



Shipbuilding Contract Risk Sharing

A White Paper
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Background and Analysis

The U.S. Navy and its shipbuilding programs have faced numerous challenges during the past decades, marked by significant cost overruns, delays, and other technical and programmatic issues. The Littoral Combat Ship (LCS) and the DDG 1000 destroyer programs were turning points towards today's unfortunate circumstances where misalignment on design baselines between industry and Navy have resulted in delays and cost increases across multiple programs. Numerous studies, testimonies, and initiatives have been conducted to better understand and remediate the performance of new ship construction programs, with remarkably little to show for these efforts.

While complex and seemingly intractable, the current acquisition situation presents an opportunity for a fresh perspective. Despite their agreement that new ship acquisition is flawed, the gridlock between industry and the Navy can be effectively addressed with a systems approach. By implementing such an approach, the stakeholders for Navy shipbuilding can together cut through the complex challenges and gain a clearer understanding of the behaviors contributing to the gridlock, making progress towards improvement.

To this end, SMA, Inc. conducted a high-level systems dynamics assessment during the past several months. This work has led us to conclude that there is a critical misalignment between industry and Navy that, if resolved, can help unlock the many barriers to restoring program performance. Our analysis demonstrated that Navy shipbuilding contracts over the last several decades have shifted risk disproportionately to industry without concomitant and explicit changes to how the Navy and industry manage the programs, significantly contributing to delays and cost overruns. This is not surprising given that the competition for LCS attracted a wide range of industry participants, including those beyond the traditional well-established Bath Iron Works and HII, giving hope that fresh market competition would enable new government management and contracting approaches beneficial to the taxpayer and the U.S. Navy. Yet at the time, and since then with continued gradual changes, the consequences were not fully understood, and the root cause became

obscured by numerous factors such as shifts in the economy making it difficult for industry to maintain shipyard capacity and workforce, and the lack of a compelling business case to modernize infrastructure due to frequent changes in naval ship procurement plans.

Our analysis highlighted the following specific areas of significant risk:

1. Lack of a design baseline at contract award,
2. An excessive number of Contract Deliverables (CDRLs),
3. Intensive involvement of the Government through numerous reviews and working groups,
4. Migration of combatant ship survivability requirements to amphibious and auxiliary ships,
5. Uncertainty in option exercise dates,
6. Worsening of payment terms,
7. Escalation provisions that do not reflect shipbuilding conditions,
8. Lengthening of the guaranty period and increase in liability, and,
9. Introduction of impactful government changes late in the design or construction phase.

Our analysis shows that while each area has specific issues, there is an underlying common factor driving negative outcomes. Namely, untested assumptions and deeply held beliefs by industry and the Navy about each other's motivations create a lack of trust and prevent productive conversations on critical topics, which ultimately results in poor performance.

Introduction

The focus of this paper is the first of the nine identified risk areas: lack of a functional design baseline at the time of contract award. This paper provides recent examples of ship design uncertainty, driven by the lack of a functional design baseline at the award of the detail design and construction contract, and proposes options for rebalancing design risk to obtain predictable lead ship cost and schedule. We address the other identified areas of risk, both from a government and an industry perspective, in a subsequent presentation as part of an integral view of the topic.

Challenges emerge for new ship acquisition programs with the invocation of detail design specifications that take precedence over the shipbuilder's proposed functional design during detail design:

- Navy (i.e., NAVSEA) includes thousands of pages of detail design specifications that are finalized as part of the RFP.
- Then, post contract award, NAVSEA unilaterally interprets these design specifications during review of the technical deliverables that must be approved by independent technical warrant holders.
- NAVSEA's interpretation of how the specifications require modifications to the proposed functional design results in many uncompensated changes and inevitably delays the Critical Design Review (CDR).

On past surface ship programs such as DDG-51 and LPD 17, NAVSEA 05 led the development of a preliminary design and the subsequent contract design with industry involvement. The contract design established the functional baseline with approximately one hundred drawings/diagrams and an approved build specification developed in concert with industry. The RFP for Detail Design and Construction (DD&C) included the contract drawings and build specifications that the shipyard followed in developing the detail design for the ship's construction. This provided a stable starting point, and any changes to the contract design drawings or build specifications were compensable under the change clause.

