

**STATEMENT OF REAR ADMIRAL PHILLIP BALISLE, U.S. NAVY  
DIRECTOR, SURFACE WARFARE DIVISION  
BEFORE THE SEAPOWER SUBCOMMITTEE  
OF THE SENATE ARMED SERVICES COMMITTEE  
ON SURFACE WARFARE SYSTEMS  
9 APRIL 2002**

Chairman Kennedy, Senator Sessions, distinguished members of the Senate Seapower Subcommittee, Thank you for the opportunity to address you today on the status of the Surface Navy. I greatly appreciate the excellent and continued support your committee has given the Surface Navy which has allowed our Surface Warriors to contribute significantly to America's Navy's accomplishment of our missions around the world - including the swift and effective response to the attacks of last September - while continuing to advance our strategy to transform the Surface Forces to meet the challenges of the future. The United States Navy - Presence ... Power ... Precision.

Our Navy's response to the events of September 11th highlights the mobility, lethality and reach of naval forces.

On the home front, aircraft carriers, AEGIS cruisers and destroyers, and numerous other ships rapidly responded to take station off the East and West Coasts of the United States to guard the air and sea approaches to our shores in coordination with the U.S. Coast Guard and other military and civilian agencies ashore.

Forward deployed, U.S. naval forces were first on the scene and led the way for the joint force effort in OPERATION ENDURING FREEDOM. Tomahawk shooters suppressed enemy air defenses while carrier strike aircraft projected power with precision munitions hundreds of miles beyond the sea. Marines, Navy SEALs, Seabees, and Special Operations Forces sustained by Navy forces from the sea all played key roles in freeing Afghanistan from the Taliban regime and the al Qaeda terrorist network. The extraordinary warfighting flexibility demonstrated by U.S. naval forces this year is the result of the dedicated service of our active and reserve Sailors and Marines and their civil service team members. It is a testament to our commitment to mission accomplishment. The U.S. Navy is ready to fight and win. Forward deployed combat forces provide this nation with speed of response to an emerging crisis from forces that can be immediately employed from within a region. Before the most recent action in Afghanistan, Naval forces had provided the same type of timely response on 86 occasions in the last decade alone, including 11 different combat operations. In fact, even before the events of September 11th, the last 10 Navy carrier battlegroups to deploy, a span that began in 1998, have engaged in combat as part of Operation Allied Force in Southeastern Europe and/or operations in the Middle East. Additionally, in that time span, naval forces conducted non-combatant evacuation operations, conducted thousands of boardings in support of U.S. drug policy and United Nations sanctions, and participated in numerous humanitarian assistance operations. During crisis or conflict, forward-deployed and forward-based naval forces are positioned for timely response. The Navy-Marine Corps team stands ready, at the "tip of the spear," to assure access and to project joint and combined power in support of National policy.

**Strategic Environment and Navy Transformation**

The 2001 Quadrennial Defense Review (QDR) sets clear goals to assure allies and friends that the United States is a reliable security partner, to dissuade future military competition from potential adversaries, to deter threats and coercion against U.S. interests and decisively defeat any adversaries who have not been deterred from attempting to impose their will on the U.S., its allies or its friends. The QDR requires that we restore and then improve current readiness while transforming to address the circumstances of the 21st Century. To support these goals, our sovereign naval forces must be able to enhance deterrence and, should that fail, assure sea-based Joint force access to project offensive and defensive power ashore to defeat all adversaries.

New challenges, including the threat of cyberwar, weapons of mass destruction, continued international terrorism and the havoc wrought by failed states, define a most unpredictable future. These and other emerging threats will call for new deterrence options spanning the full range of threats facing our nation. Technical advances in area-denial forces including mines, small boats, diesel submarines, sophisticated anti-ship cruise missiles, landbased aircraft and ballistic missiles have expanded the challenge in the littoral areas where naval forces must operate in order to maintain the ability to project power in support of national objectives.

To counter these challenges in the littoral, robust Surface Force warfighting capabilities must be maintained to guarantee the Navy's ability to sail into harm's way, and enable our assured access in the littorals throughout the world. These capabilities are achieved through multi-layered defense-in-depth, active and passive measures, teamwork and force synergy. The evolution of our warfighting systems must be kept "lock step" ahead of the emerging threat. As the threat evolves and becomes more capable, so must the Navy's combat systems. To remain ahead of this evolving threat we must field state-of-the-art capabilities as we continue to invest in next-generation research and development.

The Navy will meet the challenge of an uncertain future by continuing to transform our concepts, organizations, doctrine, technology, networks, sensors and platforms, weapons systems, training, education and our approach to manning. At the heart of this wide-ranging transformation is the implementation of Network Centric Warfare. This integration of sensors, information systems, platforms and weapons to achieve major increases in warfighting effectiveness will provide the framework for a transformed, balanced total force that will provide the Joint Force Commander with the "tool box" of capabilities necessary to fight and win against current and emerging threats.

The Surface Warrior's contribution to the Joint Commander's "tool box" of capabilities supports a family of shaping, offensive and defensive missions including Assurance and Deterrence, Maritime Strategic Fires, Expeditionary Maneuver Warfare, Maritime Strategic Defense, Ship Self-Defense, Undersea Warfare and Homeland Security.

- Assurance and Deterrence - The enduring Navy-Marine Corps contribution to national security is combat-credible forward presence. Surface Navy forces present and engaged forward -- where our most vital economic, political, and military interests are concentrated - routinely provide a framework of security and stability that helps other instruments of national power to assure our allies and friends and to dissuade potential military competitors.

- Maritime Strategic Fires - The Surface Navy provides cruise missile precision strike and Naval Surface Fires capabilities vital to integrated Joint operations across the spectrum of warfare.

- Maritime Strategic Defense - The Surface Navy with a variety of existing and developing capabilities is postured to project defense over sea-based and landbased U.S. and Allied forces including Theater Air Defense and Theater Ballistic Missile Defense.

- Expeditionary Maneuver Warfare - Surface Navy forces play a vital role on the Navy-Marine Corps team that stands ready to project sea-based power ashore in support of Joint, Naval or Multi-national operations.

- Ship Self-Defense - This capability enhances the ability of all fleet units to survive and operate in an enemy area-denial environment and is at the core of the sea-basing concept that affords sustained access to Naval forces and supports maneuver along the length and breadth of the Joint littoral operations area unconstrained by political or sovereignty issues.

- Undersea Warfare - Command of the seas in both the open ocean and in the littorals is a prerequisite for sea-basing and the Surface Navy fields an array of existing and developing

capabilities in Anti-Submarine and Mine Warfare to ensure freedom of maneuver, access and freedom of trade on the sea.

- Homeland Security - The Surface Navy is coordinating with numerous other government and military agencies, especially the Coast Guard to defend the air and surface approaches to our coast, ports and waterways.

**A Continuing Challenge** The status of Surface Warfare today is healthy and improving. We are still the greatest Navy in the world. We have a credible, combat ready force with our primary emphasis on deployers. This year's budget submission shows real progress for FY03 and through the Future Years Defense Plan (FYDP) in support of our strategy to provide the robust warfighting capabilities necessary to pace the threat and support assured access. We are focused on providing war fighting capability and on providing the greatest flexibility for the least investment.

The Nation must continue to have a credible sea-based war fighting capability in the 21st Century, ships that can go in harm's way and accomplish the mission to support the National Security Strategy. We must have sufficient force structure in both quantity and quality and be able to put the right mix of ordnance in sufficient numbers on target.

We have made progress over the last year in many areas but there is still significant work to be done. We will continue to seek improvement in current and future readiness with emphasis on transformational technologies and concepts to provide affordable solutions that will allow us to execute all of our missions and requirements. More importantly, we will endeavor to get those solutions rapidly into the Fleet.

In my testimony below, I will first review our progress in maintaining and improving readiness before discussing our contribution to the Navy's Network Centric Warfare concept and our progress in support of the vital mission areas: Maritime Strategic Fires, Maritime Strategic Defense, Ship Self-Defense, Undersea Warfare and Homeland Security.

**Readiness - Manpower, Maintenance and Future Fleet** We are making solid progress in addressing long-standing readiness issues thanks to the leaders and sailors in the fleet and the support of the American people and Congress. Manpower, training and maintenance posted significant levels of improvement over the last year and continued improvement is supported in the FY03 budget submission. Although maintaining Force Structure will be a challenge, the Surface Ships joining the fleet today are the best in the world and we have a solid plan for the future with the DD(X) Family of Ships.

#### Manpower/Training

Manpower is our biggest investment, comprising nearly one-fourth of our allotted budget. We must continue to look for economical and efficient methods for manning our ships. The Surface Navy has no alternative but to transition from manpower and workload intensive ships to ships such as DD(X) and the Littoral Combat Ship (LCS) (which will be introduced in next year's budget submission) that will leverage new technologies to expand our warfare capabilities while optimizing manning levels. Roughly two thirds of our community billets are at sea and the preponderance of these billets are in our AEGIS ships. This coupled with the relatively long life expectancy of the AEGIS Fleet has guided us to introduce the SMARTSHIP program into the fleet and our AEGIS force. The SMARTSHIP program, which takes advantage of select technological enhancements to reduce manning requirements, is a useful vehicle to facilitate this transition from today's manpower intensive fleet to the optimally manned fleet of the future, designed around the principles of Human Centered Design (HCD) and Human Systems Integration (HSI).

#### Training Strategy

In addition to researching and adopting technologies to achieve optimal manning, and critical to our retention efforts, we must focus on development of our most valuable resource, the Sailor.

We are still engaged in a battle for people. To win this battle, we must deliver educational and personal growth opportunities for our Sailors.

The Surface Navy has adopted a strategy to reverse a trend that has seen training facilities and equipment become increasingly outdated and ineffective. The ultimate objective of this strategy is to provide optimally trained Sailors to the Fleet at the right time, establish and maintain their proficiency, and promote personal and professional development throughout their careers. This strategy focuses on tailored training, robust integrated training systems, mission area training and distance support. Through detailed billet and watch station task analysis and the installation and use of modern re-configurable trainers, we will be able to properly train Sailors while at the same time replace outdated technical training equipment, rapidly update curricula, and phase out outdated training methodologies. Emphasis on mission area training will address fleet training requirements at the earliest stages of system design and acquisition, an approach that has proven successful for AEGIS combat system training. Distance support will be essential for providing training "on demand" to support Sailors' personal and professional development and to move all training administration off the ship.

To achieve these objectives, in the FY 03 budget submission we have accelerated installations of our principle shipboard tactical team trainer, Battle Force Team Trainer (BFTT), and invested significantly in training re-engineering projects that will lead to replacement of costly and out-of-date technical training equipment in our technical schools, earlier qualification of our junior officers as Surface Warfare Officers and increased navigation, ship handling and seamanship proficiency training in our Fleet concentration area schoolhouses as well as onboard the ships themselves.

#### Junior Officer Retention

Junior Officer Retention is critical to the future of Surface Warfare and, though we are pleased with recent progress, there is still significant work to be done in this critical area. Junior Officer (JO) retention remains at the top of our manpower concerns.

We monitor JO retention by comparing the number of officers that we accessed in a particular year with the current inventory for that same "Year Group". Our retention requirements are thus different for each Year Group, generally falling between 34 and 38 percent of Officers remaining on active duty in the Surface Community at about the 7-year point. Our shipboard Department Head requirements are relatively stable. We require 245 officers to become Department Heads every year to fill our at-sea requirements without significantly overtouring these officers and gapping billets elsewhere in the Navy. To avoid confusion among different retention percentage requirements for different Year Groups, I will tailor my remarks to discuss our ability to meet the relatively stable at-sea requirements of 245 Department Heads per year for each Year Group.

In recent years, just under 200 officers a year were electing to continue their service as Department Heads. This led to increasing Department Head tour lengths to an average of 40 months and in some instances to as much as 50 months in order to cover all of our requirements. These extended tours led to significant Junior Officer dissatisfaction and worked further against our retention goals. To break this negative cycle, we established several innovative programs. Surface Warfare Officer Continuation Pay (SWOCP) offers significant financial incentives to remain on active duty in the Surface Warfare community through two Department Head tours. 1699 of the 1713 available SWOCP contracts offered over the past two years were accepted, additionally 161 of the 275 contracts available this year have already been completed.

