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**14th ICCRTS Symposium C2 and Agility – Track 4 Collective Endeavors**  
**Paper 046 Learning Through a Capability Investigation**  
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**Biographies**

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**Dr Kirsty Carter-Brown** joined NSD in November 2005 following 10 years as a published academic researcher in Biological Sciences and 2 years as a Dstl Knowledge Agent. She has been involved in a variety of programmes including research on the management and development of Ministry of Defence (MoD) acquisition processes, enterprise and benefits modelling and providing advice for the longer-term technical planning for the Modular Open Systems Architecture (MOSA) programme and the Coalition Warrior Interoperability Demonstration (CWID).

**James Mant** joined Dstl and NSD in February 2008 after 30 years as a naval weapons systems engineer in the Royal Navy. He has served in a variety of Frigates and Destroyers as a Weapon Engineer Officer (WEO) and has been involved in the acquisition of a several naval command systems. More recently he was responsible for the Information Defence Line of Development (DLOD) at the Navy Command HQ.

**Kate Gill** is the Group Leader for MSESI. She has worked for Dstl for three years, and previously for various UK defence and commercial companies. She is currently studying for an Engineering Doctorate (EngD) in Systems with Bristol and Bath Universities. She has an aeronautical and weapons background and has held Civil Aviation Authority (CAA) software

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signatory for commercial aircraft systems, as well as Military Aircraft Release (MAR) authority.

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**Abstract**

In 2007, the UK Ministry of Defence (MoD) launched the Defence Acquisition Change Programme (DACP). Integral to the programme, Through Life Capability Management (TLCM<sup>1</sup>) became the greatest challenge to the UK MoD acquisition community and its industrial partners. The TLCM process ensures continuous review, development and delivery of capability to the armed forces. Stage 5 of this process is the Capability Investigation (CI).

In March 2008, a pilot CI was launched into the Future Mine Counter Measures Capability (FMCMC) with the objective of “identifying the strategic capability requirement and the optimum system mix affordably to meet that requirement”. Over a period of six months, the CI involved six MoD/Industry workshops; the efforts of six subgroups under both MoD and Industrial leadership; and, information management, operational analysis and whole life cost studies.

Completed in December 2008, the FMCMC pilot is considered an exemplar in the search for Systems Engineering excellence whilst demonstrating the process of integration, combined learning and community drive for achievement.

This paper provides an early analysis of the demonstrated benefits of the pilot CI process, records the insights gained on good practice in conducting a MoD/Industry CI and outlines recommendations to build on the experiences and exploit the insights gained from the pilot. (313 words).

**START OF PAPER**

**1.0 INTRODUCTION**

Through Life Capability Management (TLCM) was initiated in 2007 as a top-down approach to the acquisition and in-service management of military capability through life. Based on Defence Policy and tempered by tolerable risk, TLCM allows every aspect of new and existing military capability to be planned and managed coherently across all Defence Lines of Development (DLODs<sup>2</sup>) from cradle to grave.

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<sup>1</sup> Through Life Capability Management (TLCM) is an approach to the acquisition and in-service management of military capability in which every aspect of new and existing military capability is planned and managed coherently across all Defence Lines of Development (DLOD), from cradle to grave. Because capability is the enduring ability to generate a desired operational outcome or effect, capability management is in perpetuity, and the use of the ‘through life’ terminology is superfluous. However, in the cultural environment it is still useful to retain the term as it provides a reminder that decision making needs to take a long-term perspective (The Stationary Office, 2005, Pg 17 Section A1:23).

<sup>2</sup> The UK DLODs are currently Training, Equipment, Personnel, Information, Concepts and Doctrine, Organisation, Infrastructure, Logistics and Interoperability. ([www.aof.mod.uk/aofcontent/strategic/guide/sg\\_dlod.htm](http://www.aof.mod.uk/aofcontent/strategic/guide/sg_dlod.htm))

A cyclical TLM process has been adopted, colloquially called the "waterwheel", that ensures continuous review, development and delivery of capability to the armed forces (see Figure 1). The inclusive approach ensures all of the Defence stakeholder community; Equipment Capability Customer, DE&S, MoD Centre, Front Line Commands, S&T Community (inc. Dstl), and Industry understands the dependencies between capabilities and the long-term implications of decisions and is capable of responding to changes and the changing environment.

