Written Evidence to the House of Commons Defence Committee

Inquiry into the Navy and Naval Procurement

Professor Trevor Taylor

25 May 2021

1. I am Professor Trevor Taylor, head of the Defence, Industries and Society Programme at the Royal United Services Institute where I research and write about industrial, acquisition and management issues in defence. My contribution involves mainly the industrial aspects of the committee's concerns.

2. This presentation makes six main points
   a) There are a range of reasons, appealing to different constituencies, in favour of national defence industrial capabilities in the maritime sector;
   b) Shipbuilding defence industrial capabilities, like many others, need constantly to be sustained. They cannot be run down and then easily restored;
   c) A partnered relationship linking government and UK industry should be favoured over a competitive tendering approach to ship procurement;
   d) Exports of designs and associated advice, and of ship sub-systems are more likely than sales of complex ships built in the UK;
   e) The performance and risks of the UK shipbuilding sector should be viewed in the light of the experience of others;
   f) In conclusion, the UK's aspiration to be a major and independent military power on the international stage implies the need for a positive Defence Industrial Strategy. Operationally the Navy should reflect the Integrated Review's assertion that Russia is the major threat to security in Europe, and the question is posed as to the priorities of the Royal Navy as an institution.

3. There are multiple reasons for pursuing national defence industrial capabilities, as is reflected in the number of countries in the world that are trying to build their own. In the Integrated Review and the DSIS, stances on defence industrial strategy are linked to three higher policy positions. Warship and submarine building is particularly pertinent to the first two: government asserts that the defence budget should contribute to the national prosperity/levelling up/social agenda and to the strengthening of the Union. The third driver for national industrial capabilities it that they enable 'operational independence'[i] which clearly is linked to concepts of Global Britain, sovereignty and freedom of action. A reminder is worthwhile that the 2012 National Security Through Technology White Paper included the observation that:

   > For national security capabilities in general, freedom of action rests on the assurance that we will be able to use them – or continue to use them – whenever we need to; and that when we do so, they will perform as we require. In the field of defence, freedom of action includes being able to conduct combat operations at a time and place of our choosing, [ii]

4. Clearly operational independence is a function not just of construction but assurance of supply, a capacity to modify systems and even to increase production of some items. With ships this implies that key sub-systems are under national control, can be updated according

to UK priorities, and not easily subject to external interference. The more capable a county's defence industry, the more able is its government to specify requirements that precisely support its security and defence policy.

5. Perhaps still relevant is further consideration: a capacity to develop and produce major weapons systems is a demonstration to the wider world of national technological and industrial strength, and thus a significant feature of national reputation.

6. Warship and submarine design, development, testing and production capabilities cannot be turned on and off like a tap. A defence industrial capability to design, engineer and build complex warships requires a workforce in the prime contractor that contains a wide range of skills and understanding, much of which take years to acquire. The RAND work commissioned by the Ministry of Defence earlier this century provided significant detail on this area.[iii] Shipbuilding also demands an expensive infrastructure that, for final assembly and subsequent ship launch, is tied to a specified location: Australia for example is investing $A500 m. (£275 m.) just to upgrade the infrastructure at its Osborne shipyard in readiness for production of its Hunter class variant of the Type 26.[iv] Workforce expertise, capital assets and finance considerations also apply to the dozens of major sub-system suppliers, and hundreds of smaller suppliers associated with a complex warship or submarine. Also, while materials such as specialist steels may require little or no further attention once installed, most sub-systems require constant support from an industrial source, including obsolescence management, throughout a platform's life.

7. The RAND studies noted above sent the clear message that the shipbuilding sector should be viewed holistically and needed a regular drumbeat of orders in order to maintain its capacity to deliver. This is complicated by the design and engineering phase and the building phase being at their most intensive at different times: in simple terms, two drumbeats of work flows need to be provided. This is particularly relevant to nuclear submarines which they are amongst the most demanding and complex systems made by human beings. The UK industrial capability is still recovering from the rundown of orders and then employment at Barrow and in the supply chain after the delivery of the last Vanguard class submarine. The workforces of GEC and its successor BAE Systems at Barrow fell from over 14000 in to under 3000. [v] Today the workforce is back up to 10,000 but the company and the MoD have paid a heavy financial price for the interlude in submarine work.

