EUROPEAN DEFENCE AGENCY

& Research Technology

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1. R&T Perspectives

Research & Technology makes a critical contribution to the preparation of future capabilities.

Research & Technology (R&T) makes a critical contribution to the preparation of future capabilities; together with innovative solutions developed by the defence industry including a vast network of SMEs, it brings operational benefits to our armed forces. Europe's defence systems have been developed on the basis of major R&T investments made 15 years ago. Such R&T investment underpins both industrial competitiveness and sustainable military capabilities.

Today's investment in defence R&T suffers from financial pressure. European defence data suggests a 20% reduction over the past five years. Moreover the on-going economic crisis has pushed towards national priorities to save jobs and industrial activities. The resulting lower priority for cooperative projects could have dramatic effects in the long run.

At the same time, more and more technologies are of "dual-use" nature, blurring the lines between civil and military technologies. The European Defence Agency (EDA) complements its efforts to foster R&T cooperation among Member States, by coordinating dual use projects with the European Commission's 7th Framework programme (FP7) and with the European Space Agency, under the "European Framework Cooperation" (EFC). This approach not only avoids duplication, it also allows stakeholders to exploit synergies, an objective which is shared between civil and military communities.

We see a number of technological trends with major impact for defence emerging in the next 5 to 10 years. Micro- and nano-electronics, as key enabling technologies identified by the European Commission, allow for highly integrated and smart systems. Equipped with a high degree of automation, land, naval or aerial systems can be remotely piloted, to assist and protect soldiers in dangerous situations. Technologies for protection in general will remain high on the list, e.g. to detect explosives as well as chemical or biological agents. The demand of information to make proper decisions in due time will continue to challenge sensor and signal processing technologies. On the other hand increasing dependence on electronic hardware and software also bears high risks. Resilience towards cyber threats will be vital. Both "Defence" and "Research & Development" have been carved into the comprehensive EU Cyber Security Strategy from the very beginning, setting the scene for cyber defence R&T.

EDA is also striving for a comprehensive strategy for "critical defence technologies". A first list of these technologies has been produced and will be worked out by a strong assessment with Member States through a more formalized risk management process. This necessarily needs to include a clear view where strategic dependence from sources outside Europe will require specific R&T efforts to access these technologies in Europe. Last but not least, the reduction of environmental footprint in military operations will require much ingenuity, e.g. on the energy consumption – which closes the loop to "smarter systems", as energy consumption is a key driver for micro- and nano-systems.

Defence R&T challenges are not limited to exploring new technologies: the route to innovation will need to bridge the famous "valley of death" to mature technologies up to the level of demonstrators, and for some specific areas the supply chain will require non-limited access to source material and/or technology. EDA has started to tackle also these challenges of technology non-dependence. Another major trend is also the development of open architecture systems, started with naval underwater systems, and extended to land systems.

We see a number of technological trends with major impact for defence emerging in the next 5 to 10 years.

EDA´s ability to work "à la carte", starting from two Member States, to identify and exploit opportunities and added value from small to large scale projects, has lead to measurable successes: from defence R&T investments of more than 600 M€ over the past five years, to the implementation of EFC in the area of CBRN protection, with plans to expand the coordination and cooperation in the coming Horizon 2020 research programme managed by the European Commission, to the areas of Remotely Piloted Aircraft Systems (RPAS), key enabling technologies and cyber security, to name a few.

The following chapters of this brochure will provide an overview of the EDA R&T activities and way of working, list a selection of highlights from projects and Joint Investment Programmes, complemented by capability and industrial initiatives and will conclude with figures from recent statistics.

Christian Bréant
R&T Director, European Defence Agency


POWER
READY
+ 50.02
FINE HEATER
10%
FINE HEATER
90%
CHANNEL 1 (..W)
CHANNEL 2 (..W)
CHANNEL 3 (..W)
CHANNEL 4 (..W)
FINE %
PRE %
BATH TEMP
T/C
1
2
3
4
5
6 L
6 R
PUMP
FAILURE

2. R&T CapTech Highlights

The European Defence Agency's work in the Research & Technology domain is in line with the Agency's mission to support Member States in their efforts to improve defence capabilities, EDA organises its R&T work in three Capability Technology (CapTech) areas: Information Acquisition & Processing (IAP); Guidance, Energy & Materials (GEM); and Environment, Systems and Modelling (ESM). CapTechs provide a networking forum for experts from government, industry, small and medium enterprises (SME) and academia, and they are moderated by EDA.

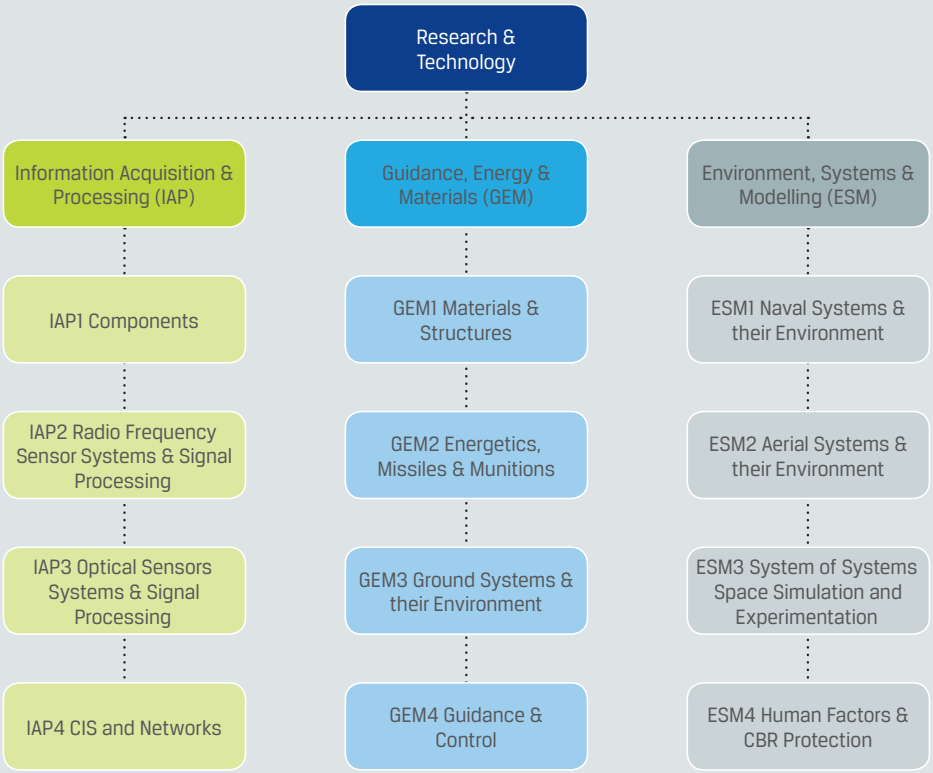
All CapTechs have recently established technology roadmaps as part of their Strategic Research Agendas (SRA), with the objective to have technologies in place when demanded by the military side or by the Agency's Capability Development Plan.

Technology development in the EDA environment is implemented through variable project geometries. The most common format is the "Category B" project, prepared by a small number of contributing Members (cM) and open to others under an "opt in" scheme. More comprehensive and complex activities are established as "Category A" project or "Joint Investment Programmes" by all pMS, with the possibility to "opt out". Recently, a hybrid format of Cat B-like projects under a Cat A umbrella has proven very successful.

All CapTechs have recently established technology roadmaps as part of their Strategic Research Agendas.

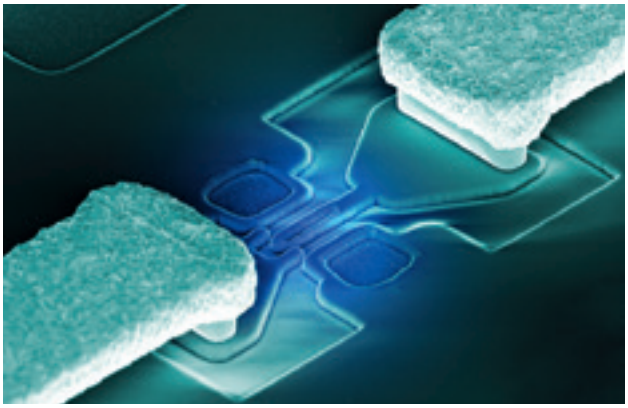
R&T projects may be of different nature, some of them consisting of simple Information EXchange (IEX) - supported by a Technical or Project Arrangement (TA or PA) without the support of any contract – while some others involve the issuing of contracts to industry for the execution of work plans. Such projects rely on governmental commitment - both financial and in-kind – of cMs, and in some cases involve additional contribution from industry. EDA can be appointed as contracting authority or – alternatively – each cM will place a national contract on its own national contractors.

Preparatory activities to facilitate pMS´ investments in Cat A and B projects can be funded from the EDA Operational Budget (OB), usually contracted as studies ("OB studies").



IAP1 Components

IAP1 covers the innovative, critical and key enabling technologies of electronic and photonic components, providing advanced capabilities to military systems, and a high degree of competitiveness to European defence industry. Dramatic change in the electronic components market with significant technology and production moving outside Europe is increasing industry's vulnerability.



