Materials & Components for Missiles Innovation & Technology Partnership

MCM ITP CONFERENCE

21 & 22 OCTOBER 2015

HILTON METROPOLE, BRIGHTON

[dstl]

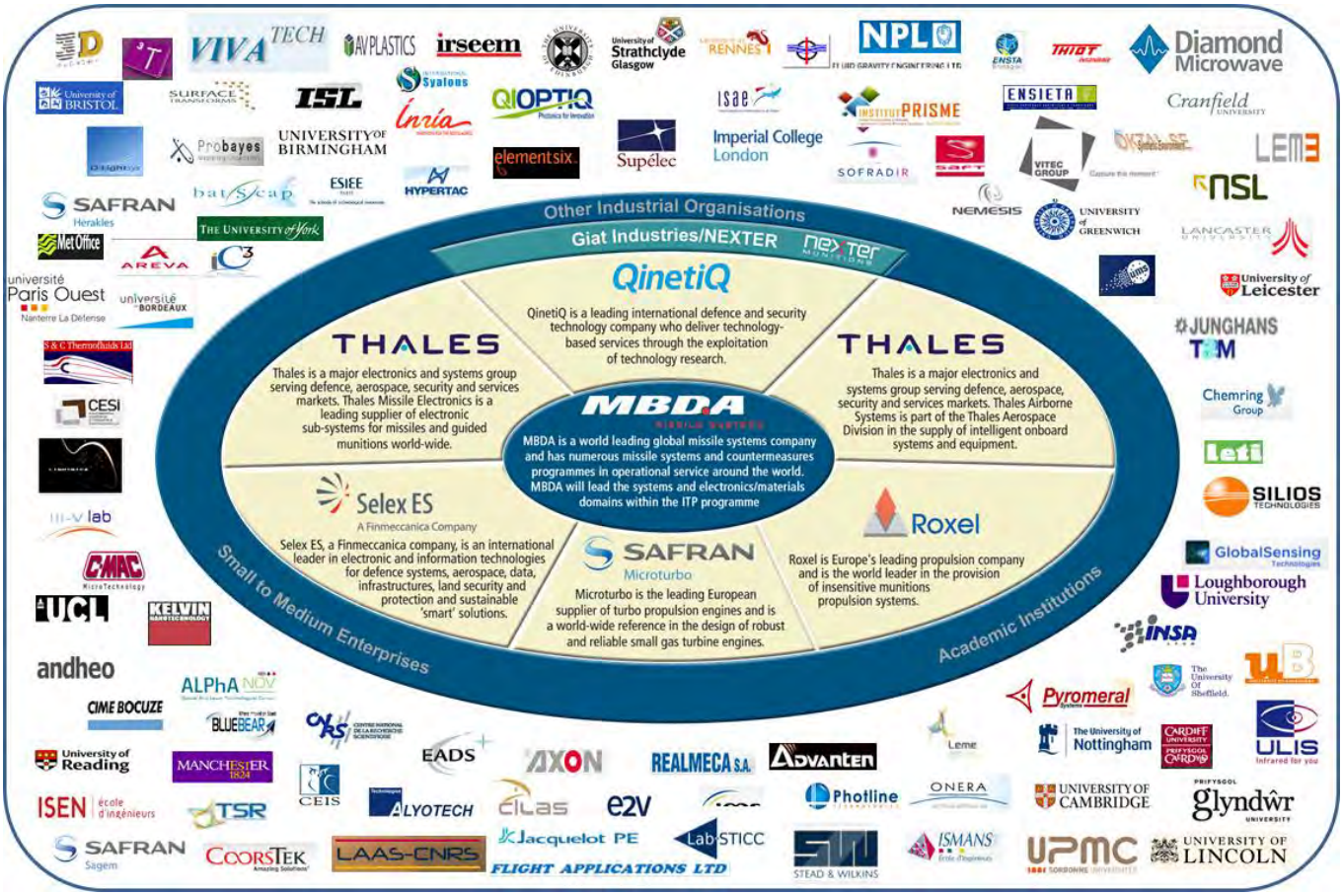
The UK MOD and French DGA MCM ITP programme brings together the best in British-French Missile Research & Development.

DGA

The Materials and Components for Missiles Innovation and Technology Partnership, MCM ITP is a dstl and DGA sponsored research fund open to all UK or French companies and academic institutions. Launched in 2007, the MCM ITP develops novel, exploitable technologies for generation-after-next missile systems.

The MCM ITP aims to consolidate the UK-French Complex Weapons capability, strengthen the technological base and allow better understanding of common future needs. The programme manages a portfolio of over 100 cutting-edge technologies which hold the promise of major advances, but are still at the laboratory stage today.

