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Sensors and Airborne Systems

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EMRS DTC
Electro-Magnetic Remote Sensing (EMRS) Defence Technology Centre (DTC)

Electro Magnetic Remote Sensing Defence Technology Centre - Introduction

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12/07/05 EMRS DTC Introduction 1

My name is Dr Alvin Wilby and I am speaking to you today as Chairman of the Supervisory Board of the Electro-Magnetic Remote Sensing (EMRS) Defence Technology Centre (DTC). This is in addition to my role as Capability Director of SELEX Sensors and Airborne Systems Ltd.

From this title slide you will immediately see that the EMRS DTC is an industrial consortium that brings together SELEX S&AS Ltd, Thales Defence, Filtronic Plc. and Roke Manor Research. Industry works in partnership with UK MOD to develop innovative defence technology.

In my presentation to you this morning I will provide an introduction to the organisation and management of the EMRS DTC. This afternoon, the EMRS DTC's Research Director, Dr Brian Wardrop, will give a technical overview of the EMRS DTC programme.

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Elapsed Time = 1 mins.

EMRS DTC



- Our Approach to the EMRS DTC
 - Concept, Operation, Outcome & Exploitation
- Illustrated Key Points
 - Our Strategy for “Pull Through” - Research Exploitation
 - Organisational Model & Contractual Framework
 - Research Theme Leader IPT
 - Programme Construction Methodology & Contributors
 - Project Reporting & Continuous Assessment
 - International Research Collaboration
 - Annual Technical Conference
- Summary

12/07/05

EMRS DTC Introduction

2

The structure of my talk this morning will take us through our approach to Defence Technology Centres. I will explain our response to the MOD “specification” for DTCs in terms of: Concept; Organisation; Outcome; and Exploitation. I will then take you through the following key points on the EMRS DTC model and explain our approach in more detail:

- Our Strategy for “Pull Through” - Research Exploitation.
- The Organisational Model and Contractual Framework that we have developed.
- The concept of Research Theme Leaders and an Integrated Project Team of Research Theme Leaders
- Our methodology for Research Programme Construction and the Contributors that it has brought together under this DTC.
- The reporting requirements for our projects and the continuous assessment process that has been implemented.
- Our approach to formal International Research Collaboration and the principles that will be applied.
- I will then review of the role of the Annual Technical Conference in dissemination of research output before closing with a summary of the key points.

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Elapsed Time = 3 mins.

Introducing Defence Technology Centres: Concept



MOD Intention

- ❑ A DTC will be a formal collaborative arrangement between industry and academic experts in a particular technology, funded jointly by participants and the MoD
- ❑ The participants will work together to generate and enhance the technology vital to the delivery of future UK Defence capabilities

EMRS-DTC Response

- ❑ Consortium partners are SELEX S&AS Ltd (prime), Filtronic Plc, Roke Manor Research Ltd, Thales Defence Ltd
- ❑ Research portfolio is constructed from an open call for proposals, enabling participation by academia, SMEs as well as larger industrial players
- ❑ Science providers are fully funded from the MoD contribution and retain same intellectual property rights as with other fully-funded MoD contracts
- ❑ Industry matching contribution is via bilateral disclosure to MoD of Company funded programmes selected by bilateral discussions with each Consortium member

12/07/05

EMRS DTC Introduction

3

The concept of Defence Technology Centres was introduced by UK MOD in early 2002. In keeping with MOD's intention for DTCs to be bodies led by Industry, MOD described the "specification" for DTCs as a series of essential and desired outcomes. In this section of my talk I will summarise the EMRS DTC's response to the key elements of the MOD "specification".

❑ MOD's requirement for a formal collaborative structure - jointly funded by participants and MOD - was met through the formation of an Industrial Consortium consisting of SELEX S&AS, Thales Defence, Filtronic Plc. and Roke Manor Research. This consortium provide the management resources and supporting processes to operate the DTC. The DTC operates an open model for participation through an open, annual call for research proposals. MODs and their DSTL Technical Advisors are involved in the governance and working structures of the EMRS DTC.

❑ Although the prime contract between the EMRS DTC and MOD is 50% funded, the industrial consortium take care of MOD's requirement for matching funds. This arrangements allows "science providers" to the EMRS DTC to be fully funded and retain their IPR. Industry and MOD work together to provide an "umbrella" for the science base.

❑ Industry's matching contribution to MOD comes "in kind", and forms a bi-lateral disclosure of each companies internal, company funded research programmes. The bi-lateral nature of the disclosure provides "industrial protections" over commercially sensitive elements of this material.

