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THE SENATE ARMED SERVICES COMMITTEE

STATEMENT

OF

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BEFORE THE

SENATE ARMED SERVICES COMMITTEE

ON

THE LITTORAL COMBAT SHIP

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Chairman McCain, Ranking Member Reed, and distinguished members of the Committee, thank you for the opportunity to appear before you and discuss the current status of the Littoral Combat Ship (LCS) program, specifically to discuss the outcomes and implementation of the LCS Review, status of the delivered ships and the mission packages, and the current status of the transition from LCS to Frigate (FF). We appreciate the opportunity to provide the Navy's assessment of the various issues raised of late as well as provide an update on the significant progress we have made in the program over the last few years.

## **Introduction**

The LCS program is of critical importance to our Navy. It consists of a modular, reconfigurable Seaframe, designed to meet validated Fleet requirements for Surface Warfare (SUW), Anti-Submarine Warfare (ASW), and Mine Countermeasures (MCM) missions in the littoral region through the use of modular mission packages (MPs). LCS was designed as a focused-mission surface combatant to replace our legacy small surface combatants; Oliver Hazard Perry-class Frigates, Avenger Class MCMs, and Patrol Craft. The ship, independent of an embarked mission, package provides air warfare self-defense capability with anti-air missiles, a high rate of fire 57mm gun, 3D air search radar, electronic warfare systems, and decoys for electronic warfare. The Navy is currently adding a capability improvement that outfits each deployed LCS with an Over the Horizon (OTH) Missile system. LCS ships will embark an aviation detachment and helicopter along with a vertical take-off unmanned air vehicle (referred to as Fire Scout). With its shallow draft, great speed, and interchangeable modules, LCS will provide increased warfighting flexibility to our Fleet and close critical warfighting gaps in mine warfare, anti-submarine warfare and surface warfare. The modular, open systems architecture inherent in LCS allows for rapid, affordable integration of new warfighting capabilities as technology evolves. This approach is consistent with the objectives of Defense Strategic Guidance directive to develop innovative, low-cost, and small-footprint approaches to achieve our security objectives. LCS complements our surface fleet and brings unique strengths and capabilities to the Fleet's mission. She will be our predominant MCM capability, and will deliver game changing ASW capability at an affordable cost while freeing up the higher end multi-mission large surface combatants to focus on their primary missions such as area air

defense, land strike, and ballistic missile defense. With 67 percent of Surface Combatant Total Life Cycle Cost being driven by operations and sustainment (O&S) costs, the LCS and Frigate (deployed more than half of their lifecycle and costing less than one third the O&S of a DDG per deployed year) provide Fleet Commanders with the quantity of ships needed that are capable of accomplishing critical missions within a challenging budget environment.

The LCS is capable of operating in a wide range of environments, from the open ocean to coastal, shallow water regions known as the littorals. LCS uses an open architecture design, modular weapons and sensor systems, and a variety of manned and unmanned vehicles to help gain and sustain maritime supremacy in the littorals, assuring access to critical areas of operation. LCS will be an integral component in countering adversary anti-access/area denial operations: clearing mines; neutralizing enemy submarines; and defeating hostile swarming surface craft. The Navy plans for LCS to be used in rotational deployments in support of our nation's rebalance efforts to the Western Pacific. As LCS forward presence increases, these ships will play a significant role in defense cooperation and naval engagements that contribute to maintaining freedom of the seas while deterring conflict and coercion.

The 2013 deployment of USS FREEDOM (LCS 1) to the Asia-Pacific region demonstrated the ability of LCS to conduct several of the core missions of the Cooperative Strategy for 21st Century Seapower. FREEDOM and her crews conducted operations and exercises, ranging from demonstrating forward presence while executing operational tasking in the South China Sea to providing humanitarian assistance/disaster relief support in the Philippines following Super Typhoon Haiyan. USS FORT WORTH (LCS 3) deployed to the Asia Pacific Region in November 2014 and assisted in the AirAsia plane recovery search efforts and multiple international exercises. Most recently, USS CORONADO (LCS 4) deployed to Singapore which marks the first overseas deployment of the INDEPENDENCE variant in which she will participate in a full range of LCS missions to include opportunities to operate with partner nations.

Currently, there are eight LCS in the Fleet, with another eighteen on contract. By 2018, LCS will be the second largest surface ship class in the Navy. The designs are stable, new yard

facilities are in place, with a right-sized, qualified work force, and both shipyards and industry teams are in full serial production in order to ensure each can deliver two ships per year. Today, the LCS program is on budget and below the Congressional cost cap. The block buy contracts for the Fiscal Year (FY) 2010 through FY 2016 ships resulted in continued reductions in the LCS shipbuilding program's production unit costs, and both shipyards are building these ships in an affordable manner.