8. In the UK, reconciling national shipbuilding capabilities with competitive tendering is difficult, even logically impossible. In practice, competitive tendering in markets where there are only two or three suppliers, where entry barriers for new firms are high, and when there is a single key customer that places order only every decade or more, often produces unintended consequences. Companies desperate to win a rare contract make highly optimistic offers, delivery is then late and over budget and all parties are unhappy. The unsuccessful bidder(s) then may leave the sector, thus reducing the possibilities for competition in future. These type of developments can also occur down into supply chains when there are few possible providers. Anyone with basic knowledge of the post-1945 evolution of UK and indeed US defence industrial structures would recognise these patterns.

9. Scrutiny of the current UK situation stresses that there is only one firm currently with experience of building the most complex vessels and it would require a multi-year and expensive transformation of Babcock for it to acquire comparable expertise. For the less

demanding requirements, competitive tendering is not easily reconciled with providing the drumbeat of orders that businesses need to justify maintaining their capabilities. The Government has spelled out the ships it wishes to acquire over more than the next decade in addition to the Type 26 and Type 31e frigates that have already been settled, and the two Fleet Solid Support ships where the key procurement decisions are yet to be finalised. The DSIS updated the envisaged pipeline of new vessels which comprised:

- a Multi-Role Ocean Surveillance Ship
- Up to five Type 32 frigates designed to protect territorial water, provide persistent presence overseas and support Littoral Response Groups
- Up to six Multi Role Support Ships (MRSS) to deliver Littoral Strike, including Maritime Special forces, in the early 2030s; and
- A new class Type 83 destroyer which will begin to replace the Type 45 destroyers in the late 2030s.[vi]

10. On the Type 31e, Babcock is using an imported design from Denmark and has not previously generated a warship. On this programme it has committed to tight deadlines and a challenging price. It would appear sensible that, in order to mitigate the risks to the Type 31e, Babcock and BAE Systems should be encouraged to develop a collaborative relationship, building on their joint experience with the Queen Elizabeth class, that facilitates shared expertise. That would imply that they would not be expected to bid against each other in future.

11. More widely, the Government aspires to revive shipbuilding in Northern Ireland, Merseyside and the northeast of England, and perhaps at the Appledore yard to Devon. However if it uses competitive tendering for the FSS and the vessels listed in the DSIS, it will lose control of the allocation of work and discourage the companies involved from making long-term investments. As things stand, the Rosyth facilities have naval shipbuilding commitments that should be finished well before the end of this decade: the Navy has said that all five Type 31e ships should be 'in service' by 2030.[vii]

12. How the MoD-industry relationship will work out will depend significantly on the behaviour of MoD commercial staff, for many of whom competitive tendering on the basis of a specified requirement and passing risk to contractors is an established and familiar way of working.

13. Regarding exports, across the world more and more countries are seeking to build their own defence industrial capabilities. It would be extremely optimistic, even rash, to rely on whole warship exports to make an industrial strategy work. Countries with the aspiration and capabilities to operate complex warships increasingly want to build them for themselves. Sales of smaller vessels for coastal protection can obviously not be ruled out, and opportunities should be pursued, but these will not have the financial or technological significance of vessels such as the Type 26.

14. However, the Type 26 shows that the sale of the right sort of designs can be successful,, with interest apparent in even the US and Japan. The T.26 design would appear to have three particularly positive features. First it was designed to be quiet and thus harder to detect. Second is large and modular, which has meant that it can adapted to take longer range air defence radars and weapons than the UK ship will feature. There is also space for unmanned air systems to be deployed. Third provision has been made for the availability of

significant electric power generation which may prove useful for novel weapons including lasers and electromagnetic systems.

15. The sale of a design is not a one-off activity but should involve continuous cooperation between the designer and the building country, especially when the design has to be modified to meet national needs. Clearly the customer must pay for the extra design-based services it needs. Moreover, while Canada and Australia are generating their own Type 26 versions, UK industry will benefit from all three customers will be using some common ship, sensors and weapon systems including Rolls Royce engines and diesel generators, Ultra hull-mounted and towed sonars, and MBDA's Sea Ceptor missiles (it was announced in April that Sea Ceptor had prevailed over US competitors for installation on the Canadian ships).

16. The companies involved are best placed to estimate cost savings to the MoD from individual exports but, from a strategic UK and corporate perspective, exports of major sub-systems must make a major contribution to a company's capacity to keep and advance its overall capability for development and production in its sector.

