

BUNCEFIELD MAJOR INCIDENT INVESTIGATION BOARD

EXPLOSION MECHANISM ADVISORY GROUP REPORT

A note from the Chairman, Lord Newton, on behalf of the Board

The Mechanism of the Buncefield Explosion

1. The violence of the Buncefield explosion that resulted in tremendous damage to the outlying area and the huge fires involving 23 large oil fuel tanks remains, at present, largely unexplained. At the time we accepted what appeared to be the common view held by the industry and the relevant expert community in Britain that this was an unprecedented event. However it was soon revealed that other incidents involving large unconfined petrol vapour clouds had occurred elsewhere¹. It appeared however that these events were not subjected to thorough investigation, at least according to our current knowledge, and so the extent of the similarity with Buncefield remains unclear.

2. From the outset the Board resolved that under its Fifth Term of Reference² it would want to see a serious attempt made to understand the explosion mechanism that produced such high overpressures at Buncefield. It was the view of the Board that such understanding would provide further material assistance in guiding the design and operation of sites that store large quantities of vaporising flammable materials. We referred to this in Paragraph 77 of our Initial Report of July 2006.

3. To discharge this responsibility, Professor Dougal Drysdale invited a group of experts from the field of combustion science³ to form an Advisory Group of which he assumed chairmanship. This Group became a *de facto* subgroup of the Board by signing confidentiality agreements that enabled them to view evidence relevant to their inquiries. I am pleased to say that the Advisory Group has been able to identify lines of further investigation that give rise to a reasonable prospect of explaining the violence of the Buncefield explosion. I must stress that this is work in hand and not concluded. Nonetheless, on the basis of what has been learned from limited exploration of the evidence available, the Group has also been able to recommend to the Board the scope of potential research required to further our understanding. It has also recommended a likely method of funding the work, and suitable governance arrangements.

¹ Annex 5 of BMIIB Initial Report, July 2006, reports on 7 incidents of 'some similarity'.

² *To make recommendations for future action to ensure the effective management and regulation of major accident risk at COMAH sites. This should include consideration of offsite as well as onsite risks and consider prevention of incidents, preparations for response to incidents, and mitigation of their effect.*

³ The group and its work is described in paragraphs 16 – 19 of BMIIB's fifth report into the design and operation of fuel storage sites, published March 2007. HSE's Chief Scientist has been involved throughout.

4. The report contains some key technical observations that will need to be pursued further before determining the extent of fundamental research required to understand the violence of the Buncefield explosion. In recognition of this, the Group has recommended a two-phase Joint Industry Project, with the key outputs of phase one being:

- A further analysis of the evidence, continuing the work of the Advisory Group
- To determine if a full research programme is feasible and likely to succeed, and
- Specification of such a programme, to be run as a Joint Industry Project.

Interim guidance to operators and regulators will be produced if feasible at this stage. Phase two would comprise the research, providing the results on which the final guidance would be based.

5. The recommendations are directed at those with a key stake in the understanding of flammable vapour cloud explosions. We support these recommendations and attach a great deal of importance to the effective conduct of the proposed work.

6. Firstly, we believe the credibility of the project requires it to have regulator, industry and academic presence on the governing committee of the proposed project (referred to as the Steering Committee in the report). We have achieved this through the make-up of the Advisory Group which has made significant progress thanks to the members giving a great deal of their time on a voluntary basis. We would like the Advisory Group members to have the opportunity to continue their contribution to the project.

7. Secondly, we believe that the Project Manager appointed should, so as to avoid any possible perception of a conflict of interest, have no commercial interests in the modelling work (experimental or theoretical) that might be required. We also believe that the Project Manager should be a member of the steering committee for phase one.

8. Thirdly, we believe effective control of both the specification and the speed of delivery of the programme would be best achieved by basing it in Britain, at least for phase one. We appreciate the extent of international interest in this work that exists in Europe, the United States and elsewhere and we hope that knowledge and information from far afield can be absorbed into the phase one programme. The Steering Committee may want to review wider funding sources for any research conducted under phase two as this is likely to require significant expenditure.

9. Finally, we believe that it is of the utmost importance that phase one commences as soon as possible. It will take 6 – 9 months to report and only then will it be possible to state clearly how much further research will be necessary to deliver sound guidance to the Industry. We will wish to take a continuing interest in this important work and will give further thought to how this can appropriately be achieved.

