



## **Defence platform design and support**

Services and solutions

# Independent expertise, innovative solutions

BMT is a leading engineering, science and technology consultancy, employing approximately 1,300 professionals in 60 offices across Europe, Asia, the Americas and Australia. With a defence heritage that stretches all the way from the water tanks where the 'bouncing bomb' was developed during WWII to the ground breaking design for the new Queen Elizabeth aircraft carrier, BMT delivers complex engineering and design capabilities for European, North American, Australian and Asian customers. As we are not directly engaged in manufacturing or construction, we are able

to provide an impartial view, supported by our status as an Employee Benefit Trust (EBT), free from the influence of external stakeholders.

Our technical expertise, combined with our history of close association with major defence organisations in Europe, the US, Canada and Australia, means we bring a deep understanding of the challenges our customers face, and can provide a wide range of solutions.

As you will see in the following pages, BMT delivers defence design and engineering services

for Sea, Land, ISTAR and Air. More importantly, we also understand that getting a platform into service is not the only challenge for our customers and that keeping it safe for use, capable and operationally available over many years is also vital. It is here that our substantial experience extends to delivering effective, innovative and technically advanced solutions for supporting and adapting our customers' military platforms throughout their lifetime to maximise their operational capability.

☞☞ BMT delivers defence design and engineering services for Sea, Land, ISTAR and Air. ☞☞

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# Surface ship design and support

Our designers and engineers have the flexibility and capability to undertake the complete design and assurance of new naval platforms, as well as introduce, execute and manage design changes to existing in-service naval vessels.

We are the leading independent centre of excellence for naval design and through-life support in Europe and North America, and one of the few external organisations to be named by the UK Ministry of Defence as a Delegated Naval Authority. We also undertake major surface ship defence projects in Australia and South East Asia.

BMT is at the cutting edge of technology and science, and we pride ourselves on executing our customers' requirements both within budget and on time. We are recognised for our depth of experience, broad technical expertise, long-term partnership management, impartial advice and reliability.

We also advise acquisition agencies on balancing the capabilities of the ships they procure against their build, through-life operating and disposal costs. Our systems engineers and naval designers can make significant contributions from the very first concept studies, through the detailed design phase to ship construction and on-going in-service support.

## Auxiliaries

Our naval architects, engineers and consultants have extensive experience with auxiliary ships mainly from supporting the platforms operated by the Royal Fleet Auxiliary. This has now extended to the design of complete auxiliary platform solutions based on our Aegir family of designs.

BMT's original concept design, Aegir®, is the blueprint for a family of naval support vessels that can replenish ships at sea and, due to their advanced double-hulled design, are compliant with the latest IMO environmental regulations. The design has been adopted by the UK and Norwegian navies for their latest support vessels and is under serious consideration by several other naval forces around the world.



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## RFA ARGUS Conversion

BMT designed the conversion of RFA ARGUS into a Primary Casualty Receiving Facility with approximately 100 hospital beds and associated medical facilities. Safety was the main priority as well as maintaining her Naval Authority and Statute Certificate by improving fire safety, escape and evacuation, damage stability and environmental friendliness in line with current legislation and standards.

## MARS

BMT is working alongside Daewoo Shipbuilding and Marine Engineering (DSME) to deliver the Royal Navy's MARS (Military Afloat Reach and Sustainability) tanker, which will provide fuel, food and fresh water to naval vessels at sea. BMT is providing the design, safety assessment, and through-life support assessment of the new tanker.

## Norwegian LSV

BMT is the design contractor for the Norwegian Defence Logistics Organisation's logistics and support vessel (LSV). We are also conducting safety assessments and through-life support assessments for the vessel. The LSV is designed to serve multiple roles, will be built by DSME.



## T-AO (X)

BMT is supporting General Dynamics NASSCO's contract with the US Navy to conduct a range of studies to better inform the navy's T-AO (X) design. This will replace the legacy T-AO 187 class, providing fuel and cargo delivery to support a full range of fleet operations.

© US Navy



## Joint Support Ship (JSS)

BMT has supported the Canadian JSS project office for several years with concept studies, preliminary designs, safety assessments, through-life support assessments and a contract design concept to allow a value for money comparison with the selected design. All these elements have made a strong contribution to this crucial programme for replacing the Royal Canadian Navy's ageing Auxiliary Oiler Replenishment ships.