With a stable design and a mature production line, we have been able to make significant progress in completing both ship and mission package testing requirements. Both variants have completed initial operational test and evaluation (IOT&E) and have achieved Initial Operational Capability (IOC). This year both variants conducted Director, Operational Test and Evaluation (DOT&E) approved Live Fire Test and Evaluation Full Ship Shock Trial (FSST) events. Our detailed analysis of the shock trial's results is in progress but all test objectives were met. Both the FREEDOM and INDEPENDENCE variant ships demonstrated the ability to survive the degrading effects of the underwater shock event associated with the close-proximity detonation of a 10,000 pound charge. We have now completed all required testing for the ships themselves and are incorporating lessons learned from that testing into future LCS and FF ships.

Additionally, we continue testing and making progress for all three mission packages on both variants, incrementally bringing new capability to the Fleet.

- Surface Warfare Mission Package (SUW MP): The SUW MP will make LCS the most capable ship in the Navy in countering the Fast Inshore Attack Craft/Fast Attack Craft (FIAC/FAC) threat. The Navy is delivering this capability in three increments with full MP IOC anticipated in FY 2020:
  - Increments 1 and 2 consist of an Aviation Module (MH-60R with Hellfire Missiles), a Maritime Security Module (two 11-meter manned rigid-hull inflatable boats (RHIBs), and two 30mm guns. Increments 1 and 2 for the SUW MP, achieved IOC in 2014. This has allowed the Fleet to deploy LCS with enhanced SUW capability, most recently with the current deployment of USS CORONADO to the Western Pacific.

- Increment 3 consists of the Vertical Take-off and Landing Tactical Unmanned Aerial Vehicle (VTUAV) and the Surface to Surface Missile Module (SSMM) armed with the Longbow Hellfire Missile.
- USS FORT WORTH (LCS 3), with an embarked SUW MP, conducted an extended operational deployment based out of Singapore. This SUW MP included a composite aviation detachment of one MQ-8B Fire Scout VTUAV and one MH-60R helicopter. This was the first time that such a combination had been deployed. The SUW MP, through its Maritime Security Module and aviation components, was extensively employed during the ship's search and rescue efforts for Air Asia flight 8501 in January 2015.
- Anti-Submarine Warfare Mission Package (ASW MP): The ASW MP will significantly increase the Navy's ASW capability and capacity. It consists of three modules netted together to continuously exploit real-time undersea data: a Torpedo Defense and Countermeasures Module (Light Weight Tow); an ASW Escort Module (Multi-Function Towed Array Acoustic Receiver (MFTA) and Variable Depth Sonar (VDS)); and an Aviation Module (MH-60R Helicopter and VTUAV). The ASW MP had a successful at-sea demo in 2014. ASW Escort Mission Module testing will commence in FY 2018 in support of IOC in FY 2019.
- Mine Countermeasure Mission Package (MCM MP): The MCM MP will replace aging legacy MCM equipment, significantly reducing the timeline for access to the contested littorals and removing the ship and crew from the minefield. The Navy is delivering this capability in four increments, with full MP IOC in FY 2021:
  - Increment 1 consists of a Minehunting Vehicle towing a Sonar Mine Detecting Set, an Airborne Laser Mine Detection Set (ALMDS), an Airborne Mine Neutralization System (AMNS), and the MH-60S Helicopter. This increment provides the capability to detect waterborne mine threats throughout the water column and on the sea floor. IOC was declared in November 2016 for ALMDS and AMNS.

- Increment 2 consists of Coastal Battlefield Reconnaissance and Analysis (COBRA) and VTUAV which provides the capability to detect mine threats and obstacles on the beach and in the surf zone.
- Increment 3 consists of an Unmanned Influence Sweep System and an Unmanned Surface Vehicle which provides the capability to sweep acoustic and magnetic mine threats throughout the water column and on the sea floor.
- Increment 4 consists of the Surface MCM Unmanned Underwater Vehicle (UUV) (Knifefish) which provides the capability to detect, classify and identify bottom and volume mines, including buried mines and stealthy mines.

As you are aware, the Navy is in the midst of a transition from focused mission LCS platforms with modular Mission Packages to a multi-mission FF capable of conducting simultaneous anti-surface warfare (ASuW) and anti-submarine warfare (ASW) missions as well as providing effective air, surface and underwater self-defense capabilities. It will be equipped with OTH surface-to-surface missiles in addition to LCS baseline SUW and ASW MP capabilities, and have additional upgrades to combat systems, electronic warfare systems, and ship survivability features. The FF will complement our inherent blue water capability and fill warfighting gaps in the littorals and strategic choke points around the world.