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Introducing Defence Technology Centres: Operation



MOD Intention

- ❑ **Management:** Each DTC will be required to appoint a full time Director to oversee the day-to-day operation of the Centre
- ❑ **Structure:** MoD envisages that each DTC may be a virtual centre comprising a broad range of participants. However MoD expects to place a contract with a single organisation or entity
- ❑ **Progress Review:** The progress of each DTC will be subject to a formal annual review by a panel comprising MoD, DSAC and consortium representatives
- ❑ **Duration:** It is expected that the duration of a Defence Technology Centre will be for an initial period of three years with an option to extend to six years

EMRS-DTC Response

- ❑ **Management:** Day-to-day management is through DTC Office staffed by Operations Director (full time) and Research Director (part time)
- ❑ **Structure:** Prime contract is held by SELEX S&AS Ltd. Research contracts have been let to 34 Science providers
- ❑ **Progress Reviews:** Project Quarterly Technical Reviews, Quarterly Supervisory Boards, Quarterly Contract Reviews, Bi-annual Phase Reviews. In addition we perform an annual Executive Briefing to key MOD decision makers
- ❑ **Duration:** Prime contract is for an initial period of three years, renewable for a further three years

12/07/05

EMRS DTC Introduction

4

On Operational Matters:

❑ The day to day management of the EMRS DTC is performed through a full-time Operations Director, Neil Whitehall, provided by SELEX S&AS. The Operations Director is provided at no cost to the prime contract. Technical leadership is provided through an independent, part time Research Director, Dr Brian Wardrop, who will be speaking to you this afternoon.

❑ The EMRS DTC is a virtual centre operating an open participation model. SELEX S&AS acts as prime contractor on behalf of the industrial consortium, and places all sub-contracts for research. The industrial consortium operates as a single effective company with resources being provided by the industrial consortium members, working in an Integrated Project Team (IPT) arrangement, at no cost to the prime contract.

❑ The EMRS DTC operates quarterly technical reviews with all projects. Governance is addressed through a quarterly Supervisory Board. Commercial matters pertaining to the execution of the prime contract are reviewed quarterly at a meeting between SELEX S&AS and MOD. The health of the prime contract is assessed through the prime contractors internal phase review process bi-annually. Moreover, an annual executive briefing is carried out to senior MOD decision makers.

❑ The EMRS DTC contract is for an initial period of three years, running to 24th March 2006, with an option to extension until end March 2009. The consortium is currently in early discussions with MOD on contract extension.

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Introducing Defence Technology Centres: Outcome



MOD Intention

MoD does not intend to specify a detailed programme of work for a DTC, but instead has defined the essential and desired outcomes it wishes the DTC to achieve

□ Essential:

- Generate knowledge, via research, appropriate to future UK defence needs in the relevant domains
- Enable early exploitation of knowledge generated for the benefit of UK Defence
- Enable knowledge generated to be used by MoD for internal UK government purposes

□ Desired:

- Enable knowledge generated in the civil sector to be used within the DTC
- Enable the knowledge generated by the DTC to be exploited for the benefit of the civil sector

EMRS-DTC Response

- Calls for proposals are based on consortium's view of industry and MoD needs
- Assessment of proposals are undertaken by consortium team, with advice from dstl on overlap with other MoD programmes
- Proposal assessment places emphasis on potential of pull-through into product
- Quarterly progress monitoring of research projects assesses exploitation route
- Assignment of dstl 'knowledge integrators' to technical themes provides path into MoD for research output
- Defence Diversification Agency assist in seeking exploitation paths through SMEs

12/07/05

EMRS DTC Introduction

5

UK MOD gave broad goals for Defence Technology Centres under “Essential and Desired Outcomes” - shown here on the left. In response:

- The EMRS DTC approach is to run an annual, open call for research proposals. This call is based on the consortium’s view of Industry’s and MOD’s future needs. The output from the annual call for proposals is assessed by the consortium’s team working in conjunction with DSTL technical advisors.
- The proposal assessment scheme operated by the EMRS DTC is designed to promote research proposals offering potential for high product impact and clear routes of exploitation.
- The consortium’s Research Theme Leaders have a dual role. Their “normal” job function is that of industry’s Chief Technology Officers. Their CTO roles position them ideally to manage the transition from basic long term research into industry’s applied research programmes. The EMRS DTC activity constitutes ~30% of their expanded role.
- The involvement of DSTLs Technical Advisors / Knowledge Integrators allows MOD to plan the transition into MODs applied research and technology demonstration programmes.
- Furthermore, several of the consortium Research Theme Leaders and Supervisory Board members have a complementary, independent role on DSAC - MODs own independent, scientific assessment body.
- Lastly, MODs Defence Diversification agency are helping the EMRS DTC to identify spin-in and spin-out opportunities with SMEs.

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Introducing Defence Technology Centres: Exploitation



MOD Intention

- ❑ The outputs of DTCs are expected to be a mixture of new ideas, concepts and techniques communicated via technical reports, presentations and demonstrations
- ❑ A DTC will also develop skilled individuals able to aid MOD in its wider S&T efforts, and to provide expert advice on a range of issues
- ❑ Ultimately the success of a DTC will be determined by the degree to which the knowledge generated is exploited to improve the UK Armed Force's military capability
- ❑ It is anticipated that DTCs will result in more effective exploitation of UK inventions and technology

EMRS-DTC Response

- ❑ The Annual unclassified conference provides MoD, industry, and academia with a detailed presentation on each of the funded projects
- ❑ All projects are required to provide technical reports on their work to DRIC standards
- ❑ Furthermore, all projects report progress quarterly. These reports are collated and summarised for MoD as a quarterly contract deliverable
- ❑ The organisation of multi-project progress meetings provides an opportunity for networking for both industry and dstl and our science providers
- ❑ Exploitation of the research is an integral thread of the DTC process

12/07/05

EMRS DTC Introduction

6

Lastly, on exploitation of research output:

The EMRS DTC operates an annual, unclassified technical conference to disseminate a concise record of the research programme output.

