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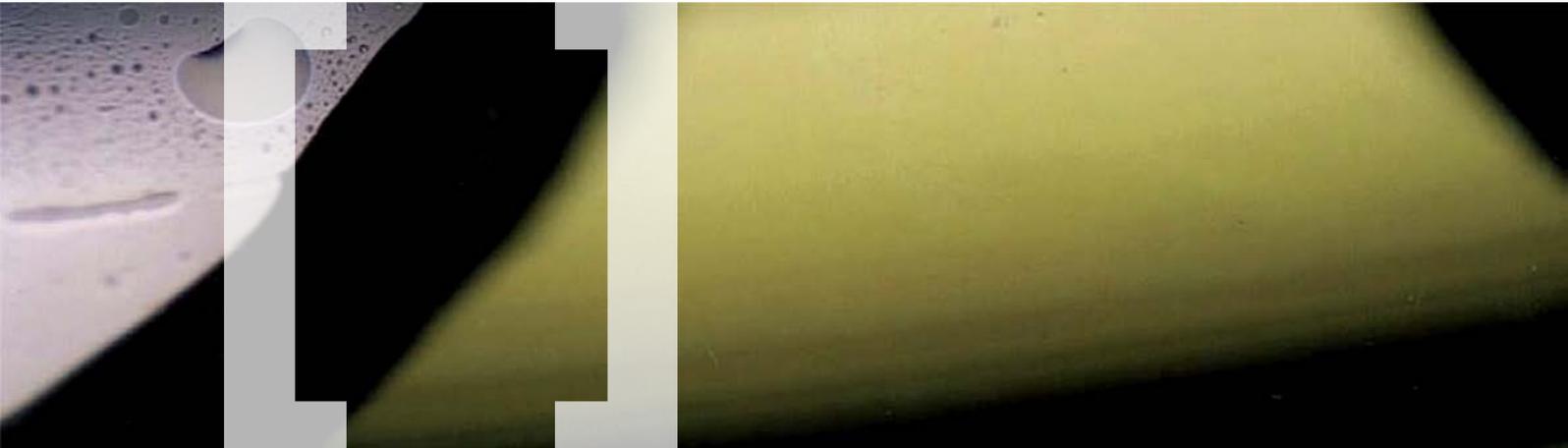
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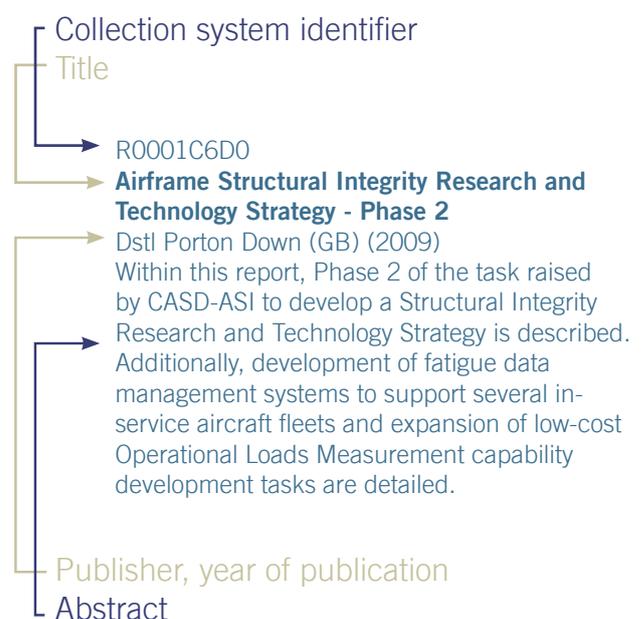
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Defence Science and Technology

Sample citation
The components for a typical citation, as they appear in Defence Reporter, are illustrated below:

Collection system identifier
Title

R0001C6D0
Airframe Structural Integrity Research and Technology Strategy - Phase 2
Dstl Porton Down (GB) (2009)
Within this report, Phase 2 of the task raised by CASD-ASI to develop a Structural Integrity Research and Technology Strategy is described. Additionally, development of fatigue data management systems to support several in-service aircraft fleets and expansion of low-cost Operational Loads Measurement capability development tasks are detailed.

Publisher, year of publication
Abstract

[dstl]
Ministry of Defence

Defence Reports

R00031EEC

A survey of crew exposure to noise in a "Terrier" Manoeuvre Support vehicle Institute of Naval Medicine, Alverstoke (GB) (2013)

Noise measurements were made in a tracked "Terrier" Manoeuvre Support Vehicle that is used for digging and moving earth. Time histories of sound pressure were acquired onto an Edirol audio recorder from two locations (commander and driver) with the vehicle being driven over road, gravel track and cross-country terrain. Recordings were made with and without a trailer and whilst the vehicle was earth moving. Measurements were made approximately 15 cm from the right ear of the crew. The data have been assessed and interpreted in accord with the Control of Noise at Work Regulations 2005. Average noise levels ranged from 91 dB(A), during earth moving, to 110 dB(A), during travel over gravel track. Noise levels were generally similar at the driver's location and at the commander's seat. Exposure periods required to reach the 'upper exposure action value' of 85 dB(A) varied from about 1 minute to about 1 hour depending on the operation of the vehicle. The noise exposure of the crew would be expected to exceed the 'upper exposure action value' specified in the CNAWR. Recommendations have been made including provision of information and training on the forms of action that personnel may take to reduce their exposure to noise, a rigorous programme of maintenance for all hearing protection devices used and appropriate health surveillance for noise-exposed personnel.

R0003118E

AW Safety Management Plan Dstl, Portsdown West (GB) (2014)

Dstl AW Safety Management Plan a subset of Dstl assurance activity addition elements to support AW requirements includes the activities required to address the Haddon-Cave report also includes activities to support closure of recommendations from SCS ITE Report.