The MCM ITP is aligned into eight technical domains, each of which is led by one of the MCM ITP industrial consortium partners[1].



[1] The MCM ITP Industrial Consortium partners are: MBDA; THALES; Roxel; Selex ES; Safran Microturbo; QinetiQ; Nexter Munitions.

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Funding

The programme is funded equally by the governments and the industrial partners and is composed of research projects on innovative and exploratory technologies and techniques for future missiles. There is strong participation from SMEs and academia with 76 participating in the programme to date, and a total of 121 organisations involved in the overall programme.

With an annual budget of up to 12.5M€ and 30% of the budget targeted towards SMEs and Academia, the MCM has become the cornerstone of future collaborative research and technology demonstration programmes for UK-French missile systems.

Conference

On 21st and 22nd October 2015, DGA, dstl, MBDA and its partners will review the last two years of the MCM ITP programme, and present the technical advances that have been made possible thanks to this cooperative programme. During the two days in Brighton, UK the 250 delegates attending the conference will have the ability to

- See the latest developments in UK-French Complex Weapons technology research.
- Meet and network with key decision makers in the defence industry, DGA, dstl and UK MoD.
- Understand the future technology requirements in the Complex Weapons sector.
- Find out how to apply for funding and get involved in the programme.
- Understand how MCM ITP funding can enhance their organisation's Research and Technology investment.

The following paragraphs highlight three example projects which have been researched within the MCM ITP programme and will be showcased at the conference:

- Next generation intelligent mission planning solutions
- Snail charge rocket motors for future battlefield weapons
- Materials for supersonic and hypersonic vehicles

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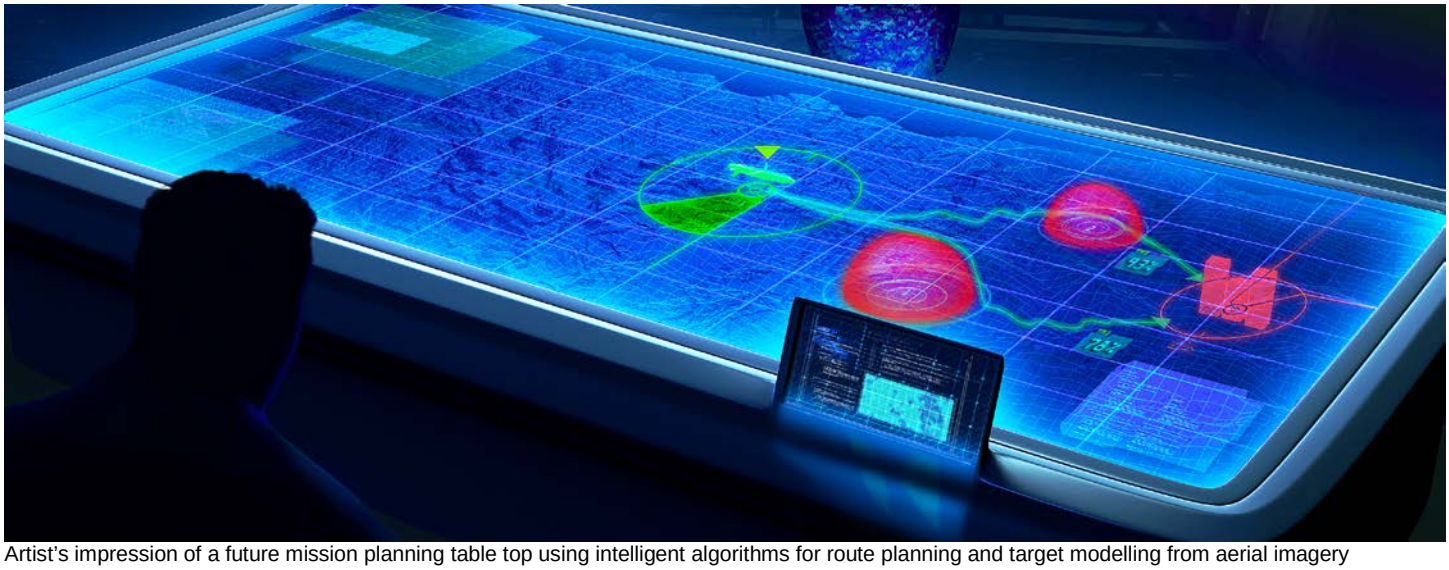
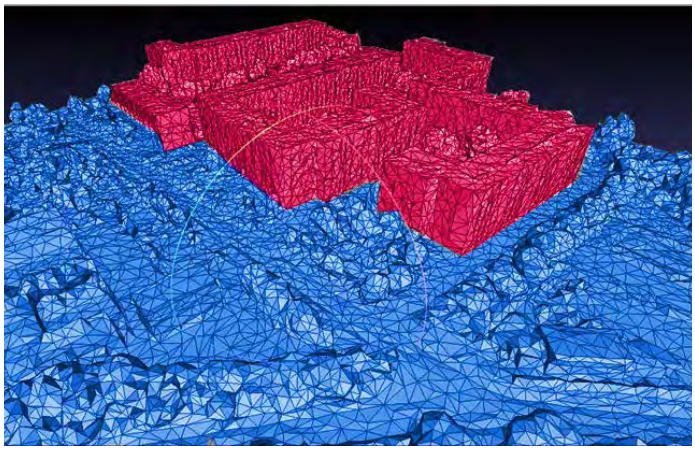
Next generation intelligent mission planning solutions[1]