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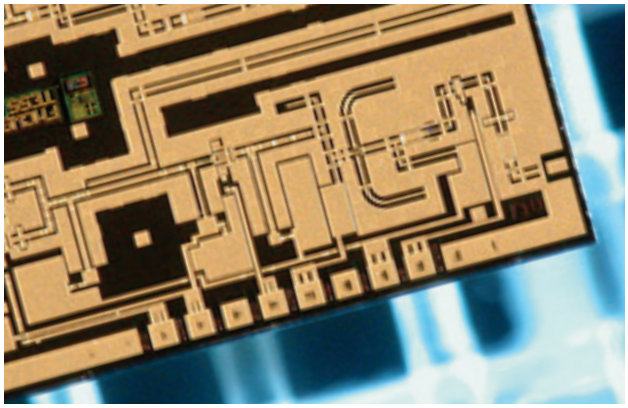
One major IAP1 work strand aims at establishing a European supply chain for next generation defence application semiconductors, using Gallium-Nitrid(GaN)-on-Silicone-Carbid (SiC) technology. Building on one another, three consecutive projects (KORRIGAN, MANGA, MAGNUS) have attracted substantial and continuous investments over the past 10 years of well above € 70 million including pMS and industry contributions. MANGA has successfully developed know-how, skills and production processes for industrially qualified 100 mm SiC wafer production and GaN-on-SiC epitaxy. MAGNUS was contracted in 2012 to a consortium of seven industrial partners and two subcontractors from France, Germany, the Netherlands, Sweden and the United Kingdom. They are focusing on application and demonstration of cutting edge enabling technologies such as Monolithic Microwave Integrated Circuits (MMIC), resilient packaging, thermal management as well as highly integrable send and receive modules for phased array antennas to be used in radar, communications or electronic protection/ warfare.

Other work strands include technologies for detection, signal processing, ultra-high integration, and component robustness. THIMS (Technology for High Speed Mixed Signal Circuits – by



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Germany, France) develops and demonstrates state of the art high-speed Mixed-Signal technology (ultrafast converters between analog and digital) and industrial production processes for cost effective sources.

EDA SoC (System on Chip) is a cooperative project with 14 industry and academic partners from France, Italy, Germany, and Norway for a budget of € 22 million. Defence applications with digital electronic systems (software radio, radar, electronic warfare, cryptography, optronics…) require integrated solutions with a high degree of (real time) performance, programmability, flexibility, reliability and compliance with safety and security specifications. SoC is a key enabling technology to such requirements. The project will provide the European defence equipment manufacturers with access to designing and producing complex advanced technology SoC solutions.

Four projects in the areas of advanced three dimensional packaging for rough military applications, THz imaging for stand-off detection (e.g. of Improvised Explosive Devices), prediction of reliability for electronic components and high performance and compact optoelectronic microwave oscillators are projects in different preparation phases. The projects CODFISH (Critical Optical Devices for Future Integrated Sampling Architectures), and SWAP (Switched Applications) were finished. Follow on projects are under consideration.

IAP1 has developed stronger relations to the equivalent European Space Agency (ESA) and European Commission (EC) communities, to identify cross domain synergies, notably in regard of strategic technology non-dependence (see separate chapter).

Finally, IAP1 conducted workshops on nanotechnology and Printed Circuit Boards (PCB) in order to identify defence requirements and research needs. A strategic EDA operational study on PCB, including a roadmap, has been started under a large industry consortium.

IAP2 – Radio Frequency (RF) Sensor Systems & Signal Processing

IAP2 CapTech comprises mainly Radar and Electronic Warfare, from a systems perspective including Signal Processing and related algorithmic research, with a project portfolio of more than € 60 million. 2012 marks the end of a cycle, as a number of projects, SPREWS, TELLUS, SIMCLAIRS, FARADAYS, have finished or are coming to an end.

TELLUS analysed and discussed enabling technologies, light, affordable and energy efficient for Radar and Electronic Support Measures (ESM) systems in urban terrain; SPREWS dealt with Signal Processing for Radar and Electronic Warfare Systems; SIMCLAIRS aims at building the technology base of a future European capability in the field of light and compact UAV RF payloads with functionality delivering a combination of Synthetic Aperture Radar/Moving Target Indicator, Foliage Penetration, ESM and possibly communications in an integrated Intelligence, Surveillance, Target Acquisition and Reconnaissance (ISTAR) package; FARADAYS´s main objective is to protect with solid arguments the frequency bands used by military radars in Europe, surveying related issues and investigating innovative techniques to support multiple usage of spectrum. All of them contain theoretical studies of applicable technologies, aiming at a Technology Readiness Level (TRL) of about 4; potential follow-ons are under discussion.

CapTech IAP2 on Radio Frequency Sensor Systems & Signal Processing made much progress with a number of projects coming to an end.

A new Category B project called SPERI aiming at Non Cooperative Target Recognition by Radar was signed at the end of 2012 and will run for the next three years.

A groundbreaking activity in 2012 was the Ad-Hoc Category B project AMBASSADOR (Advanced Model-Based Approach to SMRF Specification, Analysis, Development and Obsolescence Reduction). Aiming at a simulation framework to support systems engineering processes, it is directly adding value

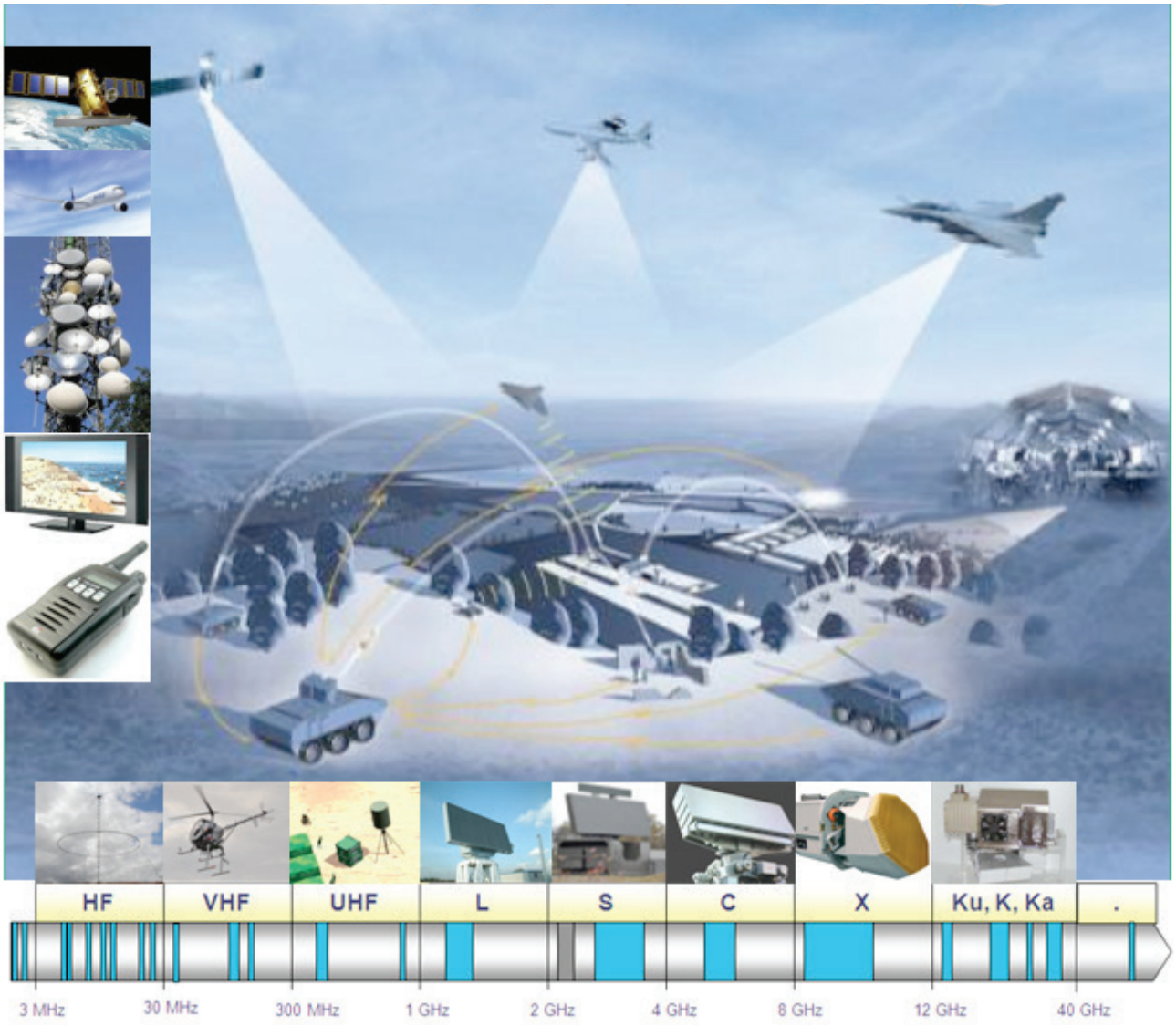

Illustration of IAP2 project Faradays

to the "Scalable Multi-function RF (SMRF)" programme. This programme will help to improve the effectiveness of design, lower costs of both prototyping and production of new systems, define new standards, common design and maintenance procedures in a fast growing area of new products.

Proposals of more Cat B projects include RFBIO (Biological effect of RF Fields), MAPIS (follow-on of JIP-ICET APIS on passive Inverse-SAR processing), ACACIA (advanced classification techniques for object recognition with radar), and SIRONA (studies of integrated RF and Optronics for next generation architectures, with similar concepts and procedures as SIMCLAIRS).

The EDA study RIBA (inside building awareness through radar) was successfully concluded. The next OB study will be RICS, on military applications based on Compressive Sensing (CS).

IAP3 Optical Sensors System & Signal Processing

The technical scope of the IAP3 covers electro-optical (EO) systems and related signal processing. Based on pMS prioritisation of the IAP3 Strategic Research Agenda, the following seven roadmaps were constructed: spectral imaging, alert processing, laser counter measures, laser sensors, imaging software, modelling and imaging hardware. These road maps address mainly the capability gaps in situation awareness (Intelligence, Surveillance and Reconnaissance – ISR), protection against portable air defence weapons (C-MANPADS) and stand-off detection of chemical, biological or radio-nuclear threats.