R000312E6

Chemical, Biological, Radiological and Nuclear (CBRN) Battlespace Information System Application (BISA) End User Evaluation (EUE) Test Plan and Report Dstl, Porton Down (GB) (2013)

This document is the test report for the Chemical, Biological, Radiological and Nuclear (CBRN) Battlespace Information System Application (BISA) End User Evaluation (EUE) sessions conducted at the Joint Systems Integration Body lab in General Dynamics in November 2012 and January 2013.

R000312E2

Composite advanced technology mast - material performance and lessons learned to support Type 26 lightweight mast technology options Dstl, Porton Down (GB) (2013)

This document summarises the experience and knowledge gained from the third mast fitted to Ark Royal in 2005 - the only UK Naval composite ship mast. It covers the design, fabrication, in- service performance, end of life disposal, issues and lessons learned. Another version of this report containing higher security level RF performance data will also be published. The mast was designed and constructed by QinetiQ with Babcock being the major subcontractor. It was intended to utilise the potential benefits of composite masts including the provision of a weatherproof environment for sensors whilst reducing topweight and minimising radar cross section. Ark Royal has now been decommissioned and sold for scrap. Before scrapping, the opportunity arose to undertake studies with the purpose of retaining corporate and technical knowledge and understanding the effects of environmental ageing on the electrical performance of the mast materials, degradation of the gel coat and durability of the novel jointing systems used. It was concluded that a good composite structure can be designed and built but the difficulty in achieving this should not be underestimated or under resourced. The third mast of Ark Royal was in service for over 7 years and showed little sign of degradation.

R000310FA

Cost Co-Ordinator End of Year Report Dstl, Portsdown West (GB) (2014)

A report to illustrate the activities undertaken in the Air Through Life Capability Management (TLCM) and Costs Study during the 2013-14 financial year. This study is part of the wider Air Domain Analysis Project. The study sought to develop a co-ordinated plan of work which could provide cost models for the Air environment and other key stakeholders. This work was conducted both in house and as Extra Mural Research (EMR). The work resulted in an upgrade to the Dynamic Air Capability

Force Generation Tool (DACFGM) and the new Automated Cost Model Generation Tool (ACMGT). The cost study and its related tools require a large quantity of data which needs gathering from a vast array of sources, much time has been spent influencing others in order extract this data.

R00031302

Crew exposure to weapon noise in a Viking military vehicle
Dstl, Institute of Naval Medicine, Gosport (GB) (2014)

Recordings were made of the exposure to noise exposure of different crew within a Viking military vehicle whilst firing a GPMG, HMG and a Grenade Launcher on the firing range at Castlemartin, South Wales. Time histories were acquired of noise from live rounds fired in single round mode and in burst firing modes. The data have been assessed and interpreted in accord with current standards concerned with health effects of exposure to noise: MoD DEFSTAN 00-27, DE&S S&EP Leaflet 06/2013 and the Control of Noise at Work Regulations (CNAWR) 2005. The highest peak sound pressure level measured was 152 dB(C) (760 Pa) for the HMG; the corresponding sound exposure level for a single round was 119 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 HMG 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 when using the H10A hearing protector or the Classic II earplugs. 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.

R000319F9

Cyber Vulnerability Investigation (CVI) Good Practise Guidance
Dstl, Porton Down (GB) (2014)

This document provides an overview of evolving good practice for undertaking Cyber Vulnerability Investigations (CVIs). It has been compiled from and continues to be refined by the United Kingdoms (UKs) Air Warfare Centre (AWC) and Defence Science and Technology Laboratory (Dstl) experiences of undertaking such cyber defence activities.

R00031BAE

Disclosure and self-decontamination of bacteria on surfaces: a year-one update
Dstl, Porton Down (GB) (2014)

The long term aim of this project is to exploit the metabolic activity associated with viable bacterial agents of concern (BACs) to produce a visible signal which will reveal their presence and, to an extent, density on a surface. It is envisaged that a spray or film could be applied to surfaces by non-specialist personnel. Further advantages of this disclosure approach are that it would avoid the problems of sampling and recovery of bacteria and differentiation of living and dead organisms. It is envisaged to be used in conjunction with existing detection technologies and not to replace them. In the simplest form of this approach, the disclosure of general bacterial activity following decontamination would reveal the locations where it had or had not been successful. By targeting enzymes characteristic of particular BACs this technology could be used to triage operationally important equipment prior to decontamination. It could also lead to a significant saving in cost during research trials in hazard management. The conclusions from the work done to date are: (i) the concept of using bacterial metabolic activity to generate a visible signal on a surface has been proved; (ii) disclosure can occur in a gel applied to a solid surface; (iii) differentiation between living and dead organisms is readily achievable; (iv) specific bacterial enzymes can be targeted using substrates that result in a coloured or fluorescent product and (v) triggering of spore germination results in the resumption of enzyme activity which can be visualised. The recommendations are: (i) engage with an extramural researcher to develop polymer matrices that can be applied to solid surfaces and provide the environment for enzyme-based disclosure; (ii) incorporate selective agents such as antibiotics in the polymer formulation to investigate the possibility of increasing the selectivity of disclosure to particular BACs and (iii) investigate the possibility of self-decontamination using the principle of endogenous enzymes, demonstrated here, to activate a disinfecting agent present in an inactive form.

R00031C80

Dstl Airworthiness Competent Organisation Exposition
Dstl, Portsdown West, Fareham (GB) (2014)

This document provides the evidence to support the Dstl claim for certification as a 'Competent Organisation,' in accordance with Military Airworthiness Authority Regulatory Publications, Regulatory Article 1005, for the delivery of Independent Technical Evaluation for the Lightning Project Team. Certification of Dstl as a Competent Organisation will be made by the Lightning Project Team based upon the outcome of an audit of the Dstl Airworthiness Capability by Systems Consultants Services Limited in January 2015. This document includes the Dstl assessment of progress towards Competent Organisation status together with evidence provided to support assessment against the Defence Equipment and Support Airworthiness Team's 3 Level Goal Structure and against the Systems Consultants Services Ltd Recommendations from the previous Audit in April 2012.