# Specialist naval platforms

As the world’s largest independent naval design consultancy, BMT offers a comprehensive portfolio of design services for advanced and specialised vessels to meet exacting specifications. We are known for innovation but do not regard it as an end in itself. Rather, we combine it with our long experience of working for defence organisations and apply our expertise to deliver practical, effective solutions.

### Canadian Surface Combatant (CSC) project

BMT is supporting the Royal Canadian Navy’s CSC project as its dedicated design, engineering and programme management contractor with a large number of tasks including concept design, requirements specifications and cost modelling, which aims to replace the navy’s current surface combatant fleet of Iroquois class destroyers and Halifax Class frigates.

### Canberra Class Landing Helicopter Dock (LHD)

BMT is working with the Royal Australian Navy’s Amphibious Deployment and Sustainment (ADAS) project office to support the development of safety requirements and management for the two 27,000-tonne Canberra class amphibious ships known as Landing Helicopter Docks (LHDs).

### US Coast Guard

BMT is supporting a human factors assessment on the US Coast Guard’s new offshore patrol vessel to ensure that the design meets the requirements of the users.

### Longbow

BMT redesigned and converted the 12,000-tonne heavy lift barge, Longbow, to enable it to undertake pre-qualification sea trials for the Principle Anti-Air Missile System Sampson (PAAMS(S)).



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#### 1: Onuk

BMT undertook the full detailed design and construction drawing of this as well as extensive hull optimisation to allow it to achieve a speed of 45 knots with excellent sea-keeping characteristics and extended range.

#### 2: Queen Elizabeth class aircraft carrier

BMT’s involvement in this high profile project dates back to the selection of our innovative twin-island platform ship design. Advantages of the twin-island configuration include increased flight deck area, reduced air turbulence over the flight deck and increased flexibility of space allocation in the lower decks. We have also provided safety assessments and through-life support assessments for the carrier.

#### 3: USNRV Sea Fighter FSF1

BMT carried out extensive design development of this 80 metres long high-speed aluminium catamaran for the US Navy to demonstrate the superior sea-keeping design of the hull.

### Caimen

As amphibious platforms become increasingly vulnerable to coastal craft and shore batteries, the operating range of landing craft launch has increased to beyond the horizon, making speed important for maintaining tempo and reducing the threat of interdiction. BMT’s family of Caimen® designs provide a step capability change thanks to an innovative tribow hull design and water jet propulsion system enabling operation at high speeds.

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### Concept design

Our proven design expertise, supported by our commitment to R&D and deep understanding of customer needs, mean that we are leaders in concept designs that focus on innovation and the application of new technologies.

### COHORT

BMT’s concept design COHORT aims to help governments establish effective and enforceable Exclusive Economic Zones. It provides a versatile and cost-effective platform for multiple roles including fishery management, safety of navigation and transit, and protection of the environment.

### Propulsion systems

BMT is supporting the US Navy’s Electric Ships Office in the development of hybrid propulsion systems. Our work includes a retro back fit programme designed to improve the efficiency of existing DDG51 ships.

BMT is and has provided specialised support as the propulsion systems integrator in support of the Integrated Platform Management for the new Landing Ship Tank (LST) vessels for the Republic of Korea Navy (ROKN).

### Specialist design, In-service, life extension and disposal support

Our technical, design and engineering skills mean that we are called upon by major government agencies to support all aspects of platform design, upgrade and life extension.

Getting a platform into service is not the only major task: the real challenge and expense can come in keeping it in effective service throughout its working life. At BMT, our naval architects have

substantial experience in adapting platforms, either updating and maintaining them for the current roles or evolving them to suit different roles. We understand and manage the environmental and engineering challenges of the decommissioning and disposal process.

Ensuring a platform is safe and meets naval standards through the life of a vessel is critical and requires an enduring engineering expertise and design capability within project teams and class desks. BMT’s depth and experience in design support, engineering and technical

expertise offers clients a centre of excellence that can augment government departments’ need to support Naval Material Assurance (NMA), and Ship Design and Acquisition Support (SDAS) of its fleets.

### Life extension studies

BMT conducted life extension and disposal studies for the Royal Australian Navy. Our survey identified the minimum requirements for keeping the existing fleet operational until replacement vessels are procured and put into service.

# Submarine design and support

Our highly qualified and multi-disciplined submarine designers and engineers support the complete life-cycle of conventional and nuclear submarines from concept designs to their safe disposal.

