

December 9, 2015

Testimony before the House Armed Services Committee
Subcommittee on Seapower and Projection Forces

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All testimony herein submitted represents the personal views of Bryan McGrath

Thank you Chairman Forbes, Ranking Member Courtney and members of the Seapower and Projection Forces subcommittee for the opportunity to testify and to submit this written statement for the record.

In April of this year, I was honored to testify before you on my views of the role Surface Forces in presence, deterrence, and warfighting, and today I have been asked to provide views on “Game Changing Innovation and the Future of Surface Warfare”.

It is particularly gratifying to testify alongside Mr. Jon Solomon, whose thinking about the employment of naval forces at the operational level of war is of unparalleled quality and depth.

I served for 21 years in our nation’s Surface Forces, from 1987 until 2008, with tours in frigates and cruisers and command of the Destroyer BULKELEY out of Norfolk. It was an honor and a privilege to take to sea under our nation’s flag, and in my present-day work, I continue to advocate for powerful and numerous Surface Forces as part of our Navy’s approach to meeting its global commitments.

This hearing is forward looking, and asks Mr. Solomon and me to think and speak about “game changers” and innovation as they relate to surface warfare. The timing of this hearing—one month before the annual Surface Navy Association Symposium — could not be better, as there is a great deal of intellectual ferment underway within the surface warfare community, spurred largely by its leaders’ visionary concept of “Distributed Lethality”.

I offer one initial caution, however. The Secretary of Defense’s “Third Offset Strategy” effort is in the news quite a bit these days, and despite senior officials’ continuing denials that it is NOT primarily about technology, it appears that most of the narrative does indeed revolve around technology. Given the globalization and commercialization of technology, any sense that the U.S. military is likely to or capable of gaining advantage through technology alone must be eyed warily. We are just as likely to be scrambling to counter technological advantages GAINED by adversaries as we are to force them into countering us. What will ultimately be determinative is not technology per se, but the speed and ease with which technology and advantage can be put in the hands of the war-fighter. Put another way, the 80% solution tomorrow is better than the 100% solution next month. I would urge this committee to do all it can to remove impediments to this sense of urgency.

Distributed Lethality

In January of 2015, VADM Tom Rowden – Commander of Naval Surface Forces – debuted new thinking about how the Surface Force would be organized, trained, equipped, and operated – both as a peacetime conventional deterrent and as an element of the Joint war-fight. This relatively simple idea--branded “Distributed Lethality” – holds that if unit level lethality were increased across the surface fleet, and that fleet were then operated differently, a greater number of adversary targets could be held at risk, a larger cost would be imposed on adversary intelligence, surveillance, and reconnaissance (ISR) systems, and adversary weapons loads would be diluted as a function of individual attack density.

It is my view that this single idea represents the most important “game changer” or innovation pertinent to the Surface Force. From it are derived a number of concepts and capabilities that should be prioritized in order to realize the benefits of a more lethal and distributed fleet. First though, some background is provided.

The concept of Distributed Lethality was an outgrowth of the March 2014 LCS wargame conducted as a result of then Secretary of Defense Hagel’s direction to truncate the LCS program and evaluate options for a follow-on frigate program. The wargame at the Naval War College revealed that the addition of even a modest, medium range surface to surface weapon system to existing variants of the LCS caused behavioral changes in both the adversary team and the “Blue” or U.S. team. On the adversary side of the equation, ships that could earlier be ignored – that is, remain only loosely targeted (because they were unthreatening) – had to remain tracked and targeted on a more continuous basis. These requirements resulted in a larger drain on adversary ISR forces, which in turn precluded them from as effectively locating and targeting high value units. Additionally, since these modestly enhanced LCS could now engage adversary fleet assets, the costs associated with initiating combat were raised. This of course, is the essence of conventional deterrence.

On the “Blue” side of the conflict, operational commanders had at their disposal in pre-conflict phases, a platform that did not have to be retired at the first sign of violence. Blue commanders actively employed these “up-gunned” assets in important roles including chokepoint patrols and high value unity area defense. The psychology of this employment is important to grasp. The ships were not any more capable of *sustaining* damage; they were only more capable of delivering it. This more lethal stance created in the minds of Blue commanders the perception of an altered risk environment. In other

words, they believed that in pre-hostilities phases, these more powerful ships would act as a greater inducement to the adversary to postpone aggression.