R00031C88

Dstl Airworthiness Independent Technical Evaluation (ITE) Competency Framework (CF)
Dstl, Portsdown West, Fareham (GB) (2014)

Dstl is required to attain Competent Organisation status to deliver airworthiness Independent Technical Evaluation to support the Lightning II safety cases for military flight test permits, release to service and through life. The procurement of Lightning II from a foreign national supplier means that some Independent Technical Evaluation must be done in government rather than by commercial suppliers. To achieve Competent Organisation status an Independent Technical Evaluation Competency Framework is mandatory. An Independent Technical Evaluation Competency Framework to support an accredited Dstl airworthiness Independent Technical Evaluation capability has been described. The report addresses the requirement, roles, competences and assessment process necessary to provide Suitably Qualified Experienced Personnel and airworthiness assured Independent Technical Evaluation for potential technical domains identified by the Lightning Project Team Leader. The Dstl Airworthiness Independent Technical Evaluation Competency Framework has been based on advice and recommendations from the Institute of Engineering and Technology "Blue Book" and Defence Equipment & Support Airworthiness Team "Independent Technical Evaluation Guidelines" document. This document supersedes the original Dstl Airworthiness Independent Technical Evaluation Competency Framework, DSTL/CR78957 v1.0, dated 31 Mar 14.

R00031C83

Dstl Airworthiness Processes and Procedures
Dstl, Portsdown West (GB) (2014)

This document contains the Airworthiness Processes and Procedures used during the delivery of Dstl's Airworthiness assured Independent Technical Evaluation advice to the Lightning Project Team. This is the third document in the Dstl Airworthiness Document Set. These processes and procedures are the basis for Dstl claim for certification as a Competent Organisation in accordance with Military Aviation Authority Regulatory Publications. The document contains procedures for airworthiness: governance, audits, tasking, competency assessment, conduct of the Suitably Qualified and Experienced Personnel Assessment Technical Understanding Meeting which is the key activity in matching competent Dstl staff to task, report writing, hazard identification and the Dstl Airworthiness Document Management System. This document supersedes the original Dstl Airworthiness Processes and Procedures, DSTL/CR79861 v1.0, dated 31 Mar 14.

R00031C82

Dstl Airworthiness Safety Management Plan
Dstl, Portsdown West (GB) (2014)

This document contains the plans for the delivery of the Dstl LPT ITE strategy. It is the second document in the Dstl Airworthiness Document Set. It details the infrastructure and supporting information to underpin Dstl certification as a 'Competent Organisation' in accordance with the Military Aviation Authority Regulatory Publications. It follows the guidance contained in the Military Aviation Authority Manual of Air Safety. Contents include: Chief Executive Director, Safety Priorities, Airworthiness Safety Management Plan Objectives, Responsibilities and organisation, training policy and plans and Safety Management Activities. Terms of Reference for key posts. Letter of Air Safety Notification format and the Master glossary and list of abbreviations for the Dstl Airworthiness Document Set. This document supersedes the original Dstl Airworthiness Safety Management Plan, DSTL/CR79860 v1.0, dated 31 Mar 14.

R00031C81

Dstl LPT ITE Strategy
Dstl, Portsdown West, Fareham (GB) (2014)

This document describes how Dstl will develop and deliver an Airworthiness capability that is tailored to meet the Lightning Project Team Customer requirements through a phased approach. It contains details of the progress to date, the Dstl Positioning Statement on Airworthiness and the plan for delivery against the 4 pillars of Airworthiness. This document supersedes the original Dstl LPT ITE Strategy, DSTL/CR80456 v1.0, dated 31 Mar 14.

R00031CDA

Entity-based approaches to managing information: A review
Dstl, Fort Halstead (GB) (2014)

A review was undertaken into the approaches presently being exploited outside Dstl for the management of information through an 'entity-based' approach. In practice this tends to rely on implementations of the 'Semantic Web' concept, whereby the fundamental units of information are stored as Semantic Triples. These triples form the basis of knowledge graphs which can be navigated to efficiently extract all relevant information pertaining to a subject/object. The purpose of this document was to provide background information to inform decision-making with respect to the future development of Dstl's knowledge and information management and exploitation processes.

Final Report WP4a Emerging Technologies and WP4b Advanced Sensor Systems for optimum SA TIN 2.034
BAE Systems, Alvington (GB) (2014)

Currently, Armored Vehicle design hinders adequate integration of personnel and their equipment. The study TIN 2.034 "Integration of Personnel into Vehicles" focuses on the Human Factors challenges linked to the integration of personnel with military Armored Vehicles. Work Packages WP4a "Emerging Technologies", and WP4b "Surveillance Systems and Driver Aids" address the future. In WP4a, some 118 emerging technologies were identified and their potential impact on the current problem areas such as Normal and Degraded Vision, Sound and Vibrations, and Cognitive Workload were investigated. In WP4b an hypothetical surround view system based on current state- of-the-art technology and scientific studies on driving and surveillance under armor using indirect viewing systems was provided. The study showed that a variety of technologies will become available in the next 5-8 years with a significant potential positive impact on the crew members of Armored Vehicles. Further research is required to successfully integrate these into vehicle technology. In order to address all the research questions associated with development of surround view, we recommend international cooperation.

Final Summary Report TIN 2.051 - Phase 1 The Defence Trainer Capability-Trainer Selection, Reward and Career Management Technical Report 1
BAE Systems, Alvington (GB) (2014)

This report identifies a good practice framework for the attraction, identification, selection, reward and career management of those in trainer roles and evaluates the current Defence approach against this, in order to better understand the human capability implications of the Defence Trainer Capability (DTC). The 'as is' situation within Defence is examined within a short scoping study and key factors and issues are identified. Similar defence and public sector organisations' approaches are reviewed within a literature review in order to identify good practice and the breadth of issues relating to this area. The research identifies key themes in the Defence approach and evaluates these against a good practice framework to identify 5 Central Research Questions which combine to provide Defence with options for addressing the key issues identified. Conclusions are drawn from this scoping study and linked directly to the research questions, which aim to take the research project into a subsequent phase.