BMT is recognised worldwide as an independent submarine specialist. The impartiality of our knowledge, developed over more than 20 years, is valued by our clients who trust us to help them procure innovative and cost-effective submarines that will operate safely at sea throughout their working life.

We have supplied our extensive submarine design and engineering expertise to national defence agencies and major contractors around the world, including the UK, US, Canada, Australia and South Korea. BMT is a key partner in the Submarine Support Management Group (SSMG) that is employed by the UK Ministry of Defence (MOD) to maintain, update and upgrade all the Royal Navy's in-service nuclear submarines. We have also, in partnership with the prime contractor, built a Centre of Excellence leading engineering changes and management for the in-service support of the Canadian Victoria class of conventional submarines.

As part of our on-going commitment to developing and expanding our specialist skills and knowledge we are collaborating with University College London to provide a graduate submarine design programme, with the aim of building a pool of talent to support submarine programmes around the globe.

## Concept design and studies

BMT designers have an in-depth knowledge of submarines, supported by a wealth of experience working with naval fleets. We specialise in providing innovative designs that balance capability requirements with ease of construction and affordability. We also carry out feasibility studies for modifying in-service submarines and have extensive experience of adapting and re-fitting them to suit different functions.

### Vidar-36

Vidar® -36 is a large and cost-effective conventional submarine design offering multiple-mission capabilities. With its built-in flexibility, the design can be adapted to suit operators' requirements.



### UK Submarine Programme

BMT provides the UK MOD with engineering design support and continues to provide programme support for submarines. This includes design option studies, assurance and risk mitigation. BMT continues to provide safety support to this programme.

### SEA1000

BMT provided the Australian Defence Materiel Organisation (DMO) with a procurement, build and support strategy, as well as impartial and rigorous budget estimates for whole life costs of owning and operating a replacement for the Collins class submarines, due to be withdrawn in 2020. As members of the SEA 1000 (Australia's Future Submarine Programme), project team our procurement and engineering experts are continuing to play an active role in the programme.



# Specialist submarine design support

Our specialist design and engineering know-how make us the partner of choice for helping government organisations to make key decisions on new submarines as early as possible in the procurement programme. This ensures the design is suitable for construction within the available technology and budget.

## In-service support

BMT has been supporting the day-to-day operations of UK Royal Navy submarines for more than two decades and has a comprehensive portfolio of expertise for keeping submarines safe, capable and available. These services range from maintenance and critical sustainability studies to escape and rescue systems, integrated logistics support and safe diving procedures. In Canada, BMT is leading a team of engineers and submarine specialists supporting the prime contractor for in-service support of the Victoria class submarines.



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## Submarine Support Management Group (SSMG)

As a key member of the SSMG we provide a dedicated team of submarine designers, safety and support specialists, power and propulsion engineers and design configuration managers. We are currently engaged in studies for the maintenance and critical sustainment of the fleet.



## Royal Australian Navy Submarine Escape and Rescue Service (SERS)

BMT carried out a Safety Case Report for the Royal Australian Navy SERS. This involved holistic safety assessments of each element of SERS as well as a review of existing safety management. Our report provides a baseline for maintaining and improving the SERS capability, which is available to submarines worldwide.

### 1: Victoria Class Submarine

BMT is working alongside the in service support contractor for the maintenance and upgrade of the Victoria class submarines. Our team is providing systems engineering expertise, project management, and submarine configuration and design leadership to this project.

2: BMT conducted an independent safety review of the NSRS to support the decision to declare Full Operating Capability (FOC) and support the conduct of a major rescue exercise.

## Life extension and disposal

At a time when budgets are shrinking, many naval authorities face the challenge of keeping their ageing submarine fleets operational beyond the period for which they were originally designed. BMT's thorough knowledge of a submarine's life-cycle means we can assess the feasibility of extending its operability. And, when submarines reach the end of their working life, we can help to decommission and dispose of them safely.

## Collins Class

BMT is advising on modifications to Australia's Collins class submarines which will extend their life and provide continuity while their replacement is procured.

## Submarine Dismantling Project

BMT, in partnership with Nuvia Ltd, is providing 'customer friend' support to the UK MOD's Submarine Dismantling Project. This aims to develop a solution

for disposing of 27 defueled nuclear submarines over 60 years. Our experts are helping to develop a project management plan, project controls, risk management and technical assurance.

Astute  
BMT developed an Obsolescence Management Strategy and Plan for the UK's Astute class attack submarine. We led a number of stakeholder workshops to assess and evaluate the obsolescence risks and identified actions to minimise those risks throughout the Astute's life-cycle.