Artist's impression of a future mission planning table top using intelligent algorithms for route planning and target modelling from aerial imagery

Currently mission planning solutions for long range missile are time consuming and include two labour intensive activities which have been studied under the MCM ITP. Once a ground target has been identified, a human operator currently builds a 3D vector model of the target from aerial or satellite imagery. This is an extremely labour intensive activity. The Rapid Static Target Modelling (RSTM) project has studied whether commercial algorithms used to build 3D architectural models from aerial imagery, have the accuracy and fidelity to replace the current manual methods. This has demonstrated significant improvements in the speed at which a ground target vector model can be built, which could result in a significant operational benefit and reduction in support costs for long range systems.

The second project, Rapid Mission Planning and Rehearsal (RMPR) considers the intelligent calculation and optimisation of the route between weapon release and target. This could result in a significant improvement in weapon utility and survivability. The most significant innovation in this project is state of the art algorithms that have been developed in order to reduce the computational demands to a point that they can update in real time and provide credible options during the mission planning process. Conference attendees will have the opportunity to see a concept table top mission planning tool developed by MBDA and the RMPR route optimisation working in real time simulation tool.



Automated Rapid Static Target mesh extracted from photographic aerial imagery of an exemplar ground target

[1] MBDA France, MBDA UK, Probayes, Flight Applications

FLIGHT APPLICATIONS LTD

MBDA MISSILE SYSTEMS

Probayes

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Snail charge rocket motors for future battlefield weapons[2]

Artist's impression of a missile using the Snail charge rocket motor for ground attack in a battlefield application

Current rocket motors in battlefield applications need to provide two functions, firstly a rapid acceleration of the weapon from the launch platform termed the boost phase, followed by a sustain phase to maintain the missile speed on transit to the target. The amount of boost compared to sustain thrust generated in these phases has an impact to the missile range. Current rocket motor designs use geometrical features inside the motor to control the burn rate of the propellant for each boost and sustain phase. However, to do this the size of the rocket motor and specifically the ratio of length to its diameter is bounded, this introduces constraints on the size of the missile and significantly reduces any flexibility to the missile designer when considering integration onto the launch platform.

To alleviate this constraint, the MCM ITP has been investigating a new class of rocket motor which is capable of retaining the boost/sustain function to maximise range, whilst giving more flexibility in the length to diameter ratio of the motor. This is achieved using a snail charge, whereby the propellant folds inside the rocket motor casing. This could provide a missile design window and capability improvement in terms of maximising engagement range and missile dimensions for platform integration.

Snail charge motor that has been designed on ITP and will be built and tested in a future phase

