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DDG(X) Program

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Large Surface Combatant Evolution



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- The DDG 51 class is an outstanding success for the Navy and holds the record for the longest production run of any surface combatant in Navy history
 - Production started in 1985 and continuing beyond 2027
 - DDG 51 FLT III will provide the world's best Integrated Air and Missile Defense (IAMD) combat system elements for the near term fight
 - Likely to remain in the Fleet through the 2060s
 - Limited in the ability to incorporate future upgrades that consume additional space, weight or power requirements
- Naval planning for the 21st century requires upgrades for the future fight. DDG(X) will provide flexibility for:
 - Increased missile capacity
 - Sensor growth
 - Longer range offensive anti-surface and strike capabilities
 - High power Directed Energy weapons (e.g. lasers)
 - Increased survivability
 - Increased efficiency to reduce operational costs & demands
 - Supported by an efficient Integrated Power System (IPS) that provides operational flexibility as well as power efficiency
 - Reduced impact on Command Logistics Fleet and improved Distributed Maritime Operations

New Hull Form Required to Introduce Enhanced Capability to Fleet and Pace Threat



Large Surface Combatant Evolution



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- DDG(X) will utilize successful evolutionary development approaches from Destroyers, Cruisers, Frigates, CG 47 to DDG 51 upgrades vice revolutionary approach
 - Lessons learned from previous shipbuilding programs used to inform requirements development, design strategy and execution plans
- DDG(X) will provide the flexibility and margins necessary to become the Navy's next enduring large surface combatant
 - Combine DDG 51 FLT III combat system elements with a new hull form
 - Resets SWAP-C margins
 - Minimize incorporation of new technologies
 - Include an efficient IPS
 - Provide greater endurance, reducing the Fleet logistics burden
- CNO approved Top Level Requirements (TLR) in December 2020 set clear path for DDG(X) execution
 - Draft Capability Development Document developed in Oct 2021
- DDG 51, Virginia, and Columbia program lessons learned demonstrated up front industry involvement is key enabler to program success
 - Columbia program Integrated Product and Process Development (IPPD) process used to help inform early relationship and industry involvement on DDG(X)