General Service Respirator (GSR) Export Special (ES) Evidence Matrix
Dstl, Porton Down (GB) (2014)

Dstl was tasked by DE&S to produce an 'evidence matrix' to state the verification required to demonstrate that the General Service Respirator (GSR) Export Special (ES) meets the criteria stipulated in the System of User Requirement (SUR) document. This information will be used to support the production of an acceptance matrix that will form part of an Integrated Test Evaluation and Acceptance plan (ITEAP) to be produced by DE&S.

Generic CFD modelling to determine material mixing times in mechanically ventilated room
Dstl, Porton Down (GB) (2014)

Computational fluid dynamics (CFD) has been used to study the speed at which a tracer material spreads across mechanically ventilated rooms. A modelling tool has been developed to automatically build and run a large number of CFD models in order to study the dependence of key mixing metrics on room geometry and ventilation parameters. The modelling tool has been produced using open source CFD software which has made it possible to simulate many hundreds of cases without incurring prohibitive licence costs. When combined with high performance computing, this makes studies of a wide parameter space possible and allows for generic conclusions to be drawn. An understanding of the parameters which control mixing in mechanically ventilated rooms along with how mixing times vary will help resilience and safety planning for accidental releases of toxic material. The CFD methods used have undergone validation against Dstl trials data for spatially averaged concentrations. Due to the differences in the room in which the trial took place and the generic study room designs, further validation with different data sets would be of benefit. The rooms modelled were regular cuboid shapes with mixing ventilation and supply and extract vents located on the ceiling. The room volume and shape, the air change rate and vent layout were varied for each room using experimental design methods to cover the parameter space. A tracer gas was released in the model from the ventilation system. The output metrics calculated were either the times taken for the 5th, 50th and 95th percentiles from the distribution of concentration across the room to exceed a threshold or the time between two percentile levels crossing the threshold. An attempt was also made to assess when the room became well-mixed based on a measure of the standard deviation of concentration across the room. Results from the generic study have also been compared to output from CFD models of four real rooms.

R0003198A

Global Network Analysis with Real Time Streaming Functionality and Generic Applicability - Capping Paper for Tumbling Dice Ltd Research and Development under CDE31604.
Dstl, Porton Down (GB) (2014)

This capping paper summarises the work performed by Tumbling Dice Limited, on the Centre for Defence Enterprise (CDE) innovation project CDE31604, entitled 'Research and Development into Global Network Analysis with Real Time Streaming Functionality and Generic Applicability'. The intention of the Dstl funded research was to take the Tumbling Dice Global Network Analysis (GNA) suite of algorithms, which existed at only a very low Technology Readiness Level (TRL), and to apply them to find interesting features of a network, such as bottlenecks and high connectivity. Many existing algorithms (such as self-organising map neural networks) slow exponentially with the volume of data because their processing cannot be shared between separate computing hardware. It was proposed that the GNA algorithms would be designed in such a way that they would not have this limitation and could be used to process large networks on a modest server. Overall, the work completed under CDE31604 has demonstrated the feasibility of a real time global network analysis toolset that has the capability to rapidly analyse a variety of networks. An independent assessment (reported in Appendix A) suggests the toolset is almost 10 times faster than a neural network based tool would likely be. The four component network analysis tools which form the Tumbling Dice global network analysis suite have been tested on a wide variety of networks including small (tree and loop) networks, a rail infrastructure network (Tyne and Wear Metro), the UK electricity transmission grid, a pair of biological networks (protein interactome of influenza H5N1 and a broad leaf woodland ecosystem network, and an open source Terrorist Network (Noordin Top Terrorist Dataset). Both in-house testing and subsequent validation by an external consultant have shown that the GNA suite is very fast and produces sensible and consistent results.

R00031274

Hindsight for Foresight Framework - A Conceptual Exploration Paper
Dstl, Portsdown West (GB) (2014)

The Hindsight for Foresight framework is designed to assist decision makers and futures analysts in their understanding of the processes by which trends evolve and how events can shift the contextual environment. By understanding how these processes interact, decision makers and analysts will be better equipped to anticipate potential patterns of trends and their impact on society and defence. Showing the interaction between trends and interests and mapping the influence of key factors and their evolution is integral to understanding the dynamic processes that underlie causality. Exploring the implications of technology and innovation alongside political and cultural trends further enhances a futures analyst's understanding of the context in which changes occur and interact. The framework avoids the narrow focus inherent in existing models and enables a wider analysis of evolutionary processes and implications for technological and societal change on defence

R00031A6F

Human Systems Integration for Land Vehicles WP1 Technical Guide TIN 2.034
BAE Systems, Alvington (GB) (2014)

The Human Systems Integration for land vehicles technical guide presents an update to Def Stan 00- 25 Part 14/1 (2000). The guide provides an overview of the vehicle HFI process, guidance, requirements and case studies that incorporate examples of human factors (HF) 'good practice' and lessons identified in a review across vehicles (tracked and wheeled). The intended audience of this guide is DE&S Requirement Managers, Project Teams, those involved in Assurance activities and Industry. The technical guide is divided into two parts: Part 1: This part provides background information on the vehicle HFI process. It is designed to provide an introduction into the use of HF within the Systems Engineering (SE) design process. Part 2: This part provides HF guidance required to support the designer in the requirements development and assessment of key components of vehicle design. Tailored HF vehicle guidance is provided followed by a recommended set of vehicle requirements that are supplied to assist Designers to tackle the HF issues discussed within the guidance. The HF information in Part 2 is divided into twelve sections, within which more comprehensive information is provided. Subsequently case studies are provided as examples of how military vehicles have been designed with HF as an integral part of the design process.

