Materials & Components for Missiles Innovation & Technology Partnership

MCM ITP CONFERENCE

22 & 23 MAY 2013 :
GRAND PALAIS CONFERENCE CENTRE, LILLE

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

Innovative UK-French Research & Technology Programme

The Materials and Components for Missiles Innovation and Technology Partnership, MCM ITP is a UK MoD and DGA sponsored research fund open to all UK-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 Guided Weapons capability, strengthen the technological base and allow better understanding of common future needs. The programme manages a portfolio of over 90 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 are 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.

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 49 participating in the programme to date, and a total of 89 organisations involved in the overall programme.
With an annual budget of up to 13M€ and 30% of the budget targeted towards SMEs and Academia, the MCM ITP is expected to become the cornerstone of future collaborative research and technology demonstration programmes for Anglo-French missile systems

Conference

On 22nd and 23rd May 2013, DGA, UK MoD, MBDA and its partners will review the first five year cycle of the MCM ITP programme, and present the technical advances that have been made possible thanks to this innovative, new cooperative programme. During the two days in Lille, France the 250 delegates attending the conference will have the ability to

- See the latest developments in Anglo-French Complex Weapons technology research.
- Meet and network with key decision makers in the defence industry, DGA 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 four example projects which have been researched within the MCM ITP programme and will be showcased at the conference:

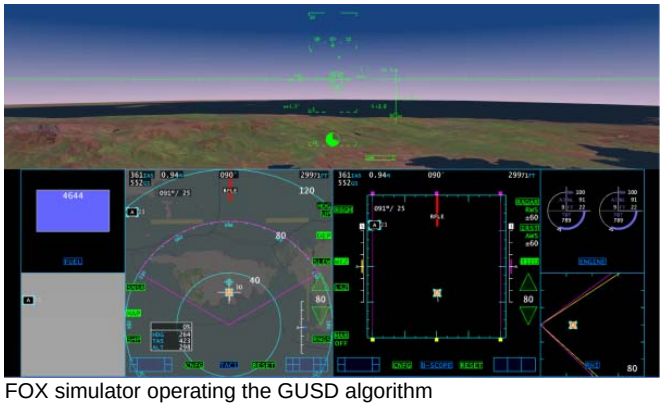
- Guidance in Uncertain Shooting Domains (GUSD)
- Dual Band Polarimetric Target Discrimination
- Longer Stand Off Warheads for the defeat of Next Generation Armours
- Materials for Hypersonic Structures - A Nose Cone Demonstrator

Guidance in Uncertain Shooting Domains (GUSD) [2]

Artist's impression of the GUSD algorithm working within a fighter cockpit. Red traces representing the likely trajectories that the enemy aircraft could have taken, intelligently calculated by the GUSD algorithm.

Currently, during air to air combat, a pilot must make decisions based on his training and judgement as to when to fire a missile, and once fired how long to maintain telemetry between the aircraft and missile. This telemetry is particularly important in long range lock-after-launch missiles to maximise the chances of a successful engagement. By breaking the telemetry link too early, the pilot risks missing the target. However, maintaining the telemetry puts the aircraft at ever-increasing risk.

The purpose of GUSD is to calculate all the likely aircraft manoeuvres during air combat, with the aim of giving the pilot a real-time calculation of the missile engagement success probability. This is displayed as a tactical decision aid in the pilot's head-up display. Moreover, once the missile is fired the technology can also be used to optimise the missile trajectory in order to maximise the probability of a successful engagement, further enhancing the capability.



FOX simulator operating the GUSD algorithm

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 operate on current missile processors. The project has successfully demonstrated this, by integrating the GUSD algorithm into the MBDA FOX aircraft simulator. Conference attendees will have the opportunity to fly the simulator and see the GUSD tactical decision aid working in real time.

[2] MBDA France, MBDA UK, Probayes

Dual Band Polarimetric Target Discrimination [3]

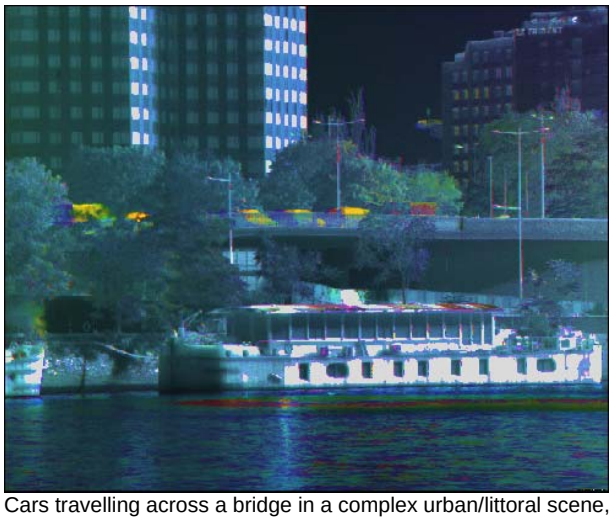
Artist's impression of a missile steered by a dual band polarimetric seeker, identifying military targets in a cluttered urban background

An essential requirement of future missile systems is the ability to differentiate between targets and non targets in a cluttered scene, where it is very difficult to discern even with the human eye. The dual band polarimetric target recognition project has been doing research to solve this problem, and design the next generation of Infra-red seekers for missile systems.

Infra-red cameras, have for decades, provided a step change in capability over visible cameras, by being able to identify targets at night as well as day from their radiated or reflected heat. It has now been shown that by also measuring other properties of light, such as polarisation, even finer target discrimination can be made.

