

Re-engineering for a new threat



Marcus Jakt looks at the RN's successful re-adjustment to the rise of asymmetric warfare, and the role of contractors such as Bassett Defence Services in providing tailored defence engineering solutions to meet its new challenges.

Most terrifyingly manifested in the events of four years ago in New York, the no-holds-barred tactics of asymmetric warfare have definitively displaced the old Cold War threat as the greatest challenge currently facing modern military organisations.

No longer can a conventional, easily definable – and predictable – opponent be expected. For the Royal Navy (RN) the suicide attacks against the USS *Cole* in Aden, Yemen (October 2000), and of the M/V *Limburg* off Yemen two years later, triggered a significant shift in emphasis. Conventional targets at medium/long range are no longer prioritised. Instead, force protection duties at close to very close range are the order of the day.

Coinciding with the implementation of 'smart procurement' policies, this is a strategic shift that has required a great deal of re-engineering and adaptation. Vessels designed during the Cold War with the principle of 'layered defence' find that their outer 'layers' – typically anti-shipping missiles and/or 4.5" cannon – are of little practical use against indeterminate, often difficult to identify, irregular threats close in.

Bassett Defence Services – a defence engineering SME based in

Hayle, Cornwall – was recently hired to help rapidly optimise the limited mix of personal small arms (SA80s) and General Purpose Machine Gun (GPMG) positions available within this innermost layer of defence.

Within the framework of increasingly restrictive procurement budgets, the challenge has been to provide a credible defence engineering solution enabling the sum total of the 'layered' approach to address the RN's evolved needs more effectively.

Accordingly, whilst a few well-aimed bursts from a GPMG might provide at least reasonable stopping power in the force protection role, its mount in naval use was originally optimised to provide a last-ditch air-defence facility (a tasking that would have been a fairly hopeless affair...). Failing the GPMG, of course, it's hard to see how even a brace of SA80s could effectively prevent a determined opponent in a speedboat packed full of explosives.

As hinted above, modern Rules of Engagement (RoEs) usually preclude turning the deck cannon on such targets – even if it were possible to acquire them sufficiently quickly (in any event, hardly ideal in what might well be a packed harbour).

It quickly became apparent that the RN would – as a matter of urgency – have to adapt its existing capabilities as best it could. Says Roger Bassett, Chairman, Bassett Group: "From the outset we understood that, in this instance, because of fast-moving events in the world, the MoD essentially had to make do with existing force levels – modified if need be, but not replaced."

Re-engineering and adapting the existing GPMG mount – the most likely candidate for re-tuning to the new threat – had to be addressed quickly and within limited economic parameters.

As a long-standing provider of services and defence engineering solutions to the MoD, Bassett Defence Services was chosen for the initial contract. Speed and reliability were of the essence: from issuing of tender to operational units receiving the new GPMG mount, Bassett Defence Services was able to respond with a production-ready solution within just 16 weeks.

Immediately, the contractor was brought in to consult with the customer – the RN. What elements of the old GPMG mount design were inadequate for the new tasking, and what would the design brief have to consider?

A number of issues were highlighted:

- Due to its limited available angle of depression, the old mount severely compromised the weapon's minimum range.
- For the air-defence role, rear handles and a remote trigger mechanism had been fitted. For force protection duties these needed removing (allowing direct access to the stock and trigger would enable greater firing accuracy).
- The link chute, disposing of spent links as the ammunition was fed through the gun, functioned inefficiently and needed redesigning.
- The ammunition box feeding the linked ammunition into the gun

remained detached from the weapon. This meant that the feed into the firing chamber risked snagging.

Early on, both Bassett Defence Services and the RN came to an agreement that a completely new design was impractical. Firstly, it would almost certainly take longer to develop (and the requirement was urgent). Secondly, it would involve more risk – both in terms of possibly engineering in new problems, and of cost escalation.

At Bassett Defence Services a 3D digital image of the original design was created within industry-standard Solid Works software in order that various revised designs could be tested.

Explains Greg Cocks, Systems Development engineer, Bassett Group: "Our aim was to implement the design specifications with as few modifications to the old GPMG mount as possible. This would help to provide a quicker, lower-risk solution to the customer – Computer Aided Design (CAD) software such as Solid Works helps enormously in allowing our technical staff to achieve that."

A re-engineered design was also preferred for a range of operational issues. For instance, a conventional design would make re-training on the new mount easier. In addition, given that from the point of view of operational safety the new design had to be the same or better than the old, certification was likely to run more smoothly and pose less of a challenge, too.

In effect, the redesign became more than just an opportunity to design in changes – it also enabled the MoD to get rid of old known flaws in the legacy design.

Using sophisticated Finite Element Analysis computer models to test different solutions – checking in advance of actual prototypes what stresses and forces any given design would likely be subject to – and liaising closely with a team from HMS Ark Royal, Bassett Defence Services quickly established the major design changes needed in the re-engineered GPMG mount:

- Modifying the existing stirrup allowed a significant increase in the amount of available depression possible, enabling very close range engagement of targets.
- Provision for tailored restriction of depression/elevation had to be made. Explains Ray Thomas, General Manager, Bassett Defence Services: "An adjustable cam was designed to allow operators to easily restrict the weapon's area of fire, dependent on where the GPMG would be located on board a ship".
- Removing the handles and remote trigger assembly allowed direct access to the stock and trigger. This enabled the weapon to be used with the necessary precision to comply with force protection RoEs. Using devices such as real-time scaled 3D images and animations, Bassett Defence Services took full advantage of the electronic design

environment to communicate to the customer the various modifications and enhancements that would be implemented.

This led to several additional changes being made to the design as comments and feedback from actual operators of the system were acted upon. Says Nathan March, Research & Development engineer, Bassett Group: "Being able to visually present a 3D solution on-screen is incredibly useful for the process of communicating with the customer."

This kind of interaction with a team from HMS Ark Royal led to:

- A re-designed link chute. This greatly benefited the operator's combat effectiveness by enabling the clean storage of spent ammunition links. Previously, such was the link chute's ineffectiveness that operators sometimes removed it completely (creating unacceptable Foreign Object Damage (FOD) risks).
- Installing an ammunition box bracket. Says Ray Thomas: "With the ammunition box bracketed to the mount the redesign meant much easier operation of the weapon. Whereas before a second operator would be feeding the ammunition into the gun – lest the linkage snag – now the weapon could potentially be fired by a single operator." Overall, re-engineering the existing mount, rather than designing an entirely new one,

meant that Bassett Defence Services could deal with known quantities. Old known flaws were removed and the risk of new ones minimised.

The company's advanced capabilities – including sophisticated design and reverse engineering competencies, plus highly developed Computerised Numerically Controlled (CNC) manufacturing and assembly facilities – were key to its ability to rapidly develop and validate a new design, all the time keeping in close contact with the relevant Integrated Project Team (IPT) at the Defence Logistics Organisation.

Procurement requirements demanding quick, efficient and reliable defence engineering solutions to urgent problems in the field are increasingly being assigned to firms such as Bassett Defence Services.

Clearly, rolling programmes such as this benefit immensely from already well-established and close cooperative relationships with the contractor. Certainly, it means they are often faster – and more economical, too.

Ultimately, notes Roger Bassett, "what the MoD looks for is value for money" – a service that Bassett Defence Services seems very capable of offering.

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