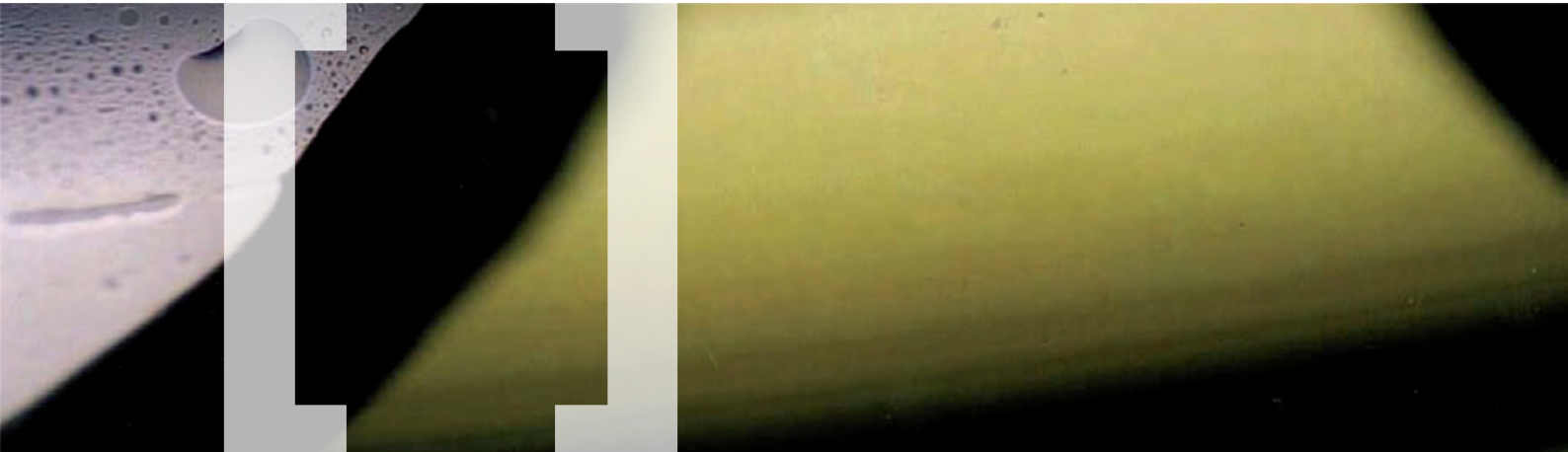


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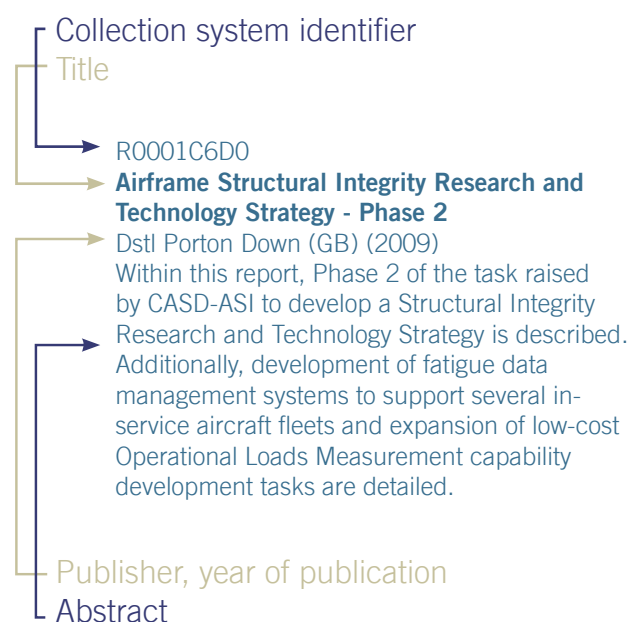
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This section provides details of scientific and technical reports added to the MOD's ATHENA Collection in the previous period.

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R0002A38C

A survey of commercially available aircrew respirators and helmets

Dstl (GB) (2012)

A market survey of Commercial Off-The-Shelf (COTS) rotary wing aircrew helmets and aircrew CBR respirator systems has been undertaken, to ascertain if equipment exists which could potentially satisfy the UK's helmet and respirator requirements, as specified in the Aircrew Protective Equipment and Detection (APED) User Requirements Document (URD). The Dstl and QinetiQ search activities, though limited in scope, have not identified any COTS aircrew protective systems likely to satisfy the primary APED goals of providing very high levels of physical and CBR protection, with low levels of user burden.

R0002A393

An Analysis of the Virtual Environment for Developing Government Experimentation (V-EDGE) System Requirements

Dstl (GB) (2012)

This document is an analysis of the Virtual Environment for Developing Government Experimentation (V-EDGE) system requirements. The requirements are specified in relation to the underpinning capabilities required to model key modelling requirements within a Synthetic Environment. They are formed into the following capability areas: Physical environment modelling; Temporal modelling; Entity modelling; Effects based modelling; System interoperability; Data capture and storage; User interface; and Analysis and review. The document draws out some conclusions from the work, and lists recommendations for the future.

R0002B7A3

Building Adequate Test Sets by Reverse Engineering (BATS) - Technical Partner's Capping Report

Dstl, Porton Down (GB) (2012)

This capping paper summarises the work performed by the project CDE22870, titled 'Building Adequate Test Sets by Reverse Engineering (BATS)'. This aimed to produce a proof-of-concept automated test and model inference framework. Experimentation has shown that such an approach can provide a meaningful basis for assessing adequacy of test sets used to test closed, black box, off the shelf software. Furthermore, the behavioural based adequacy measure can result in test sets better able to expose faults than traditional white box based syntax coverage (branch coverage) techniques.

R0002B707

CBR Capability System Model User Manual

Dstl, Porton Down (GB) (2012)

This document contains instructions on how to run the Capability Systems Model (CSM) and gives an overview of the input files to the model and the output results from the model. It relates to the Java Script CSM.

R0002BAB7

Chemical and Biological (CB) Hazard Model Technical Description (TD)

Dstl, Porton Down (GB) (2012)

The CB Hazard model predicts the human response to exposure to chemical and biological agents. An input concentration or dosage time series allows a hazard probability to be estimated based on the toxicity data for each agent. This Technical Description gives a detailed description of the algorithms used in the calculation of the hazard.

R0002B7C6

CIBM Work Package 1 - Future IMIX Capability Planning Progress Note FY11/12

Dstl, Porton Down (GB) (2012)

This paper presents the progress made during FY11/12 towards the identification and definition of the Information Management and Information Exploitation (IM/IX) service components of the Information Superiority Reference Architecture (ISRA). This study has established a methodology for identifying and defining services within the context of the ISRA. This has been applied to develop and characterise a set of candidate services that underpin IM. There are four key recommendations resulting from this study: firstly to exploit the draft architecture developed in this study,

as a basis from which to establish one or more use cases, to explore the use of IM/IX services in support of capability management and planning; secondly to build on the draft architecture developed in this study to establish a complete, fully defined set of IM services within the ISRA; thirdly to evaluate and refine the methodology proposed, using it as the foundation from which to identify and define the IX services within the ISRA; and finally to consider the requirement for an architecture working group composed of representatives from communities describing services with the MOD.

R0002A7BF

Critical Materials - Security of Supply Activity 3 - Alignment with MOD Policy Report

Dstl, Porton Down (GB) (2012)

The work reported herein forms part of the Critical Materials: Security of Supply and Impact on Operational Capability Project. This work was sponsored by the Dstl Programme Office Acquisition Policy Domain under contract number STECH/008, which aims to identify future risks to the security of the defence supply chain caused by long term access to material resources. This project has identified problems within the UK defence supply chain, including a reliance on certain 'strategic' materials that are also at risk from supply problems. Currently, there is no consistent method for managing this risk within defence procurement. In addition, the ability to recycle or re-use greater levels of materials or components is limited by a lack of knowledge of the type and location of critical materials within components, systems and platforms. This report details an activity to investigate options for possible amendments to the defence procurement process. In particular, a range of draft or current British and ISO (International Organization for Standardization) Standards were investigated, to assess their applicability to addressing such supply chain issues. BS Standards 8905, 8903 and 8887, with ISO 10303 were identified to have the potential to address the issue of materials criticality throughout all stages of the procurement cycle, thus reducing the commercial risk associated with the use of these materials in future platforms or systems. A proposal for how each of these standards could impact on the procurement cycle is presented. Future work must consider the cost and benefits of implementing such standards, along with an assessment of the legal implications of doing so.

R0002B31B

Critical materials for military clean energy technologies

Dstl, Porton Down (GB) (2011)

This report summarises the output from the study 'Critical Materials for Military Clean Energy Technologies'. This was a scoping study aimed at developing a methodology to assess whether materials reported as having a perceived risk in their security of supply

could have an impact on military applications. The methodology was demonstrated by focusing on the Rare Earth Elements (REEs). A 'top-down' approach selected military applications of clean energy technologies to identify critical REEs i.e. those where no alternative exists to realise that technology. This case study identified a number of critical REEs in addition to several non-REE materials. A 'bottom-up' study assessed market data and information on known resource/ reserves of these materials and identified a number of REEs that are predicted to have a shortfall in supply to 2020.

R0002BB5E

Current implications of mTBI for injury modelling

Dstl, Porton Down (GB) (2012)

This reports on the current understanding of mild Traumatic Brain Injury (mTBI) to provide direction to the UK MoD Land Domain Research Programme. This report is written, primarily from the perspective of systems that may protect against mTBI, finding that the definition of mTBI and concussion are interchangeable and that the current understanding indicates that the mechanisms causing mTBI/concussion are probably accelerative or due to primary blast (Shockwave interactions). Current reporting indicates that the mTBI/concussion rates in the UK military are lower than in the US military, but there is no further information that may indicate this is due to protective equipment design or operational environment. The mTBI/concussion rate is still greater in a military population than a civilian population, probably due to a more active lifestyle. This report does not recommend any further fundamental work to understand mTBI/concussion for protection systems, but does recommend watching briefs and review of the current injury models to determine their applicability for equipment research, assessment and acceptance.

R0002A38E

Deployed Sensors Review

Dstl (GB) (2012)

Current sonobuoy- based operations and detection, classification, localisation and detection techniques are reviewed in view of the demise of the Nimrod IVIRA4 ASW programme. Sonobuoy designs are investigated with respect to their possible development, integration with and deployment from, a range of unmanned vehicles. A sonobuoy miniaturisation programme is proposed based on deployment of a multiple sonobuoy field deployed by an unmanned air vehicle. Off-board sensor systems are also reviewed.

R0002B59E

Development of a Sea Hawk Aircraft Data Analysis and Monitoring (ADAM) System - Phase 1

Dstl, Porton Down (GB) (2011)

This report covers Phase 1 of ASI Task 008 - Low Cost Operational Loads Measurement, undertaken at the request of the Military Aviation Authority, Aircraft Structural Integrity Branch. This task is funded under agreement DES/CASD/1029. The development of Sea Hawk Aircraft Data Analysis and Monitoring (ADAM) system is described within this report. Further development of the ADAM system, in accordance with the current plans, to incorporate additional PDG programmes, including the Beaver, Sioux, Sea Fury and Hurricane aircraft is recommended.

R0002B8F3

Development of analytical methods for urinary metabolites of the riot control agent 2- chlorobenzylidene malononitrile (CS)

Dstl, Porton Down (GB) (2012)

The analysis of biomedical samples such as urine and blood may provide evidence of exposure to CW and riot control agents. Dstl has a well-developed capability for the retrospective identification of sulphur mustard and nerve agent poisoning, but has no such capability for riot control agents. This report describes the development of methods for the analysis of two potential human metabolites of CS: 2-chlorohippuric acid and 2-chlorobenzyl-N-acetylcysteine. The methods were applied to samples collected from army recruits undergoing riot control training with CS. 2- Chlorohippuric acid was detected in all samples two hours post exposure and in most samples collected twenty hours after exposure. 2-Chlorobenzyl-N-acetylcysteine was not detected in any of the samples. This is the first published confirmation that 2-chlorohippuric acid is a human metabolite of CS. It is recommended that the work is published in the open literature because of its relevance to defence, security and law enforcement communities worldwide.