In the priority area of alert processing, EDA launched a more detailed study on optimal distribution of image processing functions among different platforms to form a common understanding of the R&T priorities in this field and the final results were delivered in February 2013. The study proposed road maps in four development areas (EO-sensor signal processing, data transfer and platform) for future EDA cooperation. The EDA project MISSION (Mid Infrared Semiconductor Laser Modules for Defence Applications) started in 2012.

IAP4 CIS and Networks

IAP4 is supporting military requirements in the areas of Command Information Systems (CIS), Communication Systems such as Tactical Radio, Network Enabled Capabilities (NEC) and Cyber Defence.

For EU force operations, usually lacking the comfort of a communication subscriber line to plug in, a variety of capability challenges have to be tackled in detail. Many of them are related to implications from the Software Defined Radio (SDR) paradigm on next generation military radio functionalities. Lately, cooperative research on cognitive radio technologies has progressed well in the CORASMA project worth € 15 million and shared among seven Member States (Belgium, France, Germany, Italy, Poland, Portugal, Sweden). Such technologies will enable intelligent exploitation of the radio spectrum, a resource becoming increasingly difficult to access. Other top priorities on the IAP4 research list include disruption tolerant networking techniques, intelligent Quality of Service (QoS) schemes across functional layers, Service Oriented Architectures (SOA) in tactical environments, but also management of heterogeneous information.

"Cyber Space" has rapidly gained crucial relevance to defence cooperation. Therefore, increasing consideration will be dedicated to the protection of Information and Communication Systems (Cyber Security, Cyber Defence). A workshop "Research & Innovation for Cyber Defence and Combating Cyber Crime", jointly organised by EDA, ESA and the Directorate-General Enterprise & Industry (DG ENTR) of the European Commission under the European Framework Cooperation (EFC) scheme, laid the foundation for future coordination of research efforts in the Cyber domain.

Two studies, funded by EDA and carried out by multi-national consortia of industries and institutes, should be mentioned: "NEC Technical Challenges" has translated NEC requirements into technology challenges and eventually filtered them into an R&T roadmap, and "Heterogeneous Networks" which has dealt with the fact that defence forces in today´s and future engagement scenarios need to extensively rely on networks outside of physical control, providing recommendations on respective Service Level Management.

ESM1 Naval Systems & their Environment

The ESM1 Strategic Research Agenda for Naval Systems was completed in 2012.

A consortium led by DCNS (France) and also includes NAVANTIA (Spain), FINCANTIERI (Italy), BLOHM and VOSS Naval (Germany), DAMEN (Netherlands) and CESA (The Community of European Shipyards' Association) presented an industrial view on the R&T investment priorities and pMS representatives prepared the SRA based on the industrial input. The proposals of the SRA are grouped in three work strands: unmanned maritime systems (UMS), affordable mission modular ships (AMMS) and underwater platforms. The UMS work strand is ongoing and the preparations for joint R&T work in the other two work strands were started in 2012.

A major part of ESM1 work is conducted under the UMS programme that is reported in a separate chapter.

ESM2 Aerial Systems & their Environment

The most important recent achievement of the ESM2 CapTech was the launch, preparation and contract signature of ASTYANAX, the follow-on of the JIP ICET HECTOR project on structural helicopter health monitoring. It aims at defining innovative predictive maintenance tools for

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helicopters. Building on a successful system demonstration of a sensor network and predictive algorithms, three Member States Italy, Poland and Spain decided to launch this follow-on phase in order to demonstrate the system on a real helicopter structure. The programme arrangement as well as the contract signatures were achieved in less than one year.

Another achievement is the programme arrangement signature by Italy and Sweden of ISSA, a project requiring wind test activities for the integrated simulation of non-linear aero-structural phenomena arising on combat aircraft in transonic flight. The contract signature is expected for spring 2013.

In the area of certification and qualification of military helicopters, an EDA study had been launched, to take benefit of synergies between civil and military requirements, and consequently optimise the certification/qualification process of future platforms. A two-day workshop in January 2013 aimed at generating ideas for such optimisation. The final study report was presented in March 2013; its recommendations will be further discussed in the Military Airworthiness Authorities (MAWA) forum.

The ESM2 Strategic Research Agenda and technology roadmap had been completed in 2012.

Part of the work has been incorporated in the Technology Roadmap of European RPAS, drafted under the leadership of SESAR-JU (Single European Sky ATM Research Joint Undertaking); one of the key challenges addressed is the safe integration of Remotely Piloted Aircraft Systems (RPAS, also known as UAS – Unmanned Aerial Systems) in civilian airspace. The preparation of a "Joint Investment Programme UAS" (see separate chapter) is one of the priority ESM2 workstrands.

Other project proposals include the third phase of the Global System Study (GSS), in cooperation with the European Technology Acquisition Programme (ETAP).

ESM3 System of Systems Space Simulation and Experimentation

The system of systems approach can be considered as the technical view of a capability or of a military mission implying different systems. "Interoperability" and "system engineering" are two main methodological areas. A space asset is a typical system of systems, with its six main segments: payload, cargo, launcher, data links, ground segment, client applications/network. ESM3 assures the coordination for any global space R&T question, internally. (e.g. GEM2 with "energy" (launcher), IAP1 with "components" and dependencies, IAP2&3 with optronics and radar sensors and IAP4 with CIS and networks), but also externally (e.g. with ESA).

In the Modelling and Simulation domain EDA complements the work done in NATO Modelling and Simulation Group (NMSG). ESM3 focuses on tools, methods and interoperability/compatibility needs to securely work in a distributed way (for simulation, experiment, evaluation, qualification and training purposes), and share software or data. In this respect, workshops have been held to structure an "affordable" and "scalable" EU Distributed Experimentation Laboratory (EUDEL), compatible to the NATO Distributed Network for Battle Labs (DNBL). The EU Military Staff (EUMS) is fully involved in this work strand to define an EU concept. A first experiment was performed in mid 2013, quickly connecting eight locations in three countries, to run a Blue Force Tracking scenario.

ESM4 Human Factors & CBR Protection

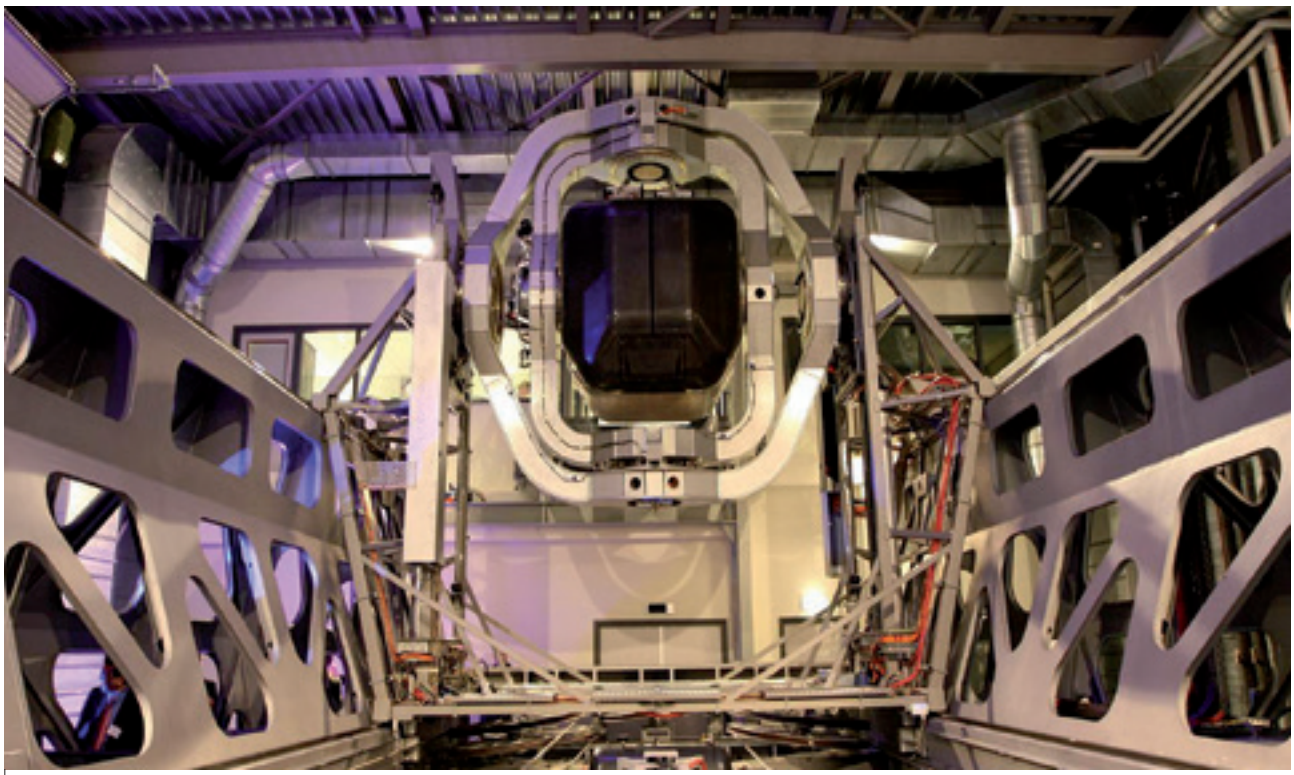
Human Factors (HF)

Besides the SRA work for long term planning purposes, the CapTech has prepared several Cat B projects in the areas of individual and team performance, such as High G on optimisation of (centrifuge and simulator High G) training for air crew, and a project on optimisation of psychological screening in recruitment. EDA studies related to Human Performance Enhancement and Human Factors for Cyber Defence.

The CapTech is also preparing R&T activities on the new capability priority of Medical Support.

Chemical, Biological, Radio-nuclear (CBR) Protection

Category B projects prepared or started in this area include T&E BIODIM, on standardisation of Test and Evaluation protocols for detection equipment for Biological threats agents, INSPIRE on exposure of military personnel to mixed hazard-



Simulator used in the High G project

ous chemicals, and a project on T&E standards for personal protective equipment

An EDA study on CBRN deals with the feasibility of stand-off detection of biological threat agents.