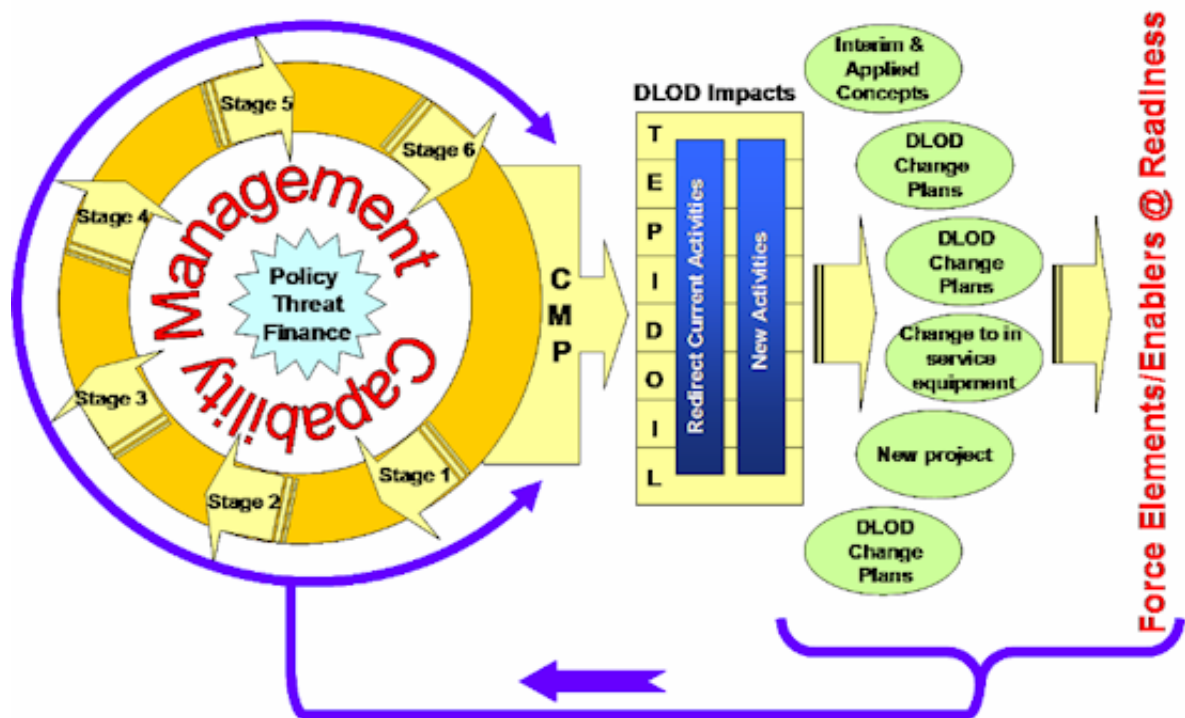


Figure 1: UK TLM Planning Process Map from planning to capability generation

The waterwheel has 6 stages, the last being capability delivery that leads into the Capability Management Plan (CMP) and subsequent acquisition where new equipment is required (see Figure 2).

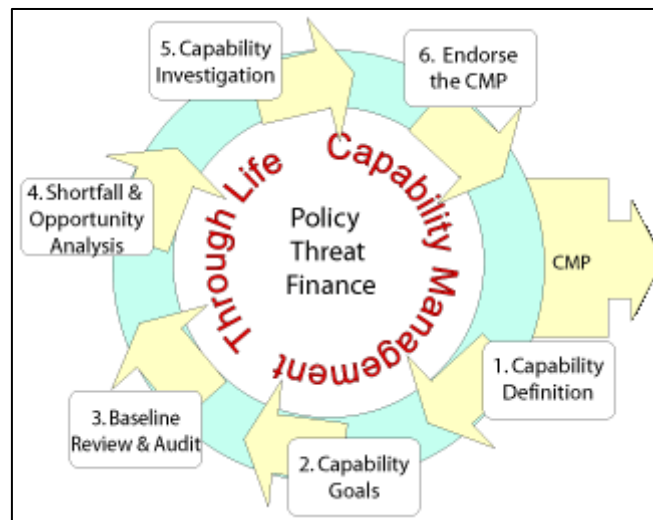


Figure 2: Further "Waterwheel" Details

Stage 5 is the Capability Investigation (CI) which builds upon the previous stages as shown above. For any defence equipment acquisition, the CI stage is a structured problem solving exercise to ensure that the future programme is based on a firm foundation. The time and effort expended is proportional to the size and complexity of the overall programme. The output of the CI is a report to the Joint Capabilities Board (JCB) that outlines its workings, conclusions and assumptions and acts as an audit trail to support the recommendations and conclusions.

In order to test the National Defence Industries' Council (NDIC) Capability Planning and Development Group's (CPDG) assessment that TLMCM Stage 5 was the most appropriate point at which industry should be brought into capability planning, at the beginning of 2008 a small number of pilot CIs were selected to test the benefits (or otherwise) of this hypothesis.