R0002A43F

Development of Test Methodologies for the Human Factors Assessment of Personal Protective Systems

Dstl, Porton Down (GB) (2012)

The human factors assessment framework (HFAF) has been developed within DSTL as a tool that provides a technical approach for Human Factors (HF) practitioners to gather HF data needed to support Dismounted Close Combat (DCC) Systems capability management. The HFAF utilises a three tier (level 1, 2 and 3) approach to HF assessments. Level 1 and 3 assessments have been well defined, however the development and description of methodologies for level 2 assessments is less mature. In the current study, a series of methodologies (including range of motion and physiological and subjective assessments) were examined to assess their suitability for level 2 assessments with particular emphasis on the utility of obstacles. The study took place at the Large Environmental Testing Facility (MOD Boscombe

Down). The methodologies were tested using five armour configurations which included a no armour control, Osprey Mk 4 body armour and three flexible body armour systems. In range of motion assessments, goniometry was able to identify differences between the armour configurations for both shoulder and thoracic-lumbar (TL) measurements. Motion analysis identified differences between the configurations for TL measurements. Of the resting measurements, spirometry and the jump test identified differences between the configurations. During the exercise test, time to complete individual obstacles, accelerometry and subjective measurements were able to discriminate between the configurations. It was concluded that the obstacle course was a useful method for assessing the performance of body armours when it is used in combination with other physiological and subjective assessments.

R0002A451

Discretion Analysis: Literature Review

Dstl, Porton Down West (GB) (2012)

An assumption is frequently made that the UK will be able to exercise greater freedom of choice over the decision over whether and how to employ military force. To test this assumption, a review of International Relations, Political Science and Psychological literature was conducted. The review concluded that little literature exists that directly addresses the question of discretion, so wider literature on decision-making was consulted as well. The review indicates that a range of complex organisational, political and psychological factors govern a decision-maker's perceived freedom-of choice. Those theories that fail to address these factors, and focus instead on the state as a rational, unitary actor with well understood preferences and objectives, were not considered to provide an adequate or accurate representation of the potential constraints on leaders' decision-making.

R0002AB97

Draft A400M Military System Survivability Case

Dstl, Porton Down West (GB) (2012)

Survivability of the A400M is used as an exemplar to explore issues that might be associated with the concept of a 'survivability case.' This is the initial Military System Survivability Case for the A400M platform, which has been developed as part of the MOD Air Domain research program under STECH/008/. It comprises: an argument (logic) that, when all required documentation is complete, will demonstrate that the risks to the platform are tolerable and As Low As Reasonably Practicable (ALARP); a synopsis of the evidence, with links to other documents, that supports the argument; and a statement detailing if ALARP has been achieved, together with an assessment of the confidence in that judgement. The operational aspect is included in the logic of the Survivability Case, but is not developed beyond the most basic level. This report provides the first draft of a Platform Survivability Case for the A400M

and advances our understanding of this approach to managing the survivability risk. It identifies a number of gaps in the evidence required to demonstrate that platform survivability has been fully investigated and the risks mitigated to ALARP and tolerable.

R0002AB96

Draft Chinook Mk6 Military System Survivability Case

Dstl, Portsmouth West (GB) (2012)

Survivability of the Chinook Mk 6 is used as an exemplar to explore issues that might be associated with the concept of a 'survivability case.' This is the initial Military System Survivability Case for the Chinook Mk 6 platform, which has been developed as part of the MOD Air Domain research program under STECH/008. It comprises: an argument (logic) that, when all required documentation is complete, will demonstrate that the risks to the platform are tolerable and As Low As Reasonably Practicable (ALARP); a synopsis of the evidence, with links to other documents, that supports the argument; and a statement detailing if ALARP has been achieved, together with an assessment of the confidence in that judgement. The operational aspect is included in the logic of the MSSuC, but is not developed beyond the most basic level. This report provides the first draft of a Platform Survivability Case for the Chinook Mk6 and advances our understanding of this approach to managing the survivability risk. It identifies a number of gaps in the evidence required to demonstrate that platform survivability has been fully investigated and the risks mitigated to ALARP and tolerable.

R0002A2B8

Dstl Athena User Survey FY11/12

Dstl (GB) (2012)

This internal Dstl study was conducted by the Human Systems Group at the request of the Programme Office. It was designed to investigate awareness, use of and attitudes towards Athena products. A survey was designed and advertised internally in order to establish these views. Quantitative and qualitative analysis was then conducted on these results so that these views could be compared against a baseline established in FY 10/11. A number of recommendations are put forward based on these results looking at making improvements to the search tool, greater training and help guides to improve use and ways which news about Athena could be communicated to staff.

R0002AB98

Dstl Targeted ITE Dive into the JCA FCS and ICAWS: Phase 2 - Comparison between the UK Expectation for Airworthiness and the JSF Programme's approach to Certification

Dstl, Portsmouth West (GB) (2012)

The Lockheed-Martin F-35 Joint Strike Fighter (JSF) aircraft is entering Low Rate Initial Production (LRIP) of which the Joint Combat Aircraft Project Team (JCA PT) has procurement commitments. The current focus of work in the JCA PT is to address the safety critical areas prior to the release of the UK aircraft to initial Operational Test and Evaluation (OT&E) flying via a Military Flying Training Permit (MFTP). Dstl is conducting an independent study into the safety critical areas of the Flight Control System] (FCS) and Integrated Warning Caution Advisory System (ICAWS), and analysis of the supporting data evidence, to contribute towards the body of evidence required for the MFTP. This study will specifically focus on the STOVL JSF variant, but the commonality in the FCS and ICAWS between the three JSF variants means that this work could be taken as the basis for assessment of the CV or CTOL variants. The FCS and ICAWS are complex systems and as the emphasis by the JCA PT was to achieve an output by January 2012, this task has been bounded in scope. Dstl suggested that the FCS work be limited to a study of the Air Data System (ADS). This was chosen because of the known ADS dependencies to meet its integrity requirement. It was agreed with the PT that Dstl combine this topic with ICAWS because of their close integration with respect to hazard mitigation. Phase 1 of this task developed a UK Expectation of requirements for the ADS and ICAWS. This was used in this study to compare against the US Baseline requirements used in JSF. The aim of this work is to ensure that no lessons learned from UK legacy experience are disregarded by the JSF programme. A major area of concern relating to ICAWS prioritisation was identified in this comparison. Recommendations were made to address this high risk area, along with a number of medium and low risk areas identified. The recommended priority areas for deep dives in Phase 3 are: Flying Qualities in Turbulence Nuisance Disconnects ADS/TNS Interaction ICAWS Prioritisation Integrated Hazard Assessment Trace ICAWS Alert Through System

R0002A7B6

Effect of Occupational Health and Safety Legislation on Defence Equipment Sustainability

Dstl, Porton Down (GB) (2012)

This report fulfils milestone activity 4 case studies deliverable. The purpose of the report is to highlight the potential disruption to defence equipment operation by the increasing amount of environmental legislation. While the MOD is exempt from much of it, there is a requirement to produce outcomes that are as good as those required by legislation. There is a risk that future legislation will not carry an automatic military exemption. There is a need to ensure that MOD will not be unprepared for material obsolescence and potential risk to capability. The reliance on COTS materials\ components where major customers are not exempt from the directives has placed those industries in a compliance environment and it would be extremely expensive and inefficient not to use components

designed for the commercial world in military applications. However, military materiel needs to be supported for a longer period of time than commercial equipment. It takes time to develop alternative materials and some substitutes may have technical limitations or become insecure. There may also be cost implications in materials costs and in increased failure rates of components. In some circumstances it may be prudent to stockpile some materials so that future demand for equipments and materials for equipment repair can be met. Legislature will have some effect on materials supply but because of the heavy use of COTS equipment and components industry will almost certainly provide alternatives. Materials unavailability is more likely as a result of supply restrictions because of material scarcity or supply control (e.g. export control by other countries).

R0002A446

Electronic structure modelling to enhance UHTC performance

Dstl, Porton Down (GB) (2012)

Much materials modelling in DSTL makes use of continuum finite element codes which takes no account of the atomic granularity of matter. A fuller description requires electronic structure based methods which additionally allow the prediction of many other properties. Physical Sciences Department has invested in the development of such a capability funded from the Ultra High Temperature Ceramics (UHTC) work package of the Payload Delivery Programme (PDP). Initial targets comprised the development of staff practitioners, networks/collaborations and establishing a virtual modelling team and this report summarises progress made in FY11/12. Competence well above the novice level has been achieved: electronic structure calculations of elastic moduli, temperature dependent conductivities and first steps towards modelling the temperature dependence of the diffusion of oxygen defects in hafnium oxide are reported. Key to the modelling strategy is the use of AWE's HPC resources. This will make possible predictions of quantitative accuracy by use of more sophisticated, and computationally intensive, models. Recommendations for further investment and future work are made including the application of this new capability to the prediction of equation of state data needed for finite element modelling of armour materials.

R0002B7C7

Exercise Bold Quest 2011

Dstl, Porton Down West (GB) (2012)

Exercise Bold Quest 11 took place from 7-23 September 2011 at Camp Atterbury, Indiana, USA. The event, the latest in a series of Advanced Concept Technology Demonstration exercises assessed a range of technologies related to identifying dismounted coalition warfighters. This report provides an overview of the technologies demonstrated and provides a summary of the results from the coalition military utility assessment.

R0002BA1B

Final report on NATO RTG-189: Bioeffects and Standardization of Exposure Limits of Military Relevant High Energetic Electromagnetic Pulses (HEEP).

Dstl, Porton Down (GB) (2012)

Dstl Biomedical Sciences has actively participated in NATO Research Task Group (RTG)-189 on behalf of the UK MOD. The members of RTG-189 were tasked with reviewing the currently available scientific literature on potential bioeffects following exposure to high peak power radiofrequency pulses shorter than 100 milliseconds (ms). This information will be used to inform an ongoing review of NATO STANAG 2345 prior to its adoption by the IEEE standards body. RTG-189 has reported that there is a lack of a published and replicated adverse health effects or biological mechanisms beyond thermal interaction for pulses shorter than 100 ms. This suggests that peak electric field limit in the IEEE C95.1-2005 RF pulse safety standard has no scientific basis. Physical laws governing the propagation of electric fields in air already limit the maximum achievable peak electric field at ~3MV/m (air breakdown). Current research efforts to expose biological samples to E-fields up to this magnitude have been unable to elicit an acute biological response. It is therefore recommended that the limitation based on peak E-field is removed.

R0002B233

Final Technical Assurance Review of the Common Geospatial Toolset (CGTS) Phase 2 Research Project

Dstl, Porton Down (GB) (2011)

The CGTS research project was a 29 month industry led study to identify the "art of the possible" and provide the technical evidence to define the technologies and enabling capabilities necessary to deliver a common and coherent geospatial capability to UK Defence. This report is Dstl's final technical review of the CGTS research and seeks to outline areas of particular interest and potential exploitation as well as to provide a critical review of the work.

R0002B879

Fixed Seabed Monitoring Sites

Dstl, Porton Down (GB) (2011)

The report provides an overview of existing fixed seabed monitoring sites. This initial overview will provide a basis for the further investigation of systems that are of particular interest. The information for each system was drawn entirely from open source material, direct contact with relevant universities and research groups will take place in the next phase of work. Searches were focused on established research groups, universities with oceanographic institutes and global oceanographic

consortiums. The most useful of these sources were the consortiums OceanSITES and EuroSITES. The results are presented in table form and are divided into the following sections: acoustic arrays with passive hydrophones; VHP active acoustic arrays; non-acoustic arrays. A section covering the proposed ESONET network is also included. As the report is provided as the basis for more targeted investigations it does not draw any specific conclusions.

R0002B1B2

Future Energy Technology Assessment: Epoch 1 report 2012 to 2017

Dstl, Porton Down (GB) (2012)

This report covers an assessment of future energy technologies that are of military significance for the sustainability of the MOD energy provision for 2012 to 2017. It considers a range of criteria important for military provision of energy, highlighting suitable technologies that the MOD should either maintain or invest effort in to. Technologies covered are; synthetic and bio fuels, hydrogen, fuel cells, renewable, improvements in current engine technologies, power and energy monitoring and critical and strategic materials.