GEM1 Materials & Structures

Research Technology and Development on materials is essential to provide systems, subsystems and components with the required performance in the field. They are at the basis of all equipment by providing the essential characteristics for the behaviour and use of assets during their life cycle. It is therefore important that government decision-makers find appropriate platforms to communicate with industry and researchers the existing materials' limitations and identify solutions for improved capabilities.

Considering that materials and structures are transversal to all platforms, the work structure of the CapTech activity was mainly subdivided by key domains – naval, land, air and soldier systems; a core team is responsible for each thematic area.

Particular attention is given to carbon fibre and non-dependence on precursors; the global vision on the value chain shared with the EC created the required momentum for a framework approach. Carbon fibre precursors may become the pilot case to enlarge the EFC to research areas other than security.

GEM1 Materials & Structures gives particular attention to carbon fibre and non-dependence precursors.

The priority axes of research already identified encompass solutions for the protection of structures taking into account new European regulations (e.g. Regulation on chemicals and their safe use - REACH), stealth properties or structural and operational performance. Research is also foreseen in improved design concepts to cope with vulnerability problems, weight and cost reduction or the introduction of functional materials. Armour (including transparent structures) and the increased use of composites, smart and micro/nanomaterials are also part of the shared strategy. Essential in the overall approach is the viability of integration of innovative solutions to operating new systems while addressing trough-life support related aspects and costs.

Not to neglect the particular importance given to the soldier platform to improve agility, including energy, and survivability. Again, other transversal aspects cross-relating to European dependency on materials or technologies and the disposal of military equipment and/or obsolescence are object to consideration.

GEM1 has started to update its SRA, dealing more with the fundamental strategic issues raised by the Key Enabling Technologies in the Horizon 2020 programme. GEM1 has also recently started cooperating with ESA, as there are areas of common interest and the potential to share expertise.

GEM2 Energetics, Missiles & Munitions

Energetic materials that perform better and are more versatile, form the backbone in GEM2; but on the systems level equal focus is given to ammunition and missiles with a view to cover the whole maturity level including systems and technologies in a comprehensive and integrated approach.

Increased range, improved insensitivity and reduced environmental impact are recognised as key enablers. Modularity is an important feature, especially in times of budget constraints, setting tough requirements on affordable designs. Precision is another important aspect of Smart Engagement. All the above, among others, are reflected in the GEM2 SRA which is designed to reflect the need to bridge the maturity gaps. Implementation of the SRA is now the overarching goal of GEM2.

Building on the success of the existing Category B projects in GEM2, two more projects are in the pipeline to be launched on Munitions-Life Management (MLM) and Mission Abort Systems (MAS). Additionally, more project-proposals are currently under consideration such as an ICET-like proposal on Energetics Missiles and Munitions (EMM) looking at low maturity technologies and also a UMS-like programme proposal focusing on smart munitions, considering the successful outcome of EDA's study on Precision Guided Ammunition.

Knowledge, Skills and Competences is another identified priority in GEM2 SRA. A mapping exercise started in autumn 2012 and is still on-going considering parallel EDA initiatives.

Civil-military synergies are also one of the GEM2 priorities which due to the nature of the topic are limited to low systems levels, primarily addressing energetic materials and enabling technologies such as electronics and computer processing.

GEM3 Ground Systems & their Environment

SAM-UGV demonstrator in testing configuration

GEM3 activities revolved around three main areas: unmanned ground vehicles (UGVs), open architecture for land platforms, and unattended ground sensors networks.

The Category B project Semi-Autonomous Small Ground Vehicle System Demonstrator (SAM-UGV) had its final demonstration in November 2012 at the military camp of Beynes in France. This project supported by Germany and France aimed at investigating and realising a semi-autonomous vehicle, equipped with the necessary mission equipment packages. Autonomy remains a challenging topic for UGVs. It is foreseen to carry on the efforts on this topic through the follow-on project Hybrid Manned Unmanned Platform, where the accent is put on convoys of unmanned vehicles. Contacts were established with the European Commission to exchange views on automated car driving in the general road traffic in the coming years.

The CapTech organised a workshop on Open Architecture for Land Vehicles in May 2012. Development, upgrade and maintenance costs for Land Vehicles are increasing significantly due to the additional technology complexity of their missions systems, such as sensors, effectors and C4I equipment. In particular, the use of proprietary standards by platform manufacturers means that the Ministries of Defence have to fund significant integration costs covering mechanical, power, data and Human-Man Machine interfaces. EDA will promote standardisation, especially through the EDA-funded study Land Vehicle with Open System Architecture (LAVOSAR) which will run through the year 2013.

Situation awareness on large ground areas is another challenge facing EU Crisis Management Operations. The EDA-funded study UGELAS (Unmanned Ground Sensors for Large Area Surveillance) explored the best way to reach this situation awareness, by proposing an architecture for unmanned ground sensors.

The CapTech also contributed actively to the Future Land Systems study animated by EDA Industry & Market directorate, with a view to develop further its roadmap of collaborative R&T activities and its Strategic Research Agenda.

GEM4 Guidance & Control

GEM4 is seeking for improvements such as increased precision, localisation performance and automation through collaborative research and technology development in the area of guidance and control.

The CapTech first Category B project EKSPLORE, with two contributing Member States (Sweden and The Netherlands) is looking at how to exploit a-priori knowledge in sensor processing.

A second project, ADM-H, aims at improving autonomous decision making algorithms with three supporting Member States (Italy, France and The Netherlands). The project was contracted at the end of 2012 with final signatures in January 2013.

Regular workshops on "future guidance and control" supported the SRA development and prospective proposals for the project portfolio.

The topic of indoor navigation was initially approached in an EDA study on 3D positioning. The CapTech is now continuing to investigate the possibilities of a collaborative project (workshop in June 2013, consultation with CapTechs GEM3 and IAP4).

Another important EDA study for GEM4 was the "Roadmap and Implementation Plan on Precision Guided Ammunition", which provided a roadmap for future activities that may impact both GEM2 and GEM4 in interaction with The Smart Munitions Working Group.

Artistic illustration of exploited prior knowledge in the EKSPLORE project. The future path of the boat is predicted by a particle filter (illustrated by the disks on the water) taking into consideration the prior knowledge of the water lane.

3. The Joint Investment Programmes (JIP)

JIP Force Protection was launched in 2007 with a budget of €55M and the cooperation of 20 Member States.

JIP FP - Force Protection

The Joint Investment Programme (JIP) on Force Protection (FP) was ground breaking when it was launched in 2007 as the first EDA JIP. With a budget of €55M and the cooperation of 20 European governments (Austria, Belgium, Cyprus, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden) four calls for proposals were performed under the oversight by a managing committee representing the contributors.

The topics in the four calls for proposals were:

- Collective survivability – five projects contracted;
- Tactical wireless communication and individual protection technology forecasting – three projects contracted;
- Data analysis and data fusion – five projects contracted;
- Mission planning/training in an asymmetric environment and secured tactical wireless communications – five projects contracted.

The programme is currently in its harvesting phase with the projects of the first two calls mostly finished and disseminated during a joint workshop with JIP Innovative Concepts and Emerging Technologies (ICET) in 2012. Dissemination of results from the remaining two calls will take place in the margins of the EDA R&T Conference 2013.

JIP ICET - Innovative Concepts and Emerging Technologies

The JIP-ICET is EDA's second Joint Investment Programme with eleven contributing Members and a budget of € 15.6 million. The programme consists of ten R&T projects and two technology studies, last of which was completed in early 2013. The exploitation of achieved results is promoted through joint dissemination events with JIP-FP (see above).

Demonstration of SARape project

The first follow-on project from JIP-ICET, the Aircraft Fuselage Crack Monitoring System And Prognosis Through On-Board Expert Sensor Network (ASTYANAX), started in 2012, and other follow-on projects are expected. The project PATCH (Personal biological Aerosol Tester for exposure Control with High efficiency) is an example of another way of exploitation, as the results will be used in a FP7 project illustrating the benefits of civil-military cooperation. Finally, the functional demonstrator developed in the SARape project would also have interesting exploitation paths. The purpose of the SARape project (Synthetic Aperture Radar for all weather penetrating UAV application) was to demonstrate a miniaturised synthetic aperture radar on a low payload UAV, with a live image display on ground. During demonstration flights with an ultralight aircraft real-time SAR images (an example presented above) were processed up to a distance of 4.5 km between aircraft (transmitter) and ground station (receiver) – far more than specified. The images revealed many details of the observed scene with brilliant image contrast and high resolution.

Based on the positive experiences of the JIP-ICET programme, a second JIP programme ICET2 has been launched.

JIP ICET2 - The Second Joint Investment Project on Innovative Concepts and Emerging Technologies

*Four years after **ICET** had started, EDA launched a new cooperative research programme, aimed at fostering the development of new, innovative technologies that have great potential for military capability development. As Joint Investment Programme, the work is expected to lead to technological breakthroughs that will contribute to the achievement of future military capability require¬ments and will improve the competitiveness of the European defence industry.*

The technical content of the planned projects covers three areas, namely environment and human factors, materials, signal processing and simulation, and is broken down into eight R&T goals:

1. AI driven systems for data & information fusion;
2. New human & systems concepts for cooperative working;
3. Energy storage technologies;
4. Criminology – bioterrorism threat applications – forensic microbiology;
5. Energy harvesting for soldier systems & sensor networks;
6. Active controls for flow and mixture of gases;
7. Space environment;
8. Verification and validation of mixed analogue/digital distributed systems.

