

resulting analysis should, therefore, be viewed as representative of the impact of various decisions, not as definitive predictions of future events.

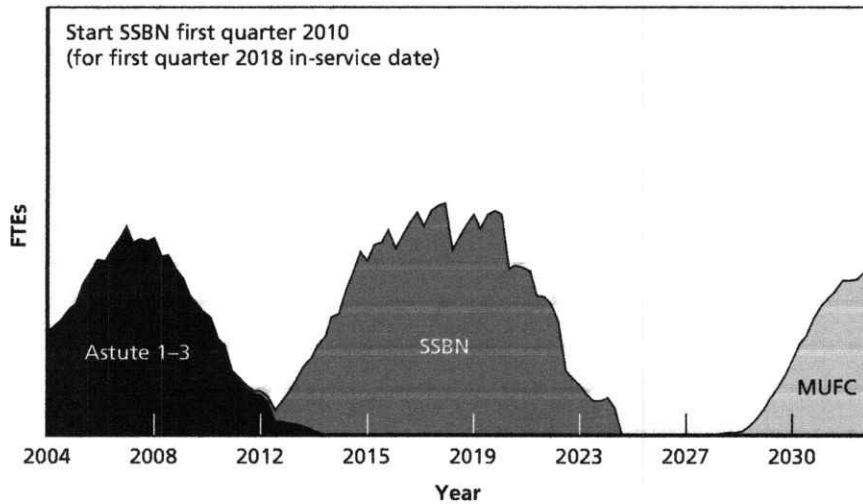
As in the design analysis, we begin by assuming the MUFC will be a class of submarines and by fixing the start of its construction. Again, the first MUFC boat should be delivered in 2034. Assuming a seven-year build period for the first of class, the first MUFC should start construction in the first quarter of 2027. With this starting point, we next turn to how best to schedule production of the follow-on SSBN class to provide efficient use of production resources.

Timing of Production for the Next SSBN Class

If the Vanguard class is held to its originally planned operational life of 25 years, the first of class will leave the force structure in 2018. Assuming an eight-year build period for the first boat of the next class, construction would have to begin in 2010. The impact on the demand for FTE production resources at Barrow is shown in Figure 3.4. The workload demand for the first three Astute-class boats is based on the Barrow estimate for completion of the current contract (see Figure 3.1). We use the projected hours for the third boat as an estimate of workload for future SSNs (including the MUFC). Finally, we assume that an SSBN would require 50 percent more hours to build than an SSN and that four SSBNs will be built.

Two problems from the production base perspective exist with a 25-year Vanguard class life. First, there is little time to produce additional boats of the Astute class before the SSBN programme begins seriously competing for production resources. Scheduled retirements of the current in-service submarines will lead to very low SSN force structure levels if additional Astute-class submarines are not built in the next decade. Second, there is a substantial gap between the end of the follow-on SSBN production and the start of the MUFC production.

Figure 3.4
Projected Workforce Demands at Barrow for a 25-Year Vanguard Class Life

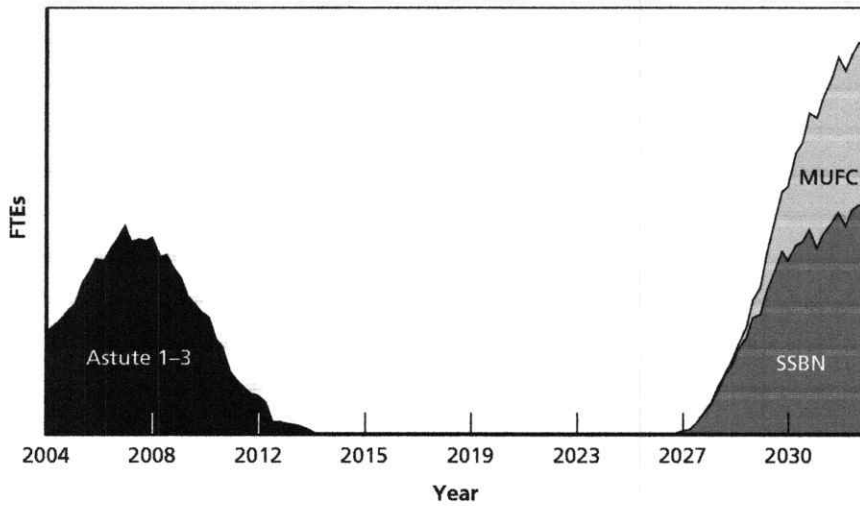


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Figure 3.5 shows the impact on the demand for production resources of a 40-year Vanguard class operational life. The problems here are perhaps even worse. Although there is plenty of opportunity to finish the Astute programme unimpeded, there would be a long gap between the production of the last Astute-class boat and the start of the SSBN follow-on programme. Furthermore, the coincidence of production between the MUFC and the follow-on SSBN boats would require a daunting increase in production resources.

To maximise production base efficiency, we should begin by setting an optimal overlap between the SSBN and MUFC programmes to ensure a smooth transition. The SSBN drumbeat and construction duration (assumed to be eight years) would then determine when the programme should start and when the Vanguard class should begin to retire. Based on the experiences of previous UK and US build programmes, we infer that an approximately five-year overlap would provide the smoothest workforce transition between the

Figure 3.5
Projected Workforce Demands at Barrow for a 40-Year Vanguard Class Life



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end of one programme and the beginning of the next. With the MUFC starting construction in 2027, the efficient use of production resources suggests that the follow-on SSBN programme should end construction in 2032. Table 3.1 shows, in each cell, when the first SSBN boat must start construction and the range of ages of the Vanguard-class boats when they are replaced,⁵ given the specified combination of SSBN drumbeat and fleet size. (Although we have so far been assuming a fleet size of four boats, we allow here for the possibility of a three-boat fleet.)

For a future force of four SSBNs, an efficient transition to MUFC construction and reasonable drumbeats of 24 to 36 months suggest a Vanguard-class operational life of between 30 and 34 years.

⁵ We assume a Vanguard-class boat is replaced when a follow-on SSBN boat is delivered. Because the Vanguard-class boats were not delivered to a set drumbeat, the age of each Vanguard-class boat varies at retirement.

Table 3.1
Start Dates for a Follow-On SSBN Based on Drumbeats and Force Levels

SSBN Force Size	SSBN Drumbeat		
	24 Months	30 Months	36 Months
4	First quarter 2018 (32 to 34)	Third quarter 2016 (31 to 33)	First quarter 2015 (30 to 33)
3	First quarter 2020 (34 to 36)	First quarter 2019 (34 to 36)	First quarter 2018 (33 to 36)

NOTE: Each cell shows production start of first of class of follow-on SSBN programme and in parentheses the range of operational lives of Vanguard-class boats.

This result is consistent with the analysis of sustaining design resources. If a force structure of only three future SSBNs is desired, then the operational life of the Vanguard class increases by a few years.

Given the follow-on SSBN start dates and drumbeats, we can place a labour-demand profile on the timeline. Figures 3.6 and 3.7 show the profiles for a four-ship SSBN programme with drumbeats of 24 months and 36 months, respectively. The quicker SSBN drumbeat results in a slightly higher peak demand for production workers than is required for the following MUFC programme. The slower drumbeat⁶ provides an almost uniform demand for production workers at Barrow as the workforce transitions from the follow-on SSBN to MUFC production.

Fleet Size and Production Timing for the Remaining Astute-Class Submarines

We have shown how SSBN fleet size and drumbeat determine a start date for SSBN construction. SSBN construction will be preceded by

⁶ A drumbeat that is too slow may result in inefficiencies at the skill level. Such potential skill-related problems are discussed later in this report.