❑ Furthermore, all projects are required to produce formal technical reports to MODs DRIC standards, guaranteeing that the research output is formally recorded and available to support knowledge transfer.

❑ To help support efficient management of the programme, all EMRS DTC projects are required to create technical progress reports. These progress reports are collated and summarised by the consortium quarterly and presented to MOD as a digest of progress as formal, quarterly contract deliverable.

❑ The execution of the quarterly technical project reviews on the EMRS DTC is carried out at multi-project progress meetings. These reviews are carried out by the EMRS DTC Research Theme Leaders and DSTL Knowledge Integrators, but also comprise an element of peer review from the presence of researchers from related projects. This cross body representation provides a mechanism for collaboration and networking for all parties.

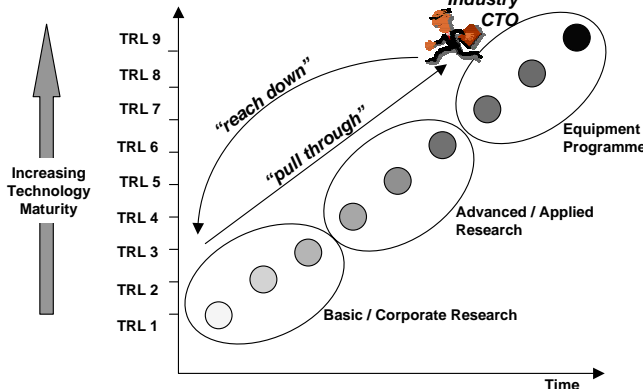
❑ As you have heard already - and will hear later - exploitation of research output is an integral thread to the EMRS DTC management process, through the pivotal role of the Research Theme Leaders, DSTL Knowledge Integrators and broad dissemination.

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Our Strategy for “Pull Through”

- Industry’s Chief Technology Officers (CTO) will work in a team with MoD Research Directors and Dstl Knowledge Integrators to select innovative research topics from universities, SMEs and research centres through open research competition.
- The IPT will then give industrial research management to the activity, complementing the researcher’s normal academic supervision.
- Research is fully funded. Exploitation rights are retained.



Normal Extent of R&D Activity					ORG
Universities	Research Centres	SMEs	Defence Contractors		TRL
High	Mid	Mid	High		High TRL
Mid	High	High	Mid		Mid TRL
Low	Low	Low	Low		Low TRL

12/07/05

EMRS DTC Introduction

7

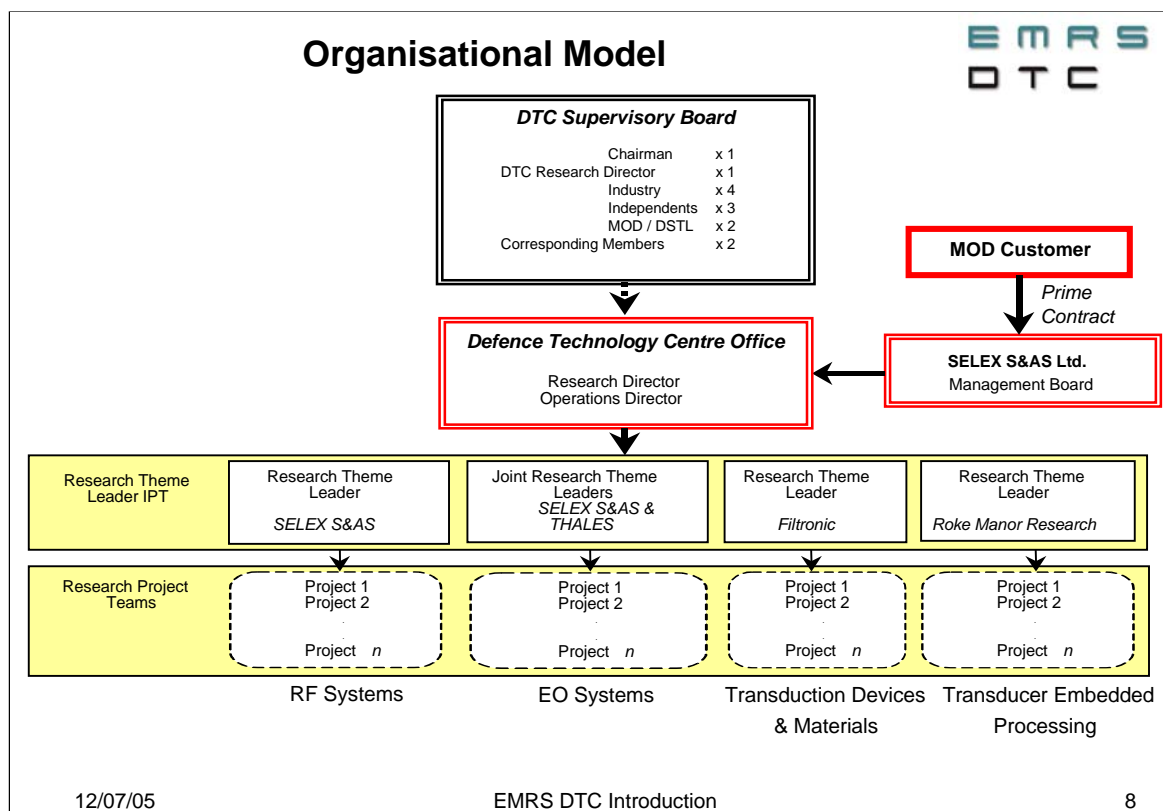
I would now like to illustrate our strategy for “pull through” and explain the unique position of industry’s Chief Technology Officers - our Research Theme Leaders:

The coloured check box on the right hand side of this slide illustrates the normal extent of R&D activity in different classes of organisations. The global financial markets demand that Defence Contractors make a return on investments quickly. This demand acts to shorten the planning horizon and limit R&D activity inside Defence Contractors to high and mid Technology Readiness Levels. At the other end of the spectrum, our universities are centres for basic, long term research and sources for innovation, but lack the organisation and cultural attributes to deliver major production programmes. In between lies the contract Research Centres and traditional defence Research Centres, plus a growing body of technology rich SMEs. These organisations have retained strong links with the science-base and their small size and cultures promote agility.

The EMRS DTC model asks Industry’s Chief Technology Officers to “reach down” to lower Technology Readiness Levels than they would normally operate at. This is possible because of the MOD funding provided through the DTC initiative. The CTO’s select the most promising ideas provided by a strong “technology push” from the science base. In selecting and managing the projects within the DTC context the CTO are provided an opportunity to manage the transition from basic long term research (under the DTC) to applied research (in industry). The DSTL Knowledge Integrators provide the same role for the transition to applied research / technology demonstration programmes in MOD. Hence a “strong technology push” is met by a high discriminating “market pull”. The result is a fast “green path” from low TRL to market exploitation.

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I would now like to illustrate the Organisational Model and Contractual Framework developed for the EMRS DTC:

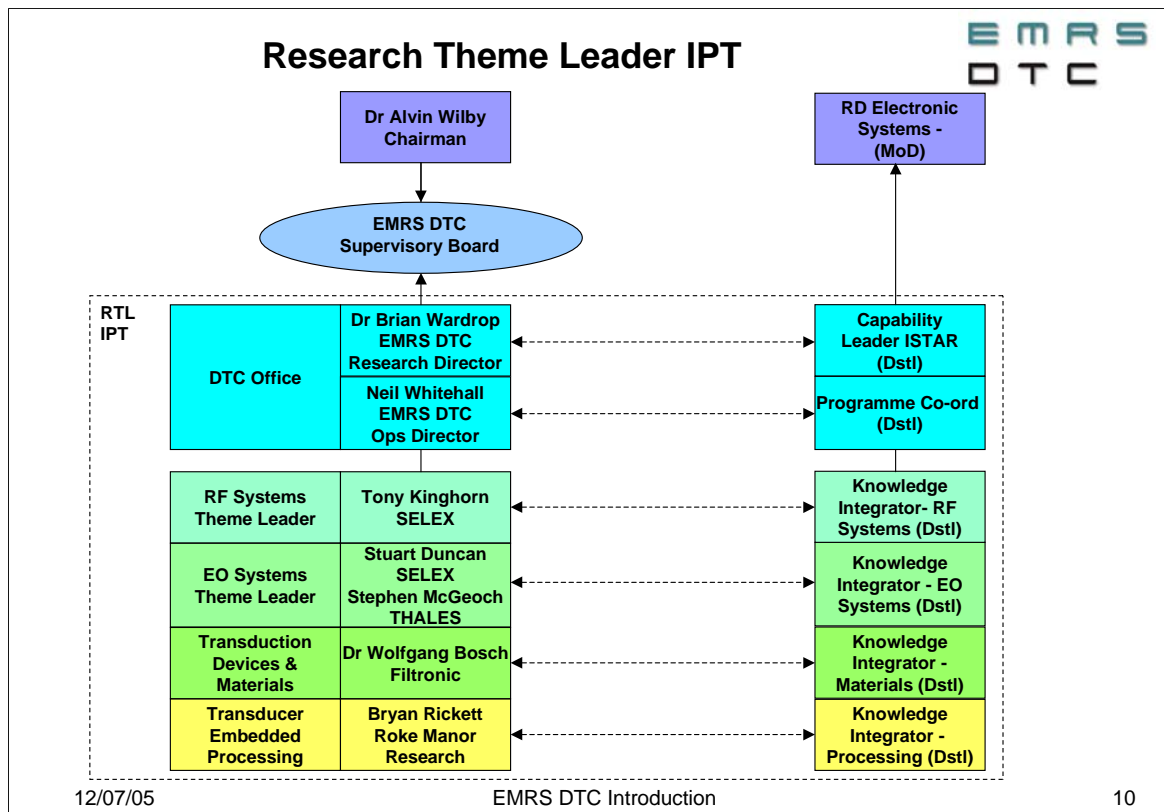
Starting at the top right of this slide, the MOD is the Customer for the EMRS DTC programme. The Prime Contract is placed onto SELEX S&AS and the obligations of the prime contract accepted by the SELEX Management Board.