### **Status of Delivered Ships**

Each of the eight LCS that are in service was delivered at a successively lower cost, and with improved reliability as compared to their predecessors. We continue to capture lessons learned and refine the Concept of Operations (CONOPs) for operating these ships forward, as demonstrated, for example, by the development and execution of the Expeditionary Maintenance Capability (EMC). During USS FORT WORTH's (LCS 3) deployment to the South China Sea from November 2014 through January 2016, she followed the LCS maintenance and sustainment model, pulling into port every 4-6 weeks for a week-long preventative maintenance availability and every 4-6 months for a two-week corrective maintenance availability and core crew turnover. Although this maintenance was typically conducted in the LCS Forward Operating Station (FOS) in Singapore, the EMC concept also allowed this maintenance to be conducted in

Sasebo, Japan, to better support USS FORT WORTH's tasking in the Northwest Pacific. This EMC approach has significantly expanded the operational employment of the LCS in theater, allowing the ships to operate for extended periods far removed from the FOS. The same capability was delivered to Singapore in advance of USS CORONADO's arrival to support the execution of planned maintenance in remote locations for the INDEPENDENCE variant as well. This model was proven effective at supporting sustained forward deployed operations.

During her deployment, USS FORT WORTH conducted U.S. and multinational operations from India to Japan and also successfully demonstrated the ability to perform in high-tempo environments just days after entering theater. USS FORT WORTH's first 12 months forward offer significant insight into the potential of these ships:

- Operated side-by-side and hull-to-hull with valued Southeast and South Asia partners during seven theater security cooperation (CARAT) exercises, MALABAR with India and with Northeast Asian allies during OPLAN training operations (FOAL EAGLE);
- Contributed to theater CONOPs by executing freedom of navigation and presence operations in the South China Sea;
- Supported multi-national Humanitarian Assistance Disaster Response missions, such as the search and recovery mission for AirAsia flight 8501 on 96-hours' notice less than one week after arriving in Singapore; and
- Executed an expeditionary maintenance period in Sasebo, Japan and leveraged fueling resources in Subic Bay, Philippines, thus extending LCS's operational range and bringing the logistical hub-and-spoke model to life.

USS FREEDOM completed a 10-month (pre-IOC) deployment in 2013, conducting similar operations in the same locations as USS FORT WORTH. Comparing the reliability and maintenance records of these two deployments, only a year apart, demonstrates how effectively the LCS Fleet has incorporated lessons learned and best practices to improve operational

availability. During an equivalent 10-month period, USS FORT WORTH was underway 33 percent more, spent less time pierside conducting maintenance, conducted maintenance away from Singapore, and experienced fewer casualties. These initial deployments of the USS FORT WORTH and USS FREEDOM demonstrate the increasing capabilities that LCS will continue to bring to the Navy as the program matures.

As we increase our operational experience with LCS, we are closely monitoring material readiness and making changes, as warranted to improve operational availability. In total, LCS readiness as reflected in operational availability and casualty report metrics is consistent with other combatant ship classes. However, we are quickly and strongly addressing issues as they emerge to raise the system reliability to yet higher levels sooner in this new class. Of particular concern, five LCS class ships have been operationally impacted by propulsion casualties in the past year. The Navy has conducted formal engineering reviews and command investigations to assess the root cause and corrective action for each of the casualties. In general, the root causes can be broken into three separate categories: procedural non-compliance (failure to follow approved engineering procedures); design related deficiencies; or production-related deficiencies.

Two of the five engineering casualties were related to procedural (non-) compliance:

The first such casualty occurred onboard USS FORT WORTH while inport Singapore, after 12 months of her 14 month maiden deployment. As a result of improper alignment of the lube oil service system (as outlined by the ship's Engineering Operating Procedures), three of the five bearings in the Combining Gear were damaged and USS FORT WORTH was unable to continue her mission in the western Pacific. Upon completion of repairs, the ship departed Singapore and returned to San Diego in early October 2016.

The second casualty related to procedural (non-) compliance occurred onboard USS FREEDOM while inport San Diego. Improper corrective action following the routine failure of FREEDOM's Main Propulsion Diesel Engine (MPDE) attached seawater pump mechanical seal resulted in seawater contamination of the engine. Upon subsequent inspection, significant

corrosion and damage was discovered inside the MPDE. The affected engine is planned for replacement commencing December 2016.

