Sister of mercy: Argus role conversion puts primary focus on casualty care

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Key Points

- RFA Argus was originally completed as a container ship, but was acquired by the UK and subsequently converted for use as an aviation training vessel
- The ship's recent SLEP and conversion were performed by A&P with design support from BMT Defence Services

A quarter of a century after being acquired from commercial service for conversion to an aviation training ship (ATS), the UK Royal Fleet Auxiliary (RFA) vessel RFA Argus has completed an extensive service life extension programme (SLEP) and role conversion refit intended to prolong its life to 2020 while changing the ship's primary role to that of casualty receiving ship.

The challenge of this task should not be underestimated. Argus was originally completed in 1982 as the container ship Contender Bezant and having been largely re-built for the ATS role in the mid-1980s, can be characterised as a bespoke platform that fulfils military requirements, its commercial design heritage notwithstanding. It had been scheduled to retire from service in 2008, with a decision to extend the ship's career to 2020 only taken in 2005.

To undertake such drastic surgery at such a late stage in the ship's life certainly carried risks, amplified by taut programme and budget constraints. Furthermore, this task was made all the more difficult by the requirement to bring the vessel in line with current Safety Of Life At Sea (SOLAS) legislation and to deal with emergent work uncovered during the refit period.

Despite its complexity, the 10-month, GBP37 million (USD56 million) upgrade package was completed on time and on cost in November 2009. Performed by the A&P Group at its Falmouth ship repair yard in southwest England as part of its RFA Cluster 1 support contract, with design services and engineering support provided by BMT Defence Services Ltd, the project attracted praise from both the RFA and the Ministry of Defence (MoD) for meeting a demanding and unusual customer capability requirement.

Casualty role

The 28,000-ton Argus was originally launched in 1981 as Contender Bezant, a combination freight roll-on/roll-off ferry and container vessel. In 1982, the MoD pressed the vessel into service as a makeshift aircraft transport for use in the Falklands (Malvinas) conflict.
Following purchase by the MoD in 1985, the ship was taken in hand by Harland & Wolff in Belfast for conversion to the ATS role. This saw the addition of extended accommodation, a five-spot flight deck, two aircraft lifts, a Type 994 air surveillance radar and a military communications suite.

In preparation for the 1990-91 Gulf War, Argus was rapidly outfitted with a medical facility in one of its hangar spaces to serve as a Primary Casualty Receiving Facility (PCRF). This fit was judged a success, although it highlighted limitations in the vessel's ability to support large numbers of additional personnel embarked.

As a result, a more permanent PCRF was added in 1999 as a secondary role fit, giving the ship two operating theatres and a 100-bed hospital - under the terms of the Geneva Convention and the International Red Cross rules Argus is not classified as a hospital ship so can be fitted with self-defence armament or have operational units embarked. At that stage, it was planned that Argus should continue in service until 2008, with the 1998 Strategic Defence Review having in the meantime outlined plans for a dedicated Primary Casualty Receiving Ship (PCRS), later re-named the Joint Casualty Treatment Ship (JCTS).

The top-level PCRS/JCTS requirement called for a global maritime medical treatment capability able to deliver medical care for casualties across a range of military tasks and conflict.

Following Initial Gate approval in December 2001, BMT Defence Services was awarded an Assessment Phase 1 contract to identify practical technical concepts and examine possible options for delivering the required capability. Atkins was subsequently awarded a contract for the development of a System Requirements Document.

However, a review of equipment plan in 2005 concluded that a dedicated JCTS was unaffordable. Instead, Argus would be run on with an enhanced medical facility.

In 2003 A&P at Falmouth was awarded a contract for the refit of Argus following the ship's return from Operation 'Telic' in the Persian Gulf. This project became a pilot for the delivery of main-tenance support to the RFA, which eschews cut-price competition in favour of long-term partnering and performance measurement, culminating in June 2008 with RFA 'clusters' contracts covering the maintenance of Argus and four Bay-class Landing Ship Dock (Auxiliary) ships.

Argus completed a first phase SLEP in 2006 as part of a refit period. This alteration and addition package saw the vessel re-engined with Rolls-Royce Bergen diesels, revised ballasting arrangements, a coating system upgrade, improved aircraft approach lighting and new military communications.

**Extensive works**

However, the largest part of the upgrade and life extension was executed in RP09, a 297-day project that saw A&P perform a conversion to reverse the ship's primary and secondary roles.

