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RESEARCH BRIEF

Reducing the Cost of Aircraft Carrier Acquisition

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The United Kingdom's Ministry of Defence (MOD) recognises that its Future Aircraft Carrier (CVF) acquisition project provides opportunities to save substantial sums of money over the life of the ships. To help realise the project's whole-life savings potential, the MOD called for an independent, objective analysis of new technologies and alternative manufacturing options. The RAND Corporation was asked to perform that analysis and, in particular, to identify and evaluate options for reducing support costs and other whole-life costs, and for reducing manpower.

The precision of the RAND analysis was limited by the fact that, at the time of the study, the design of the CVF was still evolving; therefore, detailed design and manning data were unavailable. However, RAND presented approaches to quantifying and realising cost reductions, along with some specific measures to reduce costs in various areas.

Cost Analysis Tools

The evaluation of initiatives to reduce CVF whole-life cost (WLC) requires a set of analytical tools to understand the trade-offs among various cost elements. RAND presented four such analytic paradigms:

- A total WLC model that examines the interactions among acquisition, operating, maintenance, and personnel costs and permits the quick evaluation of trade-offs and cost-reduction initiatives (see the figure).
- A method for understanding the cost of each day of carrier operations. RAND calculated a daily cost exceeding £500,000.
- A means of trading off acquisition and operating costs. This approach suggests that a £1,000 per year savings for each of the two planned carriers would justify a £25,962 up-front investment across both ships.
- A way of making a similar trade-off between initial technology and subsequent manpower costs. Replacing the typical crewmember would save £1.2 million.

Abstract

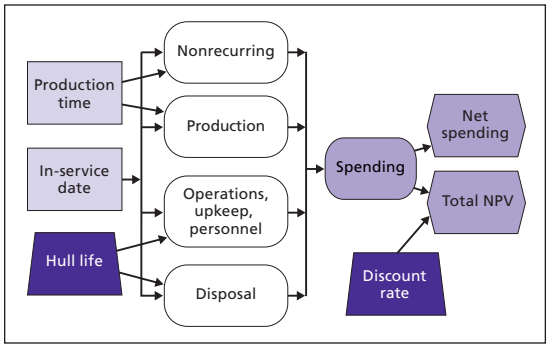
The United Kingdom's Ministry of Defence is designing its next class of aircraft carriers. At the ministry's request, RAND presented several cost-saving tools and measures, including cost analysis tools (e.g., a whole-life cost model), ways to reduce construction costs (e.g., advanced outfitting), methods to save on support costs (e.g., variations of contractor logistics support), and guidelines for reducing personnel costs, as well as numerous specific ways of doing so.

Acquisition Cost Savings

Although the focus of their efforts was on support costs and manpower, the researchers also identified several options that might lead to lower CVF construction costs:

- Using more advanced outfitting, that is, outfitting large structural elements with pipes, furnishings, etc., before the elements are assembled into the ship.
- Setting the start of the second ship to level the workload to minimise total labour costs at the shipyards constructing the large structural elements.

High-Level Architecture of RAND WLC Model for the CVF Programme



- Centralising the procurement of material and equipment.
- Considering the use of commercial systems and equipment in place of military standard equipment wherever there is no adverse impact on operations or safety.
- Ensuring that comprehensive design reviews by all stakeholders are complete so that the design of the ship is acceptable to all before construction commences.
- Minimising changes during ship construction and quickly resolving any that must be made.

Support Cost Savings

Designing some systems to commercial standards might reduce support costs in addition to acquisition costs. RAND inferred from studies for the US Navy that the use of certain habitation-related commercial systems (water, trash, etc.) in the CVF might save as much as a net £400 million in WLC across both ships.

Paint is also a major maintenance expense. If higher-quality paint were used, one of the planned dry-dockings might be eliminated, which could yield substantial savings.

In planning from the outset to save whole-life support costs, we naturally turn to contractor logistics support (CLS), in which the design contractor is paid a price to guarantee the availability of the ship. Such an arrangement motivates the contractor to make efficient trade-offs between acquisition and support costs and efficient repair-or-replace decisions.

Unfortunately, it does not appear that the MOD could have a CLS arrangement in which the contractor is responsible for every aspect of making a carrier available and is paid solely for available vessel days. The ship would be too costly and complicated for a contractor to assume full financial risk if the ship does not operate.

Instead, CLS on the CVF could be a modified version in which considerable responsibilities are left to the MOD's Defence Logistics Organisation or to the weapon system manufacturers. However, such modified CLS might be prone to areas of unclear responsibility, in which different participants blame one another for why the ship does not operate correctly.

Personnel Cost Savings

RAND began its personnel cost analysis by reviewing the approaches taken by the Royal Navy and its contractors to establishing complement size. Researchers suggested that, as further complementing work was done, the following points be kept in mind:

- A principal, persisting goal must be observed. Minimising WLC and minimising crew size, for example, will each result in a different complement.
- Some CVF systems will be inherited from the current carrier class. These systems might bring inefficient manning with them.
- Ambitious plans to cut manpower by investing in technology can be impeded by constraints on the up-front funding.
- Operational commanders may be reluctant to accept smaller complements because they would reduce the margin for error in situations threatening ship safety.

Next, RAND drew from case studies of complement-reduction initiatives on other naval platforms to identify and evaluate a number of complement-reducing measures and suggest directions for the future. Researchers identified 57 feasible complement-reduction options of potential relevance to the CVF. Of those, 12 were judged to have appreciable potential for complement reduction and to be advantageous in other respects. Six of these twelve emerged as particularly promising:

- Leaving machinery spaces unmanned, a policy change facilitated by technologies such as remote sensing of spaces.
- Consolidating watches.
- Employing a core/flex manning concept, i.e., manning only certain watches in reduced-threat environments and assigning the excess watchstanders to other duties.
- Using civilians to augment the ship's crew for nonwarfare responsibilities.
- Emphasising broad skills and a cross-trained workforce, so that a smaller crew could perform the same number of activities.
- Using conveyors to aid crewmembers in loading stores from the shore to the ship.

RAND observed that initial complement targets have historically proved optimistic, and progress towards the complement goal could be complicated by remaining challenges. For example, many complement-reducing options are not technological but procedural, and efforts to implement such changes can encounter institutional resistance.

RAND concluded by offering some general guidelines towards better defining complement-reduction options and pushing them closer to realisation:

- Consider the implications of a revolutionary CVF complement for the Royal Navy personnel structure.
- As CVF design proceeds, continue the emphasis on complement reduction and on human systems integration, i.e., the incorporation of human factors, training, health, and other considerations, into system acquisition.
- Focus on manpower-intensive activities for possible reductions.
- Place a premium on designing or selecting systems that do not require highly specialised personnel to operate. ■

This research brief describes work done for RAND Europe and the RAND National Security Research Division documented in *Options for Reducing Costs in the United Kingdom's Future Aircraft Carrier (CVF) Programme*, by John F. Schank, Roland Yardley, Jessie Riposo, Harry Thie, Edward Keating, Mark V. Arena, Hans Pung, John Birkler, and James R. Chiesa, MG-240-MOD (available at http://www.rand.org/publications/MG/MG240/), 2005, 212 pp., $24.00, ISBN: 0-8330-3667-X. MG-240 is also available from RAND Distribution Services (phone: 310.451.7002; toll free: 877.584.8642; or email: order@rand.org). The RAND Corporation is a nonprofit research organization providing objective analysis and effective solutions that address the challenges facing the public and private sectors around the world.

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