Additionally, our "Early Roller" program accelerated careers of outstanding Division Officers to Department Head tours to cover some of these critical sea-going requirements. 115 outstanding young Division Officers have stepped forward and participated in this program to date.

We believe our strong commitment to graduate education for Surface Warfare junior Officers is having a positive retention effect as well. We have increased the numbers of Junior Officers participating in graduate programs from 155 in FY00 to 200 in FY01, and already have 133 officers participating in FY02. In addition, we have allocated funds to support 40 Graduate Education Vouchers (GEV), paying officers tuition up to 20,000 dollars per year for two years.

Our assessment to date indicates that graduate education and SWOCP are a powerful retention tools, and we continue to monitor our retention progress closely.

These efforts have been effective in reversing our declining Junior Officer population trends of recent years and we are approaching our goal of 245 officers per Year Group continuing their service through two Department Head tours. The average number of Department Heads produced by YGs 91 through 94 was 179-much lower than the goal of 245. YGs 95 and 96 on the other hand already have 219 and 223 contracted Department Heads.

Except for the early rollers, these officers can be expected to start their department head tours over the next two years.

We are also continuing an aggressive resignation withdrawal campaign that has borne much fruit over the last several years. 27 officers have reconsidered their resignations in the first three months of FY 02. This is particularly significant when added to the 163 officers that withdrew their resignation requests over the previous two years.

We are not meeting our Junior Officer retention requirements yet, but we are trending in the right direction. Junior Officers are our future; we will continue to focus our energies and innovations in retaining our best. We believe the future of the Surface Warfare community is at stake.

#### Fleet Maintenance

Fleet maintenance is a pillar of current readiness. Recent world events have reinforced the need to maintain our ships mission ready to sail in support of national tasking. This is not an easy task in today's fiscal environment as we continually strive to balance the needs of today's Navy with the requirement to modernize and re-capitalize our Fleet. With our smaller force, we must also focus on maintaining our ships with minimal disruption to ships' operational schedule to provide the maximum flexibility to our Fleet Commanders.

Our ability to predict ship maintenance requirements continues to improve. The Maintenance Requirements System (MRS) is in its third year of use and has matured considerably since its introduction. This system uses historical return costs and documented deferred maintenance to project future maintenance requirements. Under the guidance of the MRS Alliance, MRS is yielding a firmer, more rigorous requirement. This more credible requirement provided the needed rationale to increase our investment in depot maintenance in FY03 budget submission.

Condition Based Maintenance (CBM) processes and our ships' Class Maintenance Plans further define our surface ship maintenance requirements. The maintenance support community has embraced CBM and is working hard at improving water-front maintenance assessment processes and our ability to determine maintenance requirements based on evidence of need.

Material condition information from these assessments is directly fed back into the programming process to ensure adequate resources are devoted to ship maintenance. This information is also being used in new ship design efforts to reduce overall lifetime costs. Programs such as Capital Investment for Labor (CIL) and Cost Reduction and Effectiveness Improvement (CREI) are also investing in new technologies and ways of doing business that will directly affect maintenance requirements and sailor workload. A recent example of this is our FY03 budget submission investment in magnetic couplings; a new technology that eliminates the requirement for our sailors to perform a time consuming alignment procedure. In the President's budget submission, we are planning to procure and install 176 magnetic couplings per year for the next four

years. This initiative not only has a high maintenance return on investment, but also significantly reduces the sailor workload. This is a win-win for both the sailor and the maintenance community and demonstrates our commitment to reducing sailor workload and improving quality of service.

In the FY03 budget submission, we funded Depot maintenance to 91.6% and Intermediate maintenance to 95% of the OPNAV assessed requirement. Although deferred maintenance is expected to grow when funded at less than a 100% investment level, MRS captures this shortfall and includes a portion of the deferred maintenance in the annual Continuous Maintenance (CM) requirement.

We remain committed to providing ships that are supported to a realistic and executable maintenance requirement and ready to respond to operational tasking. Building the Fleet of the Future As the Chief of Naval Operations has pointed out in his previous Congressional testimony, the surface combatant fleet is, on average, relatively young, but the rate of ship recapitalization bears watching. We must procure an average of nine ships per year in the later years of the FYDP to sustain today's fleet and to provide stability for our defense industrial base.

As VADM Mullen, DCNO for Resources, Requirements and Assessments, stated in his previous Congressional testimony, Navy leadership is committed to improving the recapitalization rate of the Navy, particularly in the area of shipbuilding. Our current budget sets the foundation for the future by investing in impressive programs that will comprise the core capabilities of our force in the years to come. The continuing production of ARLEIGH BURKE Destroyers, the planned production of a family of new surface combatants - the Advanced Destroyer, DD(X), the Advanced Cruiser, CG(X), and the Littoral Combat Ship (LCS) - , the TICONDEROGA Cruiser Conversion program and the Joint Command and Control Ship, JCC(X), Program present impressive technological leaps in warfighting capability, innovation, and reliability.

#### DDG-51

The DDG 51 Class guided missile destroyer program remains the Navy's largest surface ship program. The FY 03 budget request includes \$2.29 billion for the procurement of two DDG 51 Class destroyers. The request adds six additional destroyers to the procurement profile, 2 additional ships/year in FY05 through 07. The addition of the six DDGs addresses three issues: mitigates the industrial base gap issue between DDG 51 production and DD(X) construction that was evident in prior budgets; better stabilizes the surface combatant build rate as we transition to DD(X); and stabilizes future surface combatant force structure in the 2012 time frame. A new four year, FY02 through 05, Multi-Year Procurement contract solicitation draft has been recently released. It is anticipated that a contract will be awarded for these eight ships plus options this summer.

The two ARLEIGH BURKE Class destroyers procured in FY03 will be Flight IIA ships configured with the Baseline 7 Phase I AEGIS Combat System, which we introduced on the third ship in FY98. This baseline incorporates new integrated mission capability and makes these ships more capable in the littoral than any other combatant in the world. The upgrades include the SPY-1D(V) radar system, Cooperative Engagement Capability, and a 5"/62 gun.

Additionally, the DDG 51 destroyers of the Fiscal Year 2002 multiyear procurement will be forward fit with Baseline 7 of the Mk 41 Vertical Launching System, the Tactical Tomahawk Weapons Control System and the ability to accommodate the MH-60R helicopter variant.

#### The Family of Ships

The Report of the Quadrennial Defense Review Study and the Navy's leadership have recognized that assuring access to key regions abroad and projecting power, in its various forms, requires a broad range of naval capabilities. These disparate capabilities can best be satisfied by a family of ships, each of which, while capable of multiple missions as necessary and prudent, is optimized to perform a key function:

- Advanced Multi-mission Destroyer, DD(X), for delivery of precision strike and volume fires to support assured access and maneuver warfare.

- Advanced Cruiser, CG(X), to provide air superiority against cruise missile and ballistic missile threats over the total force.

- Littoral Combat Ship, LCS, capable of defeating littoral defenses including mines, fast small boats and diesel submarines. (FY 04 Program Start)

Power projection ashore at the high end of the spectrum of conflict (as well as concomitant force-protection and assured-access requirements) demands the high-volume firepower, long range precision-strike capability, ample magazine capacity, and enhanced endurance of sizeable multi-mission combatants.

However, the intricacies of the littorals demands more expansive, detailed "coverage" inshore which, as currently envisioned, may be satisfied by a multiplicity of smaller, high-speed, and highly maneuverable ships working in close concert with a distributed, netted force of multi-mission ships.

DD(X) and CG(X) will be larger, multi-mission warships, with specialized mission systems and significant ordnance payloads. They will be optimized to deliver "fires for effect" in both land attack and high-end force protection. They will be designed to be highly survivable in expeditionary operations and will provide defense-in-depth for smaller focused mission ships.

LCS will be a smaller ship with an advanced hull design, optimized specifically to operate close inshore. Key attributes of LCS will be stealth, speed, and maneuverability.

Missions envisioned for LCS include mine warfare, anti-surface warfare, and anti-submarine warfare against quiet diesel submarines. LCS will be capable of operating self-sufficiently for extended periods in a low-threat environment, including homeland security/defense missions in conjunction with USCG forces.

LCS is a new program that will be addressed in the FY 04 budget submit.

Nevertheless, it is appropriate to address it in this FY 03 supporting testimony as it will play a significant role in the 21st Century Navy force structure.

In-Service AEGIS Ships, also within this family of ships, will be upgraded through evolutionary upgrades and back fit of technologies in the DDG 51 production line and by back fit of CGs in the Cruiser Conversion program to keep them current and viable in the littoral for their entire life span.

#### Spiral Technology Transfer

Using a spiral development approach will allow technologies to be fielded when they are ready through a flight approach and lessons learned/technology sharing between programs, forged to capture cutting edge initiatives. As DD(X) drives the development of technology in many areas, we will look for opportunities to backfit advancements on existing platforms.

Carefully focused upgrade and conversion programs will ensure the existing core of surface combatants maintain the capability for battlespace dominance. The spiral technology development process of DD(X) and LCS will enable the most efficient insertion of high pay-off technologies into the Family of Ships with the least amount of risk. DD(X) and LCS will be developed in parallel and on complementary time lines.

- CG(X) will share a common hull form and propulsion plant architecture with DD(X) and will use many of the same innovative technologies to reduce crew size,

increase Joint C4I connectivity, and reduce operating and support costs.

- LCS will benefit from the DD(X) technology development by taking advantage of advanced automation technology, high density propulsion plants and increased nodal and C4I connectivity.

- In-service AEGIS Surface Combatants will receive technology upgrades that will extend their combat capabilities and keep them at the leading edge of combat effectiveness.

#### DD(X) Advanced Destroyer

DD(X) will introduce a wide range of technology for naval ships but, moreover, it will be the first deploying combatant ship of a new family of 21st Century multi-mission ships. DD(X) will integrate advanced command, control, communications, intelligence, surveillance, and reconnaissance systems to achieve an unprecedented level of knowledge of the battlefield. To ensure effective operations within the littoral, DD(X) will employ state-of-the-art sensors combined with unsurpassed radar, acoustic, magnetic, and infrared signature reductions exceeding those of all previous warships, including DDG 51. Active and passive self-defense systems, as well as cutting edge survivability features (including modular ship systems and in-stride mine avoidance) will enable DD(X) to fulfill the full spectrum of battle group missions assigned to our destroyers today, and to fight through damage.

DD(X) will have the capacity to carry the variety and volume of offensive, precise firepower, which will enable our Marine Corps and light mobile Army forces to complete their missions. These systems include Tactical Tomahawk and the Long Range Land Attack Projectiles (LRLAP) with a range of 100 miles, and will have the growth potential to include an Advanced Land Attack Missile. DD(X)'s ability to deploy a high volume of precision guided munitions will provide Joint Force Commanders with significantly improved ranges, accuracy, volume, firing rates and response times compared to current-generation ships.

In order to ensure the ship's ability to perform its primary Naval fires mission, the DD(X) design is structured to incorporate several "leap ahead" technological advances. This represents a "Win-Win" investment for the Navy as many of DD(X)'s advanced technology developments will benefit other ship classes. DD(X) will be the catalyst for:

- Integrated Power System (IPS)/Electric Drive: All-electric architecture that provides electric power to the total ship (propulsion and ship service) with an integrated plant. Benefits include reduced operating costs, improved warfighting capability, and architectural flexibility.

- Advance Gun System: 155mm gun with "fully automated" ammunition handling system and a family of munitions/propelling charges specified to achieve ranges of up to 100 nautical miles. AGS will provide high rate-of-fire (approximately 12 rounds per minute) with a magazine capacity sufficient in size to meet USMC operational requirements. Features of the AGS design will provide the basis for future Naval gun systems.

