

D/CSA/13/1/2 (359/10)

7 July 2010

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HYDRODYNAMICS – COOPERATION WITH FRANCE

Over the past 18 months we have worked intensively to define the technical and US/UK 1958 MDA related aspects of the proposed joint France/UK facility working closely with the French to produce as much detail as possible so that a properly argued decision could be made. [REDACTED]

[REDACTED]. Irrespective of the decision I remain committed to working with both the US and France having made significant advances in technical exchanges over the past two years with both countries [REDACTED]

view [REDACTED] a

I summarise below the various considerations in respect of making a decision between continuing with a UK only hydrodynamics facility and a joint France-UK facility based in France. We have developed detailed arguments around each of these over the past 18 months; arguments that have been used extensively with the Cabinet Office as the joint France-UK facility has been considered. My approach here is based on identifying risks [REDACTED]. I

concentrate only on those matters in which I have been directly involved over the past two years; primarily technical and through my chairmanship of the IAB. [REDACTED]


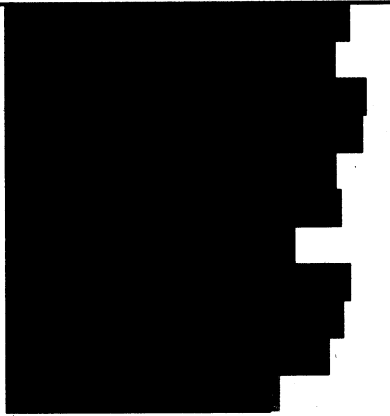

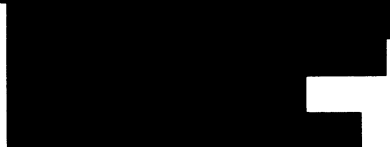

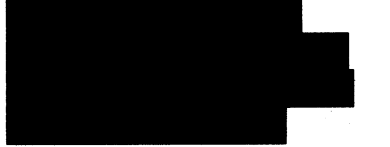
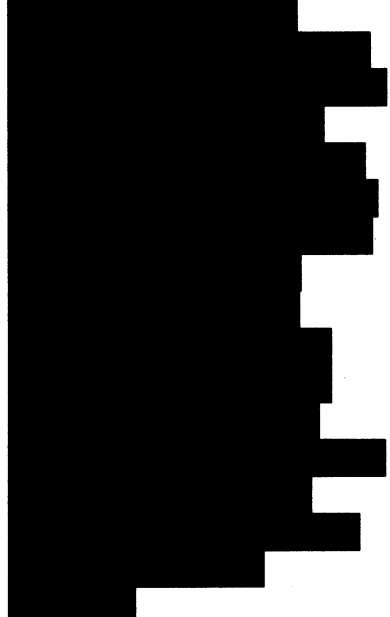
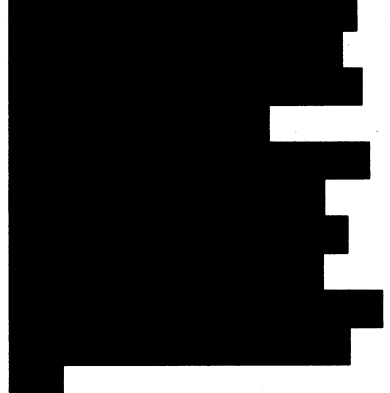
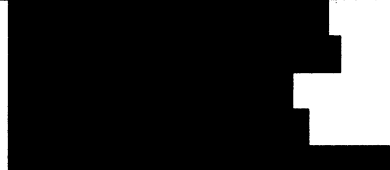
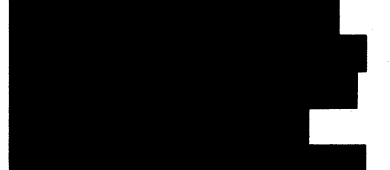
What is hydrodynamics?

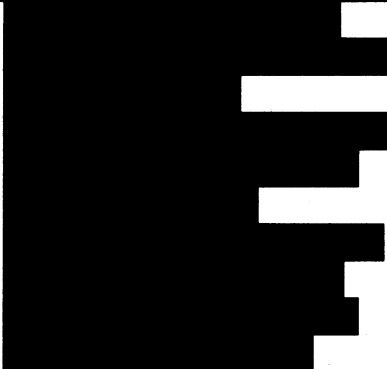
In the absence of underground testing the only recourse we have in demonstrating the efficacy of our nuclear warhead is to a combination of experiment and modelling that analyses the behaviour of all components of the warhead in the highly energetic process of a nuclear detonation. There are three techniques we use: hydrodynamics, laser implosion and computer modelling. All three are interdependent as the data from one is required to feed in to the others. Of the three the UK has an acknowledged lead, over the US and France, in hydrodynamics. [REDACTED]

[REDACTED] X-Ray images are recorded the during the detonation process. This gives us a series of snapshots of what is happening inside the weapon: a single axis X-Ray gives a projected image, a three axis X-Ray produces three images that combine together to produce a fully three dimensional image [REDACTED] This is as close as we can get to a real test and the hydrodynamics facility therefore gives us detailed information about the behaviour of the warhead in the extreme conditions of a nuclear explosion. This information feeds directly into the computer modelling providing an experimental validation of the model predictions. Because we are testing real warhead designs hydrodynamics is also used to explore issues such as ageing: how do we anticipate the effects of changes in material properties over the life of the warhead, security: what design features can we build in to prevent terrorist use, surety: how do we build in margins of design that provide greater confidence in performance and [REDACTED]

This is a technically difficult and constantly evolving process. The root of our deep technical relationship with the US is based on the need on both sides to share and challenge our technical knowledge on all aspects of warhead design and performance so that we can independently underwrite the performance, surety and safety of our respective systems. This constant sharing and challenging of technical and scientific information at the deepest levels not only ensures that our scientists and engineers are *sine pari*, but also means we are able to guarantee the performance of our warhead with absolute confidence. This deeply trusting and highly successful relationship with the US has consequences well beyond the nuclear weapon itself; we enjoy equivalent levels of sharing in nuclear propulsion, nuclear terrorism, chemical and biological defence and in unrelated areas of defence related science and technology.

	UK Only Facility	France-UK Facility
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

		
Maturity of business case in terms of technical, financial and operational considerations		
		
		
Ability to conform to safety, regulatory and security issues.		

		
Conformity to NPT		

[Original Signed]

MARK WELLAND