R0002B1B1

Future Energy Technology Assessment: Epochs 2 to 5 report 2017 to 2040

Dstl, Porton Down (GB) (2012)

This report covers an assessment of future energy technologies that are of military significance for the sustainability of the MOD energy provision for 2017 to 2040. It considers a range of criteria important for military provision of energy, highlighting suitable technologies that the MOD should either maintain or invest effort in to. Technologies covered are; synthetic and bio fuels, hydrogen, fuel cells, renewable, improvements in current engine technologies, power and energy monitoring and critical and strategic materials.

R0002A41D

GAMOV Initial Operating Capability Final Report FY 11/12

Dstl, Portsmouth West (GB) (2012)

The Generic Aggregator Model Valuator (GAMOV) framework has so far undergone 3 years of technical de-risking and development. The conclusion from this was that the risk had been suitably reduced to enable and Initial Operating Capability (IOC) to be realised. The development this FY was to enhance the framework into IOC and to perform a first-level validation exercise on the capabilities of GAMOV. The team successfully brought the framework up to IOC status and performed first level validation through the development of an Aerial Delivery Model (ADM) representation and CLARION combat mediators referred to as Grand SLAM. It is proposed that with one year's further development, GAMOV will reach full operating capability that can be exploited on a range of studies including Cyber and Joint Fires HLOA.

R0002A4A5

GAMOV Technical Architecture

Dstl, Portsmouth West (GB) (2012)

The GAMOV framework is a solution being developed in order to respond much more rapidly to the analytical requirements of customers and stakeholders. In GAMOV's development it has been identified that the framework would benefit from being deployed onto a web framework in order to exploit the benefits offered by remote application development and the emerging research into the semantic web. This report examines how GAMOV can be adapted to exploit these technologies and presents a proposal in terms of hardware and software in order to realise this.

R0002A46A

Geographically Disaggregated Conflict Analysis: Preliminary Report

Dstl, Portsmouth West (GB) (2012)

Recent operational experience in Afghanistan has shown that conflict events are often concentrated in specific geographic locations within a larger Area of Conflict. Previous DSTL analysis of irregular conflict has concentrated at a provincial or national level and so is largely unable to account for geographic variation in conflict type or intensity. Several open-source geo-referenced conflict datasets have been developed within the academic conflict studies community in recent years. The aim of this study is to investigate the potential utility of these datasets to support analytical work at DSTL and this preliminary report has covered three areas: An initial investigation of extant open-source geo-referenced datasets which may be of use to DSTL, including their geographic and temporal scope and methods of data gathering; a comparison of the ACLED Dataset with CIDNE to compare their recording fidelity for the ongoing conflict in Afghanistan; a literature review of recent work undertaken by the academic conflict studies community which has made use of the geo-referenced datasets discussed.

R0002B1B0

HERCULES Work Package 604 40 kg Maxima Configuration Analysis

Dstl, Fort Halstead (GB) (2012)

Patrol equipment configurations when limited to 40 kg of equipment as used on Op HERRICK 12 and their assessed impact on physiological burden and combat effectiveness. Produced under Project HERCULES.

R0002A491

HLA Federate Compliance Testing

Dstl, Portsmouth West (GB) (2012)

This report describes the continuation of work carried out under EIVIR, exploring the issues associated with implementing High Level Architecture (HLA) Compliance

Testing. The work involved using a known-good HLA Federate to explore whether the Compliance Test Tool and processes were capable of correctly assessing and reporting the state of the Federate Under Test, an approach known as “golden unit”. The report details the issues encountered in setting up the test tool for checking a new federate for HLA compliance. It also captures the required changes to configuration files and environment variables. The suitability of the Federate Compliance Test Tool (FCTT) was confirmed, and possible areas for improvement and enhancement are discussed in the section on “Lessons Identified”. These include modification to comply with HLA-Evolved, the need for a documented test procedure and the possible development of a generic stimulus mechanism as part of a test harness.

R0002B8F4

Human Factors Approach to Identifying Integration Issues of the DCC Soldier Helmet

Dstl, Porton Down (GB) (2012)

The Human Factors Assessment Framework (HFAF) was used to assess integration requirements for the Dismounted Close Combat (DCC) soldier. This report provides guidance based on the integration issues identified; the principles detailed in the report will have applicability to all DCC soldier equipment integration. This is necessary because poorly integrated items may lead to physical and/or cognitive impairment resulting in degradation to task performance.

R0002B31A

Human Factors Guidance for Hand Held CIED Detect Equipment

Dstl, Porton Down (GB) (2012)

Historically, research conducted to support the search for Improvised Explosive Devices (IEDs) has focused on the development of technologies to detect the component parts or the signatures produced, by IEDs. However, there has been increasing recognition of the importance of human performance in the detection of IEDs, both through the correct operation of the search equipment and through the identification of IEDs through Ground Sign (GS). Considering the detection of IEDs from a systems viewpoint, it is necessary to understand all of the elements that contribute to the probability of detecting an emplaced IED, and the impact that the IED task and equipment has on the other activities that All Arms Users (AAUs) and Specialist Searchers conduct. The purpose of this document is to bring together generic human factors guidance with the lessons learned during the development of Urgent Operational Requirement (UOR) Improvised Explosive Device (IED) detect equipment, in order to inform the specification, design and assessment of future hand held detect/search equipment. The document provides an overview of the different user groups of IED detect equipment, their characteristic, the tasks that they

conduct whilst using it and information pertinent to the design and testing of search equipment. Guidance covers the following areas: • Human characteristics, capabilities and limitations • Optimising the physical design • Optimising the user interface • Impact of equipment design on search task performance

R0002A429

IAB Improved Decision Making— Flexibility and Adaptability: valuing flexibility

Dstl, Porton Down West (GB) (2012)

Defence systems are often in service for a long time. This frequently demands that the system is updated during its lifetime, but this is frequently costly or in some cases impracticable if no provision for them is made in the initial design. But designing for flexibility often costs more—with no certain benefits—leading to difficulties in justifying the additional expenditure up-front. This problem has attracted a great deal of attention in the systems engineering literature and considerable work on the subject has been to develop the techniques of Real Options analysis. This methodology allows us to calculate how much we should be prepared to spend now to give us options in the future—in other words to calculate the value of having that flexibility. This report suggests a way to value flexibility in complex Defence systems where the benefits are in ‘Capability’ rather than financial terms. The process uses a form of Design Structure Matrices to assess where flexibility would be best applied, and compares costs using Real Options analysis implemented using Monte Carlo sampling.

R0002A65F

Integrated Approach: Study Summary and Insights

Dstl, Porton Down West (GB) (2012)

The publication of the SDSR in 2010 called for “an integrated approach to building stability overseas, bringing together better diplomatic, development, military and other national security tools”. The term “Integrated Approach” gained currency within the UK as a replacement for the “Comprehensive Approach”. The Upstream Activities project included a strand of work to provide support to Security Policy & Operations on the subject of the Integrated Approach. The governance of this strand was offered to the Integrated Approach Working Group, a working level group set up to progress cross- government working in this area with membership from MOD, DfID, FCC, and the Stabilisation Unit. This strand of work comprised two workshops to identify barriers to effective cross- government working in planning, responding to and transitioning UK responsibilities from overseas crises. This working paper records the work for future reference by other MOD and OGD studies, and includes details of the technical approach and insights gained from the workshops. No specific recommendations are made by this working paper.

R0002B73B

Integrating Design for Disposal into Defence Acquisition

Dstl, Portsmouth West (GB) (2012)

The objective of this project is to provide defence with a robust understanding of the contribution design for disposal techniques can have on reducing costs, improving sustainability performance and reducing risks to defence at both the strategic and platform levels.

R0002A45A

Investigation into potential life extension of the Grenade Visual & Infra-red L114A1

Dstl, Fort Halstead (GB) (2012)

The first production lot of the Grenade Visual & Infra-red L114A1 will exceed the approved 10 year storage life during January 2012 and data is required to enable DDOG to determine whether the L114A1 remains safe for continued use. Dstl was tasked by DE&S DGM to compile safety data on the L114A1, suitable for allowing DDOG to make a recommendation regarding a possible life extension. Six lots were selected for detailed investigation based on age and previous in-service surveillance undertaken by Dstl. One store from each lot was selected for visual assessment, breakdown, and chemical assessment of the energetic compositions. 31 stores from each lot were characterized at an assessment trial (during September 2011) to investigate safety issues (store reliability, expulsion velocity, fuse delay, and burst point) and to compare parameters against those listed in the Cardinal Point Specification or the Product Specification. This report summarizes previous L114A1 investigations, presents the findings from the 2011 in-service surveillance, and comments on the significance of the findings with respect to safety and performance. Although reduction of active ingredients within some energetic components are identified, the only safety issue identified was that some stores deployed the obscurant payload at a range less than 25 m (the 25 m lower limit has been adopted for the similar L131A1 grenade, but the L114A1 Product Specification quotes a minimum range of 20 m). However, a number of parameters show degraded performance, which will affect the effectiveness of the screen produced. If the performance of these parameters continues to degrade, it may be necessary to gradually introduce restrictions on the use of the store to ensure that it remains 'fit for purpose'. The report concludes by recommending a life extension of 2 years and that further in-service surveillance be scheduled for mid-2013, allowing a safety review to be undertaken during late-2013 or early-2014.

R0002BC70

JFX3 Augmented Reality Concept Definitions

SEA, Beckington (GB) (2012)

The JFX3 programme is examining the degree to which Augmented Reality (AR) COTS/GOTS technologies can be rapidly exploited for Improved decision support, training and other applications. To this end, It is undertaking a demonstration and evaluation of these technologies to assess their utility and potential for 'quick wins'. This report has defined a number of concepts that illustrate how AR could be used to support a number of operational challenges with a wide range of defence application areas.

R0002A48D

Land Environment Tactical Communications and Information System Decision Support Final Report

Dstl, Fort Halstead (GB) (2012)

The Land Environment Tactical Communications and Information System (LE Tac CIS) aims to provide an adaptable and coherent information exchange service in the Brigade battlespace and in a joint interagency and multinational context. The LE Tac CIS Decision Support Study project aims to advise stakeholders on the provision of a capability that meets their needs while minimising the cost burden. The study focuses on two questions: the position of the Restricted / Secret boundary, and the provision of large files, for example biometrics and imagery. This report analyses the evidence collected in an earlier report (DSTL/CR60321), and presents the conclusions and recommendations of the study.

R0002A494

Land Environment Tactical Communications and Information System Decision Support Interim Report

Dstl, Fort Halstead (GB) (2011)

The Land Environment Tactical Communications and Information System aims to provide an adaptable and coherent information exchange service in the Brigade battlespace and in a joint interagency and multinational context. The LE Tac CIS Decision Support project aims to advise stakeholders on the provision of a capability that meets their needs while minimising the cost burden. The study focuses on two questions: the position of the Restricted/Secret boundary and the provision of big files, for example biometrics and imagery. This report collects together information that will inform this advice: brigade level scenarios, lower level vignettes, existing Information Exchange Requirements and architectures, insights from related projects and exercises, and the views of current users. This information will be used in a future report to advise on the study question.

R0002A415

Littoral Manoeuvre (LitM) Mission Essential Competencies (MECs) Summary Report

Dstl, Portsmouth West (GB) (2012)

To meet the challenges operators face in preparation and training, Dstl uses a methodology that focuses on mission execution in a non-permissive environment, Mission Essential Competencies (MECs). MECs are higher order individual, team, and/or inter-team competencies that a fully prepared pilot, operator, crew or flight requires for successful mission completion under adverse conditions in a non-permissive environment. The methodology is unique in that it focuses on identifying the competencies required for mission completion during combat, as well as Knowledge, Skills, Supporting Competencies and Experiences. It relies on expert operator input to prioritise both the importance of Experiences and the environments/methods by which they are best gained. The MECs process was carried out on the Littoral Manoeuvre (LitM) role that is to be operated by Commando Helicopter Force. During the process, Sea King and Lynx subject matter experts identified six MECs, 25 Supporting Competencies, 14 Knowledges, 92 Skills and 84 Experiences deemed necessary to carry out the LitM role. This report describes the MECs process and defines those outputs.