- New Radar Suite (Multi-Function Radar (MFR)/Volume Search Radar (VSR): MFR provides DD(X) and other applicable surface combatants with affordable, high performance radar for ship self-defense. The MFR will greatly enhance ship defense capability against all threats envisioned in the littoral environment. VSR provides DD(X) and other applicable surface ships with an affordable, high

performance air search radar. Both MFR and VSR should reduce manning and life-cycle costs compared to the multiple systems that perform these functions today.

- Optimized Manning through Automation: Use of initiatives, such as advance system automation, robotics, human centered design methods, and changes in Navy personnel policies, will allow DD(X) to meet mission requirements with significantly reduced crew size while improving the sailor's quality of service. Lessons learned from DD(X) can be applied to future surface ship and submarine designs.

- Total Ship Computing/Software Development: Key to meeting optimal manning requirements is affordable open systems architecture technology insertion/upgrades to future ships. By taking advantage of commercial advances in computer processing power, distributed/integrated data networks and software development, total ship computing enables a "plug and play" environment for all internal and external user systems.

- Integrated Apertures: In addition to reducing the ship's Radio Frequency (RF) signature, shared apertures will reduce topside antenna crowding, decrease topside weight, and simplify antenna maintenance. Shared aperture technology has the potential to benefit many other Navy programs.

- Survivability: DD(X) is developing system and protection concepts that are intended to reduce vulnerability to conventional weapons and peacetime accidents under reduced manning conditions. Development areas include damage control computer-based systems that provide rapid systems restoration, fire protection devices that improve probability of survival with a reduced crew ship, and ship protection concepts that reduce magazine and commercial equipment vulnerability.

- Stealth: Operations in the littoral battlespace has made stealth an essential element of new combatant design, particularly radar cross-section reduction. The lessons learned by DD(X) will provide new insight toward all aspects of ship, sensor and weapons design.

The DD(X) family, with its transformational technologies, will be the cornerstone for a family of next-generation surface combatants. These combatants must be affordable to produce and less costly to operate. They must be designed from the keel up to enable dramatic, 50-70%, manpower reductions.

Many of these technologies planned for DD(X) were intended to be incorporated into the DD 21 program. However, the DD-21 program allowed little technical risk reduction, though many of the technologies are quite transformational. With DD 21, we were taking a single step to full capability. There was a success-oriented assumption that everything would proceed on schedule and cost. There were limited opportunities for prototyping and little room for error. In the end, these factors resulted in a program with unacceptable cost growth risk. Thus, DD(X) was formulated to employ a broad range of strategies to make our entire family of next generation surface combatants, the DD(X), CG(X) and Littoral Combat Ship (LCS), more affordable.

To mitigate the high technical risk; the restructured DD(X) program adds several landbased and sea-based prototypes for the key technologies. This provides a practical means of reducing risk within each area. The Navy will see potential problems earlier in the process, providing us a better chance to efficiently solve them. This strategy improves the chances of delivering a functional destroyer within cost and schedule.

Additionally, the Navy plans to produce the lead ship using RDT&E funds. RDT&E funding recognizes that the lead ship design will mature during the design and construction process and may require a more flexible funding medium than SCN to compensate for technology development or schedule issues. This approach is supported by ASN RDA and USD AT&L.

The Navy can react to problems without the risk of resorting to prior-year completion funding. The program manager can focus on establishing an efficient process for manufacturing the DD(X) class and avoid trading away production initiatives if costs increase. Being able to adjust the RDT&E budget for the lead ship provides the best chance to control costs and define a production process that allows the Navy to affordably build these next-generation surface combatants.

Construction of the lead ship in RDT&E is a significant change in the Navy's approach to shipbuilding, which the Navy hopes the committee will support.

Navy's FY03 shipbuilding program also provides flexibility for a smooth transition in DD(X) production. Given production approval by Navy and OSD, SCN funds allocated to FY 06/07 DDG 51 Class destroyers may be reallocated in future budget submissions to provide uninterrupted follow-on class production of the FY 05 RDT&E lead ship.

#### CG(X) Advanced Cruiser

The CG(X) will be built with the same hull and propulsion plant as DD(X). The combat system will take advantage of emerging technologies to provide sustained, theater-wide strategic defense against aircraft, anti-ship cruise missiles, and Theater Ballistic Missiles.

#### Littoral Combat Ship (LCS)

The LCS will be a focused mission ship. Built on a time line complementary to, but shorter than, that of the DD(X)/CG(X) family, it will be a practical, significantly smaller surface combatant capable of performing focused missions in places where it would be impractical or unwise to commit a larger, multi-mission surface combatant. Commercial hull technologies will be leveraged to develop these modular mission package platforms, primarily focused on missions related to battle space access.

In a sense, this is new ground and a significant opportunity as we will be building our 21st Century Surface Combatant Fleet from the keel up with the full awareness that it will operate as a netted, distributed force. We will need the focused-lethality of the Littoral Combat Ship to accomplish specific missions, while the multi-warfare, multi-mission DD(X) and CG(X) platforms provide the wide area battle space dominance for which they are uniquely suited.

Away from home waters and particularly in water space immediately adjacent to adversarial coastlines, access will be a challenge. Area denial defenses close to land will be neutralized by multi-mission surface combatants working in close coordination with specially designed, netted and configured Littoral Combat Ships, exercising the capability to counter mines, small surface combatants and the shallow water warfare threat posed by diesel submarines.

Importantly, with its size, speed and modular design characteristics, LCS has the potential to serve as a platform for mutual development with the United States Coast Guard's Deepwater Program. In this capacity LCS may provide the

foundation for the nation's interoperable U.S. Navy and U.S. Coast Guard force engaged in homeland defense. We are continuing to explore these possibilities with the Coast Guard as we both move forward with these important ship development programs. LCS will also be particularly suitable for foreign military sales, potentially providing our coalition partners with a state-of-the-art surface combatant that will ensure continuing interoperability among our Navies. In FY 03, the LCS program consists of the analysis of several ongoing experimental ship efforts. Development and production funding will be addressed in the FY 04 budget submission.

#### Cruiser Conversion

While building new platforms for the future is a prime priority, maintaining and modernizing our current platforms enables them to continue to be valuable war-fighting assets in the years ahead while concurrently trying to mitigate escalating support costs of aging equipment. As technological cycle times are now shorter than platform service life, it is fiscally prudent and operationally imperative to modernize the force through timely upgrades and technology insertion. In support of this priority, we plan to modernize the TICONDEROGA Class cruisers. Our technology insertion efforts include the Smartship initiatives and a spectrum of new capabilities on other combatants for both existing and in-development ships to be used to extend the combat system service life of these vital multi-mission platforms. The FY03 budget request includes \$104M in RDT&E funds to continue the engineering efforts to meet the schedule for the first installation, which will occur in FY06. The upgrade of these ships will add new, and enhance existing, combat system capabilities for Maritime Strategic Fires, Cooperative Engagement Capability, Force Protection and Area Air Defense Commander missions as well as increase service life with Hull, Mechanical and Electrical upgrades. These new mission capabilities will dramatically improve the ability of these warships to operate in Joint and Coalition warfare environments and the littorals. The program is essential to maintaining a mission-relevant force of approximately 116 surface combatants over the next 20 years.

#### JCC(X)

JCC(X) will provide the JFC and staff with enhanced mission capability for joint campaign management. It will also provide Naval Component Commanders with capabilities for operational control of assigned Naval and allied forces. JCC(X) will support planning and command and control of a full spectrum of Joint and multi-national efforts including:

- Major Theater War
- Forward Presence/Peacetime Engagement
- Peacekeeping/Peace Enforcement
- Humanitarian Assistance/Disaster Relief
- Non-Combatant Evacuation Operations

The program entered Concept Exploration and Definition in November 1999 and has developed a range of alternatives which will be used to decide the controlling characteristics of the ship.

The FY 03 budget request supports construction of the JCC(X) within the FYDP. The final definition of the program will be addressed in the FY04 budget submission.

#### Network Centric Warfare

The Navy's cornerstone warfighting concept of Network Centric Warfare derives maximum force warfighting potential through rapid and robust networking of

diverse, wellinformed and geographically dispersed warfighters. This requires the integration of systems, weapons and communications networks in which the right information is available to the right system or operator at the right time. Naval Forces, dispersed or concentrated, with shared awareness of the battle space and a solid understanding of the commander's intent, are prepared to exploit opportunities as they arise without reliance on centralized control procedures. The command and control environment of the future must be capable of contending with the complexity of the battle space.

Network Centric Operations are based on a robustly networked system of sensors, decision aids, weapons, warriors and supporting systems to support Joint and Naval forces in their execution of missions across the entire range of military operations. FORCEnet is the Navy's overarching, integrating concept through which Network Centric operations will be implemented by Naval forces. It will provide the architecture of networks, the Joint infostructure, web-based infrastructure, and network security for the conduct of Network Centric Warfare.

The Surface Navy's Cooperative Engagement Capability (CEC) system will contribute significantly to the force level integration that FORCEnet is introducing and ensuring interoperability of this and other systems at the battle group, fleet, and Joint levels is a major initiative to support Network Centric Operations. Sea-based Joint command and control is another pillar of the FORCEnet concept and the Area Air Defense Commander (AADC) program and the Naval Fires Network (NFN) program are prime examples of the type of transformational systems the Navy is fielding to advance our goal of universal situational awareness. We have made significant progress in CEC, interoperability, AADC and NFN over the last year and, through the FY03 budget submission, we are postured to continue to advance these revolutionary capabilities.

#### Cooperative Engagement Capability

Cooperative Engagement Capability is a system, in the Fleet today, which provides a revolutionary capability in force level integration for area defense and ships self-defense. Given increased speed and kinematics of the evolving threat, CEC integrates existing sensors and weapons more effectively across the force. The sensor netting approach employed by CEC allows many sensors throughout the force to work together to form a single composite track for each target in the battle-space. As a result, CEC delivers significant improvement in force level detection and tracking, including improved track identification (ID) continuity, improved track accuracy, and improved situational awareness for all ships and aircraft in the force.

Additionally, because CEC generates real-time fire control quality tracks, it brings significant engagement improvements including increased depth of fire, engagement of targets not held by own ship sensors, increased reaction time and maximized performance against the most stressing targets. As the only system based on shared fire control quality information, CEC provides the cornerstone to build the Single Integrated Air Picture (SIAP). This capability not only contributes to the ship self-defense of the platforms on which it resides, it also protects all naval units by "buying back" battle space, the capability of greatest value in countering a fast moving threat. It provides time for alertment, decisions and actions and allows our weapons to shoot to the maximum flight capability of the missile rather than to the limit of one ship's sensors.

Over the past two years, CEC has been rigorously tested to ensure full

integration across current fleet combat systems and data links. The system successfully completed the largest operational evaluation conducted by the Navy to date in the Spring of 2001 and was found both operationally effective and operationally suitable by the Commander, Operational Test and Evaluation Force. This highly robust and operationally realistic test series consisted of 10 underway test events over two years involving 10 warships, hundreds of aircraft sorties in support of challenging test scenarios, and nearly 30 missile firings.

Subsequently, the Joint Requirements Oversight Council (JROC) has re-validated the system's operational requirements and we have continued to work closely with the Office of the Secretary of Defense to ensure compatibility with the evolving Global Information Grid (GIG) architecture. The GIG architect has concurred that CEC is compliant with the 2003 GIG architecture although some work remains to ensure that CEC keeps pace as the GIG continues its evolution. Further, we are currently anticipating a favorable decision from the Defense Acquisition Board (DAB) that approves full-rate production of our surface-based CEC units and continues Low Rate Initial Production of the airborne units for the E-2C HAWKEYE aircraft.

The way ahead for this vital system consists of continuing the spiral development of CEC as we increase the number of cooperating nodes in the CEC sensor network (potentially including joint assets); examine CEC's potential as the foundation of the Joint Composite Tracking Network that will facilitate the development of a Single Integrated Air Picture (SIAP); ensure continued compliance with the GIG architecture; and examine alternative, potentially bandwidth-reducing, technologies. In short, Navy stands ready to field a system that is and will remain:

- Operationally Effective
- Operationally Suitable
- GIG-compliant
- JROC-validated.