The Future Mine Counter Measures Capability (FMCMC) was selected as one of the four pilot CIs and was initiated as a joint MoD / Industry venture in March 2008. This was to build upon previous work by Dstl to assess the benefits of developing and using remote vehicle technology in the detection, identification and neutralisation of sea mines.

This paper outlines the progression of the CI, focussing on the value of the CI and the learning outcomes for the MoD and wider community.

## 2.0 THE AIM AND OBJECTIVES

This CI was one of four pilot CIs initiated by Rear Admiral Paul Lambert (Capability Manager (Precision Attack) (CM(PA)) within the Directorate of Equipment Capability (DEC). The stated aim of the MCM CI was:

*“to identify the strategic MCM requirements and the optimum system mix of Portable, Organic and Dedicated (POD) systems to meet affordably the capability requirement”.*

There were also four supporting objectives:

- Development of a credible, costed and affordable option that meets the capability requirement.
- Understanding of the DLOD risks and drivers.
- Plan for transition to FMCMC.
- Assess the benefits of a joint MoD / Industry CI.

### 3.0 APPROACH AND MANAGEMENT

The overall responsibility for the CI was vested in DEC Under Water Effects (UWE) and led by the Mine Warfare Desk Officer. It was agreed that he would lead a series of workshops to form the basis of the CI. Workshop facilitation was provided by a contracted QinetiQ Senior Consultant and a Senior Dstl Fellow. The DEC UWE Capability Advisor (CA) had the greatest knowledge and vision of what the CI was aiming to achieve and he was responsible for the structure and format of the workshops<sup>3</sup>. These were all key positions and vital to the success of the CI.

It was made clear at the start that industry’s involvement would be voluntary and unfunded. Canvassing and selection of industry participants was restricted to the larger defence companies by this requirement and hence there was no involvement from smaller specialist companies and academia.

The CI drew together approximately 30 experts in a number of different technologies and processes, enabling collaborative working across all DLODs and capability planning perspectives. BAe Systems Insyte, BMT Defence Services, QinetiQ, Salamander, SERCO, Thales UW Systems and BVT contributed considerable man hours and expertise. MoD participation was drawn from: the ECC, Defence Equipment & Support (DE&S), Navy Command (the User) and Dstl.

A Dstl Project manager and a small supporting team were appointed with a budget of £250K to:

- administer and manage the process.

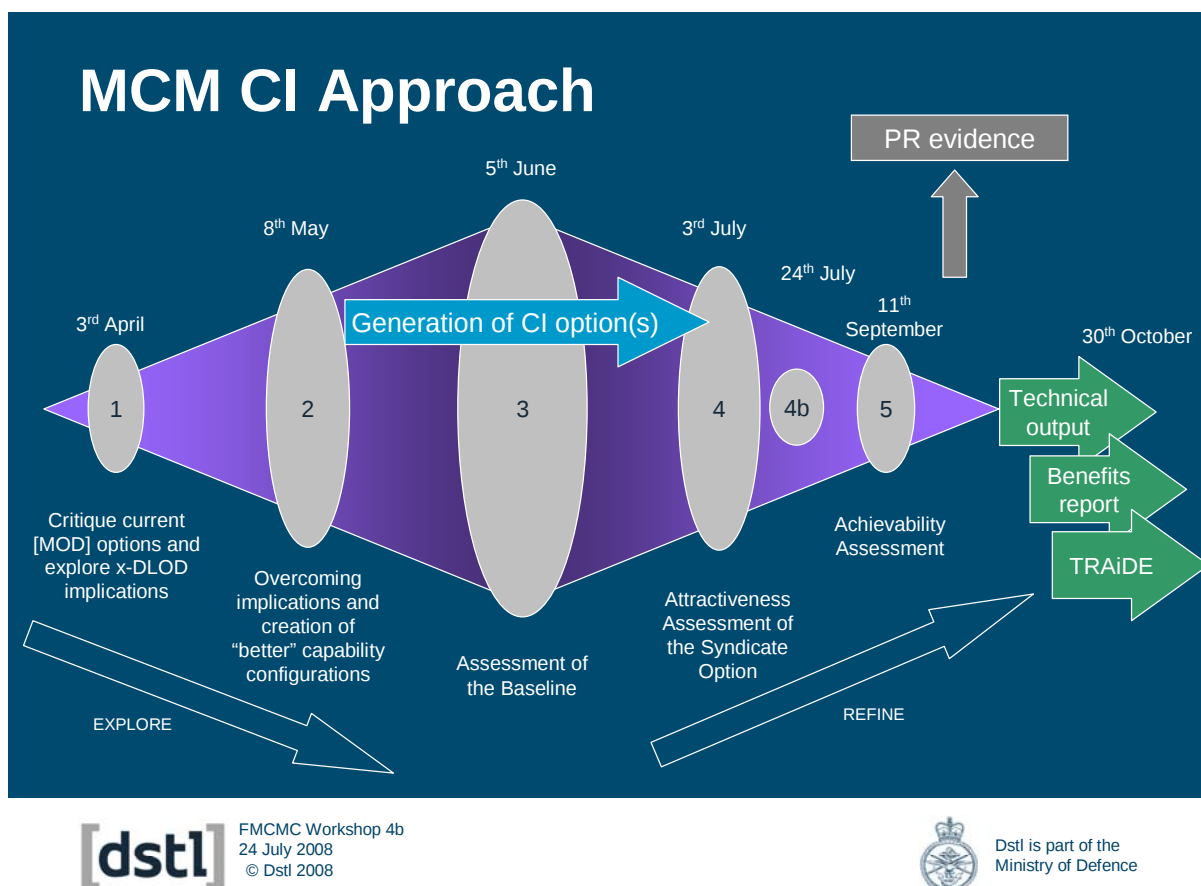
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<sup>3</sup> He received a Vice Chief of the Defence Staff Commendation for his contribution to the success of this CI