In response to these procedural compliance issues, the Type Commander has conducted a formal investigation and root cause analysis on both casualties. The Commander, Naval Surface Forces directed an engineering stand down for all LCS Class crews to review, evaluate, and renew their commitment to safe ship operation, procedural compliance, and good engineering practices. Additionally, the Navy's Surface Warfare Officer's School Command is revising the current LCS training program, to include LCS specific engineering training and related proficiency examinations. In parallel, the Naval Sea Systems Command (NAVSEA) is reviewing design details for potential design enhancements that may mitigate the possibility of such operator errors.

One of the five engineering casualties was specifically design-related:

While operating USS MILWAUKEE (LCS 5) on all four engines at full power during transit in the Atlantic, an emergency stop of the gas turbine engines led to excessive wear of the high speed clutch causing damage to the high speed clutch and combining gear. Root cause analysis is in progress, but the combining gear on LCS 5 and follow is a new design (prior manufacturer ceased operations), and changes to the control logic for the de-clutch sequence and clutch piston release speed associated with the new design are apparent causes. Design modifications based on root causes have been developed and are being tested by Lockheed Martin and RENK (the gear manufacturer), in parallel with ongoing root cause analysis efforts. Pending satisfactory testing this month (December 2016), the associated high speed clutch modifications and machinery control software updates will be applied to LCS 9 and follow prior to delivery and LCS 5 and 7 during their Post Shakedown Availabilities (PSAs). LCS 1 and LCS 3 gear sets are not affected.

The remaining two engineering casualties trace to deficiencies in the ship construction process:

USS CORONADO (LCS 4) experienced a failure of the flexible shaft coupling between the starboard MPDE reduction gear and stern tube during transit from Hawaii to Singapore. A failure review board was convened, and while material testing of the failed coupling is still in progress, shaft misalignment has been identified as a contributing factor in the root cause analysis. An alignment summit with the shipbuilder, NAVSEA design engineers, the Original Equipment Manufacturer, the Supervisor of Shipbuilding, and the Program Office has since been conducted to review, validate, and better document waterborne alignment procedures. The coupling in LCS 4 was replaced with a new coupling design in Hawaii. USS CORONADO is now on station in Singapore on her maiden deployment. This new coupling design has already been installed on LCS 6 and follow ships.

USS MONTGOMERY (LCS 8) experienced a production deficiency related propulsion casualty shortly after sail away from the new construction shipyard. Prior to getting underway, the crew discovered seawater contamination in the steering hydraulic system for one of the four waterjets. The shipbuilder drained the system, replaced the system's seawater cooler, and flushed the system restoring full waterjet functionality. The root cause assessment determined that the cooler had not failed, but rather contamination was introduced into the system most likely in conjunction with the repair of a component external to the hull in the period between delivery and sailaway from the building yard. The shipbuilder has since implemented an improved procedure for waterborne waterjet hydraulic work.

The Navy has taken a consistent and rigorous approach in assessing and addressing root causes of equipment casualties in LCS. Early deficiencies in the designs of each variant have been addressed in follow ships, but there is still work to be done in increasing the operational availability of the ships in-service. In response, NAVSEA has initiated a comprehensive engineering review of both propulsion trains, to include logistics and training, and will report their findings upon completion of the review.

## LCS Review

In February of this year, the Navy initiated a review of the LCS program to assess the concept of operations based on lessons learned from Fleet operations and the early operational deployments of the ships. The review focused on LCS crewing, training, and maintenance based on experience gained and lessons learned by the program and Fleet during operations and ship deployments. The review noted that USS FORT WORTH's deployment many successes must be replicated on a larger scale and setting conditions for crews to excel forward is the Navy's first priority. With this in mind, the Review Team identified challenges with regard to manning, crew training, maintenance, and operational testing, identifying immediate and longer term recommendations to address those challenges, reduce risk, and strengthen the program. Immediate recommendations and enabling actions include the following:

- *Single crew Pre-Commissioning Unit (PCU) hulls* – As more hulls are delivered, pairing a single crew to a ship in construction for approximately 18 months allows the pre-commissioning crew to “grow with their ship” and places experienced crews where they matter most: on ships deployed forward.
- *Forward Deploy all LCS in Blue/Gold Crewing Construct* – Implementing a Blue/Gold crew rotation approach will result in two crews rotating to the same hull every 4-5 months, forging a “cycle of virtue” between the two crews who will consistently turn the same ship over to each other.
- *Fuse the Core Crew and Mission Modules Detachments* – Although the overall number of personnel remains the same, merging core crews and mission module detachments into a single fused crew dedicated to a single mission will improve enlisted rating utilization, create crew stability, and reduce complexity.
- *Stand up of a Maintenance Execution Team (MET)* – Due to a LCS' small crew size, maintenance that would traditionally be performed by the crew on other vessels is outsourced to contractors for LCS. The LCS review recommended standing up a MET

comprised of support from off-hull, active and reserve duty, and LCS Squadron Sailors to conduct preventive maintenance. The review found that minimally manned ships require a pool of trained personnel to fill watchbill and specialty qualification gaps. The MET would also serve to relieve the unforeseen tasking of “shadow hours” whereby crew members merely shadow contractors for force protection, security and safety purposes. The MET will conduct preventive maintenance while learning the operation and maintenance of their equipment, thereby reducing wasted manhours and increasing crew ownership. Additionally, a forward-deployed team (Destroyer Squadron 7) will complement MET functions overseas while also performing material assessments.