R000319E2

Interim Technical Report TIN 2.035 Challenge 2: Multi-Source Information Assimilation to Support Decision Making
BAE Systems, Alvington (GB) (2014)

Human operators throughout Defence have to deal with increasing volumes of information via multiple independent systems. Often the human is the integrator and it is suspected that this will reduce their effectiveness. This work examines methods and tools to assist the integration and visualisation of multiple sources of information to support more effective decision-making by military personnel. Specially, this work aims to develop techniques that can improve visualisation and assimilation of information, common referred to as sensemaking, and measures to assess how effective they are. This particular report describes the Cognitive Task Analysis undertaken to identify the sensemaking requirements for COMINT (Communications Intelligence). In support

of this activity a short literature review concerning sensemaking theories was conducted which has identified that Klein's Data Frame Model and Pirolli and Card's intelligence analysts sensemaking model provide the most suitable theoretical frameworks to underpin this work. One of the key findings from this work so far is that existing requirements identification techniques do not easily deal with cognitive requirements that clearly specify design requirements. Bridging the gap between cognitive requirements and design requirements presents a very worthwhile challenge to address in this project.

R0003116A

Milestone: M13PF010301 - Counter-Improvised Explosive Device (C-IED) Training and Train the Trainer Methodology
Dstl, Porton Down (GB) (2013)

Currently the cascade, or train the trainer, approach to Counter Improvised Explosive Device (C-IED) training has not been formally evaluated. This paper makes up one of three strands of work that aim to understand the current perceptions, benefits and shortfalls of the current progression. This paper reports on output from interviews with OpTAG instructors, deployed units and units that have finished Mission Specific Training prior to deploying; on their perception of the benefits and limitations of the cascade approach to C-IED training.

R00031A20

Mounted Sustain Project Advanced Repair Summary Report 2014
Dstl, Porton Down (GB) (2014)

The Advanced Repair work stream under the Mounted Sustain research programme (RAMD) was established to investigate evolving joining technologies and to deliver quantitative analyses of their performance and durability to meet military demands. A broad programme of work has been developed to provide MoD with the necessary understanding of emerging materials joining technologies, and is described in this report. Friction Stir Welding has been identified as a technology that offers a step change in high-rate blast performance of welded joints. However, there are some significant challenges to implementation, which are being investigated. Other advanced fusion based processes are currently available (such as automated MiG) which can offer advantages in terms of improved weld quality and strength, at a fraction of the cost of FSW. However, the improvement in weld performance will never be as great as FSW due to the metallurgy involved. The impact in the Land environment of other emerging technologies for advanced joining and manufacture, such the Wire-fed Arc Additive Manufacture, are also under investigation under the Advanced Repair programme. Recommendations are made for future projects.

R00031EE4

Noise and vibration exposure on a M3 Amphibious Bridging and Ferrying Equipment
Institute of Naval Medicine, Alverstoke (GB) (2014)

A survey was conducted of the noise and vibration occurring on a M3 Amphibious Bridging and Ferrying Equipment during travel over road and operations over water. Noise and vibration measurements were made in the cab during road travel and at the pilot's location during water operations. The data have been assessed and interpreted in accord with current standards concerned with health and comfort aspects of human exposure to noise and whole-body vibration: The Control of Noise at Work Regulations (CNAWR) 2005 and The Control of Vibration at Work Regulations (CVAWR) 2005. The highest sound pressure level measured on the vehicle was 85.6 dB(A) during travel over road. The maximum acceleration value on the rig was 0.31ms to the power of minus 2 r.m.s. measured on the driver's seat during travel over road. Crew exposure to noise would not be expected to exceed the upper exposure action value during operations on road and water. Exposure to vibration would not be expected to reach the daily exposure action value specified in the relevant Regulations. Recommendations have been made on how crew can control and reduce their exposure to noise and vibration.

R00031C85

NOISE EXPOSURE ON THE BRIDGE OF HMS LEDBURY DURING FIRING OF A 30-MM AUTOMATED SMALL CALIBRE GUN AND A GENERAL PURPOSE MACHINE GUN
Dstl, Institute of Naval Medicine, Gosport (GB) (2014)

Measurements were made of sound pressure levels at three locations on the bridge on HMS Ledbury during firing from the ship's 30-mm Automated Small Calibre Gun (ASCG) and a General Purpose Machine Gun (GPMG) mounted on the bridge wings. The three locations on the bridge were the starboard door, centre and port door. The data have been assessed and interpreted in accord with current standards concerned with health effects of exposure to noise: MoD DEFSTAN 00-27, DE&S S&EP Leaflet 06/2013 and the Control of Noise at Work Regulations (CNAWR) 2005. The highest peak sound pressure level measured on the bridge was 126.7 dB(C) (43.3 Pa) for the 30-mm ASCG; the highest sound exposure level for a single round was 90.9 dB(A). The corresponding values for firing of the GPMG were 109.9 dB(C) (6.3 Pa) for the peak value and 79.5 dB(A) for the sound exposure level. The data show that the peak lower exposure action value (peak sound pressure level of 135 dB(C)), would not be reached for crew on the bridge during firing of the two weapons. Therefore there would be no requirement

for the bridge crew to wear any hearing protection during firing. Furthermore, crew on the bridge could be exposed to noise from 2340 rounds from the 30-mm ASCG or 32000 rounds from the GPMG before reaching the lower exposure action value of 80 dB(A).

R000319B6
Oculus Rift: Quick Look
Dstl, Portsdown West (GB) (2013)
The Oculus Rift is a virtual reality headset that is being developed for the commercial video games market. It is intended to provide an immersive virtual reality experience at a low cost thanks to its large field of view and off-the-shelf components. Dstl acquired an Oculus Rift development kit and has produced this report to provide a summary of the device. It includes a comparison to similar equipment, an explanation of the technology behind the device, subjective assessments of the user experience, and notes on human factors issues, potential use cases and recommendations for further work.

