses - Retained**

##### RDS Leading Firefighter/Crew Commander Courses

These were a series of modules, i.e. 'A', 'B' and 'C' modules. Records show that both WC Wicker and WC Austin had completed the 'A' and 'C' modules.

##### RDS 'C' Module – Hazardous Materials

The end-of-course report for WC Austin states the course syllabus included:

- *Tactical exercises*
- *Explosives*

## **Other Explosives Training**

### Statutory Promotion and IFE Examinations Syllabus

Those Junior Officers and officers having previously passed the examinations prior to their withdrawal in 2004 (i.e. only two years before this incident) and from the relevant IFE examinations will have been required to study the fire service training manual and potentially been examined on explosives theory and procedures (pre MSER).

### Terrorist Related Explosive Incidents

There have been a number of terrorist-related incidents within East Sussex, most well known the bombing of the Conservative party at Brighton in 1984, the fatal car bombing of Ian Gow in 1990 and bicycle bombs in Brighton in 1994. In addition, there have been a number of improvised explosives incidents by other groups including animal rights group and an unknown group with regard to parking metres.

Brighton is regularly used as a venue to host Political Conferences and when the Government that is in power at the time comes to Brighton then additional security measures are put into place, including a requirement for all personnel to remind themselves of the Service's bomb procedures.

Following the terrorist attack in September 2001, additional training has been provided with regard to the terrorist threat. In 2005 information was received regarding the risk of Improvised Explosive Devices consisting of Peroxide (TAPT). In support of this, a DVD was produced warning of the dangers and the signs to look for. This was sent out under cover of a Memorandum from the then DO Intervention, to "Officers in Charge of Stations" and required "Please ensure all station personnel view this DVD/Video at the earliest opportunity. It must not be locked away but left available for all watches".

In March 2006, the Service was invited to send observers to Exercise Seastoot. This was a joint training day with the both Sussex Police and the military. The focus was on terrorist-related incidents and included a number of demonstrations.

The following personnel that attended the incident at Marlie farm on December 3 were nominated to attend Exercise Seastoot: WC Geoff Wicker, SM Pup Upton and SM Mark Hobbs.

With the exception of WC Geoff Wicker it has not been possible to verify if the other members of personnel actually attended.

**Commentary**

Although the above shows that training with regard to explosives in general is recorded as having taken place, none of the training would reflect the changes that came about with the introduction of the Manufacture and Storage of Explosives Regulations 2005 including: the introduction of Hazard Types; the effects that confinement could have on the Hazard Division; and the revised guidance that if there is any doubt about the nature or location of the explosives involved, the fire should not be fought and the fire service should withdraw to a safe distance. Fires that have spread to buildings or areas holding Hazard Type 1, 2 or 3 explosives

Despite evidence shown that personnel have recorded having received training, and evidence that officers attending various courses at the Fire Service College would also have received training with regard to explosives, whilst giving evidence at court, either orally or through statements, a number of personnel stated that they had not received any training and one officer stated he could not recall having ever had any training in his 28 years service.

**Commentary**

The investigation team has been unable to ascertain why records exist that training has been carried out, yet in court, personnel have said that they have not received any such training. A number of reasons have been considered, including:

- Personnel had forgotten that they had received the training, especially in the stressful environment of the court room;
- The possibility that the training never took place; this is unlikely, especially in the case of externally provided training;
- Personnel had not associated other training, such as dealing with terrorist incidents including improvised explosive devices as falling within the category of explosive incidents.

The legal process prevented the Service from giving personnel copies of their training records, or briefing them before they entered the courtroom. Many personnel did refer to the procedures for acetylene incidents, which present a similar explosion risk.



## **OTHER RECOMMENDATIONS**

### **Recommendation**

The following recommendations arise from issues identified in the main Accident Investigation Report and this report should be referenced to understand the background to the recommendations, however they have been included in the Significant Findings Report for wider information.

It is recommended that East Sussex Fire & Rescue Service:

### **Recommendation**

Give consideration to providing fireground radios to every operational appliance riding position and to Officers on an individual basis.

### **Recommendation**

Fit all flexible duty system officers' cars with main scheme radio sets, to enable them to receive all safety critical informative messages.

### **Recommendation**

Include Command Team attendance times as a performance indicator in the Incident Command System Manual note.

### **Recommendation**

Amend the 'Flexible Duty System' and 'Officer Attendance at Fires' Manual notes to include a statement that there should be sufficient Officers to enable two simultaneous Level 3 Command Teams to be deployed without specialist officers up to relief stage.