**Defence Lines of Development (DLoD)  
capability integration**

BMT integrated the separate DLoD delivery plans for the Specialist Vehicles and Warrior Capability Sustainment programmes – the first time this service has been applied to equipment procurement. The vehicle programmes are the UK Army's highest priority land system projects. DLoDs capability is typically managed and assessed with regard to several dimensions or integrative elements including training, equipment, infrastructure and logistics, all of which are essential to delivering full capability. BMT continues to provide programme management support to these programmes.



**Land system design and support**

BMT has many years’ experience of providing multi-faceted, high-calibre services for land-based defence projects.

Our professional services cover the full spectrum of land system requirements across all Defence Lines of Development (DLoD) and the project life cycle including acquisition strategy, design support and assessment to maintenance and through life costs. BMT also leads the way in providing Independent Safety Advice and Independent Environmental Advice. Our solutions which use the latest technology are backed by an in-depth knowledge of the wider land-based stakeholder group and a significant portfolio of engagements. We use this optimal combination to develop and deliver innovative, value-for-money services.

**Acquisition support**

By working closely with customers, our engineers help to ensure that across the project life cycle risks are identified early and that mitigation action is in place

to reduce their effects. We carry out comprehensive requirements engineering, acceptance planning and management to support clear, concise and speedy decisions.

**Force Protection**

Force Protection is increasingly being required by the armed forces on military operations. Since 2008 BMT has been part of the MOD Force Protection Delivery Team, providing technical support for a series of Urgent Operational Requirements projects, including life-saving protective Counter-Improvised Explosive Device (C-IED) capability.

**Design support**

Our in-depth knowledge of all land-based systems means we can more easily identify factors, such as new technologies,

that could increase their complexity. By offering a full systems analysis and architecture design capability BMT can help make complex systems more affordable and effective.

**Foxhound Light Protected Patrol Vehicle (LPPV)**

BMT applied its technical expertise during the concept phase, from tender documents and requirements analysis to trials and assessment.

**TALISMAN**

BMT supported the MOD’s TALISMAN programme in the fight against mines and Improvised Explosive Devices (IEDs), defining the system requirements and managing the trials, testing and acceptance process.



**In-service support**

By providing comprehensive technology assessments, including product and market surveys, BMT helps customers to make informed decisions to maximise functionality and affordability, while minimising technical and integration risks. Sweden’s armed forces choose RAMtr@ck

The BMT RAMtr@ck management information system is the data collection and analysis tool of choice for training and simulation exercises in Sweden's armed forces. This includes the Leopard II tank, CV90 armoured vehicle and 140 live firing ranges.

**Electric Armour**

Patrol vehicles increasingly require higher levels of protection against IEDs and more conventional threats such as rocket-propelled grenades. As conventional armour would make vehicles too heavy for many tactical situations, the European Defence Agency assigned BMT to investigate electric armour technology. This included comparative benefit analysis against alternative protection solutions.

# ISTAR system design and support

BMT combines its expertise in programme management, systems engineering and enterprise architecture to support the acquisition of complex ISTAR defence projects.

**ISTAR** — intelligence, surveillance, target acquisition and reconnaissance – combine to present an optimal representation of the battle space. This provides commanders with a vital multi-dimensional picture and links together battlefield functions that help the armed forces to manage their information. BMT is currently at work on a number of key projects in this vital area.

## Communications for battlefield helicopters

Operational feedback identified a need for secure communications for Chinook helicopters when flying Beyond Line of Sight. Using our extensive knowledge

of air platform systems, we provided the technical and project documentation to support invitation to tender plus logistics support, cost modelling and risk analysis.

## DII defence information infrastructure

BMT applied its knowledge of programme management, enterprise architecture and business process management to one of the biggest IT infrastructure programmes in Europe. DII will provide around 300,000 user accounts supporting more than 500 applications, along with supporting data centres, across 2,000 MOD sites worldwide. We defined complete and comprehensive business processes for all parties involved in the project.

## LETacCIS

BMT’s strong relationship with the MOD was further underlined by the award of the LETacCIS (Land Environment Tactical Communication and Information Systems) pre-Assessment Phase Technical Support contract. This involved supporting the effective, safe and professional through-life acquisition of the next generation of tactical communications for the UK Armed Forces.



