Thales response to Defence Committee inquiry: The Navy purpose and procurement

Introduction

Thales is a global technology business operating across the Aerospace, Defence, Digital Identity and Security, Space and Transport sectors. In 2017, Thales contributed over £1.7 billion to the UK's GDP, supported over 27,000 direct, indirect and induced jobs and the average productivity of a Thales employee was over 40% higher than the national average. We pride ourselves on bringing high tech jobs that drive balanced, sustainable growth, and contribute to building inclusive economies, and delivering prosperity to people everywhere across the UK.

Thales UK has a strong maritime offer- with a customer base of over 50 navies worldwide- that reflects our heritage as the sole supplier of periscopes and optronic masts to the Royal Navy for over 100 years to supporting our customers to deliver future technologies and innovation including through our transformative Maritime Mine Counter Measures (MMCM) programme.

Our single biggest offering we provide to the Royal Navy is sensing systems, which range from sonar, radar, electronic warfare capabilities, optics and optronics; we pride ourselves on being the eyes and ears of the Royal Navy. This pedigree has been supported by an export record that has given us the resources to continue to develop our solutions and systems for the Royal Navy, ensuring that they are at the cutting edge.

Although acknowledged, the National Shipbuilding Strategy (NSBS) stopped short of recognising the totality of the "shipbuilding" industry, such as systems; these are a real jewel in the crown of the UK and yet have not been properly considered in terms of Suitably Qualified and Experience Personnel (SQEP) or prosperity, nor as a primary international differentiator in export sales of naval ships. The oversight of this area is something that we hope the NSBS refresh will address.

Part 1 – What is the UK's ambition for the Navy's role over the next 20 years?

1. ***What naval threats is the UK likely to face and what standing commitments, including for NATO and UK Overseas Territories, does the government intend the Navy to undertake? In particular what is the implication of a tilt to the Indo-Pacific?***

- The UK Government through the 2021 Integrated Review has rightly highlighted both the strategic advantage that can be gained through science and technology and the role of maritime to ensure global security and prosperity at home. Through the exploitation of next generation technologies and the strength of the totality of the UK maritime enterprise we can secure operational independence where it matters.
- The environment in which the UK armed forces are expected to operate in is changing at an ever increasing pace. With the range of actors and technologies that are being employed on the battlefield increasing exponentially and the emerging grey zone posing ever more complexity, innovation and rapid exploitation of technology through experimentation will be at the heart of being able to adapt the armed forces.

- Gaining operational advantage from data, whatever the mission, will be as valued as traditional maritime platforms and equipment. This includes the need to operate collaboratively and share intelligence in near real time with our allies and partners. A persistent presence in the Indo-Pacific region will drive us to address the challenges of interoperability between increasing numbers of nations. Intelligence sharing is facilitated through common systems. Thales is supporting this already through its sonar offer into the Hunter Class. We are also offering our EW solution to Japan.
- The logistics and support model for a more deployed Navy will need to change with a ripple-effect through the whole support chain.

2. ***What naval forces (vessels, capabilities and bases) are required to combat these threats and to deliver these standing commitments? What are the implications of cooperation with vessels from allied nations, for example allied vessels participating in carrier strike groups?***

- In the current threat environment, Thales believes that Defence must focus on transformative technologies- including autonomy, big data analytics, cyber security, artificial intelligence and connectivity- with the operational imperative to improve platform lethality, survivability, availability and affordability.
- It is critical to recognise that in terms of military ships, the age of ship design as ultimate test of survivability (compartmentalisation, armour plating etc.) is now past. Anti-ship missile technology is now at the point that even at extremely long ranges, a single missile hit probably now represents a definitive kill. So accurate, real-time information that enables an instant reaction to a threat becomes even more important.
- Once committed to a hull design, the only route for spirally defeating threats and maintaining military advantage is through the systems, sensors and effectors. Rapid capability insertion is a necessity as the need for systems development outpaces the cycle of the platform. It is in this space that the greatest technical changes are occurring and where the greatest burden of research and technology spend falls.
- Algorithms, cyber protection, digital connectivity and AI development will all be manifested in the systems space first. Operators are required to deal with massive volumes of data from maritime systems on board and, increasingly off-board the platforms. Making sense of this data can be assisted by these digital technologies, and a step change must be taken to move to new mission systems architectures that allow more access to data (to provide more insights) and that process the data in different parts of the system (to deal with overload).
- In terms of connectivity, Thales has recently delivered an extensive naval communications upgrade on board HMS Queen Elizabeth that will enable the Royal Navy to establish an additional command operations centre on board and direct a multi-nation task group.
- Additionally, Thales's Multi Domain Mission Support System (MD MSS), high-tech data system providing UK defence platforms with key operational information and improved situational awareness, is installed on the Royal Navy's new aircraft carriers, to support air operations by the Carrier Strike Group.