R00031A36
Optimising Live/Synthetic Training
Dstl, Portsdown West (GB) (2014)
This paper summaries the available research and OA that underpins MOD's current understanding of the Live/Synthetic Blend (LSB) of Training and looks at ways in which it might be optimised. Using the extant evidence base, it examines the assumptions about training, outlines the factors that affect the blend, and assesses the impact of re-blending training on operational effectiveness. It recognises the inherent complexities of determining a cost-effective LSB that optimises training outputs and concludes that the evidence indicates it is possible to adjust the LSB by transferring elements of live training into the synthetic environment, but this will not be achievable at no/notional cost. The paper was commissioned to support capability managers and senior decision-makers by summarising the analysis to date in this area. It also identifies a number of gaps in the evidence base, which could potentially be plugged by undertaking further research activities.

R00031278
PROJECT PYRAMID Mission System Reference Architecture Top Level Breakdown
Dstl, Portsdown West (GB) (2014)
This document provides a reference architecture for airborne mission systems and their associated ground control station software. It contains a structure for the major subsystems/componants, and a description of the functional componants within that structure. It is targeted at unmanned air systems, but is also applicable to mission systems (or parts thereof) for manned air systems, potentially to other sectors. The reference architecture is expected to enable the production and maintenance of a set of re usable

certifiable components, suitable for exploitation by equipment programmes. The associated MOD endeavour is known as Pyramid.

R00031A3A
Quantum Sensing of Sound; An Initial System Concept
Dstl, Portsdown West (GB) (2014)
The proposed concept describes a system for the detection of acoustic waves at the most fundamental, quantum, level, by exploiting the physics of non-relativistic quantum fields. It is based on further exploitation of the cold atom trap developed by Aberdeen University. This also allows potential identification level information at the detector on the basis of being able to access and exploit particular sound frequencies from the source. By designing an acoustic detection {and possible identification) system which works at the single quantum particle level, the phonon, we have a sensing system which is as refined in resolution as it is possible to achieve physically. It remains to be seen if it can work in practice.

R0003199A
Scoping of a Controlled Terms Service
Dstl, Porton Down (GB) (2014)
Controlled terms ensure that information is indexed consistently within an Information System and can improve browsing, retrieval and information discovery within the Information System. Providing a Controlled Terms Service would ensure that controlled terms could be accessed and searched by any number of Information Systems to provide information consistency, exchange and integration. Options and considerations for a Controlled Terms Service within Dstl are set out. An ontology is recommended as the most suitable way of providing a controlled vocabulary as it is able to represent a knowledge domain whilst including detailed information about relationships and properties. An ontology will also contribute to a semantic reasoning capability across Information Systems. A number of machine readable ontological data models are reviewed. The latest revision of the Web Ontology Language (OWL2) is recommended. Good practice in terms of ontology management is included. Accessibility of the Controlled Terms Service with current applications within the organisation is also considered, as well as a cursory review of existing ontological software and existing Controlled Terms Services on the World Wide Web.

R000311E4
Success and Failure Factors in Transitional Regimes
Dstl, Portsdown West (GB) (2014)
This report looks at possible success and failure factors in transitional regimes. The study aims to advise the formulation of policy and strategy by highlighting any key themes or overiding factors which are important

in creating a successful transition. The study found that Social, Political, International and Legal factors were more associated with success as they affected the domestic legitimacy of the regime more than Economic, Military and Internal Division factors. Post-Transition management is very important in creating a successful transition, but only in certain circumstances. However, the study also found that successful policies affecting these factors are context specific to the country and transitional process in question. Policies that work in some cases can be unsuccessful in others and vice versa. As a result, any support given to help a transitional process should be based upon an in-depth assessment of the context and situation within the state in question.

R00031257
Summary of armour assessment trial MOD Eskmeals 29th April to 3rd May 2013
Dstl, Porton Down (GB) (2013)
The results of an armour assessment trial are discussed in terms of ballistic performance, areal density, bulk and approximate costs per m^2. State-of-the-art applique armour systems were procured from industry, based on a Key User Requirement and then ballistically assessed.

R00031225
Summary of material made available from the "Post Quantum Research - Identifying Future Challenges and Directions" workshop, May 2014
Dstl, Porton Down (GB) (2014)
This report summarises material presented at the "Post-Quantum Research - Identifying Future Challenges and Directions" workshop, held at the Turing Gateway to Mathematics at University of Cambridge, May 2014. It summarises the main themes that emerge from the workshop materials, and considers the implications of these for Dstl.

R0003125D
Supply of NAC and Requirements for Additional Evidence of Efficacy DECISION POINT REPORT
Dstl, Porton Down (GB) (2014)
The MoD requires a capability to manage casualties that have lung damage as a result of exposure to inhaled chemicals, such as phosgene and sulfur mustard. Exposure to these chemicals may produce an acute lung injury (ALI), or in more severe cases an acute respiratory distress syndrome (ARDS). Mortality rates for ARDS remain high, despite decades of research into the use of novel ventilation and medical management strategies. Management of casualties with ALI or ARDS is reliant on airway management and respiratory support in the intensive care / high dependency care

setting. In the event of a release of a lung damaging chemical this could place a significant burden on these medical resources. Hence, there is an ongoing requirement to find efficacious pharmacological treatments for chemically-induced ALI, with the goal of reducing the requirement and duration of respiratory support and improving the outcome following exposure. Previous work carried out at Dstl has shown potential efficacy in administering multiple nebulised doses of N-acetylcysteine (NAC; Mucomyst™) to ameliorate the effects of sulfur mustard- induced ALI in the terminally anaesthetised pig. NAC is a pharmaceutical product that may have potential as a Commercial Off-The-Shelf (COTS) broad-spectrum therapeutic agent which could have utility in treating a number of chemical exposures, either on its own or as a combination therapy. Further research is required to provide supporting evidence to inform decisions on transitioning NAC into service as a fielded medical countermeasure for sulfur mustard-induced ALI.