[2] Roxel UK, Roxel Fr

Roxel

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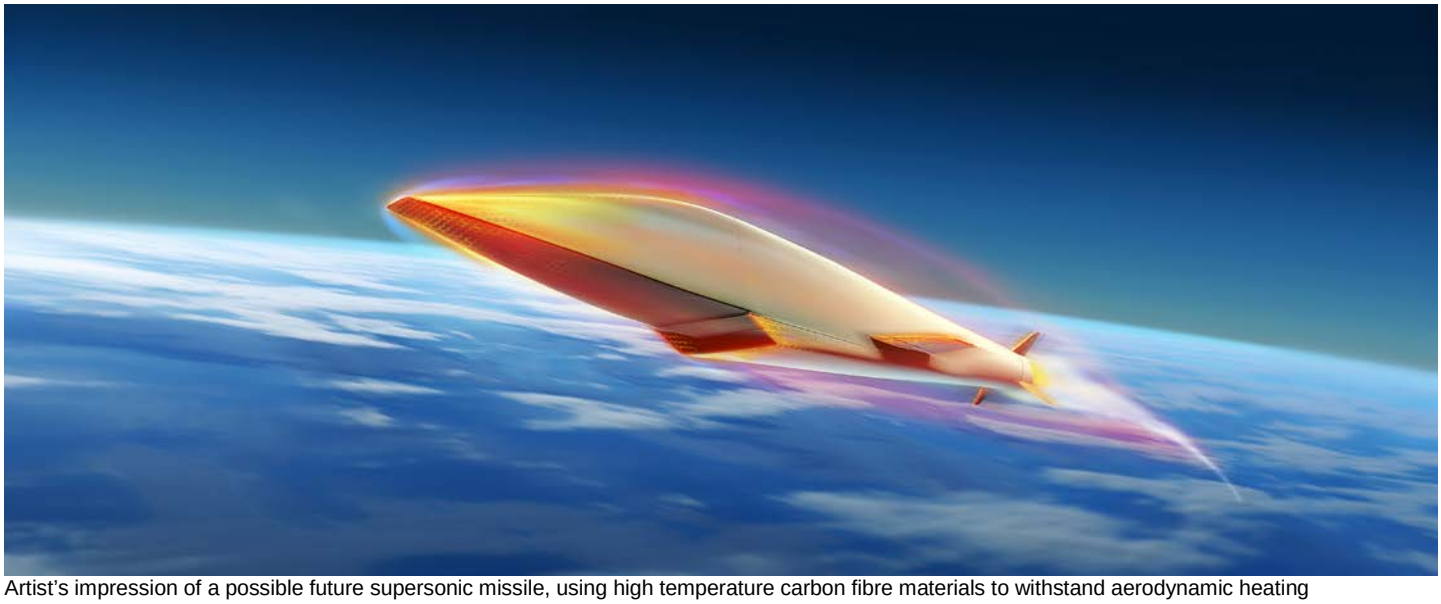
Materials for supersonic and hypersonic vehicles [3]



Artist's impression of a possible future supersonic missile, using high temperature carbon fibre materials to withstand aerodynamic heating

At high supersonic and hypersonic speeds, aerodynamic heating is such that the skin temperature of the vehicle, in particular at the leading edges, can exceed 1000°C. At these temperatures none of the traditional aerospace high performance metallic materials, such as titanium & steel, can tolerate the harsh thermal environment as their structural performance starts to degrade from 800°C onward. Therefore hypersonic airframes need to be manufactured from materials' solutions that would be capable of surviving the harsh thermal environments.

The MCM ITP has been investigating a number of materials that could fulfil the requirements for future high speed systems; these include low cost high temperature Ceramic Matrix Composites, and Ultra-High Temperature Ceramic Composites. The projects have demonstrated that these materials can withstand temperatures and durations representative of future supersonic and hypersonic missiles, maintaining structural integrity at temperatures well in excess of 1000°C and for durations of several minutes. The projects have also demonstrated that these materials can be formed into complex representative shapes that are required for future high speed missiles.

These materials provide a significant increase in capability for future missile systems, not only in hypersonic applications, but in any application where low cost, high strength, low mass structures are required. Conference attendees will be able to see these materials on display and watch videos of the high temperature testing.

Ceramic Matrix Composite undergoing blow torch testing at 1600°C

[3] MBDA Fr, MBDA UK, Onera, Pyromeral, University of Birmingham

UNIVERSITY OF BIRMINGHAM

Pyromeral Systems

MBDA MISSILE SYSTEMS

ONERA THE FRENCH AEROSPACE LAB

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The Future

The MCM ITP programme is laying the foundation for one of the key global challenges, how to deliver world class military capability at lower cost. Examples of MCM ITP technologies are already finding applications in future product roadmaps. Because of this, on 1st October 2015 the French and British authorities have funded a further twenty one projects which will extend the programme to at least 2017. This extension includes the opportunity for new organisations to propose new projects for the programme to start in September 2016 and present their research at the next ITP conference which is planned for Lille Grand Palais, France on 11th/12th October 2017.

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Conference Statistics

The following statistics were recorded on the 8th October 2015

Number of Exhibitors – 30

Registered Attendee's – 235

Number of Organisations attending – 53

Please contact Jean Dupont, jean.dupont@mbda-systems.com, if you require the actual statistics from the conference.

Conference Awards

Three awards were chosen by dstl and DGA, for the results of research carried out over the last 2 years of the programme. These were presented on the final day of the conference, and are listed as follows

MCM ITP Best Live Conference Demonstration

To be decided at the event

MCM ITP Most Exploitable Project

Extreme GaN

UMS, University of Bristol, IMS, Thales Optronic

MCM ITP Best Collaboration

Solid Plastic Optics For Future Low Cost Robust Proximity Fuzes

AlphaNov, Thales UK