As a committed navalist and former surface warrior, I am grateful for the attention that the Chairman, the Ranking Member, and this entire Subcommittee have drawn to the problem of our Surface Force being “outsticked” by adversary surface to surface weapons. The unfortunate fact that this disadvantage has grown as the result of conscious decisions made in harvesting the “peace dividend” of the 1990’s makes it no easier to bear. Simply put, the U.S. Navy has not fielded a surface warship capable of organically neutralizing another surface warship over the horizon since the commissioning of the USS PORTER (DDG 78) in 1999. This was the last ARLEIGH BURKE class destroyer to be fitted with the Harpoon Anti-Ship Missile System, which was useful at ranges of up to about 70 miles. Since that time, not only have no other ships been built that employ an over the horizon surface to surface missile, but the U.S. Navy variant of the Harpoon has declined in effectiveness versus the threat.

The Surface Force leadership evidently also looked at this growing deficit and realized that if a modern ASuW weapon employed by a modestly capable ship (LCS) could cause notable, desired behavioral change in Blue and Red commanders, then even more capable weapons employed by even more capable ships could further this phenomenon. Furthermore, if taking relatively non-lethal ships and increasing their lethality worked for small combatants, would not similar initiatives create similar effect when affixed to other ships that are not traditionally thought of as “surface combatants” – such as amphibious ships, or even ships of the logistics force? This thinking animates the core of Distributed Lethality.

While increasing the lethality of individual ships is necessary, it is insufficient to realize the full value of that investment. In order to do so, the Surface Force must be operated differently, in a more distributed manner. By doing so (therein limiting concentration of naval forces) the fleet thins the surveillance network and brings its offensive capabilities to bear across a larger geography threatening a larger number of adversary targets. This does not mean that the Surface Force can or should diminish its role in providing support to high value units. Quite the contrary. It must continue to do so. However, by spreading its own ability to threaten adversary capabilities, it reduces the adversary’s capability to concentrate its efforts largely or solely on high value units, thereby increasing their survivability and combat effectiveness.

Distributed Lethality and Conventional Deterrence

The most important quality that Distributed Lethality brings to the Surface Force is the degree to which it presents a potential adversary with a more potent conventional deterrent; this is why I believe Distributed Lethality to be a “game changer”. Clearly, an all-out, high end war with a peer or near peer competitor would result in devastating combat losses on both sides. Anything operating on, under, above, or next to the ocean and within adversary weapon and sensor range will be at risk once open conflict begins. Critics often point to the risk to the Surface Force in such warfare as justification for reducing its prominence in Navy force structure, preferring to redistribute harvested resources into other elements of the fleet design, primarily undersea warfare which is deemed to be less at risk in “Phase 3 Operations”.

There is little doubt that our nation’s dominance in undersea warfare is one of the crown jewels in both our ability to gather intelligence and in our ability to wage unrestricted warfare – when that time comes. Submarines are however, relatively ineffective instruments of conventional deterrence when compared to surface ships. The quality of being able to be seen by a potential aggressor cannot be underestimated in its contribution to deterrence by denial or punishment. This is not to say that un-located U.S. submarines are without deterrent value; only that their deterrent value is less relative to that of a visible and continuous surface presence.

However, (and as indicated earlier) the quality of that surface based deterrent has declined in the past fifteen years as the Surface Force largely abandoned the ASuW mission area in the face of a declining threat to blue-water operations. Without a peer threat on the open ocean, the Navy could concentrate its ASuW capability in the carrier air wing and to a lesser extent, the submarine force. This was a prudent path to take in the post-Cold War era, and it was likely a source of savings that went into other capabilities. But the result is that now – in an era of increasing great power competition – our Surface Force is at a decided disadvantage, which in turn diminishes its value as a deterrent. Put another way, exactly at the time when we need once again the capacity to deter great powers conventionally, our primary naval conventional deterrent – the surface ship – has been diminished.

If the Navy moves forward with a robust instantiation of Distributed Lethality, the deterrent quality of its forward presence will increase. By increasing that conventional deterrent posture, the ruinous war it is meant to deter becomes less likely to happen. Not only is this a “game changer”, but it is a prudent, necessary, and economical one. The remainder of this written testimony consists of a series of desired capabilities that would enable this innovative new concept.

Long Range Over the Horizon Surface to Surface Weapons

No ship in our inventory can disable another ship with its organic weapons at ranges greater than approximately 70 miles (the range of the Harpoon missile), and no ship has been added to the inventory since 1999 that can fire the Harpoon missile. In order to raise the level of conventional deterrence represented in our forward deployed surface vessels, the Navy must move quickly to close this gap. The pursuit of an elegant solution for the future should not preclude the immediate fielding of useful weapons available on the world market.

First, no new LCS should be built without a surface to surface missile system that is at least as capable as that which is desired for the FF class. When that missile is decided upon, it should be backfit into every LCS at its first major maintenance availability.