### **Recommendation**

Introduce an annual refresher training programme in dynamic risk assessment for all personnel attending incidents.

### **Recommendation**

Amend the 'Flexible Duty' and 'Officer Attendance at Incidents' Manual notes to reflect the skill sets required by each officer rota group, to include the number of fire investigation officers, HMEPOs and Construction Industry Training Board (CITB) trained officers.

### **Recommendation**

Review the ICS Manual note to include:

- guidance on how to avoid a 'command gap'

- provide criteria to assist Level 1 Incident Commanders with gathering risk information in order that they can carry out a suitable and sufficient dynamic risk assessment, before committing personnel to an incident.
- a formalised system for liaison with other agencies at operational incidents

### **Recommendation**

Review the Incident Command System to require that all Level 2+ Officers at an incident ensure that they have received a handover, assumed command of the incident and carried out a dynamic risk assessment before making command decisions, with the exception of safety critical decisions.

### **Recommendation**

Provide training to all Service Commanders on the advisability of committing to offensive firefighting actions without a secure water supply. Further training should also be given on tactics that can be adopted to prioritise and maximise the available water supply.

### **Recommendation**

Provide training to operational personnel on how to effectively manage incidents involving explosives and in particular bulk firework storage sites.

### **Recommendation**

Provide operational personnel with a programme of updates on how to operate the Incident Command System, reinforcing the need to declare the tactical mode at an early stage, including the definitions of offensive, defensive and transitional modes. Provide structured training to remind operational personnel of the difference between offensive actions for saveable life as opposed to saveable property.

### **Recommendation**

Provide training to operational personnel to enable them to carry out the role of water resources officer, commensurate with the level of the incident. This training should include:

- operational tactics to be adopted where water resources are scarce
- maximising flow from hydrants
- how to find open water resources in rural areas
- what assistance can be given by water undertakers to increase the flow
- use of firefighting media flow tables
- practical pump operation to maximise delivery against supply
- a formal system for pump operators to inform the Incident Commander/Command Support what delivery can be achieved with the water supply available.

**Recommendation**

Provide training and guidance for Incident Commanders on how to avoid conflict with aggressive or emotionally distressed members of the public. This training should include when to request that the police remove persons who are interfering with command decision making and/or creating difficulties for firefighting operations.

**Recommendation**

Ensure that a review of the suitability and sufficiency of relevant risk assessments is undertaken as part of the investigation process following significant safety events.

**Recommendation**

Verify if the duplicate entries found in ACTIVAT records at stations within the sample extends across the Service, and to take corrective action where necessary.

### Charges Regarding Incident

Count 1,

Martin Paul Winter is charged with manslaughter, in that on the 3rd day of December 2006 he unlawfully killed Geoffrey Wicker by gross negligence, in that

- (i) he owed Geoffrey Wicker a duty to take reasonable care in the storage and handling of fireworks at Marlie Farm, Ringmer, including fireworks that posed a mass explosion hazard;
- (ii) in breach of that duty of care he failed to take reasonable care to store and handle explosives:
  - (a) in accordance with the terms of the explosives licence for Marlie Farm,
  - (b) with appropriate measures to prevent fire or explosion, to prevent the spreading of fires and the communication of explosions from one location to another and to protect persons from the effects of fire or explosion;
- (iii) that breach of a duty amounted to gross negligence;
- (iv) that negligence was a substantial cause of the death of Geoffrey Wicker.

Count 2,

Nathan Paul Winter is charged with manslaughter, in that on the 3rd day of December 2006 he unlawfully killed Geoffrey Wicker by gross negligence, in that

- (i) he owed Geoffrey Wicker a duty to take reasonable care in the storage and handling of fireworks at Marlie Farm, Ringmer, including fireworks that posed a mass explosion hazard;
- (ii) in breach of that duty of care he failed to take reasonable care to store and handle explosives:
  - (a) in accordance with the terms of the explosives licence for Marlie Farm;
  - (b) with appropriate measures to prevent fire or explosion, to prevent the spreading of fires and the communication of explosions from one location to another and to protect persons from the effects of fire or explosion;
- (iii) that breach of a duty amounted to gross negligence;
- (iv) that negligence was a substantial cause of the death of Geoffrey Wicker.