R0002A3B7

Maritime Survivability Technology Options:- Progress Report for FY 2011 - 2012

Dstl, Portsmouth West (GB) (2012)

When giving rapid and soundly based advice on the survivability of surface ships, the benefit provided by different technologies/measures/systems needs to be appreciated and fully understood. When giving survivability advice only a small number of potential technologies are needed for the number of possible combinations to grow to an insurmountable size. In the operational context, performance doesn't necessarily translate into effectiveness. Therefore an understanding of both (i.) the performance of the various technologies and (ii.) how likely they are to occur are required in order to determine their effectiveness. Once this knowledge has been gathered it is then possible to construct practical "bundles" of technologies for analysis. This will allow operational analysis to reach quicker and more certain conclusions and will inform acquisition, research and future cost/capability trading studies. The ultimate aim of this project is to grow the knowledge base in the area of surface ship survivability whilst building upon the extant capability within Dstl in order to support MoD's intelligent customer status. In doing so, Dstl is positioning itself to offer rapid, expert advice to surface ship projects (and the wider MoD) on the appropriate balance of technologies for

optimum survivability. In order to capture this gathered knowledge a 'Compendium of Survivability Technology Options' is being compiled - covering the three key areas of survivability (Susceptibility / Vulnerability / Recoverability).

R0002A7B9

Memo on making decisions about the intent of small craft in the littoral

Dstl, Portsmouth West (GB) (2012)

The small boat threat, that can be encountered in littoral waters, provides a significant risk to Royal Navy platform operations. Small surface craft can be difficult to detect and track, and it can be very difficult to determine their potential to pose a threat. Understanding and reacting appropriately to the evolving situation is heavily reliant on the capabilities of command decision-makers. Within this study, data were collected on how decisions are made about the intent of small craft, specifically focusing on how environmental cues and information are used. A set of primarily 'visual' cues was identified, although the cues were only useful where there was a sound understanding of the local Pattern of Life. Factors such as 'experience' and the opportunity to practice or rehearse responses were also important. A forward programme is recommended focusing on improvements to Pattern of Life and Table Top Tactics.

R0002A5A1

Military Working Dogs - Data Capture and Analysis for Arms & Explosive Search (AES) Dogs

Dstl, Fort Halstead (GB) (2012)

This report describes the data received from theatre on operational taskings of Arms and Explosive Search dogs. It summarises the outcome of the statistical analysis performed on this data and presents potential explanations for the impact (or lack thereof) of different factors on performance. Limitations of the data are highlighted, and recommendations for both additional data capture, and changes to the format of the Data Capture Sheet are made.

R0002AA4A

Model Based Development for Safety Critical Software Capability Agility TOP, WP2

Dstl, Portsmouth West (GB) (2012)

This report discusses Work Package 2 of the Capability Agility Technical Demonstrator Programme (TDP), which aimed to provide cost and time savings when developing safety critical software by de-risking, demonstrating and promoting the application of a Model Based Development (MBD) approach, including automatic code generation and testing. Such methods are expected to help streamline and modularise the development of safety critical software. The primary

output from the project was a MBD Framework and enabling documentation, to support industry in the application of the MBD approach to safety critical system software development. The development of the MBD Framework was supported by two software development activities: The re-development of some of the Typhoon Flight Control Computer control laws, and the development of a Generic Flight Control System for an unmanned air vehicle. Metrics for these activities indicated that cost savings of at least 20% and 30% had been achieved respectively, when compared with the original software development processes. The project concludes that MBD is a viable approach for the production of safety critical software, and significant cost savings maybe achieved through its adoption. In light of this, MBD should be considered for all MoD system software development projects. The MBD Framework will facilitate adoption of MBD, and should be distributed across UK safety critical systems industries.

R0002BC5A

Monte Carlo Bayesian Data Fusion Source Term Estimation Sensor Likelihood Models Technical Design

Dstl, Porton Down (GB) (2012)

The Monte Carlo Bayesian Data Fusion (MCBDF) software library fuses uncertain Chemical and Biological (CB) data to make inferences about a possible release of hazardous material into the atmosphere. This document details the calculations used to calculate the likelihoods of the data conditional upon a particular hypothesized release. The likelihood models described are for: concentration sensors, bar sensors, particle counters, collector identifiers, mobile chemical detections (from unknown sensor types), meteorological measurements, and observations. In addition, the algorithms for generating simulated sensor data are also given.

R0002BC73

Mounted Sustain (RAMD) Technology Road Map

Dstl, Porton Down (GB) (2012)

Mounted Sustain (RAMD) is a study with an aim of delivering research to support increased levels of sustainability and mission effectiveness through better Reliability, Availability, Maintainability and Durability. The Technology Roadmap outlines the research packages being undertaken by the programme, linking them to study benefit, research goals and equipment programmes.

R0002B4B5

Mounted sustain programme ageing task (year 1): presenting milestone 1 (non-structural integrity) and milestone 3 (non-destructive evaluation)

Dstl, Porton Down (GB) (2012)

The report introduces two deliverable milestone reports: Milestone 1: Review of non-structural items on Land platforms, and Milestone 3: Assessment of NDT for Land asset integrity management. The reports were funded under the Programme Office (Land) Mounted Sustainability, GM7(M), RAMD, Ageing, maintainability and Durability (AMD) research programme. This programme aims to develop asset structural integrity management processes and tools; including: the development of a Decision Support Framework which guides equipment managers through the process and identifies the appropriate tools that are being developed within the programme to manage the sentencing decisions required. The tools being developed include: identification of Structurally significant Items; technology for delivering a structural snapshot using NDE, vehicle monitoring and quantitative flaw analysis.

R0002A40B

NEC Coherence - Roadmap Update

Dstl, Porton Down (GB) (2012)

For some time, Maritime coalition Command & Control (C2) has been achieved by a variety of disparate communications and information systems. With insufficient funds to fit the entire fleet with all possible variants, this equipment is treated as Military Task Equipment and moved from platform to platform as operational tasking dictates. This is both time consuming and expensive. The unintended consequence is that maritime users are forced to deal with a plethora of user devices and interfaces which enjoy varying levels of capability, support and training. C2 capability planning (as the precursor to acquisition) is driven by National/Joint requirements, plus the potentially requirements that emerge from other Coalition partners as expressed in their respective road maps. This can lead to tension between competing 'ways ahead' and this note looks into the future to update the previous roadmap. The aim is to identify challenges & risks posed by the US FORCenet programme, NATO FUMIX and AUSCANNZUKUS roadmaps, that CAP AW will need to monitor.

R0002B88C

Observations on the Behaviour of Chemical Warfare Agents and Other Liquids on Super- Repellent Textiles

Dstl, Porton Down (GB) (2011)

The wetting behaviour of low surface energy liquids, including certain chemical warfare agents, has been investigated on novel repellent textile substrates

produced under UK and US CBR defence research programmes. It was observed that high oil and water repellency ratings, determined experimentally, were not indicative of repellency to towards G agents although sulphur mustard, VX could be repelled. This anomalous wetting behaviour is not readily explained in terms of surface tension arguments and demonstrates that a material's repellency to certain chemical warfare agents can not necessarily be predicted using test liquids. It is therefore recommended that confirmation of a material's repellency to CW agents be determined using the agents themselves. Recommendations are made for further work to understand the anomalous wetting behaviours of GB, GD and triethyl phosphate.

R0002A50F

OPCW Proficiency Testing and Lessons Identified (2011-2012)

Dstl, Porton Down (GB) (2012)

The analytical chemistry capability at Dstl is funded by DST-Strategy, CB Threat Reduction through the Chemical Analysis, Verification and Attribution (CAVA) programme (Dstl Project 704835). The capability provides chemical analysis and advice to a wide variety of stakeholders across the MoD and government. A key objective under the CAVA programme is to maintain an accredited analytical chemistry capability for the identification of chemical warfare agents and other threat chemicals. In order to benchmark for the capability Dstl participates annually in the proficiency testing scheme run by the Organisation for the Prohibition of Chemical Weapons (OPCW). In October 2011, Dstl participated in the 30th OPCW Proficiency Test. This report summarises the outcomes and lessons learned through participation in this test. Dstl was successful in the test and was awarded a maximum A grade for correct identification and reporting of the spiking chemicals. As a result Dstl has maintained its status as an OPCW Designated Laboratory. A small number of continuous improvements to Dstl's procedures and reporting methods were recommended based on internal scrutiny of the test evaluator's comments, internal meetings and the annual Surveillance Audit carried out by Dstl's accrediting organisation the United Kingdom Accreditation Service (UKAS).

R0002A2BD

OSINF/T Concepts Research

Dstl (GB) (2012)

The report delivers research output in support of the emerging MOD ambitions to uplift its capability to increasingly exploit Open Source Information and Intelligence (OSINF/T). The research anticipates and supports a 'concept and assessment' phase of DLOD procurement while also providing supportive planning items to assist in directing future research. Experience drawn from the DSTL placements in intelligence centres is used to inform the planning.

R0002B6F0

Past Historical Analysis Data Trawl in Support of Land Hub OA

Dstl, Portsmouth West (GB) (2012)

The Future Land Capabilities Team tasked the Historical Analysis and Future Methods Team (HAFM) to search the HAFM archive to find Historical Analysis (HA) relating to a number of key areas in support of Land Hub OA. (U) These areas were: a. ISTAR b. Fires c. Mobility/Counter Mobility d. Logistics (U) The HAFM Team were also asked to provide HA from the archives on questions relating to: a. Sub-Unit Capability b. Headquarters Command and Communication (C2) c. Formation Capabilities (U) All information provided by this report should only be used as a point of reference for the research previously conducted. The context of the information can only be provided in the original papers which should be consulted along with the HAFM Team before any work is used in future reports.

R0002A48F

PJHQ J7 Simulation Engine and Exercise Management Tools Assessment

Dstl, Portsmouth West (GB) (2012)

This study reports on how well three simulation engines and three exercise management tools meet PJHQ J7 simulation and exercise management needs. The simulation and exercise management need was identified as an incremental change to the current system to enable future interoperability both within the MOD and with coalition partners. These requirements were then used to evaluate the requested tools. The current system, JWST, is a very effective capability, meeting most of the current and near term requirements. However, medium to long term supportability of the toolset is of concern as J7 will have to bear the support and development costs. Alternative solutions could meet the requirements, with some development effort, and will likely provide additional 'defence enterprise' benefits not achievable with the current tools (i.e. improved interoperability and reuse, opportunities to demonstrate value for money, reduced through-life costs, flexibility in deployment of support staff, etc.)

R0002A38A

Probabilistic Elicitation Phase 2

Dstl (GB) (2012)

This paper describes the activities that were conducted in the FY 2011/12 to promote, and start using, probabilistic elicitation techniques. Specifically:-

- The production of a short document describing what probabilistic elicitation is. This paper was sent to all the Dstl Chiefs.
- The creation and presentation of a poster at the Institute of mathematics and its Application's (IMA) 2011 mathematics in Defence conference.
- The use of probabilistic elicitation within a diverse range of studies.
- The promotion of the technique across the wider MoD.

R0002A637

Proposals for Defence Engagement Steady-State Reporting & Assessment Capability

Dstl, Portsmouth West (GB) (2012)

This memo outlines proposals for a reporting and assessment approach for the UK's Defence Engagement (DE) activities. It presents a high level summary of the requirements and the current systems, and presents options for stakeholders to discuss so as to elicit a fuller range of views and preferences. This work forms part of DSTL's DE study being conducted on behalf of MOD'S Security Policy & Operations (Sec Pol & Ops) directorates. The memo first describes the objectives and best-practice associated with reporting and assessment approaches (also referred to as Monitoring and Evaluation (M&E)); then summarises the current reporting approaches across government for DE, and discusses the results of an investigation into these reporting approaches; the memo then concludes with a range of options that could be implemented in order to fulfil the requirement for a reporting and assessment capability.

R0002A417

Puma Mission Essential Competencies (MECs) Summary Report

Dstl, Portsmouth West (GB) (2012)

To meet the challenges operators face in preparation and training, Dstl uses a methodology that focuses on mission execution in a non-permissive environment, Mission Essential Competencies (MECs). MECs are higher order individual, team, and/or inter-team competencies that a fully prepared pilot, operator, crew or flight requires for successful mission completion under adverse conditions in a non-permissive environment. The methodology is unique in that it focuses on identifying the competencies required for mission completion during combat, as well as Knowledge, Skills, Supporting Competencies and Experiences. It relies on expert operator input to prioritise both the importance of Experiences and the environments/methods by which they are best gained. The MECs process was carried out on the Puma helicopter operated by Joint Helicopter Command. During the process, Puma subject matter experts identified six MECs, 21 Supporting Competencies, 10 Knowledges, 91 Skills and 91 Experiences deemed necessary to carry out the Puma role. This report describes the MECs process and defines those outputs.