CEC is a dramatic improvement in area and ship self-defense for multiple ship classes. There is also growing international interest in this revolutionary new capability. This past summer, the U.S. Navy signed a Memorandum of Understanding with the United Kingdom that will ultimately lead to CEC being installed on Royal Navy Frigates and Destroyers.

Additionally, other Allied Nations including Australia, Spain, Italy, Germany, Netherlands and Japan have also expressed interest in CEC. Specific requests by these nations will be handled on a case-by-case basis.

The CEC program has been a success story this year. The John F. Kennedy Battle Group deployed with CEC last month and we added significant funding to accelerate fielding and further development of CEC and sensor netting technologies in this budget cycle. This revolutionary capability will now be installed in most battle groups by FY 07.

#### Force Interoperability - Distributed Engineering Plant

The force-level integration generated by systems like CEC provides vast improvements in ship self-defense by buying back battle space that allows extra time for decisions and actions in today's challenging ASCM environment. The integration of multiple systems in a force with different levels of capability creates a challenge to ensure interoperability between all the units in a force. The objective of the Navy's Force Interoperability Program is to engineer interoperability into our systems. Improved interoperability brings

significant warfighting capability through increased situational awareness, enhanced weapons coordination, and reduced fratricide, enabling our combat systems to operate at their full design performance level and contributing to the development of a SIAP. This is critical to close-in ship self-defense but even more critical to timely engagement of the "archer" vice the "arrow", the ultimate ship selfdefense objective.

The Navy's force interoperability program is divided into three functional areas, Assessments, Readiness and Warfare Systems Engineering. The foundation of this effort has been the establishment of a series of a land based test sites that support testing of essential fleet combat system upgrades before they are introduced in the Fleet. By networking these sites together into a Distributed Engineering Plant (DEP), we can conduct rigorous force wide interoperability testing and engineering among different combat systems, including the examination of specific battle force configurations, BEFORE the software is deployed at sea.

The Distributed Engineering Plant (DEP) continues to evolve, leveraging existing engineering infrastructure to transform the Navy. Since 1998, when the Navy initially linked existing landbased combat system facilities together to conduct realistic Battle Force interoperability testing, the program has evolved to include tailored interoperability testing for every deploying battlegroup. This testing has enabled the development of interoperability Measures of Effectiveness (MOEs), and the ability to relate these MOEs to operational performance in terms of extended warfighting battlespace.

The Navy has initiated the correction of the prioritized interoperability deficiencies found during DEP testing. Beginning in FY03, we have "closed the loop" from identification of deficiencies, to collection and analysis of data, to identification of root causes, to implementation and follow-up testing of prioritized fixes which yield the greatest warfighting return on our investment.

As we draw lessons from the interoperability testing of today's combat systems, we are simultaneously feeding the results into the development of tomorrow's combat system baselines. As we explore the transformation of the existing AEGIS Baselines into an open architecture, distributed processing combat system, we intend to build these interoperability enhancements into our new systems from the ground up. Following the successful transition to a complete COTS computing environment on our new construction AEGIS DDGs, AEGIS baseline development will introduce an open architecture, high performance, interoperable and network ready software architecture, which will eliminate many of the interoperability limitations of today's combat systems.

As the DEP has continued to mature and expand, it has become evident that the role of this powerful engineering tool must be expanded to support the Navy acquisition process, in addition to the deploying forces. From its inception in 1998 through 2000, the full efforts of the DEP remained focused on Battle Group interoperability testing. However, beginning in 2001, the DEP team established new initiatives - in addition to full Battle Group testing operations - to help program managers find and resolve problems earlier in the acquisition cycle. In fact during 2001, for the first time, 45 percent of DEP utilization was dedicated to supporting development work. For example, the Cooperative Engagement Capability program, which has rapidly become the DEP's second largest user, has been able to test 46 percent of CEC's interoperability requirements in the DEP, substantially reducing requirements to do live shipboard testing, and

therefore shifting this burden from the Fleet to the shore infrastructure.

The FY03 budget submission continues to support this most important interoperability testing and engineering development effort.

#### Joint Interoperability

In addition to the Navy's Force Interoperability Program, last year the Joint Requirements Oversight Council (JROC) established the Office of the SIAP System Engineer, modeled after the Navy's SIAP Engineer effort, to begin working interoperability issues across the Services. The office has been established as a Navy led, Joint Program Office, whose initial focus will be resolving interoperability issues currently existing in the Tactical Data Links used by all the Services. Navy remains closely aligned with this Joint initiative as we move forward in addressing interoperability issues.

#### Command and Control Systems

Installing new or improved weapons systems and integrating them at the shipboard and force level will dramatically improve Naval forces ability to project power and to provide area and ship self-defense. New and innovative Command and Control Systems will significantly enhance warfighting effectiveness by reducing confusion and coordinating the efforts of all the units in a force. Examples of such command and control systems are the Area Air Defense Commander program and the Naval Fires Network program which have both been accelerated over the last year and are fully supported in the FY 03 budget submission.

#### Area Air Defense Commander

The Area Air Defense Commander (AADC) program will provide naval forces significant new Joint Integrated Air Defense (JIAD) capability and buy back more battle space and decision time. The objective of AADC is to provide an essential Joint Air Defense planning and execution tool. AADC provides a means to conduct detailed and comprehensive air defense planning, including air space deconfliction and the optimal stationing of air defense and theater ballistic missile defense assets. AADC is being developed to be fully interoperable with the Army and Air Force air defense planning systems. Through high-resolution displays and robust communications, the AADC module also provides the capability to serve the Air Defense Commander through the entire range of conflict from minor crisis to major theater conflict.

In the wake of the September 11 attack, we identified AADC as one of the systems that would better enable our forces to conduct forward deployed operations and homeland defense and re-baselined the program to develop and deliver a system to the fleet today vice the scheduled FY05 introduction date. Through this realigned program, we installed one unit this year on USS BLUE RIDGE and intend to continue installs into next year and across the FYDP, significantly accelerating the delivery of this revolutionary warfighting capability to the fleet and, potentially, joint forces. This rapid fielding strategy increased planned unit procurements by an additional six units to a total of seventeen units across the FYDP.

#### Naval Fires Network

Within the specter of Command and Control enhancements, the Naval Fires Network (NFN) was developed to provide the network-centric infrastructure and processing capability (software and hardware) required to support CVW Strike, Surface Strike, Land Attack, Expeditionary Fire Support and Anti-Submarine missions in support of Joint and Coalition forces. NFN will be integrated into all phases of the time-critical strike/targeting (TCS/TCT) process, connecting the sensor

grid, information grid, and weapons grid. NFN's overarching goal, integrated with the Distributed Common Ground Station (DCGS) architecture, is to collect, process, facilitate fusion of and disseminate data from a variety of disparate, geographically separated, dissimilar Joint sensors (including space-based sensors) and provide it to the warfighting community in a timely enough manner to identify, target, engage (re-engage, if necessary), and destroy enemy targets. NFN's multiple sources of fused intelligence, distributed throughout the battle-space, ultimately builds Commanders' confidence, facilitating rapid decision-making. This common picture, the basis for engagement decisions, is electronically linked to mission planning and engagement systems. NFN digitally connects sensors, through decision makers, to shooters. This provides a TCS/TCT capability and enhances our deliberate targeting ability in every area of warfare including ship self-defense. NFN provides the commander with time critical intelligence, yielding enhanced situational awareness and therefore, better force posturing for self-defense.

Using the Defense Emergency Relief Fund (DERF) provided by Congress, we have accelerated deployment of this vital system. Our budget request ensures continued rapid deployment of this significant situational awareness and time critical targeting capability.

#### Maritime Strategic Fires - Projecting Precision Fires

Our Navy continues to be a ready and relevant offensive maritime force, with increased emphasis on precision strike and Naval Fires as a vital, emerging mission area to support Joint and Expeditionary Warfare. We will continue to develop our long-range Precision Strike arsenal, and be capable of conducting precision land attack in concert with joint and coalition forces.

This Naval Fires mission area includes several existing and new capabilities, such as long-range strategic precision strike provided by the Tomahawk cruise missile, and precision Naval Surface Fire Support to Marines and other ground forces delivered by a combination of gun systems.

Our surface Naval Fires programs are addressing Navy, Marine Corps, and Army needs for today, tomorrow and the future. Naval Fires include a combination of guns, projectiles, and missiles to meet Expeditionary Maneuver Warfare and Army Transformation Force requirements. These gun and missile capabilities complement each other and together will continue to improve and meet Marine Corps and Army requirements in terms of range, lethality, accuracy, and responsiveness.

#### Tomahawk

Since the success of the initial 1991 Desert Storm firings, Tomahawk has transformed our nation's tactical approach to modern warfare. Today, Tomahawk is a vital CINC asset-the nation's premier deep strike weapon. Tomahawk provides long-range, highly survivable, unmanned, all weather precision strike capability from warships at sea. As a result, the nation has come to rely on Tomahawk to meet an ever expanding number of key war fighting mission requirements, including suppression of enemy air defenses, destruction of vital C4I nodes, proportionate and surgical destruction of critical war fighting infrastructure, and engagement of time-critical targets.

With an average of over 100 Tomahawk missiles expended each year in conflict, Congress approved a 1998 reprogramming of existing Tomahawk funds to field the Tactical Tomahawk (TACTOM) Weapon System-the follow-on to the Block III missile. Applying modern manufacturing technologies to Tomahawk's core competencies, Tactical Tomahawk reduces unit production cost (\$569K in FY99 dollars) while

lowering life cycle cost and increasing the weapon's tactical flexibility. TACTOM improves responsiveness and flexibility by providing an improved anti-jam GPS capability, a satellite data link, reduced mission load and alignment times, increased accuracy, improved reliability, the capacity to loiter and then engage on demand, an ability to flex via the data link to a preplanned alternate target or to a real-time emerging target, and a flexible design that can carry alternate payloads in the future. TACTOM, the associated Tactical Tomahawk Weapon Control System (TTWCS) and the Tomahawk Planning System (TPS) will ensure Tomahawk continues to expand in capability to meet tomorrow's land attack war fighting challenges head on.

Commencing with the first Tomahawk wartime expenditures during Operation Desert Storm in 1991, the Navy has fired more than 1,100 Tomahawk missiles in combat. Most notably, the Navy fired over 600 missiles in FY98/99 during operations Desert Fox and Allied Force and recently, more than 80 Tomahawk missiles in the first phase of Operation Enduring Freedom. Approximately 90% of all Tomahawk missiles expended in Desert Fox and Allied Force and 70% fired in Operation Enduring Freedom were launched from surface ships. These surface ship expenditures represent approximately 20% of the total Tomahawk inventory produced to date.

As a direct result of the high combat expenditures in Desert Fox and Allied Force-and in recognition of Tomahawk's increasingly important contribution towards achieving our warfighting objectives-Congress provided an FY99 Emergency Supplemental of \$431M. This supplemental funded the conversion of 424 Block II missiles to the preferred Block III GPS variant as well as the remanufacture of 200 Tomahawk Anti-Ship Missiles (TASM) to the Block III configuration. The induction of these missiles into the depot commenced October 1999. This effort, known as REMAN I, will complete in May-seven months early.

Earlier this year, as a result of actual and anticipated Enduring Freedom expenditures, a second conversion/remanufacturing effort was funded with \$350M from the FY02 Emergency Supplemental. This effort, known as REMAN II, will convert the remaining Block II missiles and will remanufacture additional TASM and former surface nuclear Tomahawks missiles.

REMAN II will deliver the first of 450 additional Block III missiles in January 2003, completing approximately 15 months later. Approximately 330 TASM and former surface nuclear missiles will remain as candidates for a third remanufacture effort if funding becomes available this year or next.

In the wake of the 11 September attack, we also increased the TACTOM procurement profile. We added 362 missiles to the 1353 missiles funded by the FY02 profile. The PB03 profile now procures 1715 TATCOM missiles through the FYDP. The first of these TACTOM missiles delivers in May 2004.

We are also teaming with the Defense Threat Reduction Agency to field a Tactical Tomahawk Penetrator variant (TTPV). TTPV will address a substantial portion of the weapons of mass destruction hardened and deeply buried target set. The initial buy is programmed for 130 missiles, with an IOC scheduled for FY05.