R000311EA
Systematic appraisal of options for sample processing
Dstl, Porton Down (GB) (2014)
The aim of this research was to carry out a systematic assessment of options for sample processing to address the requirement for high confidence Biological warfare (BW) sensing across the threat agent spectrum for both aerosol and surface deposited hazards. Having concluded that effective sample processing requires a series of technologies working together in an integrated manner, a range of novel technologies were developed which allow for sample clean up and interferent removal, sample concentration, bacterial disruption and DNA purification. An automated, integrated processing test bed system was developed, able to handle heavily particle laden samples and to process 5 - 10 ml sample volumes on an appropriate timescale. Concentration factors for bacteria and proteins of greater than 200-fold have been achieved. A1000- fold improvement in the limit of detection for Bacillus atrophaeus (BG) spores was achieved on a lateral flow Hand Held Assay (HHA) following bacterial concentration. The sample-clean up unit showed removal of over 99% of large (>8 micro meter) unwanted particles from a 5 ml sample with 90% of the smaller 1 micro meter bacterial sized particles retained.

R00031A35
TIN 2.018 Ethnic Minority Representation in UK Military Cadet Organisations Interim Summary Report
BAE Systems, Alvington (GB) (2014)
The United Kingdom cadet organisations are sponsored and supported by the Ministry of Defence. There are four cadet organisations in the UK and one school-based Cadet Force. Anecdotal evidence suggests that cadet organisations attract membership from ethnically diverse groups (representative of their local

communities); however, the same level of representation is not necessarily reflected in Adult Volunteer Instructors. This study provides an opportunity to: Understand what attracts young people from ethnically diverse backgrounds to join/maintain participation with the cadet organisations; Explore the career aspirations of those who participate in the cadet organisations; Identify lessons for sustaining diversity within cadet organisations; and Understand what attracts Adult Volunteer Instructors and what are the implications for recruiting them. Data has/is being collected from cadets and Adult Volunteer Instructors via an online survey, focus groups and telephone interviews. Stakeholder interviews and a review of the psychological/sociological literature were also conducted. Emerging findings indicate that regardless of ethnicity, young people are joining the cadet organisations because it looks 'fun' or they have been encouraged by their peers. Consequently, the majority of personnel become aware of the cadet organisations via 'word-of-mouth'. This is true for both the cadets and Instructors.

R00031A21

TIN 2.042 Impact of Demographic Shift on Regular, Female and BAME Recruitment Final Report
BAE Systems, Alvington (GB) (2014)

This report details the findings of a research project focused on the impact of changing demographics and social trends on the recruitment of regular, female and Black, Asian and Minority Ethnic (BAME) personnel within the UK Armed Forces (AF). The findings indicated that the number of white males and females aged between 16 and 25 would fall by 2030, but that BAME males and females would rise steeply. AF recruitment might also be affected by changes in the prevalence of asthma, obesity, nut allergies, mental health problems and drug and alcohol use as well as trends in education, employment, migration, religion, family structure, youth crime and attitudes towards work. Taken together, these changing demographics might represent a threat to the ability of the AF to maintain the manning levels needed for operational effectiveness. The report goes on to examine ways of increasing female and BAME recruitment as a means of not only addressing these possible deficits but also to benefit from increased diversity in the workforce. The report examines both past research on recruiting females and BAME groups and the experience of overseas militaries in comparable nations.

R00031A67

TIN 3.011 The Representation of Stabilisation Operations at the Tactical Level Phase 2 and 3 Final Report Volume 1
BAE Systems, Alvington (GB) (2014)

This document is the final analytic report on Phases 2 & 3 of Task Identification Number 3.011 The Representation of Stabilisation Operations at the

Tactical Level. It describes an investigation of the use of a hybrid modelling approach for the evaluation of the impact of combat operations on the stabilisation environment at the tactical level. The document is in two volumes; Volume 1 is an overview of the research and its findings; Volume 2 has the details of work conducted on each of the research tasks. The requirement was for a toolset to help analysts understand the impact of military activities on stabilisation operations. The approach combined a stochastic combat simulation, with a deterministic system dynamics model of a stabilisation environment. The combination was used to represent a fictitious situation in which multiple actors played a role, with the British Army being committed to a support role. The evolving situation required a kinetic intervention by a British force. An evaluation event with ten participants from Dstl and Army Headquarters validated the modelling. This event concluded that the hybrid approach is a significant step forward although it has certain limitations; the approach produced output that was credible and provided insights into the effect of combat upon a stabilisation environment.

R00031A66

TIN 3.011 The Representation of Stabilisation Operations at the Tactical Level Phase 2 and 3 Final Report Volume 2
Dstl, BAE Systems (GB) (2014)

This document is the final analytic report on Phases 2 & 3 of Task Identification Number 3.011 The Representation of Stabilisation Operations at the Tactical Level. It describes an investigation of the use of a hybrid modelling approach for the evaluation of the impact of combat operations on the stabilisation environment at the tactical level. The document is in two volumes; Volume 1 is an overview of the research and its findings; Volume 2 has the details of work conducted on each of the research tasks. The requirement was for a toolset to help analysts understand the impact of military activities on stabilisation operations. The approach combined a stochastic combat simulation, with a deterministic system dynamics model of a stabilisation environment. The combination was used to represent a fictitious situation in which multiple actors played a role, with the British Army being committed to a support role. The evolving situation required a kinetic intervention by a British force. An evaluation event with ten participants from Dstl and Army Headquarters validated the modelling. This event concluded that the hybrid approach is a significant step forward although it has certain limitations; the approach produced output that was credible and provided insights into the effect of combat upon a stabilisation environment.

R000318A5

TIN 3.055 Task 2 Monitoring Fatigue and Maximising Alertness
BAE Systems, Alvington (GB) (2014)

This report describes the research carried out during a three month period to meet the requirements of the Defence and Security Implications for Emerging Technologies (DIET) project for Improving Human Performance (Year 2) under Task 2 (Monitoring Fatigue and Maximising Alertness) of the DHCSTC TIN 3.055. A programme of work was conducted to address two main objectives: 1) to identify and assess novel, non-invasive technologies designed to monitor the mental fatigue status of personnel during military operations; 2) to evaluate technologies, in particular the use of blue light, for potential efficacy, practicability, and safety as a fatigue countermeasure in military operations. In order to meet the objectives of this research task, the technical approach involved three main components: Scoping the military requirements, a review of publications both from the scientific peer-reviewed and grey literatures to identify techniques that could be practicable in military applications to measure fatigue directly and a Technology Assessment in which a categorical matrix was developed and populated to support the objective analysis of each fatigue monitoring technology. Conclusions and recommendations for future work were based on present and future military requirements, and the current maturity and validity of fatigue monitoring technologies. In addition the potential for blue light to mitigate the effects of fatigue was discussed, with consideration given to potential effects on visual performance in military applications.

