National Audit Office

Report
by the Comptroller
and Auditor General

Ministry of Defence

Investigation into equipment cannibalisation in the Royal Navy

HC 525 SESSION 2017–2019 1 NOVEMBER 2017

Key facts

3,230

instances of ship and submarine cannibalisation, April 2012 to March 2017

49%

increase in cannibalisation, April 2012 to March 2017

0.3%–1.4%

percentage of all parts provided by DE&S that were cannibalised across the main ship and submarine types, April 2012 to March 2017

26%	instances where the same part was cannibalised three or more times
71%	percentage of cannibalised parts valued at less than £5,000, April 2012 to March 2017
59	average number of cannibalisations per Astute-class submarine in 2016-17
£92 million	estimated maritime support funding removed in-year from 2015-16 and 2016-17 budgets that could increase the need to cannibalise parts
34%	part demands past their required delivery date with no forecast due date for their receipt
21%	shortfall in trained and qualified staff within Defence Equipment & Support (DE&S) navy supply teams
5%	percentage of part demands where parts identified as obsolete

Summary

What this investigation is about

1 The Royal Navy (the Navy) operates ships, submarines and helicopters to meet the United Kingdom's defence requirements. These typically comprise complex mechanical and electrical engineering systems made up of thousands of parts. The Navy needs additional parts to maintain and repair its equipment. This could be for scheduled maintenance or where it needs to unexpectedly fix equipment if it breaks, or following an accident, which cannot always be planned for.

2 How ships and submarines source parts will depend on whether they are operating at sea, or undergoing maintenance in the dockyard, and on the type of support solution put in place by Defence Equipment & Support (DE&S), a bespoke trading entity and arm's-length body of the Ministry of Defence (the Department). The support solution will be influenced by the Department's decision on how to balance investing in spares upfront against not doing so and managing the resultant risks.

3 When vessels require parts that are unavailable, the Department can authorise that they are taken from other equipment – a process known as cannibalisation. In some circumstances, cannibalisation can be the most effective way to keep vessels' operational or maintenance schedules on track. It can, for example, be a necessity during periods of high-intensity operations.[1] However, it can also lead to increased costs and disruption, divert resources from other activities and create additional technical and financial risks. In the past, we have recommended that the Department should carefully monitor and control the use of cannibalisation.[2]

4 Evidence gathered during past National Audit Office (NAO) work suggests that cannibalisation has become more common. This increase comes at a time when funding for spares has reduced across all the Armed Forces. The risk of cannibalisation has increased further with reductions in fleet sizes meaning the Armed Forces have limited alternative equipment to deploy. Introducing new ships and submarines also creates greater uncertainty over how equipment will operate and means less information is available to help make decisions on the appropriate support solution and investment. The Department has also increasingly relied on contracted rather than in-house support.

1 Comptroller and Auditor General reports: *Operation TELIC – UK Military Operations in Iraq*, Session 2003-04, HC 60, National Audit Office, December 2003; *Support to high-intensity operations*, Session 2009-10, HC 508, National Audit Office, May 2009.

2 Comptroller and Auditor General reports: *Transforming logistics support for fast jets*, Session 2006-07, HC 825, National Audit Office, July 2007; *Operation TELIC – UK Military Operations in Iraq*, Session 2003-04, HC 60, National Audit Office, December 2003.

5 Cannibalisation occurs across all the Armed Forces but our recent work has identified specific examples within the Navy, which explains the focus of this investigation. As cannibalisation becomes more frequent, its causes and consequences need to be fully understood. This investigation describes:

- cannibalisation across the Navy;
- the use and impact of cannibalisation; and
- how the Department manages cannibalisation and its causes.

6 This investigation was prepared against a background of wider concerns about the affordability of the Department's equipment and support plans, and consideration of the forthcoming changes to how the Navy will operate as vessels such as the new aircraft carriers are brought into service.[3] The investigation does not focus on inventory or supply chain management. We conducted fieldwork between April and June 2017. We carried out more detailed work on those ships and submarines experiencing the most cannibalisation – Astute-class submarines, Type 45 Destroyers and Type 23 Frigates. These complex vessels represent a core element of the Navy's operational capability. Unless otherwise stated, data analysis covers the period April 2012 to March 2017.

Key findings

Use of cannibalisation

7 Cannibalisation can be necessary but should only happen when no other solution is available. Cannibalisation involves removing a working part from a vessel or aircraft to install it on other equipment in greater need. The Department's guidance states "cannibalisation will only be conducted where no other solution is available". Decision-makers consider operational priorities and the estimated time to obtain new parts. In the past five years, between 0.3% and 1.4% of parts provided to the main classes of ships and submarines have been cannibalised parts. However, each instance has a wider impact beyond the part being replaced and can signify broader issues with the process for obtaining spare parts (paragraphs 1.2 to 1.6).