Second, the Navy should capitalize on ongoing testing of the Tomahawk Land Attack Missile (TLAM) in the Anti Surface Mode and move to production of dual use TLAM's, effectively taking over 3000 land attack missiles (employed by nearly 90 surface ships from over 8000 vertical launch cells) and turning them into ship killers out to approximately 1000 miles. This single act will bring the most return on investment the fastest, and will guarantee that both the Flight III DDG and the DDG 1000 are also capable of firing this extended range surface to surface missile. Some analysts believe that against the most capable air defense units in potential adversary fleets, the subsonic TLAM will lack necessary capability. It must be remembered however, that not all adversary platforms are that capable, and the most capable units can be targeted and neutralized by other portions of the fleet architecture (carrier air wing, submarines). In the meantime, every single cruiser and destroyer in the fleet would be capable of holding targets at risk on land and at sea out to 1000 miles. Congress should direct the Navy to fast track this missile modification with desired deployment in the early 2020's.

Finally, the Navy must move quickly to specify the requirements for a 21st century ASuW weapon or weapons—but without allowing this process to delay the TLAM modification discussed in the previous paragraph. Commonality between air and surface missiles should be a goal but not a requirement that delays fielding. This missile must be capable against the world's most advanced defense systems, and should be targetable against fixed and moving targets, at sea and ashore. The development effort for such a missile would extent into the latter part of the 2020's, which makes the TLAM modification that much more important. However, thinking that the TLAM

modification solves the ASuW problem in the long term is incorrect. A new missile with advanced characteristics is required.

Multi-Source Maritime Targeting and Tracking

The Surface Force employed a comparatively long range surface to surface missile in its past. Known as the Tomahawk Anti-Ship Missile (TASM), it was pulled from the inventory in the 1990's. Strictly speaking, the Navy did not at the time possess the ability to consistently and confidently target this missile out the full extent of its range. It simply did not have the persistent sensors nor the networking required to employ the weapon. Those days are over, but the extended range fire control loop must still be closed.

To explain, if the Navy does indeed field the TLAM in the ASuW role (or any long range surface to surface weapon for that matter) the requisite tracking and targeting infrastructure to employ the weapon at its maximum range largely exists. Overhead assets, persistent air breathing UAV's and manned aircraft, and a variety of passive systems that exploit both acoustic and electromagnetic emissions all generate sufficient active and passive targeting data to provide for effective weapon employment. The problem to be solved, and the potential game changer, is that all of this information/ data/ measurements must be analyzed to provide target quality inputs to the weapon during the various stages of its employment (pre-launch, in-flight, end-game). Although it is trite to attribute all manner of miracles to "big data", it does not seem to stretch the art of the possible to suggest that the considerable passive and active targeting data can be correlated, reported, and shared in tactically relevant timelines. This data fusion effort would combine information gathered from National Technical Means (NTM), theater assets, strike group assets and individual units and via networks of sufficient latency deliver target quality data to the missile. This closed loop data fusion and targeting capability does not currently exist.

Real-Time ISR Vulnerability Assessment

Much of the capability of potential adversary ISR complexes is known. Generally speaking, we know where these capabilities are, at what frequencies they operate, what their likely effective ranges and sensitivities are, and how weather, time of day, or sunspots impact them. One of the benefits of forward presence is that our platforms

operate day in and day out in an electromagnetic environment much like the one they may be called to fight in (although there will be “war-time reserve modes” in which some equipment operates). The Navy needs the capability (again, tapping into the wonders of big data) to “map” and display the density and effectiveness of an adversary ISR complex in real time, taking into account the factors previously stated and rolling into them the impact of attrition. The purpose of this capability would be to enable risk mitigated operations within an opponent’s Anti-Access/Area Denial (A2AD) envelope.

This capability is required in no small measure because there are always more and less risky places and times to operate within an adversary A2AD environment. The suggestion that the effectiveness of his surveillance and targeting complex is equal throughout its volume simply fails to understand the considerable variability that exists within it. What is required is to *know and understand* that vulnerability, and then use it to our tactical and operational advantage. This requires a real-time tool that assesses the ISR environment and displays areas of relatively greater and lesser vulnerability. These areas are then likely areas for power projection operations and or deception operations.

Electromagnetic Spectrum Warfare

As indicated by the suggestion that a real time ISR vulnerability assessment tool is required, our ability to operate and exploit the electromagnetic spectrum is increasingly important. We are fortunate indeed that Bryan Clark and Mark Gunzinger of the Center for Strategic and Budgetary Assessments (CSBA) only last week (2 December 2015) released a superbly informative report on the subject “Winning the Airwaves: Regaining America’s Dominance in the Electromagnetic Spectrum” (CSBA 2015). It effectively describes Electromagnetic Spectrum Warfare, its evolution and its challenges to U.S. forces. It further goes on to describe a number of useful operating concepts that would enable U.S. power projection operations in this environment and suggests new technologies and capabilities required to achieve them. It concludes with a discussion of some of the barriers to implementing such concepts and capabilities.