R0003197C

TIN 3.067 Elicitation of Numerical Data with Multiple Experts
BAE Systems, Alvington (GB) (2014)

This report describes methods for eliciting a probability distribution from a group of experts, to represent the group's opinions about the likely values of an uncertain quantity of interest. The recommended approach is that of behavioural aggregation, in which the experts are brought together to discuss their knowledge and opinions. The experts are not required to specify a full probability distribution; they instead make a small number of probability judgements, from which a distribution is constructed. The process is conducted by a facilitator, who manages the group discussion, constructs the distribution, and gives feedback to the experts. When it is not possible to bring the experts together, an alternative approach is to use mathematical aggregation, in which distributions are elicited separately from each expert, and then combined mathematically. Various mathematical aggregation methods are described in this report. Other topics that are equally relevant to both the single expert and multiple expert cases are discussed: the psychology of elicitation, advice on training experts, and eliciting beliefs about more than one uncertain quantity.

R00031A5B

TIN 3.108 Armoured Vehicle Anthropometric Research Programme Secular Trends Study
BAE Systems Alvington (GB) (2014)

This study was initiated by the Defence Science and Technology Laboratory (Dstl) to determine whether secular trends in human body size (anthropometry) might cause through-life changes to the fit of Armoured Vehicle (AV) crew in the current and future vehicle fleet. The report sets out to address five research questions. Q1: Can historical secular trends in human growth be used to determine future AV anthropometric requirements? A1: Predictions based on extrapolating historical secular growth trends are highly unreliable. Q2 Is civilian secular growth trend data transferable to the military population? A2: Civilian growth trends cannot be transferred to the military context because of the differences in population composition. Q3: To what extent does the obesity epidemic, which is apparent in the civilian population, translate to military personnel operating AVs? A3: Waist circumference, hip breadth and bideltoid breadth are increasing within the military, as they are in the civilian population, but the changes are less marked. Q4: To what extent will the recent changes in the UK's immigration policy impact future UK military anthropometric data? A4: Future anthropometric data will reflect greater immigration from countries whose people are of smaller stature than those currently represented in the Tri-Service Database. Q5: With the increasing emphasis in wider society on health, better nutrition and fitness, to what extent will these changes impact on predicting human growth trends? A5: The effect on anthropometry of an 'emphasis in wider society on health, better nutrition and fitness' will continue to be slight, diffuse and uncertain.

R000316F0

Trial PROTEUS Dstl Conduct Report
Dstl, Porton Down (GB) (2014)

Dstl attended the NATO SG2 hostile fire trial PROTEUS to collect live fire data for the development and testing of UK threat warning capabilities. Data were collected on gunfire, RPGs and underslung grenade launchers fired close to the data gathering equipment. This data will be used to test threat warning systems to ensure that UK platforms have appropriate hostile fire indication capabilities in the future.

R00031A39

Two-Page Summary Report TIN 2.035 Challenge 3 - Overcoming the Language Barrier - Behavioural Monitoring to Feedback Trustworthiness Intuitions. Study 1: Data and Results
BAE Systems, Alvington (GB) (2014)

Beliefs about another's trustworthiness play a central role in military peacekeeping. Research suggests that intuitions about another's trustworthiness may occur without conscious awareness and may be detectable through a person's body movement. This investigation tests this hypothesis and aims to develop a device to facilitate decision-making by alerting users to their non-conscious intuitions. Forty participants took part in simulated military interactions in which they interviewed four 'citizens' (i.e., confederates) about their knowledge of a fictional crime. Citizens were either cooperative or non-cooperative, and had either useful knowledge of the crime, or no information. Initial results showed that participants held the most trust towards citizens who were cooperative and in possession of useful knowledge. They were less trusting of those who were uncooperative, or cooperative but with no useful knowledge. Participants' body movement, as measured via an Xsens MVN motion-tracking suit, showed more erratic trunk and leg movement when interacting with citizens that were believed to be least trustworthy by participants. Together with conscious trust perceptions the results suggest that feedback regarding erratic movement could help to identify those participants that are holding back information from those that wish to be helpful but are genuinely ignorant.

R00031A6D

Two-Page Summary Report TIN 2.051 - Phase 1 The Defence Trainer Capability - Trainer Selection, Reward and Career Management Technical Report 1
BAE Systems (GB) (2014)

This report identifies a good practice framework for the attraction, identification, selection, reward and career management of those in trainer roles and evaluates the current Defence approach against this, in order to better understand the human capability implications of the Defence Trainer Capability (DTC). The 'as is' situation within Defence is examined within a short scoping study and key factors and issues are identified. Similar defence and public sector organisations' approaches are reviewed within a literature review in order to identify good practice and the breadth of issues relating to this area. The research identifies key themes in the Defence approach and evaluates these against a good practice framework to identify 5 Central Research Questions which combine to provide Defence with options for addressing the key issues identified. Conclusions are drawn from this scoping study and linked directly to the research questions, which aim to take the research project into a subsequent phase.

R0003199E

Verification and Validation for the AQuA Book
Dstl, Portsdown West (GB) (2014)

This report supplements the Analytical Quality Assurance (AQuA) book hosted on the Treasury web site, specifically providing additional advice concerning: what constitutes analytical quality; a four stage model for the conduct of V&V in support of analysis activities; the verification and validation activity to be conducted in each stage of the work; and a consideration of common analytical pitfalls.

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