

Title	The Repeatability of Large Scale Explosion Experiments
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Executive Summary	<p>In May 1990, a joint industry project, the Blast &amp; Fire Engineering Project for Topside Structures, was initiated to study the special hazards facing offshore operators. The objective of Phase 1 of this project was to provide interim guidance to designers and operators for reducing the potential for another major disaster [1]. In addition to providing this interim guidance, this project recognised that, because the physical and chemical processes underlying fire and explosion behaviour are scale dependent, there was a need to obtain data on these hazards from full scale experiments. Therefore, as part of Phase 2 of the project, a series experiment of full scales was undertaken to obtain quantitative data on the explosion hazard in geometries truly representative of the offshore environment [2].</p> <p>The results of this project indicated that high explosion overpressures could be generated and that water sprays activated prior to ignition could significantly reduce these overpressures. As a consequence of these findings, the UK Health &amp; Safety Executive (HSE) commissioned a further project in which experiments were undertaken to identify methods of reducing the severity of explosions [3].</p> <p>Within this programme of work, it was identified that there were significant variations in the results obtained from two nominally identical experiments. Given the importance of the large scale data in terms of providing definitive reference information, both for the provision of guidance to offshore operators and for explosion model evaluation, the HSE commissioned an additional series of experiments to study experimental repeatability. The repeatability was studied by the means of a series of eleven experiments which were performed using two different test configurations, with five experiments being carried out in one configuration and six experiments in the other configuration. These test series were denoted as the Alpha and Beta series respectively. The Alpha series experiments were centrally ignited, whereas in the Beta series of experiments, ignition was at one end of the test rig. For each of the experiments carried out within the respective test series, the experimental conditions were nominally identical.</p> <p>This report examines the results obtained from the experimental programme. The report is divided into five sections, Section 2 details the mechanism behind the generation of an explosion overpressure, Section 3 details the experimental arrangement for each of the each series, Section 4 details data from the experiments, Section 5 describes further analysis of the data from the two test series, and Section 6 draws conclusions from the analysis carried out in Section 5.</p>
Table of Contents	1 Introduction..... 1 2 Explosion Mechanisms ..... 1 2.1 Pressure Generation in Explosions ..... 2 2.2 Factors Influencing Explosion Severity ..... 3 3 Experimental Arrangement..... 4 3.1 Explosion Test Rig..... 4 3.2 Test Rig Operation..... 6 3.3 Instrumentation ..... 7 5 Experimental Test Programme..... 9 5 Results..... 10 5.1 Internal Overpressures ..... 10 5.2 Flame Arrival Times ..... 11 5.3 External Overpressures (Free Field) ..... 11

5.4 Weather Conditions .....	11
6 Analysis of Results .....	11
6.1 Variance of Peak Internal Overpressures.....	11
6.2 Variance of Peak Internal Overpressures Between Experiments.....	12
6.3 Variance of Overpressure at Time of Flame Arrival .....	14
6.4 Overpressure Impulse .....	14
6.5 Comparison of Overpressures with Flame Arrival Time.....	15
and Stoichiometry Data .....	15
6.6 Influence of Atmospheric Conditions.....	16
7 Summary .....	17
8 Recommendations.....	17
9 References.....	17
Tables 1 – 38	
Figures 1 – 8	