Top Level Requirements Overview



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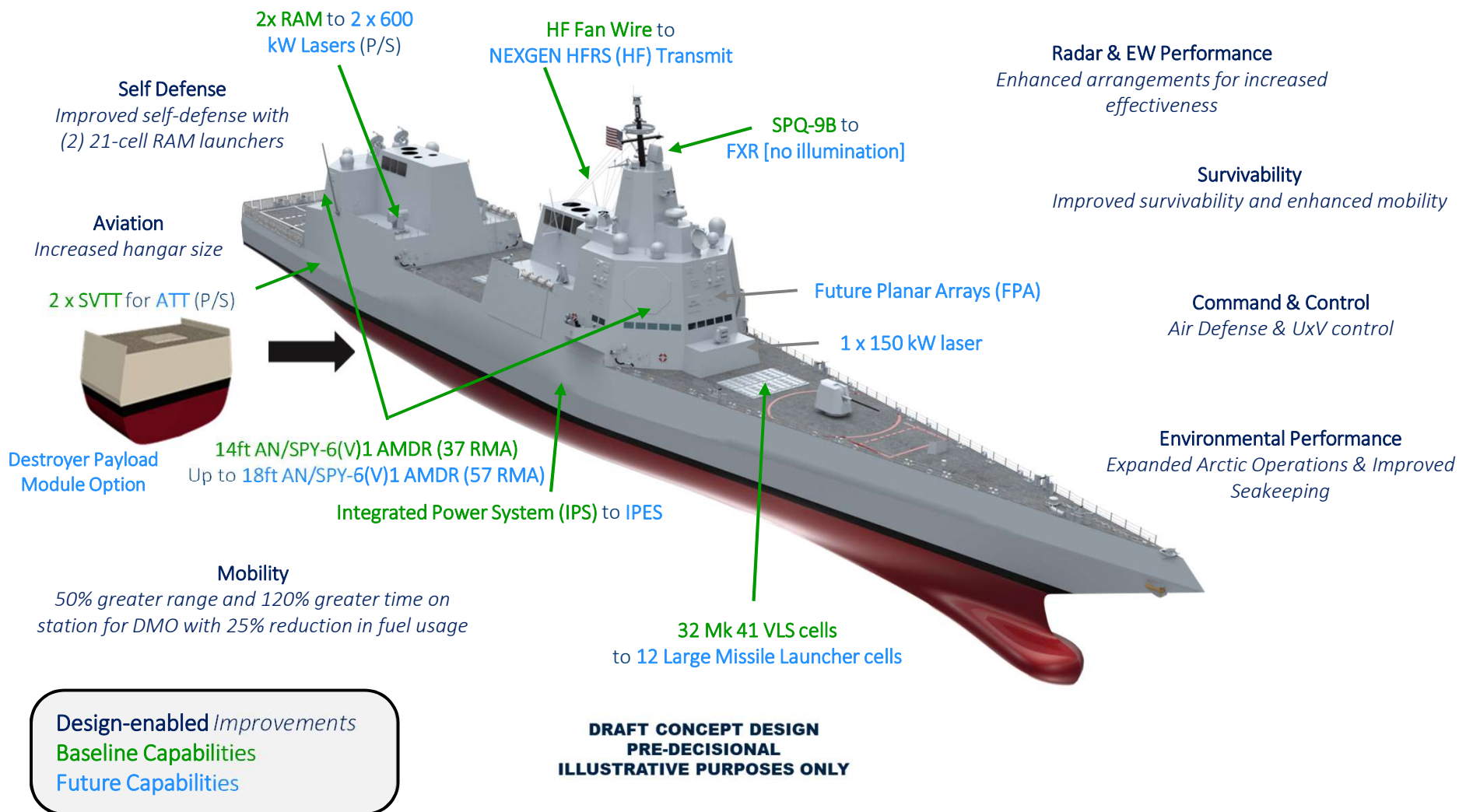
Key Metrics/TLR Areas	DDG(X)
Flexibility	<ul style="list-style-type: none">• Reestablish new construction SWAP-C margins - Arrangeable area margin of 5% beyond reservations; Weight margin of 10%; modern naval architecture requirement for KG of .4m; Power margin of 20% + debitable power from propulsion via IPS; Cooling at 20% upgradeable to 40%;• Space reservations for future upgrades - AMDR and C4I growth, high power directed energy, Large Missile cells in place of 32 VLS cells; IPS for power flexibility; pre-planned growth for additional VLS, Large Missile cells, or future capabilities
Vulnerability	<ul style="list-style-type: none">• Improved over FLT III in maintaining mobility & IAMD after damage;• Acoustic, IR and UEM signatures all improved by >50%
Mobility	<ul style="list-style-type: none">• Current design objectives: Range >50% increase; Time on station >120% increase; Efficiency >25% increase
Capability	<ul style="list-style-type: none">• Utilize FLT III Combat System elements + two 21-cell RAM launchers. Supports increase in VLS cells, Large Missile Launcher cells, sensor growth, Directed Energy weapons, C4I



DDG(X) Design-Enabled Warfighting Improvements



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DDG(X) – Designed Lethal, Affordable, Upgradable & Sustainable