Following the Steering Board decision to launch the programme in June 2012, a programme arrangement detailing administrative issues has been drafted and signed by eight Member States in January 2013. The contributing Members are: Austria, Germany, France, Italy, Luxembourg, the Netherlands, Poland and Sweden. The budget for the ICET2 programme is € 5.2 million. The first call for proposals was issued in April 2013 and selection of projects will be achieved in the second semester 2013.

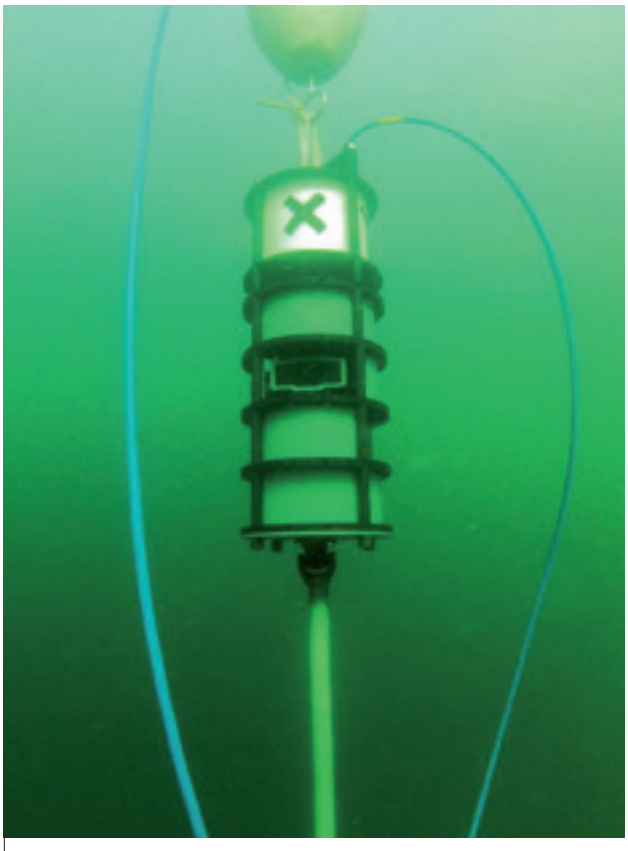
UMS Programme

The "European Unmanned Maritime Systems for Mine-Counter-Measures and other naval applications (UMS)" represents the first major and concrete success of an ambitious technology programme directly connected to Maritime Mine Counter Measures (MMCM), one of the twelve urgent actions in EDA's Capability Development Plan. Through R&T, demonstrators and de-risking studies, the UMS is expected to prepare the next generation

Swedish delegation at a sea trial organised in the framework of the UMS Programme

of technologies of the Category B Armament programme MMCM, currently in the preparation phase for delivering an initial capacity by 2018.

Ten EDA participating Member States (Belgium, Finland, France, Germany, Italy, the Netherlands, Poland, Portugal, Spain and Sweden) and Norway are contributing to the four-year € 53 million programme which aims at improving naval capabilities by improving the capabilities of Unmanned Maritime Systems through a system-of-systems approach while taking into account the notions of interoperability, modularity, interchangeability of modules and standardisation. As mentioned above, UMS projects focus mainly on MCM (influence minesweeping; drifting mines detection; and buried mines detection and neutralisation) but also address other naval applications including Harbour Protection and Anti- Submarine Warfare. In addition, the programme includes projects with transversal impact, studying issues such as: underwater communications; improved autonomy; network enabled coordination; interfaces and standards; and even safety and regulations for unmanned maritime vehicles. A systems-integration group has also been established to coordinate the programme and examine future UMS R&T topics such as UMS launch-and-recovery, torpedo defence and energy supply for unmanned underwater vehicles.



A diver detection sonar in a HAPS (Harbour and Base Protection Systems) sea trial

A considerable network of more than a hundred experts has already been established and is envisaged as the main EDA forum for addressing R&T for Unmanned Maritime Systems in the future. The first amendment to the UMS PA was signed in spring 2013 adding one new project and extending the scope of another project. Several new UMS-projects are under preparation to be included in the UMS programme in later PA amendments.

JIP CBRN within European Framework Cooperation (EFC)

Protection of CBRN threats is the first topic to be addressed within the EFC. The EDA contribution is a Joint Investment Programme (JIP-CBRN), with a centrally managed budget funded by all contributing Members. The cooperation encompasses research activities identified under the security research theme of the Union's seventh Research Framework Programme (FP7 SEC) and the EDA JIP-CBRN. The JIP-CBRN is overseen by a management committee comprising one representative from each cM. This committee is chaired by EDA and also comprises non-voting representatives from the EC.

The PA JIP CBRN was signed on 22 March 2012 in the margins of EDA's Steering Board and the first call for proposals was launched in May 2012. The selection decision on the proposals has been done in September 2012 by the management committee: seven projects have been awarded (three projects on B detection, two on C detection, one on Mixed CBRN sample handling and one project on Modelling and Simulation of CBRN protection architectures).

In 2012 the management committee started the preparation of the second call for proposals. In 2013 this preparation was finalised and the call was launched in spring 2013.

JIP RPAS within EFC

The Joint Investment Programme on Remotely Piloted Aircraft Systems (JIP-RPAS) addresses the challenges of RPAS traffic insertion in the general airspace. EDA works in close coordination with ESA and the EC to achieve initial safe integration of RPAS in the European air space by 2016. Launched in June 2012, JIP-RPAS aims at addressing the interlinked challenges of technology and regulation needed to ensure this integration, focusing on the enhancement of military capabilities. The work is strongly coordinated

with the integrated roadmaps of the EC, namely the Regulatory Roadmap led by EASA, the R&D roadmap led by the SESAR-JU and the legal and societal roadmap led by the EC.

The following key technical challenges were adopted in the JIP-RPAS:

- Air Traffic Management interfaces;
- Safe recovery systems, decision making and autonomous behaviour;
- Taxi, automatic take-off and landing;
- Sense and avoid;
- Weather detection and protection;
- Safe automated monitoring and decision architecture;
- Line of Sight / Beyond Line of Sight infrastructures (+ space capabilities) – here the EDA-ESA cooperation marked a milestone in contracting two complementary studies for demonstration of a satellite-based data link architecture for UAS;
- Dependable emergency recovery;
- Ground station – Human Machine Interface;
- Health monitoring/optimised designs for maintenance.

So far, eleven Member States showed interest in the programme. A management committee has been set up with the participation of Austria, Belgium, Czech Republic, Germany, Spain, France, Italy, Luxemburg, Poland, Sweden, the United Kingdom, and EC and ESA. Meetings take place once a month, starting as of September 2012. This management committee drafted the rules of reference of the JIP. A list of high-level technical topics has been prioritised according to cM interests, and will support the elaboration and selection of demonstration projects. The signature of the respective Programme Arrangement is planned for the EDA Steering Board in November 2013, and the first contracts should be signed early 2014. Final scope and perimeter of the programme will depend on the financial contributions that cM will commit for the JIP.

Improvised Explosive Devices will not go away. The only way to defeat them is by defeating the networks that employ them.

4. Contributing to European Capability Development

Improvised Explosive Devices will not go away. The only way to defeat them is by defeating the networks that employ them.

Fight Against IEDs

Recent operations have shown that Improvised Explosive Devices (IEDs) have become the weapon of choice for the adversary. This has driven the creation of a Countering IEDs (C-IEDs) approach. In the future it will remain important to retain a general war fighting capability as a deterrent; however it is more likely that the actual operations conducted will be about countering adversary networks hidden in civilian populations. As such, many of the traditional skills sets of policing are increasingly being used in a defence environment, using evidence and a judicial type of approach to drive operational activity.

Since its foundation in 2008 the EDA Project Team on C-IED has developed a strategy "Guidelines for Developing a National C-IED Capability" based on which collaborative efforts have methodically launched. Key achievements include:

- A novel train-the trainer approach enabling Member States to nationally develop key skills sets resulting in programmes on Search, Ground Sign Awareness, Combat Tracking and Manual Neutralisation Techniques;
- The definition, acquisition, design and deployment of in-theatre forensic exploitation capability manned by a multinational team in record time. Operational since autumn of 2012 this shows the effectiveness of forensics as an integral part to the ISAF operation;
- The development of a novel "black box" architecture for recording data from incidents;
- A wide range of efforts and projects addressing new protective systems for vehicles and personnel stemming from the JIP Force Protection and CapTechs GEM1 and GEM3;
- A scenario-driven systems engineering approach to establish appropriate requirements and optimise the use of detection techniques and technologies, ultimately to strategically steer investments;
- A number of different sensor and data fusion projects in the JIPs as well as the CapTechs IAP1, IAP2 and IAP3 to support the capability of threat detection;
- A better understanding of which of the IEDs features are detectable and how this information can be exploited appropriately.

The Resilient Threat Management 2013 conference, organised in partnership with the Irish Presidency of the Council of the European Union, took stock of the past and present while pointing out the direction for the future. IEDs will not go away and the only way to defeat them is by defeating the networks that employ them. EDA and its Member States are developing a comprehensive strategy that will focus even more on countering adversary networks, drawing on the strengths of civil and military expertise and resources.

Combat Equipment for Dismounted Soldier

The majority of EDA participating Member States have their own national soldier system programmes. The increasing complexity of the equipment worn today by infantry soldiers has turned them into independent platforms. The scope and advancement of those programmes differ: some are currently being fielded in significant numbers, while others are still in the development phase. However, those programmes mostly follow similar technical objectives, such as weight reduction and increase in available power: this results in partial duplication in research, development and evaluation efforts. Besides, most of those systems are not interoperable, leading to operational constraints in current multinational operations.

The EDA programme Combat Equipment for Dismounted Soldier (**CEDS**) proposes a harmonised soldier programme in the medium term, by promoting the convergence of national development roadmaps. It gathers the efforts of eight contributing Member States: Austria, France, Germany, Finland, Portugal, Romania, Spain and Sweden. Its primary objective is to increase the combat effectiveness of the dismounted soldier in any combat environment.