Man made objects reflect light at different levels of polarisation compared with natural materials. This principle has now been extended to allow an Infra-red camera to clearly identify not only sources of heat, but also give an indication of what types of materials are present in the scene. This could yield a significant advance in capability, by making it easier to identify targets not detectable with the current generation of Infra-red cameras, nor the human eye.

A dual band polarimetric camera which was built during this project will be demonstrated at the conference. Delegates will have the opportunity to see the discrimination offered by this technique in a real time demonstration.



Cars travelling across a bridge in a complex urban/littoral scene, clearly separated in yellow from the background using polarisation

[3] Selex ES, MBDA France, MBDA UK, Lightnics

Longer Stand Off Warheads for the defeat of Next Generation Armours [4]

Artist's impression of a battlefield missile penetrating an armoured vehicle protected by a Defensive Aid Suite (DAS) using a long stand off warhead

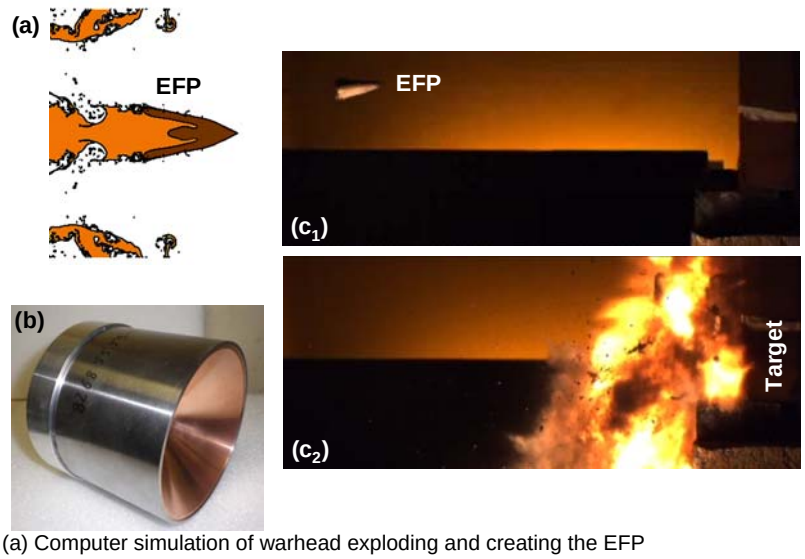
Currently the majority of battlefield missiles are designed to defeat armoured targets by detonating close to the target, where conventional warheads are most effective. However, this allows the missile to be countered by Defensive Aid Suites (DAS), which are triggered by the incoming missile and neutralise the threat before the warhead is initiated.

The Long Stand off Warhead project is researching new warhead technologies that are able to detonate several meters away from the target, whilst still being able to penetrate battlefield armours.

Two Concepts are being studied. The first concept is described here and consists of a single warhead that when detonated creates an aero-stable Explosively Formed Projectile, or EFP. The stand off circumvents the DAS, and results in a defeat of the armoured vehicle. The key innovation in this project is the design of the warhead and EFP, and its ability defeat modern armour systems.

The project has successfully demonstrated the technology with warhead trials being carried out at representative stand off ranges and with representative target armours.

Conference attendees will be able to see further details of the technology together with the results of firing trials that have been carried out.



(a) Computer simulation of warhead exploding and creating the EFP
(b) Photograph of Long Stand Off Warhead prototype
(c) Stills from high speed photography of the warhead trial (aero-stable EFP moving left to right)

[4] QinetiQ, Nexter Munitions

Materials for Hypersonic Structures - A Nose Cone Demonstrator [5]

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 can exceed 1000°C. At these temperatures traditional aerospace materials such as aluminium cannot tolerate the harsh thermal environment. Therefore hypersonic airframes need to be manufactured from expensive and heavy high temperature materials such as titanium or Ceramic Matrix Composites (CMC), to cope with the demanding environment.

HVN–CMC is a low cost alternative to current Ceramic Matrix Composite materials. The project has demonstrated that this new carbon fibre reinforced ceramic matrix material can withstand temperatures and durations representative of future hypersonic missiles, maintaining structural integrity at temperatures of up to 1100°C and for durations of several minutes. The project has also demonstrated that the material can be formed into complex representative shapes, with the successful manufacture of a full size hypersonic missile nose cone.

This material provides 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 materials are required. Conference attendees will be able to see further details of the project with the HVN-CMC missile nose cone on display at the MBDA stand.

Hypersonic missile nose cone manufactured out of HVN-CMC high temperature carbon fibre

[5] MBDA Fr, MBDA UK, Onera, Institut Prisme

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, the French and British authorities have agreed (subject to final contract negotiations) to continue the MCM ITP programme for a further period of up to six years, at a similar level of funding. An inter-governmental agreement covering this new period is in the process of being concluded by the two nations, following which MBDA will launch a new tranche of research and an annual call for proposals.

Conference Statistics

The following statistics were recorded on the 9th May 2013

Number of Exhibitors – 19

Registered Attendee's – 221

Number of Organisations attending – 51

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 UK MoD and DGA, for the results of research carried out over the last 5 years of the programme. These were presented on the final day of the conference, and are listed as follows

MCM ITP Breakthrough Project

Materials for Hypersonic Structures – A Nose Cone Demonstrator

Onera, Prisme, MBDA

MCM ITP Best Demonstration / Trial

Investigation of Materials and Process-routes for Uncooled Turbines

University of Birmingham, Safran Microturbo

MCM ITP Most Innovative Project

Guidance in Uncertain Shooting Domains

Probayes, MBDA