Count 3,

Martin Paul Winter stands charged with manslaughter, in that on the 3rd day of December 2006, he unlawfully killed Brian Wembridge by gross negligence, in that

- (i) he owed Brian Wembridge a duty to take reasonable care in the storage and handling of fireworks at Marlie Farm, Ringmer, including fireworks that posed a mass explosion hazard;
- (ii) in breach of that duty of care he failed to take reasonable care to store and handle explosives:
  - (a) in accordance with the terms of the explosives licence for Marlie Farm;

(b) with appropriate measures to prevent fire or explosion, to prevent the spreading of fires and the communication of explosions from one location to another and to protect persons from the effects of fire or explosion;

(iii) that breach of a duty amounted to gross negligence;

(iv) that negligence was a substantial cause of the death of Brian Wembridge.

#### Count 4

Nathan Paul Winter stands charged with manslaughter, in that on the 3rd day of December 2006, he unlawfully killed Brian Wembridge by gross negligence, in that

(i) he owed Brian Wembridge a duty to take reasonable care in the storage and handling of fireworks at Marlie Farm, Ringmer, including fireworks that posed a mass explosion hazard;

(ii) in breach of that duty of care he failed to take reasonable care to store and handle explosives:

(a) in accordance with the terms of the explosives licence for Marlie Farm;

(b) with appropriate measures to prevent fire or explosion, to prevent the spreading of fires and the communication of explosions from one location to another and to protect persons from the effects of fire or explosion;

(iii) that breach of a duty amounted to gross negligence;

(iv) that negligence was a substantial cause of the death of Brian Wembridge

#### Count 5

Alpha Fireworks Limited stands charged with contravening a health and safety regulation, in that on the 3rd day of December 2006 did contravene a provision in a health and safety regulation, namely Regulation 10(1) of the Manufacture and Storage of Explosives Regulations 2005, in that it was a person who stored explosives not in compliance with the conditions of the explosives licence in respect of Marlie Farm.

#### Count 6

Alpha Fireworks Limited stands charged with contravening a health and safety regulation, in that on the 3rd day of December 2006 at Marlie Farm, Ringmer, did contravene a provision in a health and safety regulation, namely Regulation 4(1) of the Manufacture and Storage of Explosives Regulations 2005, in that it was a person who manufactured or stored explosives and failed to take appropriate measures: (a) to prevent fire or explosion; (b) to limit the extent of fire or explosion, including measures to prevent the spreading of fires and the communication of explosions from one location to another; and (c) to protect persons from the effects of fire or explosion.

## GLOSSARY OF ABBREVIATIONS

AC	Area Commander
ACoP	Approved Code of Practice
ADR	Accord Dangerous Routiers
AI	Accident Investigation
ALP	Aerial ladder Platform
ARA	Analytical Risk Assessment
CA	Competent Authority
CC	Crew Commander
CFOA	Chief Fire Officers Association
CHAF	Quantification and Control of the Hazards Associated with the Transport and Bulk Storage of Fireworks
CLER	Classification and Labelling of Explosives Regulations 1983
CMT	East Sussex Fire & Rescue Service Corporate Management Team
COMAH	Control of Major Accident Hazards Regulation
DRA	Dynamic Risk Assessment
E, Echo	Call sign of Extended Rescue Pump
EN	European Standard
ESCC	East Sussex County Council
ESFRS	East Sussex Fire & Rescue Service
FBU	Fire Brigades Union
Ff	Firefighter
FOA	Fire Officers Association
FRS	Fire & Rescue Service
GC	Group Commander
GRA	Generic Risk Assessment
HD 1.1 (1.1G)	Explosives of United Nations ADR Hazard Division 1.1
HD 1.2 (1.2G)	Explosives of United Nations ADR Hazard Division 1.2
HD 1.3 (1.3G)	Explosives of United Nations ADR Hazard Division 1.3
HD 1.4 (1.4G)	Explosives of United Nations ADR Hazard Division 1.4
HMEPO	Hazardous Materials, Environmental Protection Officer
HSE	Health & Safety Executive
HSG	Health & Safety Guidance Note
HSL	Health & Safety Laboratory
HT 1	Explosives of Hazard Type 1

HT 2	Explosives of Hazard Type 1
HT 3	Explosives of Hazard Type 1
HT 4	Explosives of Hazard Type 1
ICU	Incident Command Unit
ISO	International Standards Organisation (Container)
L139	Approved Code of Practice for the Manufacture and Storage of Explosives Regulations 2005
LOCEF	List Of Classified Explosives and Fireworks
LPP	Light Portable Pump
M&CC	East Sussex Fire & Rescue Service Mobilising and Communication Centre
MDT (MODAS)	Mobile Data Terminal
MSER	Manufacture and Storage of Explosives Regulations 2005
NEQ	Net Explosive Quantity
PC	Police Constable
PDA	Pre Determined Attendance
POPIMAR	Policy, Organisation, Planning and Implementing, Measuring Performance, Audit and Review
PPE	Personal Protective Equipment
RDS	Retained Duty system
SECAmb	South East Coast Ambulance Service
SC	Station Commander
STEP	Sequence Time Event Plotting
TNT	Trinitrotoluene
T/	Temporary
UNHD	United Nations ADR Hazard Division
W, Whiskey	Call sign of a Water Tender
WC	Watch Commander