R0002B5C0

Quantitative analysis of a phenolic resin

Dstl, Porton Down (GB) (2012)

Analytical pyrolysis has been used to quantify the volatile organic compounds (VOCs), the permanent

gases and water generated from the thermal decomposition of phenolic resin. In spite of the widespread use of phenolic resins in thermal protection systems the underlying decomposition mechanism is not yet fully understood. Previous work has identified the range of VOCs as well as permanent gases that are produced during pyrolysis of phenolic resin. The range of compounds generated during thermal decomposition predicates the requirement for a number of complementary analytical techniques to identify the compounds. Pyrolysis-gas chromatography-mass spectrometry and pyrolysis-Fourier transform infrared spectroscopy techniques have therefore been developed. The effect of heating rate on the decomposition products has then been addressed. The initial results indicate that phenolic resin heated at a high heating rate (20000 °C/s) produces a larger quantity of VOCs compared to that of low heating rate (20 °C/min). The amount of carbon dioxide produced is also reduced at higher heating rates.

R00029F42

Quantum Computation and Quantum Sensing: A Disruptive Technology

Dstl, Portsmouth West (GB) (2010)

Quantum computation, and the wider application of quantum mechanics to sensor devices, have the potential taken together, to be the basis of a disruptive technology for defence applications. In this Technical Report we introduce the key concepts of Quantum Mechanics and Quantum Computation (especially in relation to spin systems). We then discuss how these can be applied to create innovative sensor applications based on gravitational magnetic and infra-red signatures. The mathematics of these processes is spelled out, in order to emphasise their development potential. Some of these ideas are likely to be novel to the defence arena.

R0002A3B8

Radiological Anatomical Assessment of Cervical Neurovascular Structures to Explosive Fragmentation

Dstl, Porton Down (GB) (2011)

The aim of this paper was to determine military specific cervical neurovascular and external anthropometric data. This will be used to scale future numerical injury models of the neck and improve body armour design with a view to prevention or mitigation of combat neck injury.

R0002B3A4

Requirements for Operational Analysis Model Development for the Theatre Ground Sustainment Capability Planning Group

Dstl, Portsmouth West (GB) (2012)

The report has examined the Operational Analysis (OA) needs stemming from Through Life Capability Management, the Acquisition Operating Framework and Strategic Balance of Investment to support the Theatre Ground Sustainment (TGS) Capability Planning Group's Capability Management and their Equipment Programme projects. It has used the review of logistics models sponsored by ACDS(Log Ops) to select a range of suitable models to support TGS OA needs. Recommendations have been made for developing models and piloting some improvements in OA modelling support for TGS.

R0002B8EE

Reversal of GB and GD-induced neuromuscular blockade produced by dichloride and dimethane sulphonate salts of HI-6 and P2S in guinea pig diaphragm preparations.

Dstl, Porton Down (GB) (2012)

HI-6 dimethane sulphonate, HI-6 dichloride and P2S have been compared for their ability to restore GB and GD-inhibited neuromuscular function in guinea pig diaphragm preparations. Experiments were designed to measure recovery due to cholinesterase reactivation in both GB and GD experiments as well as direct action in a further set of GD experiments. In all cases there was no significant difference between the degrees of neuromuscular recovery produced by the dimethane sulphonate and dichloride salts of HI-6. In all tests the HI-6 induced recovery of neuromuscular function was significantly higher than that observed with equimolar doses of P2S.

R0002B799

Review of ricin antitoxin (ovine) non-clinical research and development

Dstl, Porton Down (GB) (2012)

The MoD has an extant requirement for a post exposure therapy for emergency use protection following exposure to an inhaled challenge of ricin toxin. The current approach is to develop an ovine plasma-sourced antitoxin consisting of an antibody (immunoglobulin G, IgG) or fragment (F(ab')₂ or Fab') thereof, that when administered to an exposed individual will recognise and bind to the ricin toxin preventing its toxic effects. The aim of this review is to identify any critical knowledge gaps that could impact on the further advanced development of a ricin antitoxin. This was achieved through a critical scientific review of the

experimental efficacy studies, the operational analysis and the background assumptions and justifications underpinning the development of ricin antitoxin as a Medical Countermeasure (MedCM). Critical knowledge gaps are stated explicitly and have been used to define a series of recommendations enabling future studies to be focussed on the continued advanced development of ricin antitoxin.

R0002A972

SAM Theory Note- Measurement Statistics

Dstl, Portsmouth West (GB) (2012)

The System for ASPL Measurement (SAM) is a facility for the accurate measurement of the Absolute Sound Pressure Levels (ASPLs) of features in the underwater acoustic signature of vessels. This report documents the methods and formulae used in the derivation of reporting statistics from the individual ASPL measurements.

R0002A46E

Situation Awareness Measurement Method (SAMM) Validation Logbook

Dstl, Fort Halstead (GB) (2012)

The development, verification and validation of the Situation Awareness Measurement Method (SAMM) are documented in this report. The method has been developed over a number of years and initial pilot applications of the technique have demonstrated its utility. This report contains a summary of the method, along with assumptions and limitations of its use.

R0002A2B5

Summary of SE Tower SIG1 Workshop on Multi Level Security 31 August 2011

Dstl (GB) (2011)

This document summarizes the outputs of a SE Tower workshop on Multi Level Security (MLS) which was held at Dstl Portsmouth West on 31st August 2011. The workshop was organised by the DS2I project sponsored by Cap JTES under the STECH008 contract with a view to informing future research on this topic to be carried out by SIG1 of the SE Tower. The objective was to generate ideas to move forward from the current known, but imperfect solutions (guards, diodes etc) towards a Trusted System - which might or might not use existing workarounds. It was not to be a rehash of what was already known, or a sales opportunity. The objective was refined during the day to reflect who and what is meant by 'trusted' in the Trusted System, and what the Trusted System should enable. For the main part of the workshop the attendees split into four 'Task Groups' each tasked with generating and presenting ideas on how to overcome the issues associated with each of the standard workarounds. The exam question for this was:

'How can we move forward to create a 'Trusted System' that is not a variant of System High?' The main strands that emerged from the workshop are listed, together with the research ideas and diagrams that were generated in the course of the day.

R0002B8FC

Summary of TTCP JSA TP4 Workshop 2010: "Best Practice in Bringing Together Systems Engineering and Research"

Dstl, Portsmouth West (GB) (2012)
Report details the discussions from a TTCP JSA TP4 workshop involving Industry, Academia, and National Defence organisations (from the UK, US, Canada, and Australia). The workshop focussed on "Best Practice in Bringing Together Systems Engineering and Research" and led to a number of recommendations. The range of recommendations covered such aspects as the role of Systems Thinking and Researchers to how Systems Engineering should shape research programmes. The workshop took place over 2 days (June 2-3 2010) at SELEX, Edinburgh, UK.

R0002B21F

Sustainability and Resilience Assessment (SuRA)

Dstl, Porton Down (GB) (2012)
This report was commissioned by the Defence Science and Technology Laboratory (DSTL) of the Ministry of Defence (MOD) to examine the possibility of accounting for and trading sustainability and resilience costs and benefits in defence acquisition. The key outcomes of this research are:

- The research demonstrates that it is possible to identify and consider sustainability and resilience parameters alongside financial costs, interoperability and operational effectiveness;
- A methodology for the assessment and trading of these parameters has been developed;
- Stakeholder engagement has informed this, however a stakeholder engagement plan is required to ensure successful implementation of the methodology; and
- A proof of concept assessment is required to further develop the detail within the methodology, engage stakeholders, and identify how the approach could be implemented within the MOD procurement process.

The proposed methodology is called a Sustainability and Resilience Assessment (SuRA). It is consistent with current MOD procurement guidelines using the CADMID (Concept-Assessment-Design- Manufacturing-In-operation-Disposal) framework for procurement, although there will need to be a shift in the way MOD approaches sustainability and resilience across the acquisition process if this approach is to be successfully implemented. The methodology culminates with a matrix accounting analysis which looks at the tradeoffs, interactions and feedback loops between each of the parameters. This allows the analyst to trade the costs

and benefits of sustainability and resilience within and between procurement options. It is recommended that 'proof of concept' case studies be undertaken. A case study for each environment of defence (air, maritime and land) is required to prove the methodology. The next step in this process should be wider stakeholder engagement within MOD. This should form a focus of the work programme going forward as effective stakeholder engagement is critical in achieving credibility and buy-in of new processes and tools, with both external and internal stakeholders

R0002A453

System Requirements Document for Generic Training Facility (GTF)

Dstl, Portsmouth West (GB) (2012)
A Generic Training Facility (GTF) will consist of a number of classroom facilities located throughout the UK, Cyprus and Brunei in support of in-Unit Steady-State Command Battlespace Management (Land) [CBM(L)] training. The aim of this initial task is to investigate and determine the baseline hardware requirements for GTF to host a portfolio of training applications currently expected to be delivered on GTF at Initial Operating Capability (IOC).

R0002A492

Technology Trends and Implications for ISTAR

Dstl, Portsmouth West (GB) (2012)
Cap ISTAR have an ongoing requirement to understand the impact of future technologies on the ISTAR enterprise. In response to this Dstl designed and facilitated an experimental workshop, refined from a practice workshop, to assess emerging technologies for impact and priority against a set of System Concepts related to ISTAR. The 37 technologies assessed were a subset of the ESTA (Emerging Science and Technology Assessment) survey, from the F&I (Futures and Innovation) Domain. The workshop drew upon the experience and knowledge of Dstl Subject Matter Experts and MoD stakeholders in the ISTAR Domain to make the assessment. As this is an experimental process a series of recommendations have been made for future work of this nature.

R0002B737

The Technical Cooperation Program - Land Group annual meeting - May 2012

Dstl, Porton Down (GB) (2012)
The Technical Cooperation Program (TTCP) Land Systems Group (LND) annual meeting was held in May 2012 with the aim of reviewing the TTCP programme against national and TTCP requirements. The 3-4 year programmes for the 6 Technical Panels (TPs) and Action Groups (AGs) have been revised as a result of this review with the lowest scoring panel, Land Operations

Research (TP-4), being terminated. The Land Group will recommend to TTCP Principals that highest scoring panel for Mitigation of Battlefield (AG-3) should transition from AG to TP status. Business cases for TP-4 and AG-3 will also be presented to the Principals for their review. Other changes to the 3-4 year programmes for the panels have been made and these have now been communicated to the UK National Representatives involved. Regarding the future S&T programme beyond the 3-4 year horizon, the Land Group identified the need to establish an S&T Framework to support TTCP Armies in the 2030 timeframe. UK actions to support this new TTCP requirement have been initiated with relevant MOD Stakeholders, drawing from the UK Future Land Operational Concept (FLOC).

R0002B7D9

TMAP Polarisation Slant Angle Module Documentation

Dstl, Portsmouth West (GB) (2012)

This report documents the mathematics and Matlab implementation of a TMAP, (Threat Modelling and Analysis Program) module calculating the polarisation slant angle for use in aircraft engagement modelling. The report gives input and output specifications as well as detailed descriptions of the mathematics used and details of the Matlab implementation.

R0002A437

Typhoon Aircrew NBC Protection: Long Duration ECS Rig Trial

Dstl, Porton Down (GB) (2012)

Typhoon aircrew NBC protection will be provided by the Locality Specific Protection (LSP) subsystem. As part of system level qualification testing, a long duration cockpit trial has been conducted to verify that the wearing of the various NBC protection assemblies would not result in unacceptable levels of discomfort or other effects which may affect system acceptability. As part of this test, the protection afforded by the head mounted equipment was assessed in order to obtain the required qualification evidence. Testing was conducted in the single seat ECS rig located at BAE SYSTEMS Warton. Comfort (above and below neck equipment) and mobility were found to be acceptable, and the pilot mounted filter, including access to, and operation of, the manual change over valve, was acceptable. The GFE included in the trial was also rated to be acceptable. One subject found the oxygen mask (ADOM) to be comfortable; a second that it caused him a level of discomfort which was noticeable but tolerable. A third found the mask to be unacceptable from the perspective of comfort, although this was addressed by fitting the mask lower on the nose. When correctly fitting head equipment was worn (to provide ocular and oro nasal protection), the results of protection factor testing were fully acceptable. When considered in the context of the results of the Typhoon aircraft CB simulant trials, the levels of protection measured during the trials are fully compatible with meeting the protection requirements.