The two Block III remanufacture efforts, coupled with the increased PB03 TACTOM missile procurement profile, will increase missile inventory to approximately 2/3 of the Navy's Tomahawk requirement by FY09-assuming no future expenditures. While this approach of combining Remans and TACTOM is clearly the best way ahead, current funding does not yet fulfill war-fighting requirements.

Just as Tomahawk has provided the National strike weapon, Tactical Tomahawk, with its capabilities for loiter and in flight retargeting, will also provide a significant Land Attack weapon, especially suited for targets beyond the 100 nm range of future guns.

#### Naval Gun Systems

The Navy's approach for tomorrow's fleet is to develop a set of NSFS weapon systems to install in existing AEGIS ships. These weapon systems include the 5 inch 62 caliber gun and the Extended Range Guided Munitions (ERGM). These NSFS capabilities are expected to meet USMC requirements in accuracy, lethality, and responsiveness.

#### 5 Inch 62 Caliber Gun

The 5 inch 62 caliber gun is already installed in eight ARLEIGH BURKE class ships, commencing with USS WINSTON S. CHURCHILL (DDG 81). The gun was successfully tested during a firing exercise in DDG 81 in Fall 2001. This new gun will provide significantly better reliability, require less maintenance, and will fire the Extended Range Guided Munition(ERGM) to an objective range of 63 nm.

As mentioned above, the 5"62 gun is already in the fleet on recently commissioned DDG 51 Class ships and the FY03 budget request supports installation of 5"62 Guns on all following DDGs. 5"62 installation is also planned for some Ticonderoga Class Cruisers as part of Cruiser Conversion.

#### Extended Range Guided Munitions (ERGM)

ERGM has overcome significant technical challenges and stands as a most important Naval Surface Fires System program. A December 2001 controlled vehicle test shot yielded successful rocket motor performance and proper functioning of the ERGM's guidance package which uses GPS to guide to target. Testing continues during 2002.

Navy made a recent decision to change ERGM's payload to a unitary warhead vice the originally planned submunitions, improving lethality against the target set. The ERGM IOC will shift to FY06 to support development of the unitary warhead, and will provide precision Fires in support of Expeditionary Maneuver Warfare. ERGM extends gun ranges to 63nm - a significant improvement over the 13nm range afforded by conventional 5" rounds.

#### Advanced Land Attack Missile

To meet the full set of USMC NSFS requirements, - an Analysis of Alternatives for an Advanced Land Attack Missile (ALAM) was conducted. We envision that ALAM will be fielded in DD(X) as a spiral development and may be backfit in our current AEGIS ships, and potentially submarines. The Analysis of Alternatives (AoA) provided Navy and OSD leadership with potential technical options. We anticipate ALAM will completely address the full NSFS target set, including mobile/moving targets, and hardened and deeply buried targets. Competing priorities precluded inclusion of ALAM in the FY03 budget submission. Navy is addressing the initiation of an ALAM program in the FY04 budget development process. As an interim effort to meet near term NSFS requirements, the FY03 budget submission fully funds the Tactical Tomahawk program, providing the most efficient balance for Strike and NSFS requirement.

#### Naval Fires Control System

In order to safely and effectively employ long range, precision guided weapons

in support of complex amphibious and joint land battle operations, we are developing the Naval Fires Control System (NFCS). NFCS is a battle management system that will automate NSFS functions and be the enabler for surface land attack in net-centric warfare. NFCS will support mission planning for the 5 inch 62 caliber gun, ERGM, as well as conventional rounds, and support evolving Expeditionary Warfare capabilities, tactics and doctrine. NFCS will be interoperable and consistent with Joint C4ISR systems. NFCS ties the Navy into the digital battlefield, and will be completely interoperable with the Army and Marine Corps' Advanced Field Artillery Tactical Data System (AFATDS). NFCS will IOC in FY03. The first NFCS suite was installed in USS LASSEN (DDG 82) in September 2001.

The FY03 budget submission supports installation of NFCS on DDG 81-108, and selected CGs as part of Cruiser Conversion.

#### Future Naval Fires Systems

For the future, DD(X) will have the capacity to carry the variety and volume of offensive, precise firepower, which enable our Marine Corps and light mobile Army forces to complete their missions. These systems include the Tactical Tomahawk (TACTOM) and the Advanced Gun System (AGS), firing the Long Range Attack Projectile (LRLAP) to distances of 100 miles. DD(X) will also have the growth potential to include the Advanced Land Attack Missile. DD(X)'s ability to deploy a high volume of precision guided munitions will provide Joint Force Commanders with significantly improved ranges, accuracy, volume, firing rates and response times compared to current-generation ships.

The 155mm gun, with "fully automated" ammunition handling system and a family of munitions/propelling charges, is specified to achieve ranges of up to 100 nautical miles. AGS will provide high rate-of-fire (approximately 12 rounds per minute) with a magazine capacity sufficient in size to meet USMC operational requirements. The AGS design will provide the basis for future Naval gun systems.

#### Maritime Strategic Defense - Projecting Area Defense

Building on the "backbone" of CEC to network fire control quality data throughout the battleforce and STANDARD missile enhancements, Surface Combatants will be able to conduct lethal engagements of large numbers of cruise missiles and aircraft over water around the seabase and, in selected cases, over land around Joint forces ashore. Combining the track data from CEC with that of other services in a Joint Single Integrated Air Picture will permit profound advances in tactical decision speed and accuracy.

To achieve synergy at a local level, combat systems are integrated at a shipboard level by systems designed to network sensors and systems within the lifelines. Programs that support this shipboard level integration effort include the Ships Self-Defense System (SSDS) and the AEGIS Weapons system. Combined with the STANDARD Missile program, data link systems and CEC, these cutting edge combat systems form the basis for area air defense that is expanding to the kinetic range of our missiles.

#### Joint Integrated Air Defense

The readiness of naval forces to perform Joint Integrated Air Defense (JIAD) missions remains a central focus for Surface Warfare. The objective of JIAD is to ensure Assured Access and Projected Defense as our military forces move essential combat and logistic forces through the littoral and into the Sea and Air Ports of Debarkation (SPODs and APODs). The Navy's forward presence,

strategic and tactical mobility, and ability to conduct sustained sea-based combat operations form the basis for our significant contributions to JIAD and are essential to support US national strategy.

Today's naval forces remain positioned to lead the JIAD effort with systems such as CEC, Naval Fires Network (NFN) and Area Air Defense Commander (AADC). Our ability is also tied to the robust war fighting capability inherent in combat systems such as the AEGIS Weapons system and the Ship Self-Defense System which continue to pace the emerging threat, in parallel with focused major modernization programs such as Cruiser conversion, DDG 51 shipbuilding and Force Interoperability Enhancement programs.

#### Ship Self-Defense System (SSDS)

The Ship Self Defense System (SSDS) is the combat system of the future for all NIMITZ class aircraft carriers and LDS 41, LHD 1 and LPD 17 ship classes. SSDS is a physically distributed, open architecture computer network consisting of commercially available hardware.

It includes operator consoles using the Navy's AN/UYQ-70 standard display family for human machine interface, commercially available circuit cards and fiber optic cabling. SSDS, significantly expands the capability of both Advanced Combat Direction system (ACDS) Block 0 and Block 1, performing the integration function for detection and engagement as well as performing automated detection and quick reaction functions, emphasizing performance in the littoral environment. SSDS also serves as the integration point for the Cooperative Engagement Capability (CEC) and the Tactical Data Links (TADILS) on these ships.

Following operational requirements approval in 1995, SSDS development began for the LSD 41 class ships. Designated SSDS Mark 1, this system provided integration and automated operation of the combat system elements of these ships, including the SPS 49 radar, SLQ-32 electronic warfare system, Close-in Weapon System and the Rolling Airframe Missile Block 0.

Following a successful OPEVAL in 1997, the system was approved for full rate production, and has subsequently been fielded on all 12 ships of the class, providing them with a robust anti-ship cruise missile defense capability.

After the successful deployment of SSDS Mark 1, the Navy began the development effort to expand the SSDS system to meet the evolving requirements of aircraft carriers and large deck amphibious ships. Designated SSDS Mark 2, this system will integrate additional weapons and sensors including the SPS-48E air search radar, the SPQ-9B ASCM radar, Re-architected NATO Sea Sparrow Missile System (NSSM), and RAM Block 1. Additionally, SSDS Mark 2 provides the integration of the Cooperative Engagement Capability and the Tactical Data Links (TADILS) for these ships, providing a powerful ASCM capability as well as enhanced command and control capabilities to embarked Battle Force commanders.

The Navy has increased its investment in the SSDS program to ensure complete combat system integration, testing, and certification for USS RONALD REAGAN (CVN 76) and USS SAN ANTONIO (LPD 17). These new construction ships will be the first built with the SSDS MK2 combat system, ensuring their ability to pace the increasingly lethal anti-ship cruise missile threat. Additionally, funds were added to equip land based training sites on both coasts as well as to initiate a technology refresh process for this Commercial Off the Shelf (COTS)-based system.

The FY 03 budget submission adds funds to accelerate fielding of this important combat system.

#### AEGIS System

The AEGIS weapons system brings immense warfighting capability to defeat the emerging threat and represents the backbone of the surface fleet. Over 50 percent of today's surface combatants are AEGIS ships and by 2010, that figure will grow to 75 percent. Additionally, the profound role of AEGIS lies in new advances in warfighting capability, including TBMD, CEC and expanded Land Attack capabilities, which will all be introduced through the AEGIS combat system.

#### AEGIS Baseline Consolidation and Open Architecture

As the number of AEGIS ships grows and new capabilities are introduced, the complexity of the combat system is increased, and we are faced with rising lifecycle costs. If not addressed, these costs have the potential of eroding warfighting readiness. Additionally, a threat to AEGIS warfighting readiness stems from costs necessitated by replacement of Commercial Off the Shelf (COTS) computing hardware. As industry has incorporated new hardware to meet the advanced computing requirements of our new AEGIS combat systems, the myriad of computer boards and processors needed to drive the sophisticated AEGIS Combat System have become increasingly COTS based. Because this COTS hardware technology continuously changes as the marketplace rapidly introduces new computing technology, we must conduct COTS refresh of our shipboard systems every two to five years on average to avoid component obsolescence. Available data indicates that these COTS refreshes will come at a cost of \$60 to \$75 million per AEGIS baseline. This cost is unavoidable due to the extensive research and development effort required to integrate COTS hardware with other existing AEGIS combat system software and hardware interfaces.

The Surface Navy is exploring new ways to mitigate these spiraling life cycle costs. One-way that offers the most potential is transitioning the AEGIS Combat System to an open computing system architecture. Open architecture would transition the existing AEGIS centralized software and interfaces to a software design using a modern commercial language and software development techniques. Once in an open architecture configuration, changes to the AEGIS combat system hardware and software, whether required due to component failure or age, or to support expansion of the system to perform new warfighting capabilities, could be done much more quickly and cheaply than with today's legacy architecture. In a real sense, Open Architecture is the key to maintaining the warfighting readiness of the AEGIS Combat Systems over the life of these ships.

Additionally, as we explore the transition of the existing AEGIS Baselines into an open architecture, distributed processing combat system, we intend to build in interoperability enhancements from the ground up, as well as integrating new capabilities to fully enable the transformation to network centric warfare operations of the future.

#### SPY-1D (V) Radar System

The AN/SPY-1 radar system is the primary air and surface radar for the AEGIS Combat system installed in the TICONDEROGA (CG-47) and ARLEIGH BURKE (DDG-51) class warships. It is a multi-function, phased-array radar capable of search, automatic detection, transition to track, tracking of air and surface targets and supporting missile engagements. The third variant of this radar, AN/SPY-1D(V), known as the Littoral Warfare Radar, will improve the radar's capability against low-altitude, reduced radar cross-section targets in heavy clutter

environments and in the presence of intense electronic countermeasures. SPY-1D(V) will be fielded on DDG 91 and follow-on DDGs. It will be delivered to the Navy in October 2003.