In recent years, the Navy has shifted to industry-developed preliminary designs through funded study contracts that inform Navy program requirements. Feedback is provided to the Industry Teams through design reviews where non-compliance and risk areas are identified. Upon completion of the study contracts, the Navy issues an RFP for Detail Design & Construction (DD&C) with an updated System Specification. As part of the proposal, the shipyards revise their preliminary designs with significant expenditure of resources to conform to the changes in the System Specification and provide design artifacts similar to what the Navy used to provide as a contract design. Upon award of a fixed price incentive fee (FPIF) contract, the shipyard commences

detail design without an approved functional baseline that is then matured with intense Navy involvement through numerous reviews and working groups. After hundreds of design deliverables are submitted, reviewed, comments resolved and finally approved, the CDR is conducted. Upon successfully resolving any open issues, the Navy approves the design baseline—well after the initial contract has been awarded causing additional delays.

This change in approach since LCS and DDG 1000 has shifted the design risk largely to industry. The functional design that is proposed forms the basis for the detail design, but it is subject to the interpretation of thousands of pages of specifications by independent technical warrant holders without responsibility for cost or schedule. The result is significant delays in conducting CDR, uncompensated changes, and building a very different ship from the one proposed and priced. Because of this process, it is not uncommon, nor surprising lead ships are late and over cost.

The Navy believes this approach is rational for several reasons. It allows the Navy to retain control over the design and eventually approve its desired design. Contractually, the service believes it is on firm grounds because the System Specifications are part of the contract requirements. However, this approach fundamentally results in material changes, and therefore, the use of fixed price contracts for DD&C is inherently incompatible with the process because the functional baseline is not firm at award, and what eventually is built is not what formed the basis for the bid price. Specific recent examples are examined to highlight the challenges of the current approach to DD&C.

Examples

Four recent naval ship procurements were chosen to spotlight the impacts resulting from a lack of a design baseline at release of the RFP for DD&C and subsequently at award. The *Constellation* class frigate is a clear example with its lead ship delivery delay estimated to be 36 months. The TAGOS-25 Ocean Surveillance Program is a variation on the theme with additional funding needed to award the lead ship and the contract restructured to fund detail design separate from the construction thereby delaying the procurement of follow-ships at

an increased price. Similarly, the added complexities to the AS(X) Submarine Tender Replacement had only one bidder because of requirements instability and has reverted to design studies to reduce costs. Finally, the ongoing Medium Landing Ship (LSM) procurement has seen a growth in requirements and costs similar to the others with Congress likely to authorize and fund just the design portion in the FY25 NDAA and Defense Appropriations Bill. Without action by the Navy, the LSM program will see similar delays and challenges as other named programs.

Constellation Class Frigate FFG-62

Concept Design (CD) study contracts were awarded in February 2018 to five teams: Austal, GD Bath Iron Works (BIW), Fincantieri Marinette Marine (FMM), HII Ingalls, and Lockheed Martin (LM). The designs had to be based on an existing in-service parent design modified to meet U.S. Navy requirements. The requirements were provided in a systems specification that was a mix of performance and design specifications that evolved during CD to a final version of over 3,000 pages. The designs were developed over 16 months under firm fixed-priced contracts valued at \$23 million with the addition of significant industry investment by each team. Monthly technical exchange meetings focused on design aspects such as the structure, propulsion system, and the electric plant. Formal two-day design reviews were conducted at the midpoint and end of the study contract, with the Navy providing notice of any significant non-conformances and risks. It is important to note that NAVSEA technical warrants were informed not to provide their preferences during the reviews because of the ongoing competition. While named Concept Studies, the level of review and design artifacts were equivalent to a Preliminary Design Review for a Major Defense Acquisition Program.

The RFP for DD&C was issued in July 2019 following the completion of the study contracts. The offerors were required to provide 100+ design artifacts equivalent to a contract design as part of the technical proposal. FMM, the winning contractor, proposed a

frigate based on the Italian FREMM parent design with the hull elongated and displacement increased by approximately 500 tons for design margins and future growth. At the time of award in April 2020, the functional design shared 85% commonality with the original FREMM design. Unfortunately, as reported in an April 2, 2024, article by *USNI News*, “alterations have brought that commonality down to under 15%.”¹ FMM had proposed to conduct CDR 14 months (and construction within 15 months) after the award, assuming it had a stable, functional baseline as the result of two extensive design reviews during the concept design study contract, correction of identified weaknesses during the proposal discussion process, and their selection as the awardee.