R0002A599

UK CAPABILITY IN ENERGY HARVESTING AND ITS USE IN COVERT ON- MAN APPLICATIONS

Dstl, Porton Down (GB) (2012)

This report is an overview of the current UK capability for energy harvesting. The report has a particular focus for covert energy harvesting from on-man systems. A summary of the UK capability for movement, temperature difference, solar and radiofrequency energy harvesting is included.

R0002A490

VALKYRIE Work Package 6A - Section Level Target Locate and Hand-off Findings & Recommendations

Dstl, Portsmouth West (GB) (2011)

VALKYRIE Work Package 6A (WP6A) commenced in January 2011 with the aim of identifying immediate options to improve target locate and hand-off processes at the section level within OP HERRICK. A dual track approach was used to explore the requirements and constraints via three HERRICK use cases at the same time as identifying potential options that could address them. A range of potential options were identified that could improve the target locate and hand-off process at section level and these were assessed against the high level user requirements. Further investigations led to an exploration of a the Digital Magnetic Compass (DMC) option which concluded that latest DMC technology was unlikely to be able to sufficiently overcome the effects of magnetic fields of a Dismounted Close Combat (DCC) environment in order to provide an accurate target bearing. It would be unreasonable to expect a rifleman to recognise such errors and be able to sufficiently compensate for them, both in cognitive and practical terms. It was recommended that WP6A be closed within VALKYRIE and placed within the Sensors and ISTAR for Close Combat (SI4CC) Research Programme. It was also recommended that the VALKYRIE team maintain links with the SI4CC research programme to help identify and support any research with HERRICK potential.

R0002A975

Vaporised Hydrogen Peroxide Decontamination testing of the Typhoon Aircrew Ground Conditioning Unit Liquid Module

Dstl, Porton Down (GB) (2012)

Typhoon aircrew will be provided with the Aircrew Ground Conditioning Unit Liquid Module (AGCU LM) to provide a capability for the Pilot to remain cool during the donning of flight equipment and during transit to and from the aircraft. The equipment is required to be decontaminable following exposure to chemical and biological warfare agents. This report describes testing

that has been conducted to assess the compatibility of the AGCU LM with a biological decontamination process using vaporised hydrogen peroxide.

R0002A406

A QUALITATIVE ANALYSIS OF THE VIEWS EXPRESSED BY A SAMPLE OF ROYAL NAVY PERSONNEL WITH RESPECT TO THEIR HEALTH, FITNESS AND LIFESTYLE.

Institute of Naval Medicine, Gosport (GB) (2012)
The Institute of Naval Medicine (INM) has been conducting a longitudinal study of stress in the Royal Navy (RN) since 2007. In 2011 (Phase VI of the study) questionnaires were sent out to those respondents still serving. A major area of investigation in Phase VI related to overweight and obesity, and attitudes to lifestyle and physical activity. The purpose of the present report was to qualitatively analyse the free text comments made by respondents and describe the main themes concerning healthy lifestyle in the RN. From the 1241 respondents a total of 392 (31%) personnel commented within the free-text question on the questionnaire. The comments were reviewed using the thematic analysis approach which generated the overarching theme "The Royal Navy's organisational impact on its personnel's desire to improve their quality of life". Exploration of the themes resulted in key areas of discussion, including the desire for a culture change, top-led encouragement to engage in exercise, dietary provision and nutritional education and provision of services and facilities to lead a healthy lifestyle. It is recommended that the RN should review compliance to the 2 SL's Personnel Functional Standards, which state that personnel should complete a minimum of 3 hours of vigorous activity a week during the working day. Furthermore, the findings suggest that a healthy eating campaign could be put in place to educate personnel and catering staff, and that customised exercise training programmes for individuals need to be established for better engagement and adherence to training programmes. The findings of this report can be used to inform Physical Training Instructors and other professional groups involved in the health and wellbeing of RN personnel.

R0002A9DD

Baseline and occupational noise exposure survey onboard RFA Mounts Bay

Institute of Naval Medicine, Alverstoke (GB) (2012)
Noise measurements were made in 278 compartments and cabins at various locations onboard RFA Mounts Bay whilst the ship was at anchor in waters around Falmouth. Additional measurements included noise in 43 Marine Engineering (ME) spaces. The data have been assessed and interpreted in accord with the recommended maximum noise limits (MNL) listed in the Maritime and Coastguard Agency's Code of Practice on Controlling Risks due to Noise on Ships. Occupational

noise exposures of personnel of the ME section were also assessed for occupational noise exposure in accordance with Control of Noise at Work Regulations (2005). The A-weighted equivalent continuous sound pressure levels show that sixteen compartments onboard RFA Mounts Bay exceeded the recommended limits specified in the guidelines. Although these compartments were seen to exceed the recommended limits, those measurements that exceed the limits by 1 dB(A) or less should be used with caution as the accuracy of the meter should be taken into account. It is estimated that ME personnel would be expected to reach the upper exposure action value (85 dB(A)) based on a given typical working day. Current hearing protection used by ME personnel, if well maintained and used appropriately, should provide sufficient protection against the high sound pressure levels measured in these spaces.

R0002A973

Noise assessment of the new Paint Spray Facility, 1710 Naval Air Squadron

Institute of Naval Medicine, Alverstoke (GB) (2012)
Noise exposure within the new Paint Spray Facility, 1710 NAS in HMNB Portsmouth has been assessed as required by and in accordance with the Control of Noise at Work Regulations 2005 during spray painting activities. The daily personal noise exposure level, LEP,d, of the paint sprayer was calculated to be 71dB(A) and that of the paint mixer to be 68 dB(A) which is below the Lower Exposure Action Value, defined in the Regulations, of 80 dB(A). Therefore, no further actions are required to be taken under the Regulations.

R0002B89A

Noise exposure from firing a Sea Viper missile onboard HMS diamond

Institute of Naval Medicine, Alverstoke (GB) (2012)
Recordings were made of noise exposure of crew members at different locations during firing of the Sea Viper missile onboard HMS Diamond. Time histories were acquired of noise at the bridge wings (port and starboard) and near the 30 mm medium calibre gun (port side) and on the bridge. The data have been assessed and interpreted in accord with current standards concerned with health effects of exposure to noise including the Control of Noise at Work Regulations (CNAWR) 2005. The maximum peak sound pressure level measured was 162 dB(C) at the port side bridge wing. The sound exposure level for the one firing was 141 dB(A). The corresponding values for the bridge were 150 dB(C) and 124 dB(A), respectively. These data show that the peak upper exposure action value (peak sound pressure level of 137 dB(C)), would be exceeded when firing the Sea Viper missile. The CNAWR peak exposure limit value of 140 dB(C), that takes into account the protection afforded by hearing protection, would probably be exceeded using the current hearing protectors. However, a combination of

Peltor H10A hearing protectors and Classic II ear plugs would probably not exceed the peak exposure limit value. If personnel are regularly exposed to such noise levels, then it is recommended that they be informed and trained on the forms of action that they can take to reduce their exposure to noise and that a programme of health surveillance is put in place.

R0002B1D9

Noise exposure of operatives firing the SA80 assault rifle

Institute of Naval Medicine, Alverstoke (GB) (2012)
Recordings were made of noise exposure of different personnel involved in firing a SA80 gun on the range at Worthy Down. Time histories were acquired of noise from live rounds fired in single round mode. The data have been assessed and interpreted in accord with current standards concerned with health effects of exposure to noise: MoD DEFSTAN 00-27 and the Control of Noise at Work Regulations (CNAWR) 2005. The highest peak sound pressure level measured was 160 dB(C) (1996 Pa); the corresponding sound exposure level was 126 dB(A). The data show that the peak upper exposure action value (peak sound pressure level of 137 dB(C)), was exceeded on firing the weapon. The CNAWR peak exposure limit value of 140 dB(C), that takes into account the attenuation afforded by hearing protection, is unlikely to be exceeded using any of the commonly available hearing protection within the MoD. If personnel are regularly exposed to such noise levels, then it is recommended that they be informed and trained on the forms of action that they can take to reduce their exposure to noise and that a programme of health surveillance is put in place.

R0002B868

Noise exposure of personnel operating the 20 mm KAA cannon fixed to a GAM-B01 gun mounting.

Institute of Naval Medicine, Alverstoke (GB) (2012)
Recordings were made of noise exposure of personnel operating the 20 mm KAA cannon fixed on a GAM-B01 gun mounting onboard RFA Orangeleaf. Time histories were acquired of noise from live rounds fired firstly in single round mode and then automatic mode (bursts of up to 8 rounds). Recordings were made at four locations: the loader's position, the aimer's position, the instructor's position and at an observer's location. The data have been assessed and interpreted in accord with current standards concerned with health effects of exposure to noise: the Merchant Shipping and Fishing Vessels (Control of Noise at Work) Regulations (MSFVR) 2007, The highest peak sound pressure level was 169 dB(C) (5881 Pa) measured at the loader's position; the corresponding sound exposure level was 143 dB(A). The data show that the peak upper exposure action value (peak sound pressure level of 137 dB(C)), was exceeded on firing the weapon. The MSFVR peak exposure limit value of 140 dB(C), that takes into account the

attenuation afforded by hearing protection, is unlikely to be exceeded using the current hearing protectors worn (H61FA combined with Classic II ear plugs). If personnel are regularly exposed to such noise levels, then it is recommended that they be informed and trained on the forms of action that they can take to reduce their exposure to noise and that a programme of health surveillance is put in place.

R0002A43D

Submarine Exposure Limit Review: Methanol

Institute of Naval Medicine, Alverstoke (GB) (2012)
The toxicology of methanol has been reviewed with a view to setting limits for exposure in HM submarines. Submarine health based action levels (SHALs) derived for continual patrol exposure. After reviewing the latest toxicological data the following SHALs are proposed SHAL90 less than 50 ppm; SHAL24 less than 100ppm; SHAL60 less than 1000ppm. The limits recommended in this report should form the basis for the setting of operational maximum permissible concentrations (MFCs).

R0002A9E3

The Applicability of Semantic Interoperability to Preparedness

DSTO, Edinburgh, South Australia (AU) (2012)
Preparedness is one of the main risk management programs used for allocating resources in Defence. Effective management Preparedness requires access to multiple data sources, each of which may have unique structures and semantics. Semantic interoperability is one means by which information from these multiple sources may be integrated into a single system, which could, e.g., provide a mechanism to automatically determine the impact of deficiencies. This report provides a review of applicable technologies, proposes a system through which ontology mapping may be employed to achieve semantic interoperability, and discusses various components of such a system. It also recommends a further program of research to investigate prototyping.

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R0002A7D1

NATO Education and Training Network

North Atlantic Treaty Organisation, Neuilly-sur-Seine Cedex, France (FR) (2012)
NETN was originated to integrate and enhance existing national capabilities and focus on the education and training of NATO Headquarters' staffs and NATO forces. A NETN consisting of a persistent infrastructure, distributed training and education tools, and standard operating procedures not only supports the training of NATO headquarters but also enables the Nations to collaborate with each other. NETN promises a cost and time efficient capability, and broader and deeper

interoperability. It also introduces an opportunity to integrate the training of NATO headquarters with the tactical forces when needed for short notice mobile mission rehearsal training. To meet this demand, Allied Command Transformation requested that NATO Modelling and Simulation Group start a technical activity in 2006. Modelling and Simulation Group 068 (MSG-068 NETN) was formed for this purpose in 2007. The MSG-068 NETN Task Group recommends and demonstrates a way forward for interoperability, technical standards and architectures to link the NATO and national training and education centres to provide a persistent capability, and also identifies and recommends roles and responsibilities within the scope of NETN. MSG-068 NETN Task Group conducted a distributed standalone experiment between October 25 and November 5, 2010 and a distributed demonstration during I/ITSEC 2010.