The CEDS programme is based on a common core which supports identified functionalities (such as situational awareness, combat identification…) contributing to the functionality of national dismounted soldier systems. Besides, some parts of the system such as batteries and chargers have been identified as "common" by contributing Members.

Building on the Common Staff Target developed by the Letter of Intent nations, capability experts have defined a set of Common Staff Requirements (CSRs) for dismounted soldiers. These requirements cover in detail the following areas: C4I (Command & Control, Communications, Computers and Intelligence), Effective Engagement, Deployment and Mobility, Protection and Survivability, Sustainability and Logistics, Training. Technology experts from contributing Members are currently reviewing the way to translate these ambitious requirements into technological solutions, including R&T activities. This review takes in particular the form of the CEDS Feasibility Study Programme (**CEDS-FSP**).

The CEDS-FSP essentially consists of eleven feasibility studies addressing various soldier related topics. It includes both national contributions as well as studies to be awarded, following a call for proposals to interested industry and research entities. It draws its originality from two aspects:

- this is the first call for proposals for an ad hoc programme made fully available on the EDA website. This provides R&T service suppliers with more opportunity to take part in the programme;
- the feasibility studies derive from a robust, thorough capability analysis: the collaboration between procurement engineers and capability officers has been exemplary throughout the programme.

Military Green – Delivering Resilient Capabilities for a Sustainable Future

Recent experiences in theatre have shown that energy supply is an Achilles' heel of operations. As such it must be viewed as a capability in its own right, which is reflected in that fuel and energy is among the top ten priorities of the EDA Capability Development Plan (CDP).

Increasing energy efficiency and reducing consumption comes with a number of benefits. Lives are saved as a result of there being fewer fuel convoys to target. Effectiveness of operations is increased in terms of autonomy, endurance and mobility.

Costs are cut not only during operations but also in preparing for them at home (Ministries of Defence are typically the biggest government energy consumers).

Addressing the environmental impact of waste and water management as well as from the use of munitions and materials reduces the footprint further. This provides a good start to the post-conflict reconstruction phase and contributes to sustainable development.

EDA's Military Green umbrella looks at strategically reducing the footprint in such a way that capabilities are enhanced, drawing on civil-military synergies, while making a collective contribution to the EU 2020 goals. Military Green also offers the possibility of addressing the bigger picture in terms of tackling international security risks associated with global changes in climate and biodiversity.

The tools at our disposal to make a difference are establishing sound policies and strategies, developing energy efficient and environmentally responsible systems and to create new business models that stimulate the choice of green solutions.

Key achievements to date include:

- Launching the development of a holistic Military Green strategy for the defence and crisis management community with the aim of enhancing capabilities, minimising the footprint and better understanding of the implications of changes to climate and ecology;
- Statistical view of energy consumption from past and present operations along with design optimisation of land installation – stemming from the Fuel Dependencies study;
- Development of best practices for design guidelines for both land installations and marine platforms, aiming to increase energy efficiency and benefit from the strengths of novel technologies;
- The Go Green project, a novel business model developed by EDA, which sees wide scale implementation of solar energy on military facilities in seven countries;
- Research projects looking at improving the through-life environmental impact of munitions, from manufacturing through utilisation onto disposal;
- Projects looking at novel green structural and protective materials.

Figure 1 – **State of the Art in Through the Wall Radar**

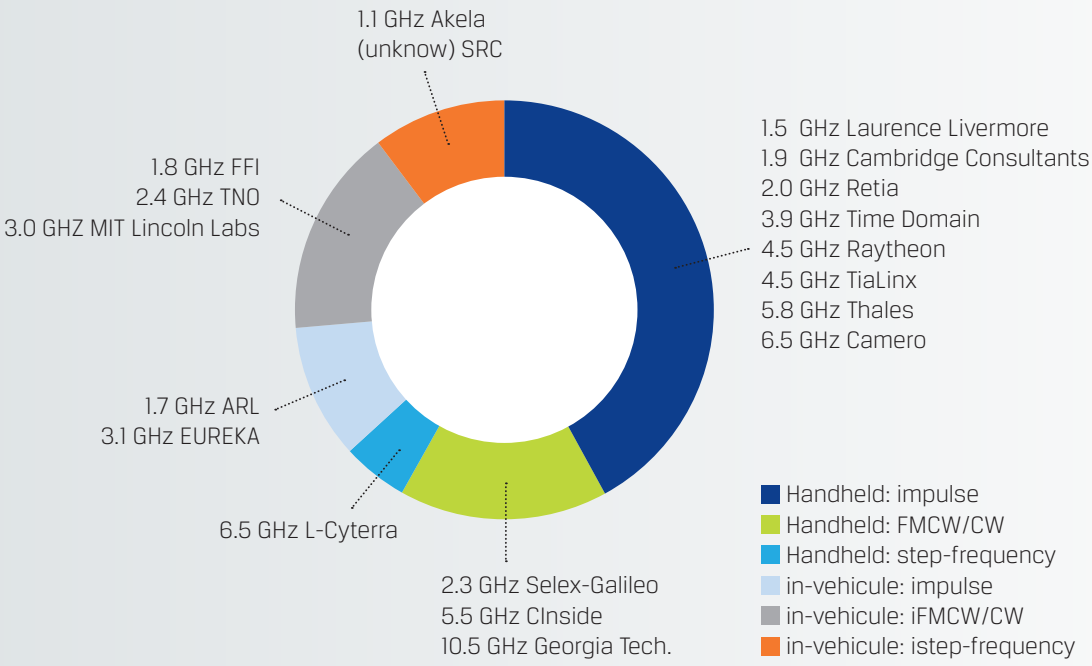


Figure 2 – **Choice of frequency for TTW radar systems**

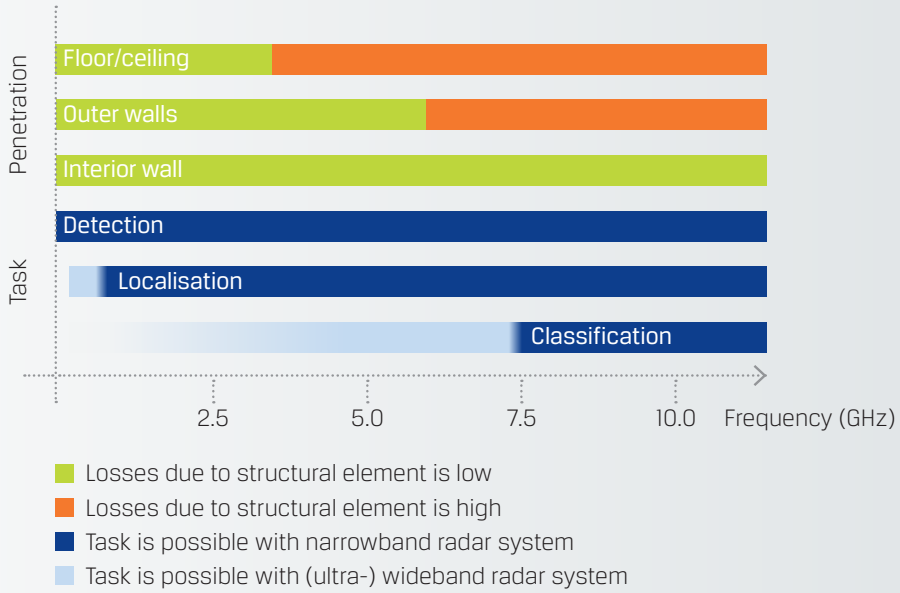
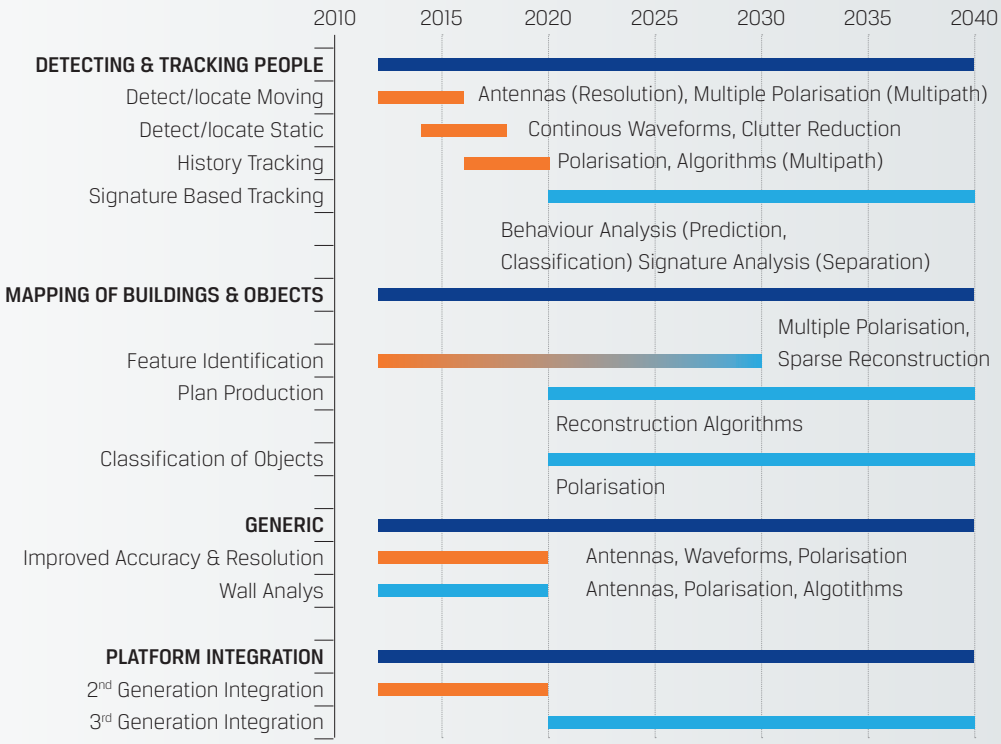


Figure 3 – **Capability and Technology Roadmap**



"Radar Technology for Inside Building Awareness" (RIBA)

The EDA study "Radar Technology for Inside Building Awareness" (RIBA) was awarded to BAE Systems and TNO in 2012. It was concerned with the evaluation of the application of see through the wall radar technology to particular scenarios of relevance to European defence and addressed questions such as how far a radar penetrated buildings, how accurately it mapped the locations of walls and doorways and how reliably and accurately it located personnel within buildings.