- *Lengthen LCS Crew Turnover in Theatre to Include an O-6 Assessment* – As recommended in the recent USS FORT WORTH Command Investigation, this longer time period will enhance the oncoming crew’s situational awareness and allow the combined crews to perform critical maintenance tasks together if needed. Broadly resembling an approach used in SSGN turnovers, O-6 assessments during turnovers will provide leadership greater awareness of crew readiness.

In addition to the immediate recommendations listed above, the review team identified the following longer-term recommendations:

- *Establish Testing Ships* – Assign the first four LCS ships (LCS 1 – 4) as dedicated CONUS-based testing, training, and surge platforms through Mission Package IOC, to be manned by a single crew and commanded by a post command LCS O-5 commander to insulate deploying ships from broader testing requirements. The ships will be maintained at deployable configurations and upgraded, as planned, to support the myriad of operational functions and integration intricacies of the associated mission packages to fully support testing. We will evaluate the effectiveness of these assets for this purpose in the near term, and if it becomes evident that a dedicated land-based facility would prove more efficient and effective, adjust accordingly.

- *Establish Training Ships* – Beyond the four test ships, divide the remaining 24 ships into six four-ship divisions of the same variant including a dedicated training ship in each division. Of the four ships, retain one training ship in CONUS to certify the Blue/Gold crews that will man the three forward deployed ships of each division. This approach provides a surge-ready LCS Fleet with more operational availability forward and an improved blend of ownership and stability. To support this concept, we will also homeport all INDEPENDENCE variant ships in San Diego, CA and all FREEDOM variant ships in Mayport, FL over time.
- *Steady State: Establish Blue/Gold Crewing Construct with Training Ships* – A Blue/Gold deployment approach is projected to present a more optimal rotational posture. This concept creates six four-ship divisions of the same variant including a dedicated training ship in each division. Of the four ships, one training ship will remain in CONUS to certify the Blue/Gold crews that will man the three forward deployed ships of each division. Also referred to as 7:4:3 (seven crews, four hulls, three ships forward), this approach provides a surge-ready LCS Fleet with more operational availability forward and an improved blend of ownership and stability beyond the legacy LCS operational 3:2:1 concept.

In the course of this study, it became clear that the LCS crewing construct is the critical variable that most impacts other factors such as manning, training, maintenance, and – most importantly – operations. The LCS Review Team assessed manpower requirements in detail and implementation of these recommendations are underway. Changing to a Blue/Gold crew rotation (a tried-and-true model proven by the submarine Fleet) will increase LCS Sailors' familiarity with specific ship systems, enabling the crew to have a greater sense of ownership in their ships.

Our assessment is that the recommended solutions from the Navy's recent review of LCS will yield the results needed to increase forward presence and provide a proven capability to our Fleet Commanders.

## **Full Ship Shock Trials (FSST)**

As part of the DOT&E approved Live Fire Test and Evaluation Plan for the LCS program, Full Ship Shock Trials were conducted on USS JACKSON (INDEPENDENCE variant) and USS MILWAUKEE (FREEDOM variant) this summer. The unprecedented achievement of completing FSST on two different ships in a single test was the positive result of efficient test execution and effective ship performance under shock loading. Data collected during FSST is used to validate the models used to predict how a ship reacts to an underwater shock event. The results of the FSST, as well as other testing and modeling efforts, are then used to determine the overall survivability of the ship against the specified set of threats that the ship is required to meet.

The LCS Program Office accomplished all FSST test objectives within budget, for both ship variants, demonstrating that the ships and ships' systems are able to survive the degrading effects of an underwater shock event. Initial results indicate that ship performance was consistent with requirements and the data collected shows a strong correlation to the modeling and simulations done before the trials. Data analysis is ongoing with final test reports expected in the third quarter of FY 2017.