Unfortunately, the NAVSEA technical warrants continued to impose unilateral design changes without a balanced consideration of cost, schedule, and contract factors with the program stakeholders, resulting in a CDR 24 months into the contract and construction delayed to August 2022, a 10-month delay under a firm-fixed contract. These issues were called into sharp relief in GAO’s May 2024 Report² on the *Constellation* class that “*As of February 2024, over a year and a half after beginning construction, the Navy and its shipbuilder had successfully closed (approved) 168 CDRL items while another 343 remained open (not approved).*” It is not a surprise that SECNAV’s recent review of shipbuilding programs found that the lead frigate delivery delay has now grown to 36 months. While some of the delay is due to staffing and supply chain issues, a significant portion is due to changes required by NAVSEA to the proposed design.

T-AGOS Ocean Surveillance Ships

Industry design study firm fixed-price contracts were awarded in July 2020 to four teams: BMT Designers and Planners/Philly Shipyard, Bollinger, Toma-Sea Marine Constructors, and VT Halter valued between \$2.17 and \$2.78 million. The Navy used the industry studies to inform its understanding of design-cost tradeoffs in support of the RFP for DD&C initially intended to include a Navy developed contract

¹ <https://news.usni.org/2024/04/02/constellation-frigate-delivery-delayed-3-years-says-navy>

² <https://www.gao.gov/products/gao-24-106546>

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design. The resulting size and cost were much larger than anticipated due to the significantly higher speed required over previous ships (20 vs. 12 knots), increased crew accommodation, low noise requirements, and larger mission equipment.

The RFP for DD&C was issued in November 2021, requiring the offeror to develop the contract design versus the Navy providing one (no reason was provided). In recognition of the design effort thrust upon industry, proposals were initially not due until April 2022 subsequently extended to May 2022 to provide additional time for industry to develop designs meeting the System Specification (well over 500 pages) and prepare the extensive design artifacts (drawings, diagrams, analysis, etc.) that were required. The RFP included the following statement regarding the proposed design:

"The award of the DD&C Contract does not indicate that the Government has approved or certified the design provided with the proposal."

Only two teams submitted proposals: Bollinger and Austal/Toma-Sea/TAI. Philly Shipyard chose not to bid without a Navy Contract Design, and VT Halter was consumed with its DD&C contract for the Polar Security Cutter. Both offerors were well over the Navy's budget leading to a long round of discussions over cost drivers where the Navy decided to retain the existing requirements. Consequently, the Navy postponed the contract award until May 2023, when it awarded Austal with a \$113.9 million firm fixed price contract for detail design with fixed-price incentive options for up to seven T-AGOS ships. The first ship was budgeted in FY22 to cost \$434.4 million and has subsequently grown to \$789.6 million in the FY24 budget—an increase of \$355.2 million, or 81.8%.

SECNAV's 45-Day Shipbuilding Review did not provide an assessment of the T-AGOS program stating it was TBD as a new program start. However, without an approved functional design and with the likely same intense involvement of the Navy through numerous reviews and working groups, and hundreds of CDRLs to be reviewed and approved, it is likely that delays will occur along with additional increases in the cost of the ships.

Submarine Tender Replacement AS(X)

Preliminary Design Study firm fixed-price contracts were awarded in April 2022 to HII Ingalls, L3Harris (L3H)/Philly Shipyard and GD NASSCO for \$3.0 million. Additional work was authorized in FY23 extending the period of performance through September 2023 and total value to \$6.0 million. The Navy continued to add requirements through the study including late addition of shock requirements despite industry informing the Navy that the existing requirements could not be met within the lead ship budget. Other significant cost drivers include speed of 20 knots, tending services, cargo stowage, and accommodations.

The RFP for DD&C was issued in July 2023 before the end of PD with a revised System Specification (500+ pages) that included shock requirements. The RFP included the same comment as T-AGOS regarding the proposed design not being approved at contract award. The teams could not provide designs that met the Navy's budget and, in the end, only NASSCO submitted a bid. Congress marked the lead ship budget submission in FY24, zeroing SCN and providing \$100 million in RDT&E for cost trade studies, ultimately delaying the ship's acquisition by several years.

Medium Landing Ship (LSM)

Industry concept design studies were awarded in June 2021 to five teams: Austal, Bollinger, FMM, TAI Engineers, and VT Halter with follow-on options for preliminary design which were subsequently exercised. The value of the CD/PD fixed price contracts were \$3.1–\$3.3 million. The designs were based on parent designs modified to meet evolving requirements through a series of impact studies. As with AS(X), the Navy continued to add requirements, including shock and firefighting systems which drove the cost of the ships well above the \$150 million average initially estimated by the Navy.