A survey of current systems and technologies established the state of the art that can be seen in Fig. 1.

The scenario evaluation identified as desirable capabilities:

1. Form a map or plan of the layout to determine all possible routes to take through the building;
2. Determine the locations of critical objects determining its nature, identifying present persons distinguished between captors and hostages and movement patterns of people within the building.

The technical review contains a detailed exposition of system trade-offs and gives performance evaluations for the full range of scenarios previously considered. It shows that Through the Wall (TTW) radar systems can generally obtain useful penetration through most wall types but only limited penetration through floors and ceilings made of thick concrete. For the classification of objects such as small-arms, high bandwidth is needed which is only readily available at higher frequencies - due mainly to bandwidth limitations of current antenna and front-end technology. These considerations are summarised in Fig. 2.

A concept for a future stand-off TTW radar system was presented considering the deployment and practical usage of such a system. A variety of platforms is considered and a key characteristic is a division into the sensor head and a control and monitoring station with a wideband communication link between the two. Also, a system may operate in a variety of modes addressing each of the desirable capabilities listed above. Mapping modes require a great deal more computational power than location modes and this computational requirement has a major impact on the power, weight and size requirements of the system.

A demonstration of the feasibility of the various operating modes identified was investigated using the TNO SAPPHIRE radar. It is found that many aspects of mapping the layout of a building are feasible though effective penetration achieved by the radar may be limited. Although techniques show promise, there is still appreciable development required to attain a degree of technological maturity which is operationally useful. Detection of objects such as weapons was also investigated with an initial evaluation of the polarisation signature.

Detection and tracking of personnel was also investigated and it was not found possible to detect stationary personnel using background subtraction. Detection of moving personnel using Moving Target Indication (MTI) techniques was also investigated showing the generation of potentially useful tracks for multiple personnel throughout the length of a building. Differences are observed for observation through a thin wall and through a thick wall, with the tracks being much less reliable in the latter case. Appreciable ghosts, thought to be due to multipath, are also observed in both cases. Nonetheless, this mode of operation looks very promising. Additionally, the feasibility of using transponders on 'blue forces' for tracking friendly personnel has been investigated.

The study concluded with a roadmap for future technology showing capability gaps and indicating technologies which may be developed to fill those gaps considering only aspects related to future stand-off systems. Thus, for the capability of detect/locate moving (people), development of antenna technology is identified to improve the angular resolution of current systems, and development of technology related to the use of multiple polarisation is identified to address the problem of ghost targets arising through multipath. Generic improvements and the need for platform integration are also indicated.

Regarding the current hand-held systems as the first generation, the second generation, predicted to be feasible around 2020, consists of stand-off systems capable of detecting and locating both static and moving people, presenting simple track histories and identifying some features in a building, e.g. some, but not all, walls. A third generation would consist of stand-off systems capable of unambiguously tracking individuals based on discrimination of distinct signatures, movement prediction based on behavioural analysis, and automatic production of complete plans of building layout.

5. Working With Partners

European Commission and European Space Agency

As described in previous chapters, EDA actively seeks to work with institutional partners, such as the European Commission (EC) and the European Space Agency (ESA). The signing of the Letter for European Framework Cooperation related to CBRN protection in 2011, was an important step.

EDA also maintains structured cooperation with ESA and the EC on critical space technologies. A technology mapping is conducted in order to produce an 'urgent action'- list on "Critical Space Technologies for Strategic Non-Dependence". It serves as a tool to identify synergies between the organisations and is in line with EDA's strategic work strand on European Technology non-Dependence (ETnD) – see below.

EDA actively seeks to work with institutional partners, such as the European Commission (EC) and the European Space Agency (ESA).

Another area where EDA and the EC are joining efforts is the development of research and innovation strategies for smart specialisation, and the possibility of funding from the European Structural Funds (ESF). Research for technologies that can be exploited by the military and for civilian purposes, and that can be made available to SMEs for developing innovative solutions, also outside defence, can receive funding from ESF.

More detailed work is planned for the future. EDA is drafting its position on the critical defence technologies and intends to coordinate its investment efforts with those of the key enabling technologies on the EC's side. Also on Standardisation and RPAS, EDA continues to seek cooperation.

European Technology non-Dependence

Europe's ability to act autonomously depends on an appropriate degree of technical and industrial non-dependence. In this context the EDA study "European Defence Technological & Industrial Dependencies (EDTID)", contracted in 2011, had mapped and analysed dependencies, developed a methodology for dependence management and identified a set of priority actions. Case studies on aerial platforms (RPAS and helicopters) were used to illustrate dependence in practice and the experience of other government and industrial areas was examined for best practice.

The overall assessment was that at the defence system integration level, Europe is currently relatively healthy and globally competitive. However, the increasing disparity between European investment on defence R&D compared with US investment, is likely to threaten this position. The military aeronautics sector is particularly at risk, with a potential capability gap for next generation combat aircraft and also for RPAS. Other European deficiencies were identified in areas such as cyber security, RPAS, complex weapons, R&T intensive sub-system and components (e.g. for high performance sensors), navigation and positioning technology, crypto, data fusion and signal processing as well as validated data sets and operational models needed for planning and safe conduct of military operations. In addition to defence specific dependences there is an increasing European dependence on enabling technologies and raw materials, and among them the rare earth, which requires diligent management.

In conclusion, there is a strong case for a more coherent European approach to managing dependences of the EDTIB. Priorities among Member States are, however, not fully aligned. Therefore a dynamic approach is needed so actions serve as catalysts towards a stronger collaboration. The study has developed a methodology for dependence management and a portfolio of proposed priority actions. However a shared common European perception and policy response on identifying and managing technical and industrial dependencies requires high level political buy-in.

European Industry

EDA is maintaining a structured dialogue with the European Industry, through National Defence Industry Associations (NDIAs) and the AeroSpace and Defence Industries Association of Europe (ASD), to exchange information on current activities and views on specific developments.

In 2012, this focused on the issue of European technology non-dependencies, industry´s role in NATO and the preparation of the EC's next Research Framework Programme HORIZON 2020.

Finally, ASD representatives provides regular updates to both EDA and national R&T points of contact on their view of CapTech performance, which is rated still very positive despite the difficult financial climate.

6. Statistics

Category B projects

Cat B Projects with TA/PA signed in 2012

In 2012, participating Member States signed 12 TAs and PAs for R&T projects for a total value of approximately € 52.2 million (including VAT and industrial co-funding), leading to the placement of 4 contracts by the EDA in the same year (MAGNUS, ASTYANAX, MISSION and SPERI) and one – so far – in 2013 (ADM-H). Three projects are implemented through national contracts (RSEM, MODITIC and T&E BioDim). Table 1 lists the projects along with their cM, significant dates and figures.

Cat B Projects completed in 2012

In 2012, 9 R&T Category B projects were completed: they are listed in Table 2. For each completed project, an executive summary is published on the EDA website (www.eda.europa.eu/projects).

Cat B Cat B Candidate Projects for 2013

The portfolio for 2013 is constituted by 26 Category B candidate projects, involving 16 EDA pMS and Norway: Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Italy, the Netherlands, Norway, Poland, Portugal, Slovakia, Spain, Sweden, and the United Kingdom. The total value of the portfolio is above 108 M€.

The complete list of candidate projects updated on 12/3/2013 is reported in Table 3.

Portfolio of Cat B R&T projects

Table 4 compares figures for the value of R&T Category B projects completed and those whose contracts were placed by EDA in 2012, and the value of the portfolio for the candidate projects. Please note that the figures differ from the table related to PAs and TAs, because not all EDA projects are implemented through EDA contracts, and because contracts are usually signed a few months after the signature of the PA/TA.

EDA studies

These studies support the activity of the CapTechs, and are prepared within the CapTech in strong coordination with the other EDA Directorates. They are ideally suited for technology watch, preparation of R&T projects (pump prime), general architecture studies, and surveys of the 'state of the art'.

During 2012, thirteen studies were contracted (see Table 4) and nine studies were completed under the lead of the R&T Directorate. One completed study is presented as an example in the section "Radar Technology for Inside Building Awareness" (RIBA).