R0002A38F

NATO Human Resources (Manpower) Management

NATO (FR) (2012)

Human Resources responsibilities have become broader and more strategic over time. The role of Human Resources has evolved from primarily being responsible for hiring, firing, payroll, and benefits administration to a more strategic role in employee selection, training and promotion, as well as playing an advisory role to the organisation in areas of labour relations and legal compliance. Many problems that currently exist in the HRM arena make it difficult for Nations and NATO HRM bodies to function efficiently and effectively. In this study, SAS-059 identified practices used in military organisations regarding strategic and operational HRM, to define best practice in HRM, to identify and define the data requirements necessary for successful implementation of strategic and operational HRM and to improve transparency on HRM issues especially between NATO HRM bodies and NATO Nations. Customized HRM framework for military organisations was developed as Human Resource Management FRamework Model (HRM FRAM) describes HRM related processes throughout an organisation. Models and methods were categorized into groups according to HRM FRAM phases. The problems with HRM data were also identified.

R0002A0A1

Coalition Battle Management Language (C-BML)

Research and Technology Organisation (FR) (2012)

This technical report describes the results and conclusions of the NATO Modelling and Simulation Group MSG-048: Coalition Battle Management Language (C-BML). C-BML is a standard for an unambiguous language that can communicate military information among command and control systems, simulation systems and autonomous systems and support a great number of military enterprise activities. The work described in this report deals primarily with

the assessment of preliminary versions of the C-BML standard and initial prototype implementations of C-BML communications software to support military activities such as training and mission planning. This report provides a set of requirements for C-BML that have been developed during the execution of the MSG-048 Experimentation Programme. The experiments comprising the experimentation programme provided many lessons learned that form a major part of this document. Finally, this report provides recommendations concerning the future use of C-BML, including the coordination with other standardization bodies.

R0002AA2E

Risk-Based Tailoring of the Verification, Validation, and Accreditation/ Acceptance Processes

Research and Technology Organisation, North Atlantic Treaty Organisation (FR) (2012)

MSG-054/TG-037 was tasked to finalize an overlay standard for Verification, Validation, and Accreditation (VV&A) of Federations and then formalize the draft as an international industry standard by vetting the document through the Institute of Electrical and Electronics Engineers Standards Association's (IEEE-SA) standards processes. Additionally, foundational work was produced and documented on applying risk as a tailoring mechanism for the VV&A overlay.

R0002A2E0

Rotary-Wing Brownout Mitigation: Technologies and Training

Research and Technology Organisation North Atlantic Treaty Organisation (FR) (2012)

The RTO HFM-162 Rotary-Wing Brownout Mitigation Task Group was formed to examine the effects of Rotary-Wing Brownout (RWB) and whiteout on pilots during operations. Brownout is the condition developed by recirculating rotor downwash as a helicopter lands or takes off in an arid or a snowy (whiteout) environment. The dust, dirt, or snow that is developed by the downwash renders out-the-cockpit visibility severely degraded or non-existent. The resultant mishaps due to the Degraded Visual Environment (DVE) are a serious problem and partner nations report losses of aircraft and personnel. This study was undertaken to investigate the incidence and severity of the problem in partner nations, to examine and document current and planned technology developments, and to evaluate and document the brownout training procedures within NATO. To provide a true, multi-purpose helicopter sensor, the TG members envision laser radar technology integrated with a navigation forward looking infrared radar. Intuitive hovering and landing cockpit display symbology, such as that described in this report, must also be an integral part of an effective system for DVE landings.

R0002A7C4

Formal System Specification Support Document

Critical Software Technologies Ltd, Chilworth (GB) (2012)

VICS-FM (Verification and Integration of Closed Systems through Formal Methods) is a proof of concept to formally verify the integration and functionality of closed systems, in particular commercial off the shelf (COTS) products. The approach brings together the formal language Event-B, mathematical proof theory and the Rodin toolset and provides the mechanism for creating abstract models of COTS systems and to then verify these system properties against operational requirements. The formal models can also be reused across different military scenarios. The approach proposed represents a step change in the use and successful integration of COTS products; using formal methods to guarantee their integration and functionality. The outcomes of VICS-FM will provide a solution that will increase the level of confidence on complex system of system solutions containing COTS systems. Moreover, it will support the production of safety-cases by providing formal proofs of a system's correctness. The purpose of this document is to inform the key stakeholders of the nature of the work to be done by describing the system, specify some of the non-functional requirements which are not covered in any other document, and describe the formal models created in Event-B. The formal model presented in this document will be subject to formal verification and validation. This document has been produced in the scope of contract ref. DSTLXI000062330 - regarding the CDE proposal 22765. This document will be used as evidence of the completion of milestone 1 "Initial version of the models".

R0002B4A2

Impacts of IA on Cross Domain Search and Access

IBM UK Limited (GB) (2012)

This report has been produced under the Enabling Secure Information Infrastructure (ESII) Task 16 research programme 'Multiple Security Level Access and Search'. The objective of the ESII Task 16 research programme is to demonstrate significant improvements in the ability to search for, access, transfer and use information across multiple security domains. The focus of this research is on the following two areas as identified by MOD: Task 1 - Cross Domain Workstation (CDW) Development - to support cross security domain access and data exchange. Task 2 - Multiple Security Level Search (MSLS) - to enable search / discovery across data in multiple security domains. The report constitutes milestone MCCI_10_02_216_26 and presents the outputs from element 5 of 'Detailed Design' Work Package 5 (WPS). The conclusions from the analysis presented in this report are: 1. The implementation of a cross-domain search solution defined by the candidate architecture is technically feasible, and it will meet the IA requirements for cross-domain search; 2. Limitations

in current COTS search engines mean that federated search with merged search results is only possible if the same search engine is used at all points within the infrastructure; 3. There are a number of significant implementation issues in the presentation of search results to users, which render it (at best) no better than for a user to have a cross-domain workstation and to be submitting individual searches on each domain.

R0002B5CF

MAST CDE 23770 - Dual Purpose Structural Panels with Thermal and Signature Control Capability - Final Report

Malvern Optical Ltd, Throckmorton (GB) (2012)

Main and Forward Operating Bases use a variety of local and temporary structures to house military operations and facilities for personnel. There is a desire to improve the operating environment for personnel and reduce the reliance on regular supplies of fuel. Together with the environmental requirements, there is a need to protect equipment and personnel from opposing threats, which includes the need for effective camouflage. Currently deployed temporary structures have a very limited ability to control their own infrared signature and maybe easy to detect from the air or space. Likewise such structures tend to be poorly insulated and subject to heating / cooling from the environment, to the detriment of the personnel and equipment inside. There is also a desire to provide hot water for personnel and facilities. MAST STC (Materials and Structures Technology Science and Technology Centre) CDE (Centre for Defence Enterprise) project 23770 aims to address this by developing an innovative structural panel based on commercially available building materials that are durable, lightweight and have good insulating properties. The final panel designs will be configured to control their external and internal surface temperatures. The project will investigate three modes of operation. • Infrared Electronic Camouflage (IR EGAM) • Solar water heating • Interior temperature control The project will also considers modes of operation to make the most efficient use of power and water, including energy scavenging and storage of hot and cold water through the diurnal cycle. This report describes the results of the project and trial activities.

R00027F33

COTS to Capability: Lessons identified from COTSEE (Issue 2)

QinetiQ Ltd, Farnborough (GB) (2011)

This report has been written under the Dstl Commercial Off The Shelf (COTS) Evaluation and Exploitation (COTSEE) contract (FTS3/1000050736) to outline the lessons identified by COTSEE in exploiting COTS technology to construct Technology Demonstrators for research purposes. Issue 1 of this report (published in May 2011) captured general lessons identified under a COTSEE project that developed a Technology

Demonstrator to investigate the benefits of simulated training in the context of a Joint Helicopter Command (JHC) Rotary-Wing Crew Served Weapon (CSW) Operator Trainer. Issue 2 of this report updates the original report to reflect additional lessons identified for developing capability from COTS gained under the COTSEE Offshore Raiding Craft (ORC) Gunnery project (Phase 1); another project that sought to exploit COTS technology to construct a technology demonstrator for research purposes. This report forms an important 'Lessons Identified' document that will help MOD de-risk future Technology Demonstrator Programmes (TDPs), and identifies implications for the procurement, technical, safety, business and/or commercial process of providing COTS-based research/training systems for UK MOD.

R000299BD

COTSEE Annual Report

QinetiQ Ltd (GB) (2011)

This report has been produced to satisfy the formal output requirement of WP1 -6a of the Commercial-Off-The-Shelf Evaluation and Exploitation (COTSEE) programme under contract FTS3/1000050736. This issue of the report details the work conducted up to the end of FY10/11. A second issue of this report will be delivered on the 30th March 2012 and will report on the work conducted during FY11/12. QinetiQ has the capability and track record, as proven through the provision of previous COTS Exploitation Unit (COTSEU) projects, to reduce MOD'S Through-Life-Costs through changing and improving the approach by which MOD adopts COTS technology and in doing so helping to reduce the financial burden of training, improving the utilisation of assets in theatre and reducing the risk to troops. This support is delivered in a manner that is cost-effective, readily exploitable, industry-inclusive and aligned to MOD'S simulation strategy. Work conducted to date across the COTSEE programme work packages includes the following: A COTSEE SharePoint site has been created to provide a central location for the storage of all COTSEE information and documentation; A number of COTS technology evaluations have been conducted and have been compiled into a COTS Catalogue stored on the COTSEE SharePoint site; The first Information Exchange Event (IEE) and Intervention Design Review have been held at QinetiQ Farnborough; The Game Developers Conference 2011 held in San Francisco was attended by Stu Armstrong (QinetiQ); A Government Owned, Contractor Operated (GOCO) COTSEE lab design review meeting has been held to discuss options for the design of the COTSEE lab; The location of the COTSEE lab has been identified and agreed with the customer; The proposals for the initial lab hardware and software purchase are in the final stages of agreement; and A Facility Manager for the COTSEE lab has been assigned. An initial review of how COTS technologies can potentially be exploited within the MOD has been conducted by bringing together findings from a number of the individual work packages and mapping potential COTS technologies against the categories of MOD requirements identified.

R0002A7C0

COTSEE CIED Phase 2 Scenario Design Document

QinetiQ Ltd, Farnborough (GB) (2012)

Task 3 (CIED) of the Commercial Off The Shelf Evaluation and Exploitation (COTSEE) Programme under contract FTS3/1000050736 has been undertaken to help investigate "quick win" technology interventions using COTS games and communications technologies to develop and demonstrate an environment for trainees to be immersed as both red and blue players for CIED training. This report outlines the scenario which will be used to deliver a Capability Concept Demonstration.

R0002761A

COTSEE Driver Training Task 5.3: Games Engines Terrain Database Capabilities

QinetiQ Ltd, Farnborough (GB) (2011)

Task 5 (Driver Training) of the Commercial Off The Shelf Evaluation and Exploitation (COTSEE) Programme under contract FTS3/1000050736 has been undertaken to help investigate the requirements needed for a simulated Common Driver Training (CDT) programme, with a view to informing future research activities. This report outlines the outcomes of Task 5.3, which reviewed games engines terrain database capabilities. The specific objectives of Task 5.3 were as follows: • To explore how effectively current Commercial Off The Shelf (COTS) games engines run with the high fidelity database of Bovington developed by XPI Simulation; and • To provide a summary of what commercial games software must be able to do, with respect to terrains, to deliver effective training within the military driving domain. The steps followed in this work were as follows: • Identify a terrain database that is considered representative of user requirements; • Attempt to load this database into the representative games engines; • Document the issues that were identified during this process, especially those that have implications for games engine developers; • Identify other terrain-related factors from knowledge of the wider training domain; and • Summarise the desired terrain related features that games engines must provide if they are to support defence driver training.

R00029956

COTSEE Joint Helicopter Command (JHC) Demonstration Design Document

QinetiQ Ltd (GB) (2011)

This document has been written in support of Work Package (WP) 8-1 (Design Review) and will cover the objectives, system design, integration, safety, commissioning, testing and demonstration as detailed in the Project Tasking Statement of Requirement (1) and Change Proposal Form (3). This document has collated the details and progress to date and has shown the level of maturity that has been achieved at this

stage. The safety review has started and will continue for the lifetime of the project. Commissioning and testing has been planned and will be conducted as detailed in Section 5. The demonstrations to the stakeholders planned in Section 6 will be undertaken as detailed with the aspiration that formal acceptance by the customer will be gained.