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- provide expert advice from completed Operational Analysis (OA) and conduct new OA where necessary.
- assemble detailed information for the conduct of workshops and syndicates, for example system details for “building blocks” and scenario settings.
- evaluate outputs from workshops and syndicates and assemble these as coherent statements.
- evaluate the tools and techniques used.
- lead the production of reports on the output.

Figure 3 shows the overall “Systems Thinking” approach to the CI, with the timing of the six workshops. The diamond shape indicates the classic systems thinking approach of diversification and unconstrained thinking in the initial stages followed by a narrowing down or focussing on to potential solutions that can be taken forward into the next stage.



**Figure 3: The “Diamond” Approach**

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The workshops were equally split between Dstl and Industry sites. This was not a planned outcome, but it undoubtedly helped in making industry feel a truly equal partner with the MoD.

This CI timeline was demanding. The tasking was issued at the end of January with the CI required to be running by the end of March. A Preview Day was held 20th March and the first Workshop 3rd April. An informal mid term report was delivered in July with the final report and presentation to CM(PA) in October.

Additional syndicate and sub-group work was arranged between workshops to focus on specific aspects of the investigation. Facilitated voting sessions were used in three workshops to bring objectivity to the investigation, but also to act as a catalyst to encourage discussion on the issues raised by representative operational scenarios.

The workshops were mainly used to present new information, feedback analysis from previous workshops and conduct voting. As 30 tends to be too many to generate new ideas and output, smaller syndicate groups were also formed with between 6 and 12 attendees. The first syndicate work took place towards the end of May. There seemed initially to be some reluctance for industry members to take leadership roles. However with encouragement at the smaller syndicates it was pleasing to see some very capable industry representatives come forward to lead the syndicates and make a very valuable contribution. It was in these first syndicate groups that real creativity became apparent and the eventual favoured option was first spawned. In retrospect it may have been better to hold these smaller groups earlier, but there is a balance to be struck in briefing the larger group to ensure a consistent level of knowledge and encouraging creativity in the smaller groups.

Later in the CI the emphasis changed to output and transition. This was principally achieved by setting up 4 sub-groups to take individual strands forward during August and September. The subjects were Transition (led by MoD - DE&S), Innovation, Counter Countermeasures and Commercial and Financial (all lead by industry). The final report includes much of the output from these sub-groups.

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The Transition sub-group subsequently led into the FMCM MoD / Industry Naval Endeavour (MINE). This is a DE&S led evolution from the CI, which aims seamlessly to take the CI partnership forward into development of the necessary strands of work to support refinement of the MoD Planning Round (PR)10 re-profile, further populating and updating an enduring evidence base for MoD to produce the FMCMC Initial Gate Business Case (IGBC) for subsequent acquisition.

The provision of cost estimates was handled by an independent company with a strong track record of supporting the MoD in this type of work. This provided a mechanism through which potentially sensitive company cost data was protected, and avoided the need for Non Disclosure Agreements (NDA).

There was a short delay in issuing the final report whilst copyright and release conditions were agreed. This delay could have been avoided by agreeing this as soon as the format of the final report was agreed.