## Watchkeeper

BMT completed an independent review of the UK MOD’s Watchkeeper Unmanned Air Vehicle (UAV) programme, the largest of its kind in Europe. Watchkeeper will provide battlefield commanders with accurate, high-quality imagery in near real-time and enhance British military ISTAR capabilities. The review identified areas for improvement and made pragmatic recommendations to the MOD.

# Air system design and support

BMT’s extensive expertise in naval and land defence programmes can also be applied to air systems that require the same high level of performance and safety.

## Air Traffic Management Control and Monitoring System

BMT is the Independent Safety Auditor (ISA) for the Air Traffic Management Control & Monitoring System (CMS) at RAF Mildenhall. Our role is to ensure that the CMS is installed in line with official guidelines and aviation regulations. The CMS provides vital information about the status and serviceability of the aeronautical ground lighting control and monitoring system.

## In-service support

Once systems are operational, it is crucial to maintain optimum and safe performance. BMT’s experts provide the essential performance assessments to keep air systems working effectively.

## Air Defence and Air Traffic Systems (ADATS)

BMT has supported the ADATS team for over 15 years by conducting in-service performance assessment. We collect, manage and analyse a range of information and data from the T101 and T102 radars in the UK and assess the operational availability, reliability and spares turn-around time.

## Search and rescue

BMT developed a fleet operation model to help the UK Search and Rescue Helicopter project team select a service supplier that offered the best value for money. The model simulates the performance of the helicopter fleet, taking into account characteristics that would affect performance and costs of any service solution.



## Acquisition support

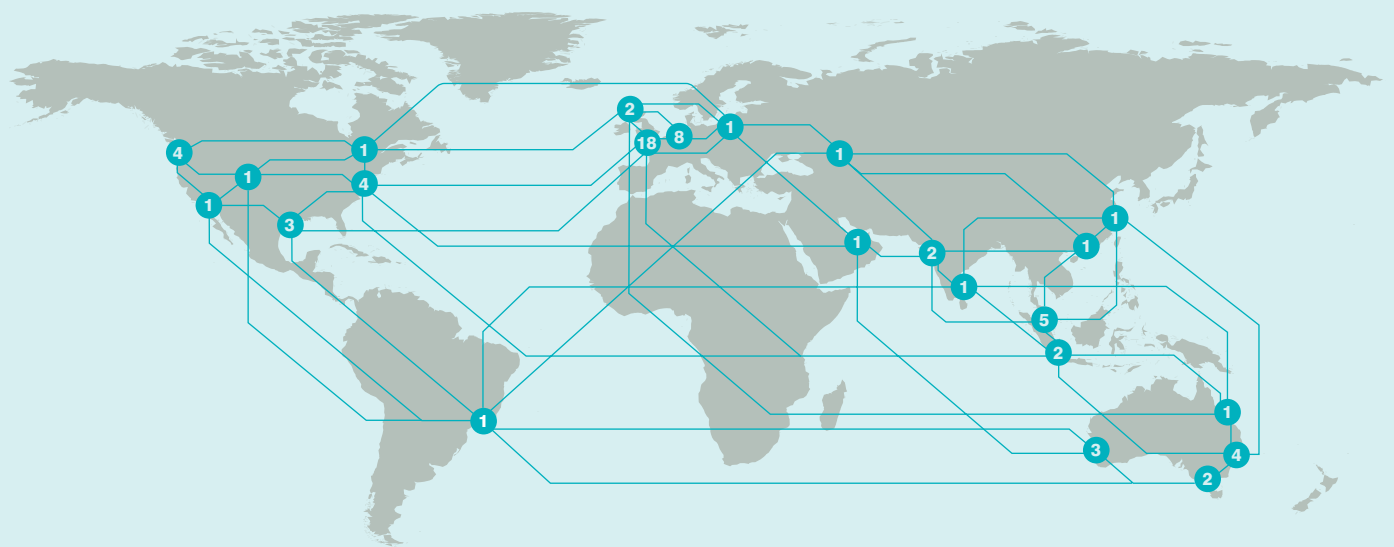
Our experts ensure that all air system acquisition projects meet stringent safety, serviceability and value-for-money requirements.

## Airbus A400M military transport

BMT developed the Value for Money Benchmark to support the in-service assessment phase. This was used by the MOD project team to determine the preferred procurement strategy. Our experts also modelled the costs of in-service support for the first ten years of operations.



**With locations in all of the major markets we serve, ours is an active network that sees us sharing skills and knowledge, combining disciplines and building international teams to create integrated answers to the questions of our national and international customers.**



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