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### **Marlie Farm Investigation, East Sussex Branch of the Fire Officers Association Commentary**

Following the tragic events at Marlie Farm on December 3<sup>rd</sup> 2006 when Brian Wembridge and Geoff Wicker lost their lives and a number of other colleagues were injured the Fire Officers Association has fully engaged with both East Sussex Fire & Rescue Service and the Fire Brigades Union to ensure a comprehensive investigation.

The Fire Officers Association Branch would like to take this opportunity to commend the work of the investigation team who, due to the nature of the incident, were exposed to images and details beyond their normal range of work experience. Their professionalism has led to the production of this comprehensive report that will hopefully become instrumental in improving Firefighter safety both in East Sussex Fire & Rescue Service and also in the wider Fire Service community.

The Branch Officers who have had the opportunity to read this report in full prior to publication support the recommendations made by the investigation team. We would also wish to recognise that East Sussex Fire & Rescue Service has already made significant strides towards implementing many of these recommendations.

The Branch Officers do however, believe that there is a danger that this report, coupled with the recent HSE letter praising the Service for the steps it has taken, may be regarded as the end of the process. It is recognised that the Fire Authority and the Service has significant pressures in relation to funding and that given the current economic pressures for the national economy that these will increase over coming years.



It is the view of the Fire Officers Association Branch that whilst the Service cannot be immune to these pressures, they must not be allowed to undermine the valuable work that the Service has undertaken to ensure Firefighter safety.

Specifically the work of the Operational Improvement Team and the Service wide quarterly training themes that they deliver should be guaranteed for future years.

Additionally further efforts should be made to ensure that training records for operational personnel are accurate and available in a timely fashion to allow managers to ensure staff meet training requirements.

With regard to the Firefighter Safety Project Group, whilst there is naturally a desire to accept the project as embedded in daily business, the Fire Officers Association would wish to see this project group continue to meet at regular intervals, chaired by a Principal Officer, to maintain an overview of all issues relating to Firefighter safety, including the consideration of the outcomes of significant National and International safety events.

Mark Rist  
Chair

Paul Sundaram-Hardwicke  
Secretary



Health and Safety  
Executive

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HM Principal Inspector of Health  
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Mr D Rothery

Gary Walsh (Deputy Chief Fire Officer)  
East Sussex Fire and Rescue Service  
20 Upperton Road  
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Date 21 April 2010

Reference

Dear Mr Walsh

#### **HSE INVESTIGATION OF ESFRS FOLLOWING MARLIE FARM EXPLOSION**

I am writing further to our meeting on the 19<sup>th</sup> February when we discussed ESFRS' progress with the action plan it had drawn in response to Russell Adfield's letter dated 12 June 2008.

During the meeting you provided myself and Andrew Cousins with an updated action plan that detailed the services' current position on delivering the agreed improvements to risk information gathering and training, amongst other things. Having heard the steps that have been taken by the service as part of the action plan I believe that ESFRS has made significant improvements in its corporate approach to managing the risks facing firefighters. This is apparent in the new processes for gathering, monitoring, and sharing risk information, and in the 'core brief' system, though this appears to require some further refinement.

I was also encouraged to learn of the increased training resource for the benefit of retained duty personnel, and the proposed expansion of the CFBT facility at Maresfield. I am sure you are aware that the HSE's national inspection of fire and rescue services in 2009/2010 looked at the provision of realistic fire training as one of its key inspection topics.

Given that the actions in the agreed action plan are complete, I do not propose to further monitor ESFRS work in this area. Of course, it remains ESFRS' on going to duty carry through these actions, and monitor the efficacy of them. I am aware that your consultants, Risktec have carried out or will be carrying out another audit of ESFRS in March 2010, and no doubt the recommendations from their audit will enable the service to continue to learn and improve.

Should you require any advice or assistance in the future, please feel free to contact me. I would be grateful if you would provide copies of this letter to the relevant representative bodies.

Yours sincerely

**Paul Vinnicombe**  
HM Inspector of Health and Safety