8 Across ships and submarines, cannibalisation has increased 49% in the past five years, with a total of 3,230 instances involving 6,378 parts. During 2016-17, there were 795 instances of cannibalisation. This equates to 66 instances a month, compared with 30 a month in 2005. Since 2004, the Navy has reduced its fleet of ships and submarines 31% from 127 to 87, meaning that a higher proportion needs to be deployed, or ready to deploy, at any one time in order to meet defence requirements. In 2016-17, ship and submarine cannibalisation accounted for 60% of instances across the Navy. Navy Merlin helicopters make up the remaining 40% (paragraphs 2.1 to 2.4).

3 Comptroller and Auditor General reports: *The Equipment Plan 2016–2026*, Session 2016-17, HC 914, National Audit Office, January 2017; *Delivering Carrier Strike*, Session 2016-17, HC 1057, National Audit Office, March 2017.

9 Some 40% of ships and submarines receiving cannibalised parts needed them so they could be ready for operations or training. In these cases, cannibalisation rectified issues that would have reduced the operational capability of ships and submarines. The remaining 60% of ships and submarines did not need the parts for operations or training. Instead, in some cases the parts were required to complete planned maintenance work to a specified schedule so as to avoid potential delays and additional costs (paragraphs 2.7 and 2.8).

10 Both older and newer classes of ships and submarines have required cannibalised parts. In particular:

- **new Astute-class submarines** experienced the highest average number of cannibalisations across ships and submarines, with 59 instances per submarine. They also experienced more defects than older equipment, with a third of these defects resolved through cannibalised parts (paragraph 2.5).

- **older Type 23 Frigates** experienced an average of 17 cannibalisations per ship in 2016-17. As technology progresses and equipment gets older, parts can be more difficult to obtain. During 2016-17, 5% of parts requested through DE&S, part of the Department, have consistently been identified as obsolete (paragraphs 2.5 and 3.7).

11 Our analysis shows 71% of parts cannibalised on the basis of operational need were low-value, but the cost of moving the parts could be much greater. Our analysis shows that the majority of cannibalised parts cost less than £5,000, with less than 1% valued at more than £500,000. The Department does not know how often the cost of replacing cannibalised parts exceeds the value of the part being replaced. Departmental analysis, covering 146 Type 23 Frigate cannibalisations in 2012, showed that in 50% of these cases, the cost of cannibalisation was equal to, or greater than, the value of the part. In 25% of cases it was four times greater. Even though cannibalisation has increased, the Department has not updated or broadened its analysis (paragraph 2.16).

Managing cannibalisation and its impact

12 The need for cannibalisation is exacerbated by both a lack of information about when parts will be delivered, and delays in receiving parts on time. In March 2017, the DE&S Ships Operating Centre met 55% of part demands from ship and submarine crews by the required date (target 75%). The Submarine Operating Centre met 63% of demands (target 80%). At the same point, of 17,038 ship part demands already past their required delivery date, 34% had no recorded forecast delivery date. Identifying a forecast delivery date can be more difficult where the Department has contracted-out support arrangements. The Department has undertaken a number of initiatives to improve ship and submarine supply chain management (paragraphs 3.9 and 3.10).

13 The Department does not routinely monitor the use, causes and impact of cannibalisation across the Navy. The Department considers and assesses cannibalisation and trends over time for individual vessel types. There is no overall accountability for managing cannibalisation across the Navy or routine data collection or analysis assessing why cannibalisation occurs or its impact. This information gap makes it difficult to determine when cannibalisation is becoming more routine, its underlying causes, and the trade-offs between cost savings and cannibalisation (paragraphs 3.1 to 3.4).

14 The Department has taken decisions to reduce support without complete information to fully assess and manage the impacts and costs. In the past two years, the Navy has removed an estimated £92 million from its maritime support in-year budgets, 34% of the total £271 million maritime support budget cuts, which could then increase the need to cannibalise parts. In particular, the Department decided not to invest in complete technical documentation or in fully cataloguing parts when vessels are brought into service. Of Type 45 Destroyer parts cannibalised, 42% were not catalogued, making it difficult to identify and obtain the required parts and increasing the likelihood of further cannibalisation. As of March 2017, the Astute-class submarine production programme had not committed £137 million of approved support funding (paragraphs 3.12 to 3.14).

15 Each instance of cannibalisation can delay programmes, create additional engineering risks and add to the work of staff, affecting morale. Cannibalisation has a number of impacts the Department needs to manage including:

- **programme delays:** In the past five years, the number of cannibalisations from the Astute-class submarine production line increased 43%, from 77 instances in 2012-13 to 110 in 2016-17. Cannibalisation caused a 42-day delay and led to the Department having to pay an additional £4.9 million in relation to HMS Artful (Boat 3), and has also affected other boats (paragraph 2.17);
- **engineering risk:** Cannibalised parts, along with additional parts that must be removed to gain access to them, may be damaged while being removed, transported or reinstalled. An estimated 11% of the parts recorded by ships as having shortcomings in their material, design or documentation were cannibalised (paragraph 2.12);
- **testing:** As well as additional work to remove cannibalised parts, engineers need to test systems on both the donor and recipient equipment, reducing the time available for routine maintenance (paragraph 2.12); and
- **people:** The 2017 Navy risk register identified a lack of spare parts as a risk to operational capability given its demoralising effect on personnel (paragraph 2.13).