Table 1 – **Flux of EDA R&T Category B contracts in 2012**

Cap Tech	Reference	Title	Lead	Contributing members	Approx. Value
GEM2	B 0993 GEM2 GC [RSEM]	The Reduced Sensitivity Energetic Materials for the Higher Performance of the Inertial Confinement	PT	PT - DE, IT	3
IAP1	B 0975 IAP1 ERG [MAGNUS]	GaN with UMS GH25 process	FR	FR - NL, SE, UK, DE	12,5
ESM4	B 1097 ESM4 GC [MODITIC]	Modelling the Dispersion of Toxic Industrial Chemicals in Urban Environments	NO	NO - SE, FR	2,5
IAP3	B 1103 IAP3 GP [MISSION]	Mid Infrared Semiconductor Laser Modules for Defence Applications	DE	DE, IT, FR	5,5
IAP4	B 0882 IAP4 GC [MIDNET]	Military Disruption Tolerant Networks	DE	DE - FI, FR, NL, PL, PT, SE	7,2
GEM3	B 1278 GEM3 GP [HyMUP]	Hybrid manned / unmanned platooning	FR	FR- DE	1,5
IAP2	B 1139 IAP2 GP [SPERI]	Signal Processing for Enhanced Radar Image (follow on of ERIT OB-study)	IT	IT - DE	4
ESM2	B 1288 ESM2 GP [ASTYANAX]	Aircraft fuSelage crack moniToring sYstem And progNosis through on-boArd eXpert sensor network	IT	IT - PL, ES	3,8
ESM2	B 1190 ESM2 GP [ISSA]	Integrated Simulation of Non Linear Aero-Structural Phenomena arising on Combat Aircraft in Transonic Flight	IT	IT - SE	3,6
ESM4	B 0965 ESM4 GP [T&E BioDIM]	Test & Evaluation of Bio Collection, Identification and Detection Equipment	NO	NO - AT, ES, SE, FR, IT, NL, DE	0,8
GEM4	B 0818 GEM4 GP [ADM-H]	Autonomous decison-making based coordinations techniques for Autonomous Vehicles	IT	IT - FR, NL	5
GEM1	B 1143 GEM1 GP [CEDS R&T Feasibility Studies]	The launch of a set of Research & Technology (R&T) Feasibility Studies on the Combat Equipment for Dismounted Soldier (CEDS) Programme	ES	ES - AT, FI, FR, DE, IT, PT, RO, SE	2,8
				Total value	**52,2**

Table 2 – **R&T projects completed in 2012**

Acronym	Project name	End date (MC acceptance of final deliverables or administrative closure)	Project value M€
B-0448-IAP4-GC	HDR-HF	3/04/2012	2,58
B-0909-ARM-GC	FICAPS	8/11/2012	6,72
B-0038-IAP1-ERG	CODFISH	25/04/2012	1,15
B-0901-ESM3-GC	CAPRICORN	17/12/2012	1,25
B-0049-GEM1-ERG	EFP	13/11/2012	5,08
B-0964-ESM4-GC	FODAI	31/08/2012	0,28
B-0035-IAP1-ERG	POLYNOE	30/04/2012	1,83
B-0055-IAP2-ERG	SPREWS	5/03/2012	4,01
B-0390-IAP1-ERG	SWAP	27/02/2012	2,42
		Total	**47,81**

Table 3 – **R&T candidate projects for 2013**

Cap Tech	Reference	Title	Lead	Contributing Members	Approx. Value
UNDER NEGOTIATION					
IAP1	Amendment n°1 - B 1336 IAP1 GP [PERU]	Packaging 3D for Heterogeneous Rugged Electronics	FR	FR - NO, IT	6,2
IAP2	B1375 IAP2 ERG [SIRONA]	Studies of Integrated Rf and Optronics for Next generation Architectures	UK	UK - FR	16
IAP2	B 0987 IAP2 ERG [RFBIO]	Biological Effects of Radiofrequency Electromagnetic Fields	SE	SE - UK, DE, FR	6,8
GEM1	B 1091 GEM1 GP [CERAMBALL]	Light weight ceramics for ballistic protection	AT	AT - DE, FR, IT, SE, NL, NO, CZ	2,5
ESM4	B 1362 ESM4 GP [HIGH G]	Future High G Training in Military Aviators	AT	AT - FR, DE, NL, PL, SE	4
GEM1	B 1192 GEM1 ERG [ALOMAS]	Advanced Low Observable Materials and Structures	DE	DE - FR, NL, SE	4,5
				Sub-total	**40**
UNDER STAFFING					
ESM2	B 1387 ESM2 ETAP [GSS Phase 3]	ETAP Global System Study Phase 3	IT	IT - FR, SE, DE, ES	11
IAP2	B 1382 IAP2 ERG [ACACIA]	Advanced classification techniques for object recognition with radar	NL	NL - SE	3,8

Cap Tech	Reference	Title	Lead	Contributing Members	Approx. Value
GEM2	B 1251 GEM2 GP [MAS]	Mission Abort System	DE	DE - IT	4,6
IAP4	B 0980 IAP4 GP [TACTICS]	Tactical Service Oriented Infrastructure	DE	DE - FI, FR, IT, PL, NO	12
				Sub-total	**31,4**
UNDER LANGUAGE REVISION					
IAP1	B 1338 IAP1 GP [HIPPOMOS]	High Performances comPact Optoelectronic Microwave OScillators	FR	FR - IT	3
ESM4	B 0885 ESM4 GC [SOCUMOD Ph2]	Social & cultural modelling of FHQS & the operational environment (phase 2)	SE	SE - FR	3
				Sub-total	**6**
PROGRAMME ARRANGEMENT UNDER SIGNATURE					
GEM1	B 1324 GEM1 GP [PATCHBOND]	Bolt free battle and operational damage repairs of metal and composite aircraft structures	NL	NL - DE, ES, FI, NO	8
ESM4	B 1151 ESM4 GP [IDCRR]	Impact of Demographic Changes on Recruitment and Retention	BE	BE - FR, NO, SE	0,4
				Sub-total	**8,4**
SIGNED					
IAP3	B 0967 IAP3 ERG [ALWS]	Air Platform Effects on Laser Systems and Electro-optical Warning Sensors	UK	UK - SE, DE, IT, FR	1,5
ESM4	B 1325 ESM4 GP [EBLN]	European Biodefence Laboratory Network	IT	IT - BE, NO, NL, PL, AT, FI, SE, FR, DE	6,1
IAP1	B 1337 IAP1 GP [TIPPSI]	THz Imaging Phenomenology Platforms for Stand-off IED detection	DE	DE - SE, NL, PL	2,2
IAP3	B 0777 IAP3 GC [ECOMOS]	European Computer Model for Optronic System Performance Prediction	DE	DE - FR, IT, NL, SE	1,6
IAP4	B 0983 IAP4 GP [IN4STARS 2.0]	Information Interoperability & Intelligence Interoperability by Statistics, Agents, Reasoning and Semantics	NL	NL - EE, SE	3
GEM1	B 1114 GEM1 [CCNS]	Corrosion Control on Navy Ships	FR	FR - UK, DE, IT	6,5
IAP1	B 1336 IAP1 GP [PERU]	Packaging 3D for Heterogeneous Rugged Electronics	FR	FR - NO	6,2
				Sub-total	**27,1**
				Total value	**112,9**

Table 4 – **Flux of EDA R&T Category B**

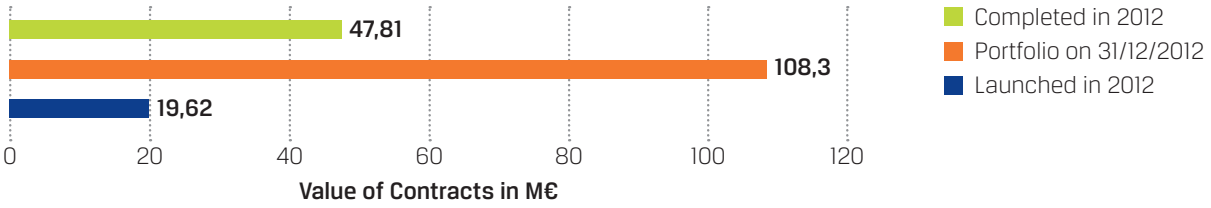


Table 5 – **OB Studies contracted in 2012**

OB Studies contracted in 2012				
Acronym	**CapTech**	**Title**	**k€**	**Contractor**
PCB-R	IAP1	Printed Circuit Board Roadmap for Defence Applications	346	MBDA - FRANCE
SWIR GV	IAP3	Short wave infrared gated viewing	144	RHEINMETTAL DEFENCE ELECTRONICS GMBH
ESF	-	European Structurals Funds for PMS	129	ERNST & YOUNG
RICS	IAP2	Radar Implementation of Compressive Sensing	350	SELEX SISTEMI INTEGRATI
UMS-ST	ESM1	UMS Standardisation Technologies	340	EURL GEOS BUSINESS INTELLIGENCE
CYDEF	ESM4	CYber-DEfence human Factors	133	FRAUNHOFER-GESELLSCHAFT
CILTE	ESM3	Framework Contract - Collaborative & Innovative Laboratory Tool Experiment (contract 01)	8	RGA SYSTEMS
CDRA	IAP4	Cyber Defence Research Agenda	250	EVERIS SPAIN S.L.U.
CMC	ESM2	Study on civ-mil certification	92	FRAZER-NASH CONSULTANCY
SOBID	ESM4	Stand Off Bio Detection	97	FRAUNHOFER-GESELLSCHAFT
HuPE	ESM4	Human performance enhancement study	190	TNO
EOMOD	IAP3	Study on the Electro-optical Background, Signature and SEnsor Modelling	150	TNO
LAVOSAR	GEM3	Land Vehicles for open systems architecture	345	RHEINMETTAL DEFENCE ELECTRONICS GMBH
-	-	Defence Research and Procurement Investments in Europe and their Effect on the Economy	2	
			Total	**2 576**

7. Figures for 2012

EDA-FUNDED R&T STUDIES

€ 2.58 million committed for 14 new studies.

CATEGORY A R&T PROGRAMMES

€ 19.3 million committed for one JIP-UMS contract (project value excl. VAT) and the two programmes JIP-CBRN and JIP-ICET2

CATEGORY B R&T PROJECTS AND PROGRAMMES

€ 52.2 million committed for twelve new Project or Technical Arrangements (incl. VAT and co-funding).

TOTAL OF NEW CONTRACTS FOR EDA-FUNDED STUDIES, CATEGORY B PROJECTS AND BUDGET COMMITMENTS FOR CATEGORY A PROGRAMMES

€ 74.1 million committed for new contracts and programmes (14 EDA funded studies, twelve new Category B projects, one JIP-UMS contract and two category A programmes).

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