Under the prime contract SELEX S&AS acts as prime contractor and leader of the Industrial Consortium. To facilitate the DTC the prime contractor provides a full time Operations Director to staff the “DTC Office” in conjunction with an independent, Research Director provided under the prime contract.

Governance is provided by a Supervisory Board. The Board is chaired by the prime contractor, and is comprised of Industrial Consortium company representatives, independent academics, an independent industrialist and representatives from the customer (MOD Research Acquisition Organisation & MOD DSTL).

The industrial consortium operate as a Single Effective Company, with each consortium member providing a Chief Technology Officer to act in the role of Research Theme Leader. The overall Research Programme is divided into four Research Themes: RF Systems, EO Systems, Transduction Devices and Materials and Transducer Embedded Processing. The management of these themes is assigned to the consortium member companies as illustrated on the slide.

All sub-contracts for research work are placed by the prime contractor.



I would now like to tell you more about the roles and responsibilities of the Research Theme Leader IPT.

The RTL IPT is led by the Research Director, Dr Brian Wardrop.

The IPT consists of the Research Theme Leaders (provided by Industry) and the DSTL Knowledge Integrators (provided by MOD).

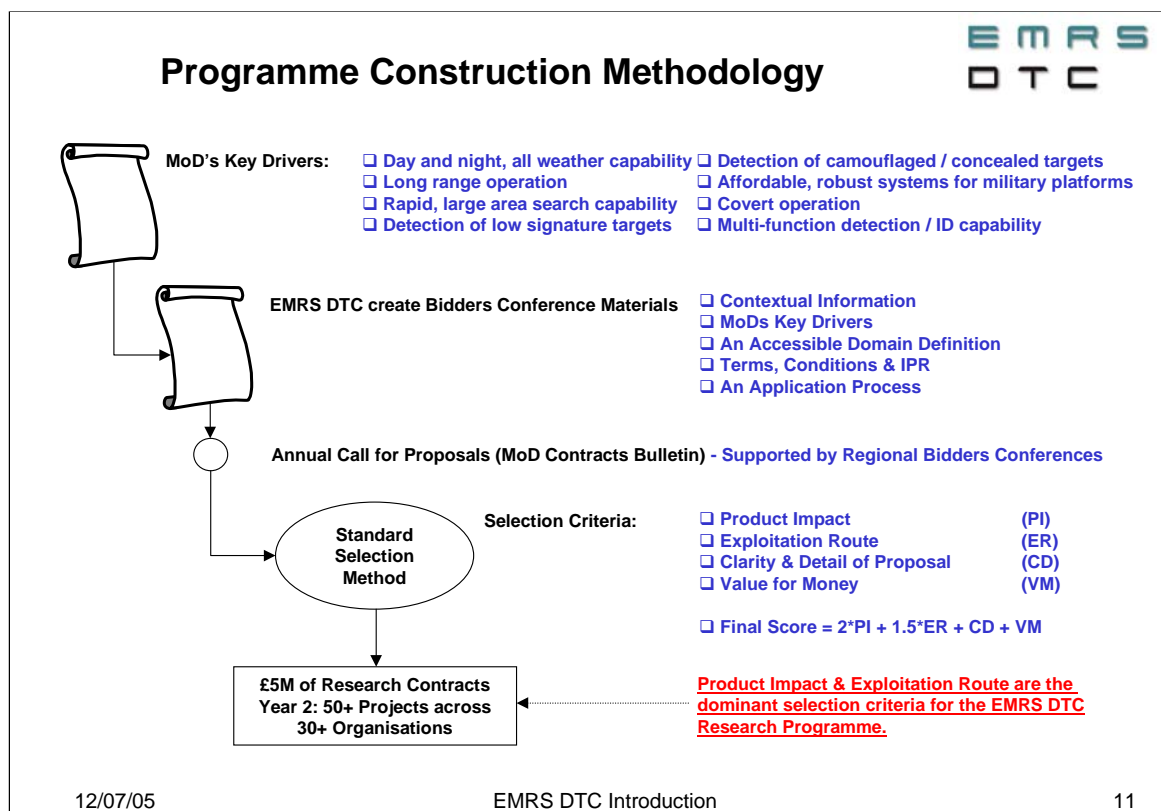
The Research Theme Leader IPT:

- Selects the projects for inclusion in the programme.
- Gives each project industrial direction, complementing the scientific research management of the “science provider” organisation.
- Provides a continuous assessment of the quality and value of each project.
- Make recommendations on project initiation & continuation to the Supervisory Board.

The DSTL Knowledge Integrators best positioned to advise on potential overlap with previously sponsored MOD research and current MOD programmes. The DSTL Knowledge Integrators have provided a great deal of useful input to the EMRS DTC projects through Government Furnished Information (GFI).

The DSTL Capability Leader provides a technical link with the primary customer in the MOD Research Acquisition Organisation.

The DSTL Programme Co-ordination function provide guidance on MOD policy & procedures.



I would now like to tell you more about our Programme Construction Methodology:

Each year, between the 1st week in October and end December the EMRS DTC holds an open call for research proposals. To support this annual call, we operate the process described on the slide.

MOD seeded the EMRS DTC with a set of “key military drivers” set out succinctly in eight bullet points.