- Digital trust in architecture and systems becomes even more important as we depend on data collected by a growing number of off-board assets, including those of partners and allies in a collaborative force.
- Sharing of data is becoming increasingly important yet many of the security concerns remain, especially in the most sensitive areas. Nations will only share data and operate with the UK if they can trust the UK's security process and integrity of their systems which use that data.
- Other assets and technologies that might be considered include:
    - Surface and Sub-surface vessels, potentially augmented with autonomous or semi-autonomous surface and sub-surface vessels.
    - Compatible or integrated Comms and Data systems (offensive and defensive) – digital combat cloud.
    - Ability to exercise synthetically to keep tactics and Concept of Operations (CONOPs) fresh between allied nations between deployments.
    - Interchangeability of assets in the force mix (crewed/uncrewed), and the sharing of elements between nations e.g. US F-35 on UK Carrier.
    - Capabilities to enable military forces to manage and control the electronic environments where they operate and to surpass the capabilities of the threats they face, ultimately supporting survivability.
    - Effectors like Laser-based directed-energy weapons

Part 2 – Are naval procurement and support plans delivering the capabilities required for this role?

5. ***The Navy's Hunt and Sandown Mine Counter Measure Vessels will be replaced by an Autonomous Mine Hunting Capability currently under development. How likely is this to be able to replicate the vessels' full contribution, including to partnerships with allies through deployments like Op KIPION, by the time they reach retirement in the early 2030s and what are the implications if it does not?***

- Thales is working alongside the Royal Navy to manage the transition from manned mine warfare vessels to unmanned, as well as supporting the refurbishment and sale of Sandown Mine Counter Measure vessels to other nations. As part of this roadmap, the Royal Navy may want to consider a hybrid capability, where autonomous assets are added to conventional mine warfare vessels to facilitate the transition to autonomy. The common command system between the Royal Navy's mine warfare vessels and the new autonomous capability developed together with the French Navy makes the insertion of autonomous assets onto a traditional vessel a straight forward proposition.

    a. ***What other progress is being made on integrating UAVs into the Navy?***

- In the military domain, the Royal Navy is re-capitalising much of its fleet in the coming years and at the same time having to develop ways to exploit digital technologies. Autonomous systems (and related digital technologies) are seen as a huge enabler to extending the capability of the fleet (filling gaps, extending reach, multiplication of force), and provide a way to do the same

missions in a different way (new CONOPs), for more operational effect. They allow high value personnel and manned assets to be engaged in other tasks.

- Thales's main sensor products are critical to the mine warfare role of the Sandown and Hunt Class mine countermeasures vessels and we are now delivering the Maritime Mine Counter Measures (MMCM), a joint programme between the UK and France to harness the potential of maritime autonomy in the mine-hunting role and reduce the risk to personnel in the minefield.
- In order to move quickly through the development cycle, Thales opened its Maritime Autonomy centre last year in Turnchapel Wharf Plymouth, primarily to support the Maritime Mine Countermeasures (MMCM) programme, but it is being used for a variety of trials and experiments for defence and civil customers. This compliments the already well established Thales UAV Test and Training Centre at West Wales Airport that successfully hosted Unmanned Warrior in 2016 and delivered high end UAV trials and test capability to MOD on a daily basis.
- Turnchapel is rapidly becoming a hub for the vibrant and diverse marine and maritime autonomy ecosystem in the South West. We believe that MoD could find more efficiency by maximising use of such technology themed facilities and avoiding duplication.
- The Unmanned Surface Vessel (USV) Halcyon is based at Turnchapel and has been extensively used as a research and development platform. It has been used to explore different ways of controlling an autonomous boat, including bio-inspired routing. Halcyon has also been used to investigate the opportunities for hosting other platforms, for example, Unmanned Air Vehicles (UAV).
- Given the market trends and challenges to be solved we have a plan for a more expansive Operations Centre, building on the current Turnchapel footprint and capabilities, developed to manage global Maritime Autonomous Systems (MAS) operations. Our vision is that the Operations Centre will include digital tools to explore; CONOPs, prepare and de-risk missions, store and exploit information, build and import digital twins of assets. [i]
- As part of this activity, Thales is developing an environment digital twin of Plymouth Sound, its autonomous systems and key infrastructure. The use of the synthetic environments will be increasingly import to the rapid and safe development, test, evaluation, and certification (assurance) of future autonomous systems operating in the maritime environment and any supporting infrastructure as part of an integrated system of systems.
- Thales is also exploring the possibility of using autonomous systems in the ASW domain and leveraging its existing experience to develop systems of systems which will provide persistent surveillance in the undersea battlespace. The expertise we have in autonomous systems of systems combined with our knowledge of undersea communications and the maritime ecosystem we have developed around our Turnchapel site will be brought to bear.
- These technologies are more widely used in the civil domain. They are not as easily brought into military systems due to long procurement times for the ships, submarines and aircraft, combined with high security requirements and the consequences of poor resilience and untrustworthy data sources. However the maritime operational environments in both domains have many of the same characteristics, such as; being highly safety critical, relying on high value assets, the importance of mission success, scarcity of human capital, and demanding security requirements. Both environments are working on the regulatory frameworks to allow safe and