R00027F58

COTSEE Offshore Raiding Craft (ORC) Demonstration Design Document

QinetiQ Ltd, Farnborough (GB) (2011)
This Demonstration Design Document has been updated to support Work Package (WP) 7-4 of the Commercial Off The Shelf Evaluation and Exploitation (COTSEE) Offshore Raiding Craft (ORC) to reflect the specifics of the installation and integration plan and to further clarify the objectives, system design, integration, safety, environmental, commissioning, testing and demonstration as detailed in the Project Tasking Statement of Requirement (SoR) [1] and Change Proposal Form [2]. This document has collated the details and progress to date and has shown the level of maturity that has been achieved at this stage. The safety review, in line with the Safety Plan [3] has started and will continue for the lifetime of the project. Commissioning and testing has been planned and will be conducted as detailed in Section 5. The demonstrations to the stakeholders planned in Section 6 will be undertaken as detailed with the aspiration that formal acceptance by the customer will be gained.

R00027F35

COTSEE Offshore Raiding Craft (ORC) Demonstration Design Document

QinetiQ Ltd, Farnborough (GB) (2011)
This document has been written to support Work Package (WP) 7.1 of the Commercial Off The Shelf Evaluation and Exploitation (COTSEE) Offshore Raiding Craft (ORC) Design Review and will cover the objectives, system design, integration, safety, environmental, commissioning, testing and demonstration as detailed in the Project Tasking Statement of Requirement (SoR) [1] and Change Proposal Form [2]. This document has collated the details and progress to date and has shown the level of maturity that has been achieved at this stage. The safety review, in line with the Safety Plan [3] has started and will continue for the lifetime of the project. Commissioning and testing has been planned and will be conducted as detailed in Section 5. The demonstrations to the stakeholders planned in Section 6 will be undertaken as detailed with the aspiration that formal acceptance by the customer will be gained.

R00027619

COTSEE Task 5.2 - Applicability of Motion Cueing Technology to Driver Training Requirements

QinetiQ Ltd, Farnborough (GB) (2011)
The Commercial-Off-The-Shelf Evaluation and Exploitation (COTSEE) DRIVER Task 5.2 team (XPI Simulation Ltd., QinetiQ Ltd. and Quintec Associates Ltd. (a Thales company)) were tasked to examine the use of motion cueing technologies to driver training requirements. This brief report describes the research task that was undertaken. The team gathered evidence from a wide variety of sources, including academic studies, industry visits, industry technical specifications and their own experiences and established that certain motion cueing technologies are appropriate to driver training, and identified some driver training tasks that would benefit from the use of motion cueing. During the investigation phase of this study no existing schema for describing devices for inducing motion cueing in driving simulators was found. Without this it is difficult to review, categorise and map devices against requirements in a common manner. To address this need the team have developed a driver motion cueing schema. A design concept was generated using mostly Commercial-Off-The-Shelf (COTS) technologies that the MOD may wish to consider to inform their development of requirements for a common driver training facility which can be used for experimentation and exploited to provide training for defence drivers. Specific recommendations have been made with regards to taking the work further into a practical stage, and establishing if a greater percentage of driver training can be done virtually using simulators, providing an equal or better training capability than currently exists whilst reducing fuel and other live training costs.

R00029957

COTSEE Task 6 Transport Hub Architecture Design Document

QinetiQ Ltd (GB) (2011)
Architectural Design Document (ADD) articulates the high level overview of the Synthetic Environment (SE) capability that the Cassidian UK, System Design Centre (SDC), are providing to dstl to address the requirements for the 'Assessing Adversary Behaviours Using Synthetic Environments (AABUSE)' CONTEST experimentation

R0002995A

COTSEE Task 6 Transport Hub Final Report

QinetiQ Ltd (GB) (2011)
The aim of the SIG3, COTSEE, Task6 Transportation Hub SE research tasking is to address the objectives of the Assessing Adversary Behaviour Using Synthetic Environments (AABUSE) experimentation. Specifically, the Transportation Hub SE fulfils the AABUSE

requirement to deliver the aim of the CONTEST PROTECT Behavioural Science Working Group to: 'Design, build, test and utilise a synthetic environment that allows investigation of the effectiveness of different security strategies within a transportation hub environment in a safe, repeatable and auditable way.' This report articulates the overall development of the Transportation Hub SE. It provides a high level summary of activities that have taken place on the project; lessons learnt and identifies future opportunities to further develop the solution.

R0002A7C2

COTSEE Task 9 Infantry Battle School (IBS) Joint Fires Capability Concept Demonstrator: Lessons Learnt Report

QinetiQ Ltd, Farnborough (GB) (2012)

On the 28th and 29th of March 2012, the Infantry Battle School (IBS) Capability Concept Demonstrator (CCD) took place over three sites: Land Warfare Centre (LWC) in Warminster; Copehill Down, Salisbury Plain Training Area (SPTA); and the Royal School of Artillery (RSA) in Larkhill. The aim of the CCD was to integrate and demonstrate COTS technologies, as selected by the RSA and IBS, which can be deployed for training mounted and dismounted troops. QinetiQ was requested by Dstl to support the CCD aim through:

- Integration of tracker tools and VBS2, which included the following: Support to Trak (Global Solutions) to integrate their software into the CCD; Support to Igloo Vision to integrate VBS2 into their Dome; Importing Geo Referenced VBS2 terrain Database where required.
- Providing a configured Local Area Network (LAN), including provision of supporting Interface Control Document (ICD), in order to facilitate VBS2 network traffic (including DIS) between the various points of presence at LWC and RSA Larkhill.

Overall the CCD has successfully demonstrated various COTS technologies which could be deployed for training. All the participants managed to integrate their sub-systems into the overarching system and all the demonstrated systems worked together without any major technical issues. This report includes recommendations to improve the preparation and conduct of future experiments and training events, which aim to utilise similar technologies.

R00027E88

COTSEE Task3 CIED Final Requirements Report

QinetiQ Ltd, Farnborough (GB) (2011)

The report details the elicited requirements for the construction of a COTS SE that allows trainees to be immersed in the training and development of TTPs for CIED. Trainees would be able to role play as both red and blue players within the SE, allowing them to learn from playing both sides. Many requirements were identified as being common to both the All Arms User and Specialist User, primarily the use of a synthetic environment for training and the ability to represent both blue and red forces. The All Arms user requirements are

more focussed on the ease of use of the system such that it can be used to provide additional training to the currently conducted live training. The Specialist User requirements are instead more focussed on the ability of the system to support training of tactics to the point of processing an IED. The report recommends that the All Arms and Specialist user requirements identified during this study should now be used to identify and assess potential COTS technologies that could meet those requirements. These requirements should ultimately be used to drive the development of a COD that meets the users' training needs and that can be fielded to the users within a short timeframe.

R00029950

COTSEE Verification and Validation Report

QinetiQ Ltd (GB) (2011)

This study conducted a survey of commercial games software developers to develop an understanding of the verification, validation and acceptance processes and techniques used in support of simulation development. From this, a set of recommendations have been developed for undertaking the Verification and Validation of commercial games such that they are compliant with the UK DEFSTAN 03-44, 'A Generic Process for the Verification and Validation of Modelling and Simulation and Synthetic Environment Systems'

R0002B8F6

Application of Flexible Displays in Close Combat

Roke Manor Research Ltd., Romsey (GB) (2011)

Advances in state-of-the-art flexible display technology should offer several benefits for use within the military, particularly within the close combat environment. These include: Lower power requirements ; Reduced weight of screens; Potential for Reduced Emissions; Increased robustness; Flexible form factor/Increased flexibility of displays; Potential conformability (with motion and on arbitrary surface); Smaller depth of screen; Portability; Improved picture quality (esp. in direct sunlight); Potential reduction in future cost; and Disposal. This project has provided an expert assessment of current and future flexible display technologies and their potential military applications, both now and in the future. It has drawn upon expertise from Roke, alongside knowledge from experts within the Photonics and Sensors group at Cambridge University. It has also taken into consideration the higher TRL development work at the Printable Electronics Technology Centre (PETEC), and Arizona State University. This work culminated in a demonstration workshop of current state-of-the-art flexible display technology to MoD stakeholders, and identified the key features of the display technology. The demonstration included several prototypes developed under this project using Smectic A (SmA) technology. SmA is a low TRL technology which can be used to produce a bendable, flexible, potentially transparent display and is being actively researched at Cambridge.

R0002A67E

ELS Task J02 Recuperation Model Proof of Concept Study Report

Systems Engineering & Assessment Ltd, Frome (GB) (2012)

ACDS (Log Ops) sponsored Task J02 for the development of a Recuperation Model (RM) under Dstl's Expeditionary Logistics and Support Research Programme (ELS RP). The task is to determine the feasibility of developing a process, supported if necessary by an analysis tool, to assess MoD's resource commitment in undertaking Contingent Operations and the consequential risks to its ability to undertake subsequent operations. The task will develop the RM in two phases, of which the first is a proof of concept (PoC) study reported in this document. In response to captured requirements, an initial version of a flexible analysis tool was developed to calculate platform wear, damage and loss functions. The aim of the tool is to support what-if cases for the evaluation of risks and opportunities associated with proposed changes to schedule, budget and infrastructure policies and constraints. The tool was developed in Microsoft Excel; it has a menu-driven user interface and produces tabular and graphical reports.

R0002B3A7

On Board Hydrogen Generation and Enrichment of Diesel in Context of MoD Applications - A Literary Review

Systems Engineering & Assessment Ltd (GB) (2012)
The use of hydrogen in vehicles is not a new technology; however the ever-rising cost of fuel, and the heavy burden of supplying fuel to the front line, has led to an increased focus on potential improvements in fuel efficiency on the part of the MOD. Dstl has been approached by companies offering on-board hydrogen generation and injection systems as a means of improving efficiency. However the evidence provided by these companies to justify their claimed benefits has frequently not been of a sufficient standard to justify investment in their technologies. Dstl has therefore commissioned this study to investigate the main technologies and to report on their likely benefits and drawbacks for use on MOD land vehicles and equipment. This study was conducted by Atkins, sub-contracted to SEA, under project number 5102148. The principal authors of this report were Alistair Wardrope (Atkins Energy), Richard Cousins (Atkins Defence) and David Frain (Atkins Energy).

R0002A7DE

Osprey Final Report: Prototype Submarine Sonar Assessment Framework

Systems Engineering & Assessment Ltd, Frome (GB) (2012)

The introduction of 'open architecture' combat system equipments, particularly the sonars, allows MoD to consider incremental inclusion of extra software-based functionality to allow military capability to be maintained against the backdrop of an evolving threat. The technical issue which this report helps address is how do you select technical approaches for insertion to meet the changes in threat? This report defines an assessment framework, initially focussed on sonar systems, which can be used to rank different technical approaches for updating the submarine combat systems in order to inform MoD decision making, through consideration of system design impact, capability benefits, technical (and related) risks, development and procurements costs.

R0002B85A

The Impact of Environmental and Sustainable Development Measures on the Maritime Supply Chain

Systems Engineering & Assessment Ltd, Frome (GB) (2012)

Shortage of resources, public concern for environmental issues and legislative restrictions place pressure on all operators in the maritime domain to behave with greater responsibility. It is inevitable that these pressures will continue and increase over time. An overview is provided of administrative and technology-based measures addressing fuel conservation, emissions and pollution control in ships and aircraft. Each measure is described, its relevance to the operation of the MOD maritime supply chain is examined, and the likely trend to 2030 is estimated. Where a measure might be exploited in Royal Fleet Auxiliary platforms in order that the platform's environmental performance could benefit, this is identified.

R0002A6AD

How can we develop legal and autonomous unmanned aircraft?

Unmanned Systems Canada, Ottawa (CA) (2011)
This presentation gives an introduction to the laws of armed conflict (LOAC) and how they apply to autonomous air systems (UAS). A systems engineering approach is used to produce a set of requirements which must be met if UAS are to meet LOAC. A new "top-down" approach has been developed here which specifies the roles of authorised entities, whether human or machine. All control decisions and the criteria to make them can be correctly allocated within the system to the entity which can legally make the decision. Human decision-maker must be presented with relevant information with time to make their decision. One conclusion of the presentation is that the UK does not want to develop fully autonomous weaponised UAV systems.

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