To these key military drivers, the EMRS DTC team add contextual information and a domain definition that is more accessible to the science base. At Bidders’ Conferences the team describe the terms and conditions under which work is contracted, and the application process that they need to complete.

The annual call, and it’s associated Bidders’ Conferences, is advertised on: the EMRS DTC web site; in the MOD Contracts Bulletin; and, via mail-shots to our extensive contacts database.

In early January each year the Research Theme Leader IPT assess the output from the call. This is performed using a Standard Assessment Criteria. The criteria values: Product Impact; Exploitation Route; Clarity & Detail; and Value for Money. The assessment criteria is designed to promote research with potential for high Product Impact and clear Exploitation routes.

If necessary, “final run-off” presentations are held and a further marking scheme applied.

To date, this methodology has promoted broad inclusion of participating organisations at no loss in research quality.

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EMRS DTC - Contributing Organisations



- ❑ Major Defence Contractors:
 - ⇒ SELEX S&AS Ltd, THALES Defence Ltd., Roke Manor Research Ltd., Filtronic Plc
- ❑ Small - Medium Sized Enterprises:
 - ⇒ Blue Horizon Inc., CST Global, Element Six Ltd., ESL Defence Ltd., Insys Ltd., Intense Photonics Ltd., Nallatech Ltd., Sula Systems Ltd., Waterfall Solution Ltd., TW Research Ltd., VTT Electronics
- ❑ High Quality Academia:
 - ⇒ Cranfield University (Royal Military College of Science), Edinburgh University, Glasgow University, Heriot-Watt University, Imperial College London, Leeds University, Sheffield University, Strathclyde University, Southampton University ORC, UMIIST, University College London, University of Birmingham, University of St Andrews
- ❑ Research Centres:
 - ⇒ Roke Manor Research Ltd., BAE SYSTEMS ATC, QinetiQ, AREVA Technology Centre, Insys
- ❑ Corresponding Members:
 - ⇒ CSSIP (Australia), US ARL CTA Advanced Sensors (USA)
- ❑ Developing International Research Collaboration Links:
 - ⇒ USA (US Army Research Laboratory & US Air Force Research Laboratory)
 - ⇒ Australia (Collaborative Research Centres - CSSIP) & DSTO
 - ⇒ France, Canada & Singapore (DSO)

12/07/05

EMRS DTC Introduction

12

The breadth of inclusion achieved in the EMRS DTC programme is detailed in this slide.

❑The slide breaks participation down into “Major Defence Contractors”, SMEs, High Quality Academia (4, 5, 5* Research Assessment Exercise rated departments), and Research Centres.

❑Additionally, the slide also details the international links that have been grown by the EMRS DTC programme.

❑In Australia the EMRS DTC has a corresponding board member in the CSSIP CRC.

❑In USA the EMRS DTC has a corresponding board member in the US Army Research Laboratory (ARL) Collaborative Technology Alliance (CTA) on Advanced Sensors.

❑Furthermore, the EMRS DTC is seeking to create formal International Research Collaborations with agencies of foreign MODs. To date the EMRS DTC has sought to form links with:

⇒US ARL AS CTA

⇒US AFRL

⇒Australia CSSIP & DSTO

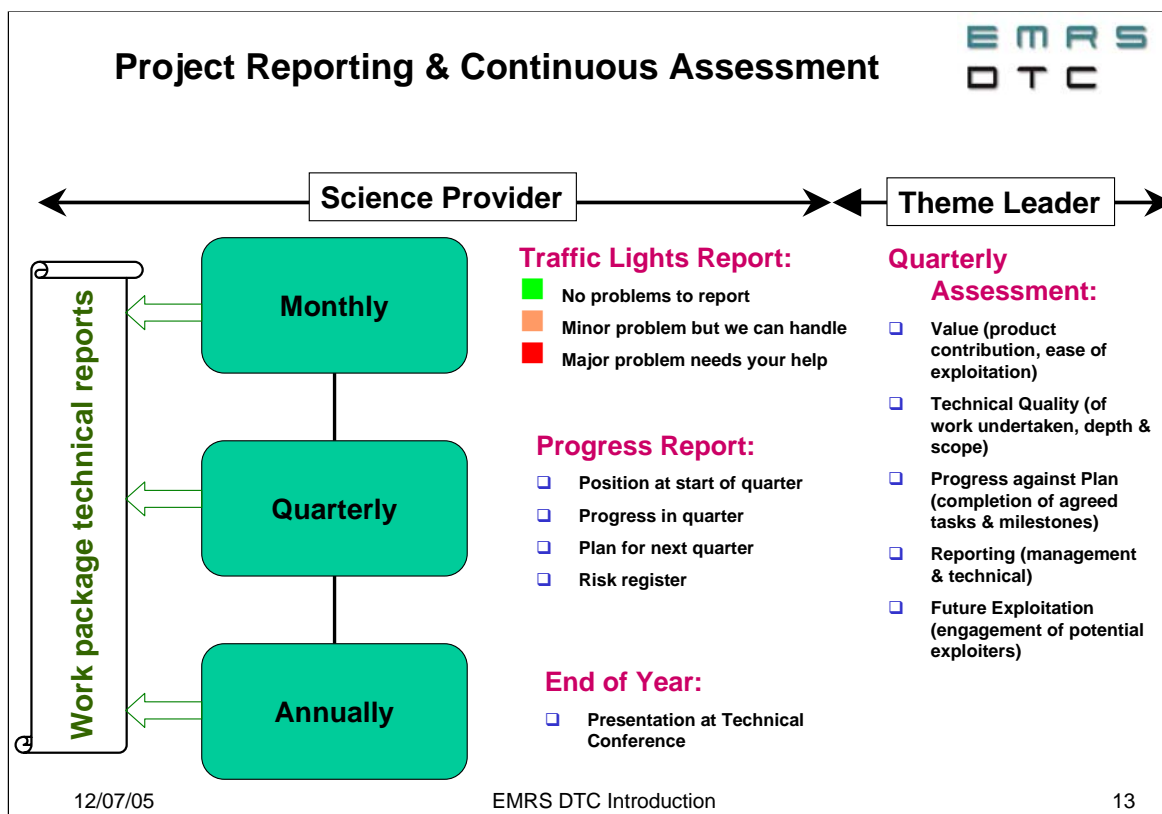
⇒France (DGA)