secure operation of autonomous systems - a critical enabler to unlocking the benefits of autonomy.

- As Thales serves customers across both domains, we are well positioned to solve many of the same problems involved in exploiting autonomy.
- We have had significant experience on the Watchkeeper programme in as a Systems Integrator bringing together the autonomous systems, their sensors and the communication networks to deliver true information advantage in the maritime domain, operating from the land, air and sea.

6. ***Is the UK's domestic shipbuilding industry able to fulfil its role in delivering the country's naval capabilities? What has been the effect of the National Shipbuilding Strategy? Does the government's decision in the Defence Industrial Strategy to determine whether to invite foreign competition on a case-by-case basis (rather than just for warships) increase or decrease the opportunities for UK shipbuilding? What will industry need to see in the government's forthcoming update to the National Shipbuilding Strategy and 30-year plan for Naval and other government-owned vessels?***

- As the UK's major systems and naval sensor provider, Thales' experience of contract letting in this sector is that design of, and orders for, systems is often left until very late in the ship construction process. In many cases, system requirements are not clarified until only a few months before the hull construction is due to be completed. This can drive suboptimal system designs and adds significant delays to the final ship construction timelines; however, the Type 31 programme- which Thales is teaming with Babcock on to deliver- was markedly different from this and involved early coming together of hull and systems design.
- This lack of forward planning alongside the physical ship building drives the same set of "boom and bust" inefficiencies into the systems ecosystem as National Shipbuilding Strategy (NSBS) 2017 tried to eradicate in keel laydown cycles.
- Furthermore it creates disconnection between the systems and the shipbuilding narrative, generating an unnatural tension between the UK shipbuilding narrative and the realities of delivering a total capability either to the Royal Navy or export customers.
- Growing a competent and expert SQEP in this area is a recognised global challenge – growing the expertise required to sustain the high tech jobs required is currently completely disconnected from the wider shipbuilding narrative. Compared to the push for a "Generation TEMPEST" cadre of experts capable of supporting the UK's ambitions in Combat Air, there is little currently outside of shipyard activities to provide a framework for the "Generation Digital Blue Economy". Without this, it is unlikely that the UK will be able to grow or attract the talent (and the associated investment) that will drive world class maritime systems, sensor and digital capabilities. It is also important that the UK maintains continuity in the areas that are significant to our national security strategy and prosperity to enable skills to be transferred from one generation to the next.
- **The update to the NSBS should include:**
    - Highlighting the criticality of sensor systems to Assured Capability, both in terms of operational advantage and operational independence. The skills and experience needed to manage a complex sensor system through-life are vested in the governance of the

system (through the system design authority role), signal and data processing software, and the design and manufacture of specific modules.

- This is the same for Sonar, Electronic Warfare (EW), Radar, Communications and visual systems. These capabilities are the kind of global market differentiators that the UK can offer – the UK already has strong recognition globally for its expertise in these areas and a strong export track record - and the NSBS should recognise that. Domestic decisions to procure non-UK capabilities in these areas will diminish this reputation and reduce export potential.
- There are certain capabilities that the UK should seek to retain as home grown, often for security purposes. If such capability is to be procured via competition, with foreign companies invited to participate then they need to demonstrate how they will develop the technology within the UK to address security and so it can be supported from within the UK. There is a big difference in terms of independence and operational advantage between body shopping manufacture in the UK and having the System Design Authority as a fully sovereign UK National asset.
- We can see examples from our international partners where a focus on price to drive acquisition strategies of complex combat systems can have consequences that ultimately can be more expensive for the taxpayer. The very public withdrawal of the Battlefield Management System from the Australian Land200 programme demonstrates the huge operational and financial risks that can arise from such a focus; the inability to satisfy interoperability and security concerns has led to millions of Australian dollars of waste. This example also reinforces the importance of having systems with which our main ally- the US- is prepared to operate alongside.