#### **4.0 CONCLUSIONS**

The MCM CI pilot lasted 6 months and reached a successful conclusion: the benefits of industrial involvement were strongly demonstrated. Many insights were gained on good practice in conducting a MoD/Industry CI.

MoD and Industry gained a mutual understanding, as did Industry of Industry and MoD of MoD. This understanding developed as all involved climbed a learning curve in the course of the CI. Industry, particularly, become more sure of themselves and participative as the CI progressed.

The CI was greatly assisted by open and honest relationships from all parties and this was maintained without any formal contracting arrangements in place, representing a significant confirmation of trust from all participants. The CI showed the significant value of early industrial engagement and the joint work did much to improve the lines of communication between all parties.

The scale of commitment necessary would tend to preclude many smaller players from participating without at least some targeted funding and this should be further explored.

To maximise the value to all the participants, it is vital to have strong leadership and a properly funded and capable support team to provide the required organisation and to manage the information produced. Dstl provided the project manager and a small supporting team with a total budget of £250K. Those selected to lead, coordinate and facilitate the workshops played a vital role in ensuring the success of this CI.

The brief timescale for conducting the CI was a limiting factor in the degree to which the question posed could be answered. As there was not a precedent, it took some time for the

participants to settle into effective working relationships. Moreover, some key information, particularly the endorsed strategic requirements, was not available at the outset which made the timescale even more challenging. The workshop approach is probably not ideal for accurately answering a numbers / balance question without being informed by detailed, scenario based analysis. So, whilst the stated aim was not fully achieved a much greater understanding was gained across the community of the technology, countermeasures, impact of the changes and the potential for conducting MCM with remote vehicles.

## 5.0 RECOMMENDATIONS

The pilot CIs need to consolidate their shared evidence and experience base of good practice.

Build upon the co-operation achieved in this CI by continuing to involve industry in ongoing TLM activity via MINE.

The work should be exploited in all areas of TLM where it could make a difference.

More thought should be put into understanding the risks to the future programme and the impact on costs that this might have, possibly as sub-group or syndicate work.

The programme for FMCM research should be reviewed to identify Technology Demonstrator Programmes (TDPs).

An enterprise model should be developed to explore where funding is really needed and best applied in future MoD / Industry CIs. The model should include the roles that might be played by smaller companies, individual experts and Academia.

The insights gained in this pilot CI should be celebrated and disseminated.

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**ABBREVIATIONS**

|           |                                                      |
|-----------|------------------------------------------------------|
| • CA      | Capability Advisor                                   |
| • CAA     | Civil Aviation Authority                             |
| • CI      | Capability Investigation                             |
| • CMP     | Capability Management Plan                           |
| • CM(PA)  | Capability Manager (Precision Attack)                |
| • CPDG    | Capability Planning and Development Group            |
| • CWID    | Coalition Warrior Interoperability Demonstration     |
| • DACP    | Defence Acquisition Change Programme                 |
| • DE&S    | Defence Equipment and Support                        |
| • DEC     | Director(ate) of Equipment Capability                |
| • DLOD(s) | Defence Line(s) of Development                       |
| • DSTL    | Defence Science and Technology Laboratory            |
| • FMCMC   | Future Mine Counter Measures Capability              |
| • FCB     | Joint Capabilities Board                             |
| • MAR     | Military Aircraft Release                            |
| • MCM     | Mine Counter Measures                                |
| • MINE    | MoD / Industry Naval Endeavour                       |
| • MoD     | Ministry of Defence                                  |
| • MOSA    | Modular Open Systems Architecture                    |
| • MSES    | Maritime Systems Engineering and Systems Integration |
| • NDA     | Non Disclosure Agreements                            |
| • NDIC    | National Defence Industries' Council                 |
| • NSD     | Naval Systems Department                             |
| • OA      | Operational Analysis                                 |
| • POD     | Portable, Organic and Dedicated                      |
| • TDP     | Technology Demonstrator Programme                    |
| • TLM     | Through Life Capability Management                   |
| • WEO     | Weapon Engineer Officer                              |

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**REFERENCES**

- [1] UK MoD, Enabling Acquisition Change, June 2006 McKane, T. (2006), “Enabling Acquisition Change – An examination of the Ministry of Defence’s ability to undertake Through Life Capability Management”, Allied Publications.
- [2] <http://www.aof.mod.uk/aofcontent/tactical/tlcm/content/introductiontotlcm.htm>
- [3] Daw, A.J., Oxenham, D. and A. Wilby (2008) Industrial Engagement in Through Life Capability Management: Insights from the MCM Capability Investigation Pilot.