SPY-1D(V) will go through land based developmental and operational testing during the summer of 2003 followed by shipbuilder trials in the fall. When netted with other ships through the Cooperative Engagement Capability system, this radar will improve the self-defense capabilities of all the ships in the network.

#### Future Air Defense Radars

The Multi-Function Radar (MFR) and the Volume Search Radar (VSR) are crucial stepping-stones to the future Theater Air and Missile Defense (TAMD) radar and will allow us to neck-down our family of in-service radars and illuminators. As an integrated radar suite, MFR/VSR will provide radar functionality for a wide range of ship classes at the best overall value to the Navy. The suite will generate significant space and weight savings and reduce shipboard radar signature.

#### Multi-Function Radar

Before the Fleet can engage with weapons systems, we must first detect hostile aircraft and missiles. Among the detection systems under development in the DD(X) program is the Multi-Function Radar/Volume Search Radar (MFR/VSR). This radar suite provides a high power, solid state, wideband (X-Band for MFR and L-Band for VSR) active phased array radar system suite optimized for the littoral mission. It will replace up to nine in-service radars and illuminators, while providing autonomous horizon search, long-range volume search, and fire control tracking. MFR is also designed for surface search, periscope detection and navigation.

MFR will enable counter-fire support, electronic protection, and air traffic control/air intercept control functionality for the close approach control function required of air capable ships. As the primary ship defense AAW radar element of the host combat system, the MFR will conduct automatic detection, ID, tracking and illumination of low altitude anti-ship cruise missiles in adverse (multi-path, lobing and ducting) propagation conditions typically found in littoral environments. It will provide missile uplink and terminal homing illumination for ESSM and SM, as well as non-cooperative target recognition (NCTR) and kill assessment. MFR brings all this capability to the combat system in littoral clutter, heavy sea state, rain, and difficult radar propagation environments. It will do this with less manpower, lower life cycle costs, and a higher operational availability than current systems. MFR is designed to be scalable for possible future applications and, along with VSR, has application for a wide range of ship classes.

#### Volume Search Radar

The Volume Search Radar (VSR) is an L-band active phased array radar using Commercial-Off-the-Shelf (COTS) based technology. It will provide long-range situational awareness with above horizon detection, and air control (marshalling) functionality. The VSR will replace the functionality of today's SPS-48E, SPS-49 and SPN-43 radars. Additionally, because it will be a non-rotating phased array radar, VSR provides the required track revisit times to deal with fast, low/very low observable, high diving missile threats as well as reducing ships signature. VSR will provide cueing for MFR to conduct functions above the horizon. It too is designed to reduce ship manning and life cycle costs.

### STANDARD Missile (SM)

The STANDARD Missile (SM) is a primary defense-in-depth weapon in the ship self-defense family of capabilities, providing hard kill self-defense at two levels. At the Area Air Defense level, SM 2 Block IV can be used at extended range to engage the ASCM carrying aircraft. Closer, but still at significant range, SM 2 Block III, IIIA and IIIB variants of the missile have significant ASCM capability as well as improved capability against surface targets.

These missiles, historically limited in performance to the range of their own ship organic sensors, are now, in conjunction with cooperative engagement capability (CEC), able to engage targets at considerably greater ranges, markedly enhancing defense-in-depth and multiple engagement opportunities.

### Extended Area Air Defense

The Navy has an ongoing effort to deploy next-generation Extended Range AAW capability which adds a robust outer layer to fleet air defenses. The SM-2 Block IV is a kinematics improvement of the proven STANDARD Missile family, incorporating a thrustvector-controlled rocket booster, a more robust airframe, and guidance and control modifications for improved altitude/range/cross-range coverage against high-performance, low-radar crosssection threats in an electronic countermeasures (ECM) environment.

The SM-2 Block IV has been delivered to the Fleet and is presently deployed in small quantities to the Arabian Gulf and Mediterranean. Block IV production was terminated at the end of low rate initial production (LRIP) in favor of Block IVA development.

SM-2 Block IVA, cancelled in December 2001, was to have added endoatmospheric theater ballistic missile defense (TBMD) and improved air defense capabilities to the proven Block IV baseline. In the Acquisition Decision Memorandum which cancelled the Navy Area TBMD program and the SM Block IVA, the Under Secretary of Defense for Acquisition, Technology and Logistics recognized a continuing requirement to "address the need for extended-range anti-air warfare capability against cruise missiles and aircraft in light of this cancellation." While the details of the extended-range advanced AAW follow-on missile are still being defined, this missile could build on the proven airframe and propulsion stack developed for the SM-2 Block IV/IVA missiles.

### STANDARD Missile - ASCM Defense

A robust area air defense missile is a prerequisite for maintaining forward naval presence, operating in the littorals, and projecting and sustaining U.S. forces in distant anti-access or aread denial environments. The STANDARD Missile-2 (SM-2) is the Navy's primary weapon for Anti-Ship Missile Defense and theater air warfare. Deployed SM-2 Block III, IIIA, and IIIB configurations are all-weather, ship-launched, medium-range surface-to-air missiles employed by all AEGIS CG and DDG ships.

Each of the blocks is progressively more capable against more challenging threats and in more difficult electronic countermeasures (ECM) environments. SM-2 variants employ inertial mid-course guidance with command updates from the shipboard fire control system with an ECM-resistant monopulse receiver for semi-active radar terminal homing. Block IIIA features significantly enhanced performance and lethality against sea-skimming threats due to a new warhead and fuze design in addition to enhanced trajectory-shaping. Block IIIB builds on the Block IIIA improvements by adding an infrared (IR) guidance mode capability to

improve performance in a stressing electronic countermeasures environment. Blocks IIIA/IIIB will be the heart of the SM inventory for the next decade.

Block IIIB is the only variant presently in production for the U.S. Navy, although Block IIIA is still produced for Foreign Military Sales. Block IIIBs are being produced as new All-Up Rounds, and as upgrades from older Block II and III missiles. The FY03 Budget submission for SM-2 Block IIIB begins an increase in SM production which promises to nearly double procurements through the FYDP compared with FY02 projected levels.

The loss of the SM-2 Block IVA development poses a significant challenge in achieving an extended range air defense capability for naval forces which will have to be addressed in the FY 04 budget submission.

#### Ship Self-Defense

Ship self-defense is integral to a layered defense concept that evolves as naval assets move toward and establish presence and sea-base in the littorals. Force defense starts with preemptive strikes by airborne assets such as Tomahawk cruise missiles and strike aircraft to neutralize the threat. As ships move closer, defense migrates to defensive aircraft and area defense assets such as AEGIS cruisers and destroyers. Finally, as naval assets move in closer to the threat, protection is based on ship self-defense systems. Ship self-defense is a fleet wide requirement and all ship types, including aircraft carriers, surface combatants and amphibious ships, are included in our strategy. Ship self-defense for anti-submarine warfare and mine warfare will be discussed in the Undersea Warfare section below so this discussion will focus on systems that support self-defense and close-in defense of naval assets against aircraft, the Antiship Cruise Missile (ASCM) threat and small fast surface combatants.

#### Anti-Ship Cruise Missile (ASCM) Defense

Our Anti-Ship Cruise Missile Defense strategy involves enhancing the capabilities of our existing ship self-defense weapons and introducing new ship self-defense systems while simultaneously integrating these systems within the ship and among ships throughout the force to achieve exponential levels of improvement in our capabilities. All three levels of integration - stand alone system, ship level integration and force level integration - are important and are being advanced in this year's budget submission. Current and near-term programs will be discussed first at all three levels of integration before moving on to a general discussion of future programs.

#### Ship Self Defense Weapons Systems - Hard Kill

Hard kill systems are designed to detect, engage and destroy ASCMs or small surface craft. The Navy significantly increased funding for hard kill ship self-defense weapons in the FY03 budget request. A common theme in our effort to increase our hard kill capabilities was to ramp up funding of missiles to achieve economic order quantity as soon as feasible. This allows us to buy missiles more efficiently, meaningfully address our ship fill requirements and optimize the use of available funds. Specific examples of this investment are explained below.

#### Rolling Airframe Missile (RAM)

In terms of capability and performance, the Rolling Airframe Missile (RAM) is our premier close-in hard kill system. RAM is deployed aboard thirty-nine U.S. ships, including LHAs, LHDs, LSDs, DDs and CV/CVNs and is planned to be installed aboard LPD 17 class ships. The RAM Block 0 missile is a highly capable missile with low altitude capability and dual RF/IR guidance that does not

require fire control illuminators. RAM Block I adds an IR all the-way capability and a Helo/Air/ Surface (HAS) mode which should begin to enter the fleet next year. This HAS Mode will allow RAM Block I to engage single engine propeller aircraft, helicopters, and small coastal patrol surface craft, while preserving point defense ASCM mission priorities. This missile has exceeded expectations since its successful operational evaluation (OPEVAL) aboard the Self Defense Test Ship with a record of 181 successes out of 192 firings including 23 of 25 firings of the most advanced Block I missile. RAM Block 0 ships will complete upgrade to Block I over the FYDP. The RAM development program is an example of the benefit of international cooperation. It was developed in cost-effective partnership with Germany with the U.S. paying only 50% of the development cost.

In the FY03 Budget Submission, the procurement profile for RAM includes the purchase of both all-up-round RAM Block I missiles and RAM alteration kits (converting existing Block 0 missiles to Block 1) that will result in a significant increase in the RAM inventory over the FYDP.

#### Evolved Seasparrow Missile (ESSM)

NATO Seasparrow, the forerunner of the Evolved Seasparrow Missile (ESSM), still provides ample self-defense against the significant preponderance of the near-term threat and is one of the world's most widely deployed ship self-defense systems. It is currently deployed on 50 U.S. ships and 110 other ships worldwide. It has an all-environment engagement capability against non-emitting, non-radiating, non-cooperative targets, including low to high speed surface vessels, rotary and fixed wing aircraft, and low radar cross-section anti-ship cruise missiles in a regime from sea level to an altitude of 25,000 feet.

The Evolved Seasparrow Missile has its roots in the NATO Seasparrow and is another example of the Navy's ability to take advantage of international cooperation to defray the cost of improving and upgrading hard kill self-defense systems. Ten Seasparrow Consortium nations have invested in the Evolved Seasparrow missile with the U.S. paying less than half the development costs. A new rocket motor, tail control, and warhead have improved the Evolved Seasparrow missile's speed, range, and lethality. ESSM is delivered in a Quad-Pack canister container of four missiles, with each Quad-Pack designed to be inserted into a single MK 41 vertical launcher system (VLS) cell. Follow-on launcher options are being examined for application on non-VLS equipped ships (CVN/LHDs). The program has enjoyed a most successful year of development and testing, highlighted by highly successful land based, live-fire testing completed last December at White Sands Missile Range. Low rate initial production approval was granted in early March.

The FY03 budget submission improves the fielding profile for ESSM, supporting installation on 17 ships across the FYDP including CVN-77, Cruiser Conversions and DDG backfit (DDG79-84). FY03 ESSM missile procurement was increased by nearly 50% over FY02 projections.

#### Close-In Weapons System (CIWS) Upgrade

Another hard kill system that has matured to meet both the evolving threat and the changing tactical environment of the littorals is the Close-In Weapons System (CIWS). After nearly twenty years of CIWS service, the Navy continues to upgrade the CIWS to expand capability and improve maintainability and reliability. The Block 1A variant of CIWS, introduced to the Fleet in 1996, possesses new high order language computer hardware and software to counter maneuvering targets, providing an increased firing rate, better receiver sensitivity, electromagnetic interference (EMI) hardening, and other significant

improvements.

In the FY02 Budget and the FY03 Budget Submission, the Navy has accelerated upgrade of the CIWS system to the Block 1B variant. CIWS Block 1B continues the evolutionary upgrade of this system with the incorporation of a thermal imager, an automatic acquisition video tracker and a stabilization system for the tracker to provide threat detection both day and night. The thermal imager improves the accuracy of angle tracking information, and the fusing of radio frequency (RF) and electro-optical (EO) sensor systems provides a marked improvement in anti-air warfare (AAW) capability, including increasing the number of hits per engagement, extending initial hit range, and countering the effects of multi-path propagation. Block 1B is outfitted with an Optimized Gun Barrel (OGB) and can fire Enhanced Lethality Cartridges.