⇒Research & Development Canada

⇒Singapore DSTO

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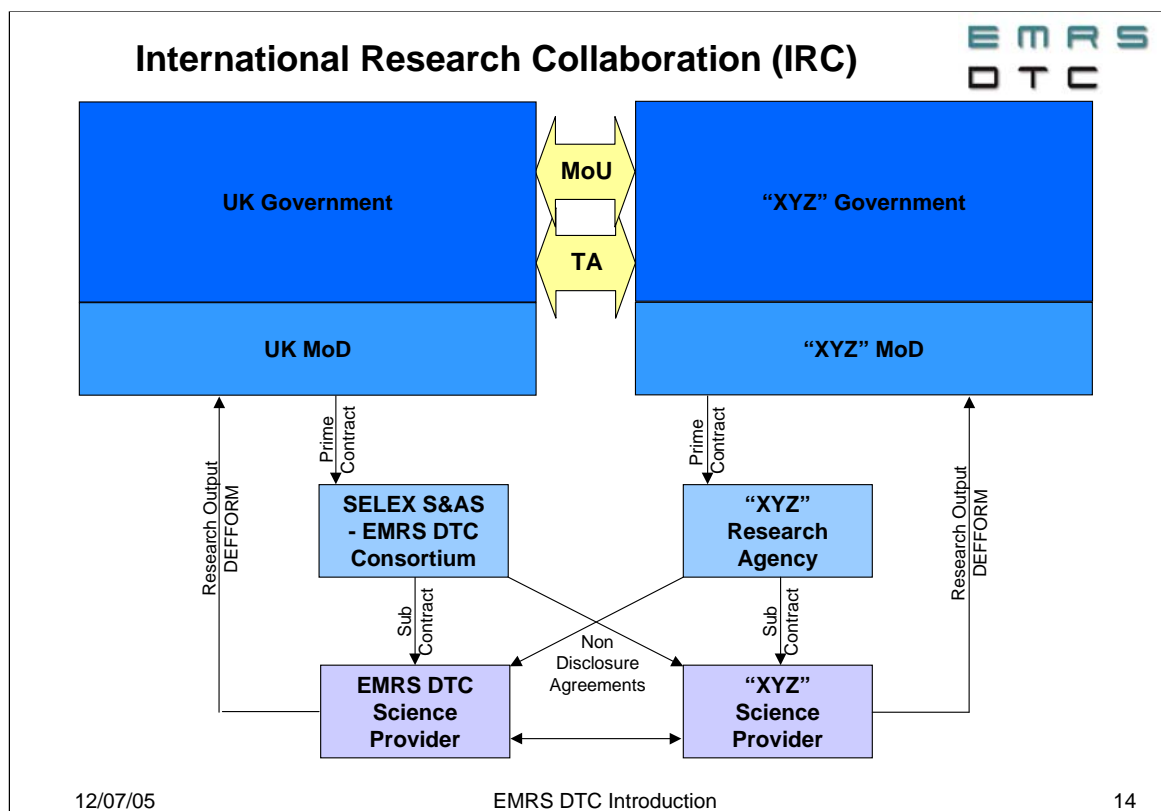
The EMRS DTC operates the reporting and continuous assessment scheme illustrated in this slide:

- On a monthly basis each of the “science providers” provide a simple “traffic light” status report.
- Quarterly, each “science provider” gives a report detailing progress in the quarter, plans for the forthcoming quarter and an assessment of risks and mitigating actions.
- Annually, each “science provider” delivers a paper at the annual technical conference.
- Additionally, the science providers deliver formal, technical reports on work-packages as they are completed through the year.

The Research Theme Leaders report quarterly to the Supervisory Board through the Research Director: Their reports include an assessment of:

- Value;
- Technical Quality;
- Progress Against Plan;
- Reporting; and
- Future Exploitation prospects.

These reports form the basis for a Continuous Assessment process that is used to manage the value delivered from the EMRS DTC programme.