Gerald Pitts, Cluster Support manager for A&P, said: "This has encompassed major equipment upgrades to safety and evacuation systems, sewage treatment, refrigeration, ventilation, reverse osmosis, fire and watertight integrity; the removal of the forward aircraft lift; the extension of the PCRS with a new access ramp and two new lifts; new PCRS equipment [including a CT scanner, sterilisation equipment and an oxygen concentrator]; and a series of structural modifications including new steel bulkheads, watertight doors and a new bridge front. There was also a major accommodation upgrade, plus extensive painting, mechanical and electrical packages."
"The major challenge we were asked to accomplish was to optimise the ship's primary casualty reception capability, while in parallel extending ship life out to 2020 and achieving compliance with the associated safety requirements for its new role during this period. At the same time, there was a desire to minimise any degradation of the vessel's rotary-wing aviation training capability, bearing in mind that Argus will still spend much of its time in the aviation training role."

BMT Design Services had already accrued knowledge of the PCRF role and function through earlier work undertaken to examine candidate concepts for a new-build PCRS/JCTS design.

But with a new-construction solution now ruled out on cost grounds, attention switched back to how much more could be squeezed out of Argus.

Accordingly, the company was in 2006 tasked by the MoD to investigate the design challenges and identify practical solutions to extend the ship's operating life.

Dan Smye-Rumsby, BMT's principal engineer-projects, said: "We embarked on a feasibility study to determine the 'art of the possible' - what could be achieved while at the same time ensuring that the platform remained safe.

"In particular, there was a strong focus on maintaining the ship's Naval Authority and Statute Certification by improving fire safety, escape and evacuation, damage stability and environmental friendliness to conform to current legislation and standards. At the same time, while the ship would assume a new primary casualty reception role, we also had to maintain her aviation training capability."

Having determined that conversion was feasible and affordable, the MoD endorsed plans for the SLEP and role conversion to be carried out as part of A&P's Cluster 1 contract. As subcontractor to A&P, BMT produced 54 separate design packages, modelled electronically using the AutoCAD 2009 software suite, to support manufacture and embodiment at refit.

Smye-Rumsby said: "Our early engagement enabled innovative yet practical solutions to the many and varied complex engineering challenges faced. This was essential to reduce programme risk and ensure that A&P could deliver 'right first time' on manufacture. At the same time, we needed to ensure very high tolerances for all drawings and measurements to ensure that all structures and steelwork fitted exactly as planned."

Pitts added: "The design team maintained a very close relationship with the shipyard to ensure it was a 'design for manufacture'. There was no margin for error given the programme and budget constraints, so it was important to combine intellectual resource and practical production expertise through effective planning."

In order to incorporate the improved PCRF, the forward aircraft lift was removed to make way for a deckhouse, decks, escape ramp and two casualty lifts. The space previously occupied by a lift has now been transformed into a casualty reception area for triage.

Smye-Rumsby said: "The new arrangement provides for a much shorter transit from the flight deck to the medical centre. In total, 170 tonnes of steel was removed, and 230 tonnes of new steel added in the lift shaft, deck house and ramp structure.

"The ramp and new lifts provide a rapid and reliable means of evacuation, embarkation and disembarkation of hospital patients. A mock-up of the ramp structure was actually built at A&P to get the buy-in from the medics."
Damage stability

The critical feature of improved damage stability was another important aspect of the refit, as it allows more time for casualty evacuation in the event of action damage. Smye-Rumsby said: "A new watertight bulkhead was fitted from the keel to 1 Deck dividing auxiliary machinery spaces, stores and accommodation. Two new watertight doors were fitted in the hangar to allow for aircraft movement without adversely impacting on aircraft stowage."

An evacuation system was also introduced, adopting a commercial off-the-shelf solution sourced from Life Raft Systems Australia. Four systems - two port and two starboard - are installed, each comprising a 100-person capacity inflatable life raft and inclined evacuation slide. A Sea Acceptance Trial was successfully completed in Portland harbour in December 2009.

The building of the PCRF deckhouse and installation of the new marine evacuation system have affected the flight deck estate, hence the ship's aviation capability, which saw the original five helicopter deck spots cut to three: with what were 1 spot and 4 spot now defunct, the remaining deck spots were renumbered accordingly.

One obvious change to Argus is the ship's new bridge structure, a modification that is more than just cosmetic, according to Pitts. He said: "There were very different regulatory requirements for ship visibility when the ship was designed. The latest SOLAS/IMO requirements demand an improved viewing area, which has meant a structural extension, new windows and some re-siting of bridge equipment."

Elsewhere, accommodation and mess facilities received an extensive facelift, with Trimline Interiors performing a large upgrade to improve living standards for both crew and patients. The improvements are complemented by the fitting of a new galley facility.

All refrigeration and air conditioning plants were changed to comply with the Montreal Protocol, while the ship's environmental credentials received a boost with a bioreactor that uses microbial action to process sewage.

A new switchboard was installed and extensive work completed to improve fire safety, including additional structural fire protection, new ventilation in the galley area, new fire detection and suppression systems, and a smoke clearance system in the stairwells.