Most notably, CIWS-1B brings a day and night Surface Mode Capability (PSuM) to this proven air defense weapons system, allowing highly responsive engagement of threats such as small boats, jet skis, and floating mines out to a range of 4000 yards.

The FY03 Budget submission initiates a CIWS Block 1B procurement and conversion program geared to expeditiously deliver significantly enhanced ship self-defense and terrorism/force protection to our amphibious ships, surface combatants and carrier force. Our FY02 and FY03 funding plan is postured to "jump start" conversion of CIWS gun mounts to Block 1B and our objective is to provide Block 1B capability across the surface force within the FYDP.

#### Ship Self-Defense Weapons Systems - Soft Kill

Layered force defense is made more robust by the combination of soft-kill systems with the hard kill systems. These systems defeat the ASCM electronic systems through jamming or deception. In the FY03 budget submission the Navy significantly accelerated the fielding of the highly effective NULKA decoy system and funded moderate upgrades of the AN/SLQ Electronic Warfare System while continuing development of the next-generation Advanced Integrated Electronic Warfare System (AIEWS).

#### NULKA Off-Board Decoy/Advanced Integrated Electronic Warfare System

Another success story of international cooperation to speed development and reduce unit cost is the NULKA active, off-board, ship-launched decoy system. Developed in cooperation with Australia (Australia paid half the development cost) to counter current and future radarguided, anti-ship cruise missiles, NULKA employs a broadband radio frequency repeater mounted atop a hovering rocket platform. NULKA radiates a large, ship-like radar cross-section while flying a trajectory that seduces and decoys incoming ASCMs from their intended targets.

NULKA is planned for installation in CG52 through 73, DD(X), DDG-51, LPD-17, and LSD-41 class ships. During recent testing NULKA provided impressive protection against multiple missile attacks.

The FY03 Budget submission adds funding to upgrade 20 FFGs with NULKA and continues funding for the installation on new construction ships and procurement for an ongoing backfit program throughout the Fleet.

#### AN/SLQ-32 Electronic Warfare System Upgrades

The soft kill "workhorse" of the fleet is the AN/SLQ-32 Electronic Warfare System. The AN/SLQ-32(V) Electronic Countermeasures Set is a family of modular

radar warning receivers and jamming systems that support the three Anti-Ship Missile Defense (ASMD) elements of detect, control, and engage. Ships use SLQ-32(V) to detect and identify threat radars and, in later variants, to engage or jam these radars or deploy decoys against them. SLQ-32(V) program started in 1973 and resulted in five variants of SLQ-32(V). Variants (V)1 and (V)2 are computer controlled, radar warning receiver systems that detect, sort, classify, identify, and indicate the presence of enemy and friendly radars. Variants (V)3, (V)4, (V)5 include all of the receive capability of variants V(1) and (V)2 and add integrated radar jamming equipment. All variants of the SLQ-32(V) interface directly to the MK 36 or Mk 53 decoy launchers. Through this interface, the SLQ-32(V) controls and coordinates the launching of off-board countermeasure decoys. Off-board countermeasures include Radio Frequency (RF) chaff, NULKA (rocketpropelled, active jamming decoy), and Infrared (IR) decoys.

This year we have added funding to upgrade the SLQ-32 to address shortfalls in the threat emitter library. Additionally, we are assessing new technologies developed in the Advanced Integrated Electronic Warfare System for potential insertion into the SLQ-32 system.

#### Advanced Electronic Warfare System (AIEWS)

As with hard kill systems, soft kill systems also must pace the threat, which is becoming smaller, faster, lower, and more maneuverable. Next generation soft kill technologies are being explored in the Advanced Integrated Electronic Warfare System program. These technologies include an advanced display, improved emitter processing, enhanced combat system integration, a new receiver capability, and improved emitter identification.. The AIEWS program has provided "leading edge" technology development that is providing an exceptional array of technologies with significant promise to improve surface Electronic Warfare capabilities in the legacy and future systems.

#### Reduced Radar Signature

Reducing the radar signature of our combatants buys battle space by complicating threat targeting and acquisition. The DDG 51 Class hull and superstructure were designed to significantly reduce radar signature to enhance survivability in an ASCM environment. Building on this concept which lowered the DDG radar cross-section to less than that of a FFG, the DD(X) is being designed to further reduce radar and IR signatures. Through Integrated Topside Design (ITD) and new hull forms making use of the latest technologies including composite materials and aperture control, DD(X) is expected to achieve significant multi-spectral signature reduction that will greatly enhance self-defense and survivability in the littoral. Such signature reduction provides dramatic advantages on the battlefield but, more over, makes future selfdefense systems markedly more affordable and practical to build.

#### Ship Self-Defense Sensor Systems

Complementary to our hard kill and soft kill weapons programs, the Navy is developing and upgrading selected sensor systems to enhance ships self-defense. These systems include improvements to the AN/SPQ-9B Search and Gunfire Control Radar, the SPY-1D Radar System, the MK 46 Optical Sight and the Thermal Imaging Sensor System.

#### AN/SPQ-9B Gun Control Radar

The AN/SPQ-9B is state-of-the-art detection system being developed to counter the emerging air and missile threats. SPQ-9B detects and tracks low-flying, high speed, small radar cross-section anti-ship cruise missiles in heavy littoral

clutter. It detects and tracks small, high speed maneuvering surface craft in sea clutter as well. The result is a significant extension of a ship's battle space to conduct self-defense engagements. The first unit was installed aboard USS OLDENDORF (DD 972) and has met all requirements with impressive results. Its configuration is based on the original Naval Research Laboratory design with a parabolic reflector antenna that is larger and heavier than the antenna of the SPQ-9A. In a mid-deployment report, OLDENDORF stated SPQ-9B was an excellent development in radar systems and the improvement of the 9B over the 9A was "tremendous" noting "the SPQ-9B has become OLDENDORF's premier radar." To provide installation flexibility, we have completed development of a rotating slotted array lightweight antenna designed to provide comparable performance to the antenna deployed on OLDENDORF but with significantly lower topside weight.

This year we have added funding to procure additional SPQ-9B systems to backfit Fleet units and will install SPQ-9B on all cruisers as part of the Cruiser Conversion Program.

#### Mk 46 Optical Sight

Mk 46 Optical Sight System is a central component of the Mk 34 Gun Weapon System, providing Electro Optical/Infrared detection and tracking capability in support of gun engagements. Ancillary uses include night/low visibility surveillance, navigation/ship handling, search and rescue, and in-port security. Over 40 Mk 46 Optical Sights are fielded in the DDG 51 class.

In the FY03 budget submission, we commenced the fielding of Mk 46 upgrades, including an Eyesafe Laser Range Finder, 3-5 Micron FLIR, and Azimuth Motor upgrade, that will significantly enhance system reliability and performance. These warfighting improvements will provide AEGIS DDGs increased ship self-defense and force protection capabilities.

#### Thermal Imaging Sensor System

The Thermal Imaging Sensor System (TISS) also provides ships with a 24-hour visual surveillance capability to be used for situation awareness, target detection and identification, and critical capabilities for challenging littoral environments. Efforts are underway for integration of this system into current and future combat systems for both fire control and target identification.

TISS is currently deployed in limited numbers in the Fleet, but the response from crews of ships with this system has been enthusiastic. TISS is a beneficial anti-terrorism/force protection asset.

In the Arabian Gulf, TISS is the system of choice for monitoring and identification of shipping in our Maritime Interdiction Operations (MIO). TISS's detection and surveillance capabilities are also of great benefit to units conducting counter-drug operations in this hemisphere. As funds permit, we are continuing a systematic program directed to outfit every forward deployed ship in the Fleet with a low light surveillance (EO/IR) system like TISS.

The FY03 Budget submission maintains support for this significant sensor capability at FY02 projected levels.

#### Future Ship Self-Defense Systems

To pace the threat, continued development of future ship self-defense systems is incorporated in the spiral design of DD(X) which will be developed as one of a family of ships that will also include two other future surface combatants, the Advanced Cruiser CG(X) and the Littoral Combat Ship (LCS). The DD(X) program in

FY 03 is fully funded with emphasis on risk mitigation and timely deployment. The combination of the stealth characteristics gained in signature reduction technology and state-of-the-art radar technology will significantly enhance the self-defense capabilities of the DD(X) and, through netting, the other ships in the force. The LCS, to be built from the start as a networked and distributed platform with open, modular architecture, will rely on networks, speed, stealth and maneuverability to enhance its own self-defense while, through those same capabilities and its organic sensors and weapons, contributing to the self-defense of other ships of the force. This is network centric warfare in a most tangible and meaningful way.

#### Multi-Function Radar/Volume Search Radar

As discussed above, Multi-Function Radar (MFR) and Volume Search Radar (VSR) associated with the DD(X) program are optimized for the littoral environment and will provide autonomous horizon search, long-range volume search, and fire control track. MFR's have the ability to provide surface search, periscope detection and navigation and enable counter-fire support and electronic protection in ship self-defense. MFR will automatically detect, ID, track and illuminate low altitude anti-ship cruise missiles in littoral environments. It will support ESSM and SM and provide non-cooperative target recognition (NCTR) and kill assessment. The Volume Search Radar (VSR) will provide long-range situational awareness and the required track revisit times to deal with fast, low/very low observable, high diving missile threats to enhance ships self-defense.

#### Infrared Search and Track (IRST) System

The Navy is investing in electro-optical and infrared (EO/IR) detection and tracking systems to provide a key capability to complement traditional radar and RF systems. The integration of multiple, layered force defense systems allows a ship to defeat a wide variety of threat missiles across the spectrum of radar cross-sections, IR signatures, and seeker types. Each system is affected differently by weather, environment, or ducting. A performance null experienced by one type of system due to its environment can be filled by another system's capability.

The Infrared Search and Track system is a sea-skimming anti-ship cruise missile detection system that adds significant improvements to the shipboard sensor suite. It improves ship survivability by providing 360-degree passive horizon surveillance, automatically detecting and tracking subsonic and supersonic threats.

The developmental system will provide ships with a 24-hour visual surveillance capability to be used for situational awareness and target detection and identification.

Additionally, tests have been conducted to integrate this system into current and future combat systems for both fire control and target identification. The first developmental model was successfully tested aboard the Self Defense Test Ship in 1997 and 1998, and on USS O'BANNON (DD 987) in 1999.

In the FY03 Budget submission we have added funding to complete a second engineering development model of the IRST system.

#### Ship Self-Defense - Patrol Boats and Small, Fast Surface Craft

Small, fast surface combatants are a serious threat in the littoral environment. The Guided Missile Patrol Boat (PTG) is a vessel generally between 50 - 70

meters and capable of carrying 4-8 ASCMs. The Surface Navy possesses adequate capability to counter both the PTG and their associated missiles. Significantly smaller boats, 5-27 meters and armed generally with shoulder-fired and/or smaller weapons, are an emerging threat. In numbers these boats could present a challenge to single ships operating in close-in littoral waters. Situational Awareness (ISR), air assets (organic or shore based) and netted multi-ship formations mitigate this challenge. Our strategy to counter this threat parallels our efforts to pace the ASCM threat, including the layered defense concept of operation, and hinges largely on leveraging the same weapons systems and integration advantages that were discussed above for the ASCM threat. As previously mentioned, several weapons developed for ASCM self defense also have surface capability, most notably STANDARD Missile, ESSM and RAM against the PTG and RAM Block 1 (HAS) and CIWS 1B against the smaller boats. Additionally, the new Littoral Combat Ship (LCS) will be designed specifically to counter this threat, leveraging networks, speed and agility.

Immediate measures to respond to the small surface craft threat include, providing additional 25mm Chain Guns, installing TISS systems on deployers and introducing organic armed helicopters to surface combatants. Each 25mm Chain Gun-equipped ship will be provided with two gun mounts to ensure 360-degree coverage for this anti-surface weapon. The TISS system, described above, is being fielded on our ships deploying into high threat areas such as the Arabian Gulf. We have also already deployed Light Airborne Multi-purpose System (LAMPS) SH-60 helicopters with Hellfire missile capability into the Fleet. In the near-term, we are accelerating the conversion of CIWS mounts to the Block 1B variant and providing the HAS capability to the RAM capable ships.