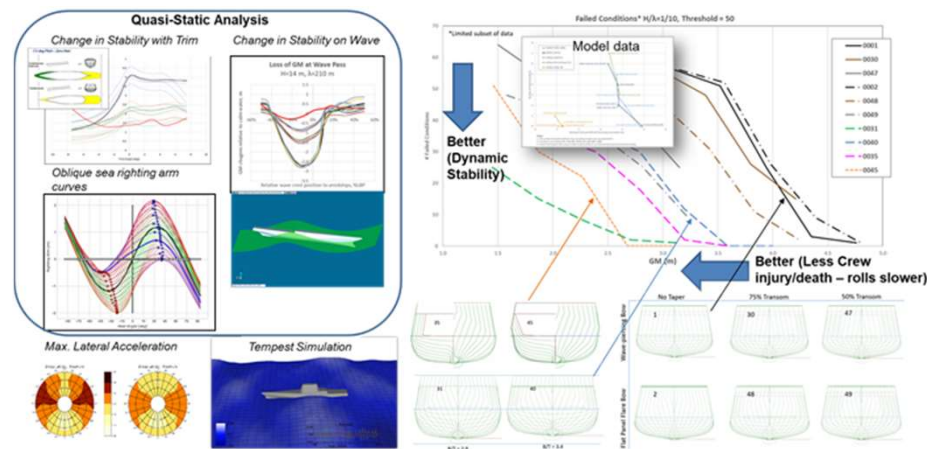
Technology Maturation and Risk Reduction



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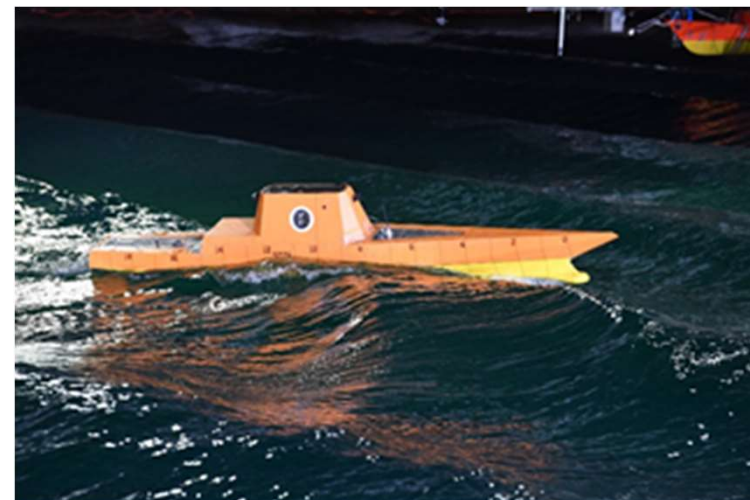
- **Deliberate Technology Maturation and Risk Reduction**

- Non developmental ship systems - land based testing to reduce critical risks prior to Detail Design and minimize risks prior to ship activation
- Developing early and robust Model Based Systems Engineering (MBSE), Modeling and Simulation (M&S), Controller Hardware in the Loop (CHIL), and Power Hardware in the Loop (PHIL) plans to help inform early design decisions



- **Critical Risks Identified**

- DDG(X) Land Based Testing for hull form and IPS will be executed at NSWC Carderock and NSWC Philadelphia planned
- IPS testing supports component level-prototyping, system integration testing, and full-scale demonstration
- Retires risk early by completing critical systems testing prior to Milestone B approval





DDG(X) Program Status



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- Preliminary through Detail Design for DDG(X) will be accomplished through a collaborative, multi-disciplinary Navy-industry effort composed of the surface combatant shipbuilders, suppliers, ship design agents and other subject matter experts
 - Collaborative design team promotes preservation of skilled / experienced Large Surface Combatant design workforce
 - Shipbuilders integrated into the team in March 2021 to help inform early decision process
 - ❑ Design decisions informed by producibility and program affordability
- Program currently in Concept Formulation with plans to enter Preliminary Design in FY22
- CNO approved Top Level Requirements (TLR) in Dec 2020 informed draft CDD development
- Acquisition Strategy in development, informed by:
 - Columbia IPPD process
 - DDG 51 Flt III to DDG(X) production transition
 - ❑ Developing thoughtful transition plan to help manage Large Surface Combatant skilled workforce and workload