17. Looking backwards at industrial performance, both Astute and the Type 45 had significant problems as they entered service, for which arguably industry and government should share responsibility. However, regarding Astute, in April 2019 the Defence Technology website underlined its comparable performance to the US Virginia class vessel alongside Astute being around two-thirds the price. BAE Systems stresses the submarines stealth attributes and the overall implication is that Astute has recovered from its earlier issues.[viii] The fifth boat, HMS Anson, was launched in April 2021.[ix] Once, provided with extra electric power, the Type 45 appears as a very capable system, especially in the surveillance and combat management field. The ship has successfully worked with the US Navy and the protection of US carrier groups. Looking forward, Its defences will need to be upgraded as threats mature from ballistic and hypersonic threats. The Queen Elizabeth class carriers were delivered on time and to anticipated cost once the requirements and government-industry cooperation in the Carrier Alliance had settled down, as were the five OPVs. However initial problems with these ships underlined the need for better quality planning, assurance and verification. Once, provided with extra electric power, the Type 45 appears as a very capable system, especially in the surveillance and combat management field. The ship has successfully worked with the US Navy and the protection of US carrier groups. Looking forward, Its defences will need to be upgraded as threats mature from ballistic and hypersonic threats.

18. In considering UK performance, it is relevant to look at the experience of others. In the US:
    - The Ford class aircraft carrier programme is taking 48% longer than expected and development costs are 18% more than first approved. Its latest unit cost estimate is $12.1 billion;
    - The Zumwalt class destroyer has seen a 122% increase in time to delivery, its development cost has increased by 362% and the latest unit cost figure is $8.7 million per ship. Only three will be built instead of the originally planned 32.
    - The Columbia class ballistic missile submarine is on track, albeit with a unit cost per boat of $8.8 billion with 12 to be built. However, the GAO fears that the labour costs associated with construction may have well have been understated. In January 2021, it reported that problems with the design software will likely cause delays and that the programme has already experienced problems with the quality of materials

delivered by 'an atrophied supplier base'. [x] The overall cost estimates for US nuclear forces are growing significantly.[xi]

- A new programme, ' the Navy's guided missile frigate program is intended to develop a multi-mission small surface combatant based on a proven ship design that provides enhanced lethality and survivability compared to the Littoral Combat Ship.' Despite its modest ambition, it is still scheduled to cost $1.1 billion per ship.[xii] The original Littoral Combat Ship has proved a 'troubled programme' [xiii]

19. On the European continent, while the Franco-Italian FREMM project has resulted in general purpose and anti-submarine variants being built, its consortia struggled to build an affordable air-defence vessel with France halting the Horizon programme in 2005. Two FREMM DA (air defence) ships are being delivered in 2020/2021 . Australia's problems with the Collins class and Barracuda class submarines and its Air Warfare destroyer certainly taught Australia numerous lessons.[xiv]

20. While the chances of cost increases and delays can obviously be reduced by the most appropriate cost estimating techniques, knowledge-based acquisition stages and commercial arrangements including Target Cost Plus Incentive Fee (TCIF) contracts, the fact that delivering complex warships on time and cost is an international phenomenon underlines the overall difficulties that can be involved.

21. Looking forwards, there is always significant risk in the generation of complex, novel artifacts. Hopefully, the advances in digital design, modelling and engineering associated with the Type 26 can assure early performance of and improved support arrangements for the Type 26. However, capturing the full benefits of a digital design, including in the in-service support phase, will require a cooperative rather than a confrontational relationship between the MoD and industry. Also not to be overlooked is that the export success of the Type 26 will put pressure on the production capacity of UK major sub-system suppliers that will be fitted into 32 rather than the initial eight vessels.

22. Defence industrial matters cannot be separated from high level defence and security policy. If the UK is to enjoy operational independence with its Navy, any temptation to fill future British hulls with imported sub-systems, to the detriment of UK high technology industry, will need to be resisted. This is significant in economic as well as strategic terms, since the cost of the hull is a relatively modest element of the overall ship cost.