In advance of the final report, the significant findings have been analyzed and recommended design changes are being assessed for incorporation into follow on hulls. In the INDEPENDENCE variant, modifications to some structural details in specific forward fuel tanks and bulkheads are being assessed and planned. The design work is complete and associated modifications will be accomplished in LCS 6 during her upcoming PSA. In the FREEDOM variant, there is need for modification to reduction gear lube oil bellows to allow for greater travel and improved bracing of lube oil piping in the vicinity of the bellows. The majority of the required changes were implemented in LCS 5 during the FSST period with the outstanding work to be completed in her PSA. For all follow ships of both variants, these relatively minor modifications will be accomplished at the most cost effective opportunity in the new construction window.

The trials also highlighted the value of planned survivability improvements, beyond LCS threshold requirements, for both the LCS and FF ships. These improvements, which include hardening of potable water systems, chill water systems, and the ship's Anti-Ship Cruise Missile system, are part of the FY 2017 LCS solicitation and are integral to the FF design.

### **Mission Package (MP) Status**

Modular mission packages are a central feature of the LCS concept and provide the ship's main combat systems capability. The MP embarked is determined based on planned employment of the ship on a specific deployment or mission, optimized as needed for MCM, SUW, or ASW. The LCS Mission Module program is integrating, testing, and fielding mission packages in accordance with Fleet needs coupled with cost, schedule, and performance requirements. Rigorous and thorough testing in realistic environments continues to validate the mission modules concept and the mature capabilities in each increment. Stable funding is key to ensuring the MPs continue successful procurement, development, and testing.

*Surface Warfare (SUW) MP* – The SUW MP provides a flexible capability to rapidly detect, track and prosecute small-boat threats, giving the Joint Force Commander the capability to protect the Sea Base and move a force quickly through a choke point or other strategic waterway. The ship uses its speed and the SUW MP capabilities, including manned and unmanned aviation assets, to extend the ship's surveillance and attack potential. LCS configured with the SUW MP can also conduct maritime security operations, including those involving Maritime Interdiction Operation (MIO) and Expanded MIO for compliant and non-compliant VBSS. When augmented with the SUW MP, the LCS has enhanced detection and engagement capability against FIAC/FAC and similar littoral surface threats. The full SUW MP, when fielded and deployed, will make LCS the most capable ship in the Navy in countering the FIAC/FAC threat.

IOC was declared for the SUW MP (Increment 1 and 2) aboard a FREEDOM variant LCS on November 25, 2014, and aboard an INDEPENDENCE variant LCS on December 24, 2015. It was embarked aboard USS FORT WORTH during her deployment to Singapore, the

first time that such a combination has been deployed. The SUW MP, through its Maritime Security Module and aviation components, was extensively employed during the ship's search and rescue efforts for AirAsia flight 8501 in January 2015, highlighting the versatility of the LCS modular mission package concept.

The Surface-to-Surface Mission Module (SSMM) is the next capability to be added to the SUW MP. Beginning in 2015, the Navy completed a series of Guided Test Vehicle (GTV) test launches of the Longbow Hellfire missile to evaluate performance of the SSMM launcher and missile system in a littoral environment. The GTV-1 testing successfully conducted against multiple threat-representative targets in a relevant environment was completed in June 2015, achieving success in seven of eight missile engagements. The demonstration proved that the vertically-launched missiles could acquire the representative targets, discriminate among the targets and the surrounding environment, and engage the targets. The GTV-2A testing, the first tests of the Engineering Development Model (EDM) missile integrated with the LCS module prototype, was completed in December 2015, achieving success in three of four missile engagements.

The program conducted a restrained firing test that validated the structural design of the SSMM Missile Exhaust Containment Structure in August 2016. The program also successfully completed the GTV-2B testing, achieving success in six of eight missile engagements, demonstrating the system's ability to engage high speed, maneuvering targets and complete quick succession launches while withstanding the associated harsh environment caused from the rocket exhaust. Six successful engagements in eight missile tests were accomplished. SSMM Longbow Hellfire testing to date has resulted in 16 successful engagements out of 20 total tests, representing a success rate of 80 percent to date, with one of the unsuccessful engagements occurring during GTV-1 due to target failure. The program plans to complete the development of the first SSMM and then conduct a Tracking Exercise (TRACKEX), Structural Test Fire, and formal Developmental Test in FY 2017 on the FREEDOM variant and a TRACKEX on the INDEPENDENCE variant in FY 2017. The program is on track to operationally test the SSMM in FY 2018 in support of IOC in the second quarter of FY 2018.

*Anti-Submarine Warfare (ASW) MP* – The ASW MP systems will provide the Joint Force Commander with both an in-stride and rapid ASW escort and large area search capability against modern diesel-electric and nuclear submarines. Through studies and testing, an LCS with an ASW MP embarked has consistently shown the ability to significantly increase detection range and overall ASW performance as compared to existing fleet systems in use on large surface combatants. The addition of this capability will significantly increase Fleet ASW capability and capacity.