Defence and Security is global in its outlook, and the EMRS DTC believes that DTCs can play a role in International Research Collaboration. A pre-cursor to a formal International Research Collaboration is the existence of a Memorandum of Understanding (MoU) on Defence Research Collaboration between the UK Government and the prospective foreign Government. To this a Technical Arrangement (TA) is added to detail the: technical areas of collaboration, the participants, principles of operation and deliverables.

For IRC involving the EMRS DTC the following principles of operation would apply:

- Work performed in a country would be funded by that country's government or agencies acting on behalf of that government.
- Work performed in the UK would be funded by the EMRS DTC.
- Co-operating Research Projects in UK and the foreign country would be identified or formed.
- The arrangement would require the agreement of, and self motivation of, the UK Science Provider and foreign Science Provider - Individual science provider organisations cannot be compelled to take part.
- Work outputs from the science providers would need to be made available to the foreign government and its contracting agency in a symmetrical manner.
- The MoU & TA mechanism includes 3rd Party IPR protection through Non Disclosure Agreements in the contracts between each Government Agency and their respective science provider. If such NDAs were not included, a science provider - science provider NDA would be required.

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Annual Technical Conference

EMRS
DTC

- ❑ The 1st Annual Technical Conference was held on 20th & 21st May 2004
- ❑ The purpose of this event is to disseminate the EMRS DTC research output
- ❑ 61 Technical Papers were presented from 57 EMRS DTC projects
- ❑ Over 350 delegates attended from UK, France, Finland, USA, Australia and Singapore
- ❑ A valuable networking opportunity connecting MOD and Industry with the Science Base
- ❑ The 2nd Annual Technical Conference will be held in June 2005
- ❑ The materials from the conference are available on our web site: <http://www.emrsdtc.com>



12/07/05



EMRS DTC Introduction

15

The EMRS DTC will hold an annual, unclassified technical conference. On May 20th & May 21st this year the EMRS DTC held the 1st Annual Technical Conference at Edinburgh International Conference Centre (EICC). The 57 active EMRS DTC projects presented 61 technical papers to an audience of over 350 delegates. The annual technical conference has an important role to play in the annual cycle of the EMRS DTC:

- ❑ The technical conference forms the main dissemination route to parties outside of the EMRS DTC consortium and science provider organisations. The conference proceedings provide an index of, and concise introduction to, the work of each EMRS DTC project.
- ❑ The EMRS DTC science providers retain full ownership of their IPR and are free to form exploitation relationships with all comers. The EMRS DTC consortium members enjoy no special position with respect to exploitation.
- ❑ The annual conference forms an excellent opportunity for other military facing organisations and civil facing industry to make themselves aware of the work, and to meet and form relationships with the science providers.
- ❑ The conference provides an excellent opportunity for those organisations considering applying through the DTC's annual call for proposals to view the entire programme and position their own proposals to maximum effect.
- ❑ The conference complete the annual cycle of competition, research and dissemination and acts to feed and stimulate the next cycle of competition via the annual call for proposals.
- ❑ It forms a unique networking opportunity serving MOD, Industry and the Science Base.

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Summary



- ❑ **EMRS DTC:**
 - ❑ **Builds a close working relationship with MoD**
 - ❑ **Research is highly relevant to the consortium companies businesses**
 - ❑ **Accesses substantial low-TRL research monies**
 - ❑ **Radical new concepts: Enable future product streams**
 - ❑ **Incremental improvements: Support current product streams**
 - ❑ **“Technology Push”: Innovative ideas are attracted towards industry**
 - ❑ **“Market Pull” - Selection Criteria: Product Impact & Exploitation Route**
 - ❑ **“Pull Through”: Testing ground for future concepts & enabling technologies**
 - ❑ **Supply Chain: Develop future key and strategic suppliers**
 - ❑ **Alliances: Supports construction of future collaboration**
 - ❑ **Continuous Assessment: Metrics enable value management**
 - ❑ **Annual conference: Initiate Knowledge Transfer**

12/07/05

EMRS DTC Introduction

16

In Summary, the EMRS DTC provides:

- ❑ A mechanism for closer working relationship between Industry, MOD and science base.
- ❑ A shared research programme, highly relevant to the consortium companies businesses.
- ❑ Provides Industry with access to substantial, low-TRL research funds.
- ❑ Creates a stream of radical new concepts to enable the creation of future product streams.
- ❑ Creates a stream of incremental improvements to support & sustain existing products.
- ❑ The framework provides attractive terms for the science base. The openness of the model enables a strong “technology push” from the science base towards our market segment.
- ❑ The role of Industry’s Chief Technology Officers as Research Theme Leaders and the Programme Construction Methodology and Assessment Criteria creates a highly discriminating “market pull”.
- ❑ The Chief Technology Officers and DSTL Knowledge Integrators work in tandem to facilitate “pull through” into industry’s internal applied research programmes and MODs applied Research & Technology Demonstration programmes.
- ❑ The DTC concept extends Industry’s supply chain to “ideas and concepts” - enabling technology rich SMEs an opportunity to develop into future, key suppliers.
- ❑ Provides an example of how Alliances might develop into Value Chains.
- ❑ Continuous assessment assures that the value of the programme is optimised.
- ❑ The annual conference completes an annual cycle and initiates broad knowledge transfer.
- ⇒ The EMRS DTC provides an opportunity for all parties to succeed, and succeed together.

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