The RFP for DD&C was released in January 2024 with a revised system specification (1000+ pages) that included shock requirements and additional requirements for cargo and accommodations. This required the industry teams to conduct another design spiral and provide a full set of contract design artifacts for the technical proposals submitted in

May 2024. Unfortunately, the additional requirements have pushed the cost well above the lead ship FY25 budget submission of \$268.1 million. An April 2024 Report from the CBO estimated the costs could be 3–4 x Navy estimates. In initial FY25 marks, Congressional Committees have reduced SCN funding to just the design portion.

Though the Marines have been vocal about the misalignment between mission, design requirements, and affordability, no one, including industry, has the courage to question the underlying assumptions of the acquisition strategy and productively prevent the impending train wreck. The current structure of behaviors between industry and Navy developed over the past two decades creates a downward spiral from which it is difficult to recover until the inevitable crisis happens. This may be a perfect opportunity to re-examine how detail design is performed. The LSM RFP contained the now standard statement that “The award of the contract does not indicate that the Government has approved or certified the design provided with the proposal.” This begs the question of what is being bought.

Potential Options for Rebalancing Risk

Given the above examples that demonstrate challenges across four classes of ships in as many years to face delays and increased cost because of lack of detail design, there needs to be an assessment of how detail design is performed. Potential other approaches are explored as well to re-balance risk to ensure future programs are on time and on budget.

We believe the current approach to detail design and construction of the lead ship does not meet FAR Part 16 criteria for using a fixed-price type contract because the functional baseline is not established at award and an extraordinary number of design specifications are invoked with inherent conflicts. The Navy would have to formally open a price renegotiation at this point, potentially invalidating the source selection or inviting a formal challenge by one of the losing shipbuilders.

Several potential options for rebalancing design risk include the following:

- **Establish a Contract Design Functional Baseline at Award**—either use the shipyard-proposed functional design or a Navy-provided contract design. Changes to the baseline must then go through a Configuration Control Board (CCB) chaired by the Ship Program Manager, and adjustments must be made to the contract. Under this model, continued use of FPIF terms is appropriate and within the FAR.
- **Change Contract Type for Detail Design**—if the Navy desires to continue down the path of not establishing a design baseline at award, then a cost-plus-award-fee contract for detail design would be more appropriate. There would then be separate long-lead material and construction contract line items (CLINs) under fixed-price terms negotiated upon completion of the appropriate design review. These could be preliminarily priced with the initial proposal as not-to-exceed prices to provide cost control.
- **Limit NAVSEA Technical Warrant Holder's Authority**—scale back technical warrants to critical areas of the design such as stability and structural design (areas that could result in loss of the ship), while other areas such as auxiliary systems and outfitting come under the Ship Design Manager's authority in concert with the Program Manager. Requirements must better serve OPNAV goals and specifications balanced to lower costs and shorten design cycles. The technical warrant approach was devised to protect a core number of NAVSEA 05 engineers during downsizing in the late 1990s and 2000s. It has now grown to eclipse the Program Manager's authority and resulted in the addition of a large number of design specifications, which each individual Technical Warrant insists must be met and with little willingness to discuss exploring creative solutions. Note that these are not requirements under the control of OPNAV but rather NAVSEA-imposed design specifications that need to be balanced to lower cost and shorten design cycles. This scaling back can be done in concert with the prior two options.

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- **Change the Behavior and Restore Trust**—the current adversarial environment is a lose-lose model where shipyards struggle, and the Navy is frustrated over ships that are late and over cost. Industry and the Navy need to find a way to return to a partnering model that existed 25 years ago, as then CAPT Goddard described in a jointly authored Naval Engineers Journal Article³. Under the partnership described in the article, the Navy and NASSCO focused on continuous process improvement and joint ownership of problem resolution. As a result, the Strategic Sealift Program achieved great success, including early delivery of the lead ship by four months under target cost. A mindset is required where the Navy and the Shipbuilder view each other as partners and share equally in the risks with a common goal of delivering quality ships on time and within target cost to support our nation's defense. There are additional examples of highly successful industry-DoD partnerships, such as the C-17 program, the Trident D5, and others that can provide valuable lessons and new ideas.

About the Authors

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About SMA

SMA has been helping companies and public sector organizations solve strategic challenges across the program lifecycle. We combine thought leaders, innovative methodologies, and creative thinking to challenge conventional thinking, uncover the root issues, and develop new approaches to intractable and persistent obstacles to success. Please send all inquiries to info@smawins.com.

³ Caskey, Goddard, and Roberts, "The Shipbuilder and the Supervisor – Partners in Naval Ship Construction," Naval Engineers Journal, July 2000