The ASW MP completed its initial integration test onboard USS FREEDOM on September 30, 2014. All primary test objectives were completed successfully, including: verifying form, fit, and function of the ASW Escort Mission Module on the FREEDOM variant; evaluating mechanical and hydrodynamic characteristics, including maneuvering characteristics at up to 12 knots; deploying and retrieving the Variable Depth Sonar; verifying safe dual tow and measured dual hydrodynamic tow characteristics; and evaluating deep water (convergence zone) search performance.

The Navy released a Request for Proposal (RFP) for the ASW Escort Mission Module EDM on August 14, 2014. After evaluating proposals, three vendors were awarded base contracts on July 20, 2015. The base contract awards funded a study by each selected contractor to address ship integration issues, at-sea testing at the sub-system and mission module level, and the development of production/delivery schedules.

In August 2016, the Navy modified all three vendor contracts to minimize and/or retire these technical and programmatic risk areas. Based on the results of the more detailed transition studies and risk reduction efforts, the Navy is in the process of exercising the contract option for one vendor to build the ASW Escort Mission Module EDM (pre-production test article).

*Mine Countermeasures (MCM) MP* – When augmented with the MCM MP, the LCS is capable of conducting detect-to-engage operations (mine hunting, sweeping, and neutralization) against sea mine threats. LCS outfitted with the MCM MP provides the Joint Force Commander with the capability to conduct organic mine countermeasure operations ranging from intelligence

preparation of the environment to first response mine countermeasures enabling joint operations to be conducted ahead of power projection forces. With the MCM MP a broader range of options will be available to the Joint Force Commander, and we will remove the ship and crew from the minefield.

The MCM MP provides these capabilities through the use of sensors and weapons deployed from organic unmanned vehicles and the MH-60S multi-mission helicopter. The unmanned vehicles include the Common Unmanned Surface Vessel (CUSV), unmanned aerial vehicles, and the Knifefish UUV.

TECHEVAL of the initial MCM MP capabilities was completed in August 2015, aboard USS INDEPENDENCE (LCS 2). The mission package met the majority of its sustained area coverage rate test requirements, but significant reliability issues were noted with the Remote Multi-Mission Vehicle (RMMV). Based on TECHEVAL results, the Navy delayed MCM IOT&E and initiated an Independent Review Team (IRT) to assess the system.

The IRT submitted their findings and recommendations in February 2016, following which Chief of Naval Operations (CNO) and Assistant Secretary of the Navy (Research, Development and Acquisition) (ASN(RD&A)) directed OPNAV (N9) and PEO LCS to develop an implementation plan to execute the RMS IRT recommendations. The implementation plan was to coordinate experimentation, technology maturation, Concept of Employment development, and industry and Fleet engagement to ensure a supportable MCM capability, tested, and delivered to the Fleet before legacy systems reach the end of their service life, including:

- OPNAV and PEO alignment of responsibility and authority with clear lines of accountability for delivery of MCM capability;
- Concept development and testing for both LCS and non-LCS based systems;

- Employment of expeditionary mine warfare capability from LCS and other Navy platforms;
- Deployment of MCM MP initial increment on INDEPENDENCE variant ships using upgraded low rate initial production RMMVs to gain operational experience.
- Cost and recommended budgetary actions.

Subsequently, the Under Secretary of Defense (Acquisition, Technology and Logistics) signed an Acquisition Decision Memorandum cancelling further development of the RMMV and separately establishing the associated towed mine-detection sonar, the AN/AQS-20A, as an independent acquisition program.

The CNO and ASN(RD&A) approved the IRT Implementation Plan on June 28, 2016. Execution of the plan is based on a three-phase approach. The first “deploy” phase of the plan focuses on exercising MCM capability from LCS or other platforms of opportunity in FY 2018 through FY 2019. The second “assess and decide” phase will evaluate data from the FY 2018-2019 deployment with the MCM MP initial increment and Fleet assessments of CUSV minehunting capability and Knifefish UUV, culminating in an MCM minehunting platform decision in FY 2019. The final “re-baselining” phase efforts focus on the long-term plan to deliver MCM capability to support IOC in FY 2021 to address legacy surface and airborne mine countermeasures systems end of service life.

To execute the IRT implementation plan, the Navy submitted an FY 2016 Above Threshold Reprogramming (ATR). This ATR was not supported, resulting in the Navy developing a revised implementation plan which was briefed to professional staff members of the congressional defense committees in September 2016. The revised plan focuses on CUSV as the tow vehicle for the AQS-20A mine hunting sonar. In the interim, two RMMVs will be groomed and one will be overhauled, and these RMMVs will then be used to continue AN/AQS-20 sonar testing, conduct data collection, and support user operational evaluation until the CUSV is available in late FY 2018, at which point the RMMVs will be replaced.

