CASCADE
ENGINEERING

DEPENDABLE ENGINEERING,
CERTIFIED SOLUTIONS

CASE STUDY
05

BAE SYSTEMS

Project: TYPE 26 FRIGATE

FROM NOVEL CONCEPT TO GUARANTEED DELIVERY:

ADVANCED MATERIAL COMPONENT DEVELOPMENT FOR MARINE PROJECT

For the defence company BAE Systems Maritime - Naval Ships, renowned for their development of numerous Royal Navy vessels, the all new Type 26 Frigate was critical to their continued reputation and business success. For the first time, at the behest of the Royal Navy, they were looking to develop a ship with a major structural element manufactured from composite materials. With a specific focus on reducing the weight of the superstructure, the development of the foremast was key to the project success.

BAE Systems was looking for a specific partner who could bring significant structural composite experience to develop the structural design, as well as complement their in-house team with experienced professionals skilled in reducing the risk on the project and ready to make important development decisions.

This teamwork resulted in BAE Systems securing a fully capable novel composite foremast design with full structural substantiation documentation to meet Lloyds Register and MoD requirements, as well as avoiding costly and untimely mistakes along the way.

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STRATEGY

This was a challenging project. Combining our Naval Architectural and Marine Engineering expertise with a deep understanding of the design drivers and issues affecting the design of the foremast structure, we were able to turn an outline design into a well-proportioned scantling plan of decks, bulkhead panels and reinforcement. This could then be optimised to pass all structural requirements at the same time as being efficient with regard to weight. Comprehensive, yet concise documentation was also critical to achieving prompt acceptance from the classification society for the structure.

Project success was also dependent on skilled, capable project management. Like many organisations, resources in BAE Systems were stretched. We brought in experienced team members to work alongside the BAE Systems team, concentrating on critical programme elements with minimal supervision, while following BAE Systems methods and Lloyds Rules (Special Service Craft). Naturally, working alongside the BAE Systems team, we kept a close eye on budget and quality standards as part of the brief.

EXPERTISE DELIVERED

Stage One: Review, modify and enhance the composite design of the foremast, a four-storey octagonal structure, 8m square at base, that contains the combat mission systems, supports the main radar at the top and various communication systems externally.

Following Stage One design completion, we optimised the structure against improved load distributions based on further iterations using FE models and structural design. Weight is key to all superstructure and optimisation of structural requirements against minimal weight was paramount to ensure the mast remained within the limits mandated within the BAE Systems & Navy requirements.

Stage 2: Our sector experience meant we not only accounted for the specific drivers within the superstructure, but also integrated the design solution with the adjacent steelwork, as well as the radar, SATCOM & combat systems, mast top bulwarks and mast sponsons.

Stage 3 and Manufacture: Following the detailed structural design, we worked alongside a specialist Norwegian marine composite manufacturer to ensure a smooth transition from design into production and subsequent assembly onto the ship.

As the first mast passed into production, it met with some teething problems. Our team remained on hand throughout the initial production process to help resolve early issues and answer questions, working directly with the suppliers at their Norwegian yard to help keep the challenging timescales for complete programme delivery on track.

"Cascade Engineering built and maintained relationships with both our internal and external stakeholders, as well as with our third party supplier. This allowed everyone to gain confidence in our design and project delivery, which also helped everyone during very busy and fraught periods of working."

Suzanne Currie, BAE Systems Project Manager & CAM - Type 26

HMS Queen Elizabeth

Photo: Courtesy Royal Navy

COMPREHENSIVE EXPERIENCE

- Involved at the heart of development programmes.
- Experience on Type 45 Destroyer and Queen Elizabeth Class Carrier programmes.
- Providing integration between our customer (the OEM) and its suppliers.
- Ceaseless drive to streamline analysis approaches, utilising technology and data handling techniques to improve robustness and expedite any analysis to allow decision making.
- Optimisation against multiple design drivers.
- Ensuring teams work with the best current data.
- Developing loading – ship motion and shock events, developing whole unit FE models.
- Safety assessment, including – shock analysis, captivity of items, lightning strike, etc.
- Development of Means of Compliance strategies and evidence requirements.
- Development of test plans, review of testing arrangements, test witnessing, results review, correlation of data and models.
- Naval Architecture and design experience/ capability.
- Marine Engineering experience across a number of flagship programmes.

CASCADE ENGINEERING HALLMARKS

- Analysis of steelwork to Lloyds Rules for Naval Ships.
- Analysis of complete structural elements, such as the units, comprising of decks, bulkheads, equipment seats, penetrations and system supports.
- Completed specific features such as yardarms, bridge wing and RAS bulwarks, shaft bracket fairings, plus SATCOM sponsons and associated installation structures.
- Integration of mechanical systems, such as the radar, SATCOM & combat systems and life raft.

CASCADE APPROACH

- Start with concept solutions – Naval Architecture, Stage 1 development.
- Move to concept development – Marine Engineering, Stage 2 structural Assessments and refinement.
- Move toward a final solution – Marine Engineering, Stage 3 assess manufacturing capabilities, production rate issues and installation and assembly limitations.
- Preliminary and Critical Design Review preparation, presentation to OEM, managing actions to progress beyond review.
- Decide on clear route forward.

Type 45 Destroyer

Images courtesy of BAE Systems, unless otherwise attributed

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