The Surface Electronic Warfare Improvement Program (SEWIP) is bringing considerably upgraded electronic warfare capability across the fleet. Much of what is available in SEWIP Block II and SEWIP Block III is classified, but the unclassified information available indicates that Block II brings considerably enhanced passive sensitivity to enable ships to exploit the emissions of other ships, aircraft, or missiles. These emissions can now be sensed from greater distances than ever before available,

and their directionality can be more finely honed to enable target quality passive cross-fixing. Block III incorporates all of the capabilities resident in Block II, but then adds considerable “Electronic Attack” (or jamming) capability.

It is advisable to have as much of the full Block III capability as possible integrated into every surface combatant irrespective of size. The demands of electromagnetic spectrum warfare suggest that the creation of electromagnetic haves and have nots in the environment will limit the utility of less than capable ships and make them more vulnerable. Additionally, the Navy must work to fully network shipboard combat systems in a manner in which both hard kill and soft kill options can most effectively be employed against demanding threats while conserving consumable weapons such as missiles and decoys. Networking a surface action group together to enable smart employment of hard kill and soft kill options, driven by tactical decision algorithms embedded in the network, create a “hardened”, task oriented SAG that is better able to exploit its lethality in an A2AD environment.

Surface Ship Medium Altitude Long Endurance (MALE) UAV's

Distributed Surface Force operations must be underpinned by sufficient overhead ISR and communications relay/networking capability, especially in a satellite denied environment. Current embarked helicopters lack the persistence necessary to perform these tasks (though they are vitally necessary for others), and the current/planned generation of combatant employed UAV's lack both persistence and payload carrying capability.

Distributed Surface Operations require an organic, Medium Altitude Long Endurance UAV capability such as is currently being studied by DARPA's Tactically Exploited Reconnaissance Node (TERN) Program. The following description of TERN comes from DARPA's web page (<http://www.darpa.mil/program/tactically-exploited-reconnaissance-node>):

“In May 2014 DARPA and the Office of Naval Research (ONR) signed a memorandum of agreement making the program a joint effort – calling it Tern. Tern builds on DARPA's TERN program and seeks to combine the strengths of both land- and sea-based approaches to supporting airborne assets. Tern envisions using smaller ships as mobile launch and recovery sites for medium-altitude long-endurance (MALE) unmanned aircraft (UAVs). Named after the family of seabirds known for flight endurance – many species migrate thousands of miles each year –

Tern aims to make it much easier, quicker and less expensive for DoD to deploy persistent ISR and strike capabilities almost anywhere in the world.

Ideally, Tern would enable on-demand, ship-based unmanned aircraft systems (UAS) operations without extensive, time-consuming and irreversible ship modifications. It would provide small ships with a “mission truck” that could transport ISR and strike payloads to very long distances from the host vessel. The solution would support field-interchangeable mission packages for both overland and maritime missions. It would operate from multiple ship types and in elevated sea states.

DARPA and ONR envision Tern as improving aviation capabilities from smaller ships substantially beyond the current state-of-the-art. The program has three planned phases. The first two phases focus on preliminary design and risk reduction for the Tern system. In Phase 3, a performer would be selected to build a full-scale demonstrator Tern system for ground-based testing, culminating in an at-sea demonstration of launch and recovery.”

Distributed surface action groups (SAG) require persistent ISR support, and if conflict results in the reduction of satellite communications and networking, ships operating distant from the carrier strike group will need the ability to generate these capabilities organically.

Of additional interest is the possibility that a surface combatant based MALE UAV could assume some or all of the UCLASS ISR requirement currently being debated for employment from the aircraft carrier, so that the carrier air wing would then be left to concentrate on the contested strike requirement that exists in UCLASS.

Conclusion

The presence, persistence, and flexibility of the Surface Force makes it a powerful component of this nation’s forward deployed conventional deterrence posture. In order to continue to carry out this role, new ways of thinking must be applied to its organization, training, equipping, and employment. Distributed Lethality provides for an initial concept for moving the Surface Force in the direction of providing such an enhanced deterrent posture. The reality of growing great power contention demands this kind of thinking, and whatever support this Sub-Committee can lend to ensuring that sufficient resources are applied to support the lethality and hardening of the Surface Force would be of great importance to meeting the challenges posed.