## **Transition to Frigate**

On February 24, 2014, the Secretary of Defense (SECDEF) directed that the Navy limit the number of Flight 0+ LCS ships to no more than 32 and that the Navy submit alternatives for a more capable and lethal Small Surface Combatant (SSC) with capabilities generally consistent with a FF. In response, the Navy formed a Small Surface Combatant Task Force (SSCTF). The SSCTF's efforts informed the Navy's recommendation and SECDEF's decision memorandum of December 10, 2014, approved the Navy's plan to procure a SSC based on an upgraded LCS Flight 0+ hull form.

The SSCTF approach entailed five key activities. First, establish and co-locate a team of operational, technical, and acquisition experts with experience in surface combatant operations, design, and program execution. Second, develop a process that integrates capability concept development, requirements analysis, engineering and design, cost analysis, and program planning to characterize a rich trade space. Third, obtain and consider the Fleet's views and perspectives on SSC capability needs in the 2025+ timeframe. Fourth, seek and consider industry's ideas regarding existing ship designs and ship systems including hull, mechanical, and electrical and combat system components. Fifth, ensure the analysis and findings represent technically feasible and operationally credible SSC alternatives for consideration by Navy leadership.

The SSCTF proposed to Navy leadership that a modified LCS fulfilled the requirement of "a capable and lethal small surface combatant" providing the multi-mission SUW and ASW capability consistent with the Fleet's view on the most valued capabilities delivered by a SSC at the most affordable cost. Further, the study concluded that this approach would provide the shortest timeline to first ship delivery (FY 2023) and last ship delivery (FY 2028) with no gap in production; and could support a subset of capability and survivability upgrades on LCS production ships as early as FY 2017. Navy leadership accepted this recommendation and proposed for SECDEF's decision that the upgraded LCS Flight 0+ hull form be used as the basis for the new SSC (termed a Frigate).

The FF's design continues to mature in preparation for a RFP release to both LCS shipbuilders in 2017, which could support contract award in late FY 2018. The FF will bring multi-mission capability to a modified LCS hull form, incorporating MP components from both the SUW and ASW mission modules. The FF does not change the fundamental LCS mission sets, but rather provides additional lethality and survivability capabilities that support executing independent, integrated, high-value unit escort, and both offensive and defensive SUW and ASW operations.

In December 2015, SECDEF directed that the total LCS/FF procurement be truncated to 40 ships. This programmatic decision, reflected in the President's Budget 2017 submission, is not indicative of a change in the overall 2012 Force Structure Assessment (FSA) interim update conducted in FY 2014. The FSA interim update determined a post-2020 requirement of 308 ships in the battle force, corresponding with a 52 SSC requirement necessary to fulfill the Navy's essential combat missions.

The December 2015 SECDEF memorandum also directed that the LCS program down-select to a single variant and transition to the FF no later than FY 2019. In response to the SECDEF direction, the Navy has outlined a path to down select to one shipbuilder (one variant) as early as FY 2018, but no later than FY 2019, for the last twelve ships of the program based on the FF design. The Navy intends to make a down select decision based on best value criteria based on cost and warfighting capability. This acquisition strategy sustains the two shipbuilders competing for the single ship awards in FY 2017 while enabling competitors to align long term options with their vendor base in support of the subsequent down-select, and accelerates delivery of the desired FF capability to the Fleet. Additionally, the plan preserves the viability of the industrial base in the near term in support of potential opportunities for Foreign Military Sales opportunities.

## **Conclusion**

The LCS and FF Classes close critical warfighting gaps for our Fleet Commanders. LCS will provide much-needed MCM, ASW, and SUW capability at an affordable cost, freeing up the

higher end multi-mission large surface combatants to focus on their primary missions such as area air defense, land strike, and ballistic missile defense.

Looking ahead, the Navy is planning for the next generation Fleet, including SSCs, using the established requirements generation process to determine what warfighting gaps will be present and what capabilities the future SSC will require in order to fill those gaps. When completed, we look forward to briefing you on the outcome of this analysis and the composition of the future Fleet.

The Navy's role in providing for our national security strategy includes ensuring freedom of navigation for all maritime traffic, providing reassurance to our partner nations, and deterring those who would challenge us. As more LCS ships are deployed forward, these innovative ships will deliver the persistent presence our allies and partners desire and our nation's security demands consistent with this role.

We are committed to working with Congress as we continue to make adjustments to how these ships are employed. We thank you for your past support and urge your continued support. We welcome your oversight, and we look forward to answering your questions.