23. The Navy, with eight Type 26s, six Type 45s and seven submarines, will lack the numbers for a sustained high-end confrontation with two major states. Since the Integrated Review asserts repeatedly that Russia is the most acute threat to the UK and Europe as a whole, and *Defence in a Competitive Age* finds that 'Russia continues to pose the greatest nuclear, conventional military and sub-threshold threat to European security', it seems likely that the 2021 deployment of a Carrier Strike Group to East Asia will henceforth be a very unusual event. The Arctic and the northern passage from Asia seem set to be more important commercially and perhaps militarily.

24. Whether the Royal Navy institutionally is more keen on being able to work closely with the US Navy than it is on operational independence or working with other European navies is not a question I am equipped to answer, but is a significant matter.

Endnotes

[i] There are multiple uses of this phrase in Ministry of Defence, Defence & Security Industrial Strategy, 2021, Defence and Security Industrial Strategy (publishing.service.gov.uk)

[ii] Ministry of Defence, National Security Through Technology, 2012, p.26, National Security Through Technology (publishing.service.gov.uk)

[iii] The United Kingdom's Naval Shipbuilding Industrial Base: The Next Fifteen Years | RAND; Can the United Kingdom Rebuild Its Naval Fleet? Challenges and Opportunities for the UK Shipbuilding Industrial Base, 2005–2020 | RAND; Commercial Shipbuilding Techniques: Can They Be Applied to Warship Production in the United Kingdom? | RAND; RAND_RB9205.pdf; RAND_MG725.pdf; The United Kingdom's Nuclear Submarine Industrial Base, Volume 2: Ministry of Defence Roles and Required Technical Resources | RAND; The United Kingdom's Nuclear Submarine Industrial Base, Volume 1: Sustaining Design and Production Resources | RAND; The United Kingdom's Nuclear Submarine Industrial Base, Volume 3: Options for Initial Fuelling | RAND

[iv] ASC upgrades Shipbuilding facilities in Adelaide to launch $35 billion naval project – Global Defense Corp

[v] Barrow Part 2 (1911 to present) | BAE Systems | International; The Independent, 23 October 2011, VSEL faced with 3,000 more job cuts | The Independent | The Independent

[vi] DSIS p.91.

[vii] Royal Navy formally announces the names of the 'inspiration class' Type 31 frigates | Navy Lookout

[viii] Astute vs Virginia: Which navy has the best nuclear attack submarine? (naval-technology.com); https://ukdefencejournal.org.uk/britains-stealthy-hunter-killer-submarine-the-astute-class/;

[ix] Fifth state-of-the-art Astute submarine is launched | BAE Systems | International

[x] GAO, COLUMBIA CLASS SUBMARINE: Overly optimistic cost estimate will likely lead to budget increases, Washington DC, April 2019; COLUMBIA CLASS SUBMARINE: Delivery hinges on timely and quality materials from an atrophied supplier base, Washington DC, January 2021.

[xi] See Congressional Budget Office, Projected Costs of U.S. Nuclear Forces, 2021 to 2030 (cbo.gov); Patrick Tucker, Estimated Cost of US Nuclear Modernization Jumps 28 Percent, DefenseOne, 24 may 2021, Estimated Cost of US Nuclear Modernization Jumps 28 Percent - Defense One

[xii] All US data from Congressional Research Service, 'DEFENSE ACQUISITIONS ANNUAL ASSESSMENT Drive to Deliver Capabilities Faster Increases Importance of Program Knowledge and Consistent Data for Oversight', June 2020, GAO-20-439, DEFENSE ACQUISITIONS ANNUAL ASSESSMENT: Drive to Deliver Capabilities Faster Increases Importance of Program Knowledge and Consistent Data for Oversight. See also Canadian problems in bringing a coast Guard vessel into service, Paul Withers,, 'New coast guard ship beset by malfunctions, training delays 18 months after N.S. arrival' , CBC, 19 May 2021, New coast guard ship beset by malfunctions, training delays 18 months after N.S. arrival | CBC News.

[xiii] GAO, Fast Facts, Littoral Combat Ship and Frigate: Delaying Planned Frigate Acquisition Would Enable Better-Informed Decisions, Littoral Combat Ship and Frigate: Delaying Planned Frigate Acquisition Would

Enable Better-Informed Decisions (gao.gov), p.

[xiv] See for instance, Robert Macklin, *Air Warfare Destroyer: the game-changer*. Canberra, ASPI, 2018. ANAO-MPR-2017-18-p157-PDSS-Sea4000Phase3.pdf;