7. ***How realistic are proposed exports of Type 26 and Type 31 frigate designs and what effect would they have on costs of the frigates for the UK? Since most foreign buyers will seek to produce ships domestically, how much value are these export deals likely to deliver to UK shipbuilding?***

- We firmly believe that exports are an important part of the virtuous circle in defence and we were pleased to see the DSIS make reference to that. Exports are vital to the development and improvement of technologies that benefit the UK but are not reliant on UK tax-payer funded R&D.
- The economic benefit assessment of shipbuilding in the UK should include the full contribution of the enterprise. It should recognise that the UK gains value from across the global addressable market, even if physical shipbuilding is not part of the export solution- it is worth noting that systems and architectures are around half of the total value of a ship.
- Through the role of the UK as a key reference customer, UK procurement decisions have a huge impact on export success and as a result the value delivered to the UK through export deals.
- Benefits to the UK of the export of naval systems include:
    - Direct financial benefits of increased; job creation throughout the UK supply chain, direct and indirect tax revenues and gross value added impact of Thales on UK GDP.
    - Lower UPC for the Royal Navy through the driving down of supplier prices as volume increase, as well as increasing the through-put on the manufacturing lines, resulting in

improved obsolescence management and providing a platform for continued technology development and enhancement.
    - The non-recurring engineering burden on a single customer will also be reduced as the size of the user group increases, as the cost of new developments can be shared.
    - Military capability benefits; interoperability with allies will be supported through shared capabilities, providing an avenue to further strategic G2G relations that can be utilised with partners in contested and hostile areas.
- The costs of not taking into account export can also be significant; as an example, the procurement for the Royal Navy Electronic Warfare capability did not provide an opportunity to discuss the exportability and prosperity benefits of a circa. £1bn export pipeline and the impact of the UK decision on that pipeline and the long-term sustainment of a UK EW capability across the full depth of supply chain.

8. The government's Defence Industrial Strategy promises up to five Type 32 frigates and a new class Type 83 destroyer but no further details on these ships' designs and roles have been provided: how can the government learn from previous programs in designing and delivering these two ships?

- Type 31 was emblematic of the step change in thinking across the UK defence maritime sector. The focus on bringing together the best that the market could offer at a competitive price, with an aggressive delivery timeline was a true disruptor in the original NSBS.
- Thales believes that future programmes need to take another bold 'next step' and prepare for the world of 2030 and beyond. In a decade where autonomy will be the norm, driven by AI systems connected to a flexible, globally accessible digital backbone, all tested in a digital twin, the types of capability and thus the industrial base required to deliver this will need to change.
- Rather than starting from the platform build, we need to take a systems and digital-first approach together with a focus on building trust in autonomous systems.
- A containerisation approach allows the role of a ship to change at pace depending on needs of the geographic area it is operating in, with different missions systems being loaded / changed over quickly.
- In order to do this successfully, there needs to be the ability to quickly and seamlessly integrate into the combat system, driving the need for open architectures. This needs to encourage, not stifle, competition and, subsequently, innovation.
- A blended fleet and ability to change roles of ships in the future via 'containerisation' needs truly open architectures. To help mature thinking in this space Thales has developed the T-X Ship concept, alongside a broad UK industrial team, to explore and demonstrate how that could be achieved in the future surface fleet.
- Whilst this is just a conceptual exercise, T-X Ship is intended to demonstrate a transformation in thinking especially in terms of technology and CONOPS. We have tested the feasibility of a transition from lean-crewed to un-crewed operations, as the trust in autonomy builds. The clean propulsion roadmap draws on dual-use technologies. Digital-first means that T-X would be designed, developed, and tested utilising digital twins. This novel design approach enablers a higher refresh rate of platform systems with the spiral development of capabilities.

- We would like to see the thinking behind the T-X Ship supporting the T32 concept, especially around how autonomous systems of the future will be developed, tested, industrialised, procured and operated. We believe that the concept could be developed into the type of ground breaking national programme that would bring together the maritime sector as has been seen in the aerospace sector. This would support the levelling up agenda, driven by truly world leading innovation and investing in next generation skills across the ship building enterprise.

[i] A digital twin is a model that recreates a real-world object or system in digital form. What makes digital twins so valuable is that they not only help you to understand what's happening in the real world, but also to carry out experiments and explore "what if" scenarios.