Future Enhancements that will continue to improve our anti-small boat capability include introduction of the SPQ-9B, the Multi-Function Radar (MFR) and the LAMPS MH-60R helicopter. The SPQ-9B Gunfire Control Radar, described above, is specifically designed to provide better detection of small surface craft and to allow the 5inch/54 gun system to engage. The MFR, designed to function in the littoral, will provide the automatic tracking, autoidentification and periscope level sensitivity necessary to detect, track and target small, fast surface craft. Though not possessing the requisite algorithms for periscope detection, in certain environmental conditions, SPQ- 9B has demonstrated promising capability during at sea testing. Finally, the MH-60R helicopter, employed from in-service cruisers, destroyers and frigates or future platforms like LCS, and armed with hellfire missiles, offers considerable capability against small surface craft.

The LCS is being developed to conduct this type of difficult, focused littoral mission as a complement to our current and future multi-mission surface combatants in the balanced total force. As part of a netted and distributed force, the LCS will use its speed and agility to enhance its own self-defense and contribute to the self-defense of other platforms in the network. We are leveraging work in other programs to start work on LCS related technologies now and expect to formally fund the program next year.

#### Undersea Warfare

Undersea Warfare (USW), which includes Antisubmarine Warfare (ASW) and Mine Warfare (MIW), is and will remain a Navy core competency and is critical to assured access. The littoral environment provides a challenge for ASW. The proximity to coastal waterways, harbors, and shipping lanes increases ambient noise and significantly complicates the already difficult challenge of undersea acoustic detections. This continued acoustic space complicates the problem of

sorting legitimate target echoes from random background echoes. Littoral sonar performance and prediction are highly problematic. Now more than ever, ASW requires a team effort as the harsh littoral requires exploitation of each detection opportunity.

In our shipboard sonar program, we are pursuing an aggressive two-pronged strategy. First, we intend on taking full advantage of the enormous advancements in computing power and networking. We have targeted these technologies for the AN/SQQ-89(V)15 and the AN/SQQ-89A(V)15 with the Multi-Function Towed Array (MFTA) Undersea Warfare Suite. Through analysis we have learned that our best payoff is gained by employing active sonar in conjunction with active acoustic processing techniques and optimizing our passive sonar arrays to operate in the noisy and complex waters of the littoral. Second, we are investing in systems that afford surface combatants mine hunting capability. History has shown time and again that mines are the most effective asymmetric threat in the littoral environment. Their vast diversity and increased proliferation, coupled with abundance of mine-like clutter present in the littorals demand that we equip our Fleet with the ability to find and avoid this threat. The concept in which we are engaged is called remote mine hunting and, when executed successfully, will allow us to sail in seas heretofore closed to us, simply because mines might be present. Add to the ASW sensors described above, improvements in ship torpedo defensive systems, the improved MH-60R helicopter program, and the new Mk 54 Lightweight Hybrid Torpedo, and it is clear this budget submission is focused to enhance surface combatant ASW effectiveness.

#### AN/SQQ-89 Program

In the near term, our ASW focus centers on upgrading the existing AN/SQQ-89 sonar suites to meet future undersea challenges. The upgrade, designed to counter the quiet dieselelectric submarine threat in the littoral, enhances existing capabilities for shallow-water prosecution and adds new, robust capabilities such as torpedo recognition and alertment, and cross-layer active detection using broadband waveforms. The system will capitalize on open system network architecture, and Commercial Off-The-Shelf (COTS) functional enhancements to reduce procurement and development costs, and also simplify future capability upgrades. The AN/SQQ-89 undersea warfare control system provides a fusion point for sonar data, bottom topography, and non-acoustic sensors. With the AN/SQQ-89, surface warriors will have superior data fusion and processing, combined with more effective sensor coverage.

Critical to future ASW is the Multi-Function Towed Array (MFTA), developed in concert with the Submarine and IUSS communities, it will provide warfighters with a below layer active/passive detection sensor and a torpedo detection receiver optimized for shallow water environments. Unlike previous towed arrays that were restricted to deeper water, the MFTA is designed to serve as a receiver for the hull mounted 53 sonar, extending the reach of the hull sonar away from own ships noise. Additionally, surface combatants will receive the MH-60R with its advanced ASW suite, including the AQS-22 Airborne Low Frequency Sonar (ALFS). The SQQ-89(V)15 working in a coordinated manner with the MH-60R carrying the new Mk-54 digital torpedo will give surface warriors a powerful ASW capability in any ASW environment.

The FY03 budget submission represents a significant change of strategy for SQQ-89A(V)15 fielding. Under this new strategy, these systems will now be installed in Ticonderoga Class Cruisers as part of the Cruiser Conversion Program in addition to the installation plans for DDGs. OPN funding levels were revised

downward as part of this budget to reflect the shift of funds to the CG Conversion SCN account.

#### Mk 54 Torpedo

As the shallow waters of the littoral environment have become better understood it is clear that ASW acoustic torpedoes require more robust detection and signal processing capabilities to further enhance performance in littoral environments. With defense-wide fiscal constraints prevailing, a new "bottom up" development program has not been feasible. The determination was made that state-of-the-art COTS processors combined with technologies and performance features already incorporated into the Mk 50 Lightweight Torpedo and Mk48 (ADCAP) Heavyweight Torpedo, if effectively adapted to inventory units of the Mk46, provide the most cost-effective alternative to counter today's threat. In 1995, the Mk54 Lightweight Hybrid Torpedo program was initiated to provide a cost-effective shallow water performance upgrade to the lightweight torpedo inventory of MK46 and MK50 torpedoes.

For the Mk54 the incorporation of non-developmental item technologies from existing weapons and commercial industry has resulted in a significantly improved shallow water performance while reducing total ownership cost. Extensive use of COTS and open systems architecture enables the Mk54 to be readily upgraded via technology insertion and software upgrades to counter future threats. CG47, FFG7 and DDG51 class combatants, the SH-60B/F, MH-60R and the P-3 aircraft will all employ the Mk54.

The Mk54 is planned to IOC in FY03 with full rate production commencing in that year. We significantly accelerated the procurement of the Mk54 in the FY 03 budget submission to achieve significant savings through procurement at Economic Order Quantities (EOQ), and to obtain a significant improvement in capability within the FYDP.

#### AN/SLQ-25A

The advances in computing technology have allowed an increased sophistication and enhancement to our underwater defensive systems, specifically the AN/SLQ-25A. Central to our future undersea defensive systems will be a focus on the existing AN/SLQ-25A, which will be enhanced with state-of-the-art acoustic sensors and automated processing.

The AN/SLQ-25A system is currently a soft-kill countermeasure system that acts as a decoy to confuse incoming homing torpedoes. It is the most widely used torpedo countermeasure system fielded on our ships. The AN/SLQ-25A is a towed system that operates at all times when the ship is at risk of torpedo attack, and unlike some of the more sophisticated countermeasure systems, the AN/SLQ-25A in its current state does not rely on cueing from an Anti-Submarine Warfare (ASW) system.

#### Torpedo Recognition and Alertment

If a ship is to react to a torpedo fired against it, there must be a way for the ship to detect the torpedo. Our surface combatants, using input from both the hull sonar and towed arrays, employ a processor and display system to gain alertment and recognition of torpedo acoustic emanations. The alertment and recognition system is used in conjunction with ship maneuvers to evade the torpedo and deployable countermeasures to effect a soft-kill of the incoming torpedo.

The AN/SQQ-89 Anti-Submarine Warfare combat system Torpedo Recognition and

Alertment Functional Segment (TRAFS) will detect and localize torpedoes at tactically significant ranges when torpedo acoustic noise is received by the towed array or the hull sonar. In the development of this important system, recent advances in acoustic sensors and computing have provided promise that the AN/SLQ-25 can be adapted to provide a significant improvement to torpedo alertment.

#### Anti-Torpedo Torpedo (ATT)

The ATT is the only near-term, hard kill countermeasure that promises to be effective against all threat torpedoes. The ATT will soon complete an FY01 Advanced Technology Demonstration (ATD). The Navy Staff has worked very closely with the Office of Naval Research on further development of this promising weapon system, as well as the potential to integrate this capability into shipboard systems for torpedo defense. The torpedo detection programs previously discussed lay the foundation for introduction of an ATT capability as it materializes.

#### Remote Mine Hunting System

While it is preferable to avoid mined areas (using our knowledge superiority), military objectives may require operations in close proximity to mined waters. The Navy will continue to aggressively research and prepare mine countermeasure (MCM) systems to ensure effective operational capability in littoral waters in support of land campaigns. Countermeasure technology must keep pace with the increased sophistication in mine fusing and stealth technology.

For surface combatants, a new addition to the AN/SQQ-89 USW suite will be the AN/WLD-1, Remote Minehunting System (RMS). The first RMS deployment is presently planned for DDG-91 in FY05 and represents the first generation of organic mine countermeasures (OMCM) systems for surface combatants. RMS is a semi-submersible vehicle that tows a mine hunting sensor suite to detect, classify, locate, and identify mines in the water column and on the sea bottom. RMS can operate autonomously and maintain a radio frequency link to the ship to allow sufficient forward deployment from the host ship, thereby reducing risk and minimizing interference with other ship missions. Through the AN/SQQ-89 and Global Command and Control System Maritime (GCCS-M), RMS will communicate mine location information to the rest of the fleet, supporting the integration of organic and dedicated mine warfare forces. RMS represents leading edge technology in organic mine hunting which must be leveraged into our future ships to provide optimum operational capability and flexibility.

#### MH-60R Multi Purpose System (LAMPS)

An important piece of undersea warfare and force protection is the Light Airborne Multi-Purpose System (LAMPS) SH-60B and its next generation, the MH-60R helicopter. These helicopters play a significant role in our "assured access" strategy. The MH-60R will provide improved capability in littoral - specifically in improving situational awareness and providing defense against an increasing threat from small surface combatants and quiet diesel submarines.

The MH-60R will bring an Inverse Synthetic Aperture Radar (ISAR) capability, the advanced ALQ-210 EW suite, and an integrated AQS-44 FLIR capability to our surface force. The MH-60R and its AQS-22 dipping sonar, along with an improved COTS based acoustic processor will enable the execution of multi-static ASW, contributing to our ability to detect threats in harsh littoral environments. In addition to these significant mission avionics capability upgrades, the decision was made last year to shift to a new manufacture program geared to directly improve the readiness and operational availability of these helicopters. This

program provides a critical warfighting component for our surface combatants.

#### Conclusion

Our Surface Navy remains a pre-eminent maritime fighting force in an ever changing and dangerous world that continues to be characterized by instability, uncertainty and ever increasing asymmetric threats. Today's Navy possesses the mix of capabilities required to carry out our Nation's maritime strategy. But we must do more to pace tomorrow's inevitable challenges.

The Surface Navy we are building for the 21st century will be characterized by speed, agility, strategic reach and an enhanced "toolbox" of capabilities all designed to assure access, project power and project defense. The "family of ships" in our 21st century Surface Navy will be truly transformational and will dominate the battle space, undersea, on the surface and in the air. This "family of ships" will be a force designed from the keel up to operate as a distributed, netted force. Today, we are on our way to realizing the full benefits of network centric warfare with capabilities such as CEC, AADC and NFN operating at sea, and we will build upon our successes to move towards the more enhanced and transformational networked architecture of FORCENET.

In a challenging world, our Surface Navy remains a critical force in defending U.S. interests abroad and our citizens at home.

On behalf of Surface Warriors and our Navy, I want to offer my sincere thanks for your continued support and thank you for this opportunity to speak before you on the state of Surface Warfare. We have met and are meeting the challenges of the Cold War, the conflicts of the 1990's and now the first war of the 21st Century, the War on Terrorism. In doing so, the message is clear: be prepared for the unexpected. We continue to strive earnestly to do just that.