Future Navy

May 2017

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Over the past year there have been numerous studies, conducted by the Navy and several other organizations, that have explored what the future fleet should look like.

Two consistent conclusions emerge from this body of work:

- **First, the nation needs a more powerful Navy, on the order of 350 ships, that includes a combination of manned and unmanned systems.**
- **Second, more platforms are necessary but not sufficient. The Navy must also incorporate new technologies and new operational concepts.**

Finally, as we increase our naval power, our focus cannot be on some distant goal decades in the future. The Navy must get to work now to both build more ships, and to think forward - innovate - as we go. To remain competitive, we must start today and we must improve faster.

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Faster and More Complex. And Faster.

There is broad agreement that the current security environment is faster paced, more complex, and increasingly competitive. Time is an unforgiving characteristic of that environment - things are moving faster, including our competitors. More and more often you hear one word to describe the pace: exponential. In many ways, information technology is driving this. But the pace is quickening everywhere. As Chairman of the Joint Chiefs of Staff General Dunford has made clear, more and more of our challenges are multi-domain, trans-regional, and multi-functional.

This exponential and complex dynamic is playing out on the seas. As the world's population rises, more of it is moving to the coasts. The number of megacities is projected to grow from 31 today to 41 by the end of the next decade; the vast majority of them will be within 100 miles of the coastline. People are taking to the seas for trade and sustenance at rising rates: maritime traffic has risen by 400 percent over the last 25 years, and world aquaculture production increased 13-fold over about the same time frame. As maritime appetites grow, they are driving people to stake claims to oil, natural gas, and minerals that are increasingly accessible as technology advances and the polar ice cap recedes. And people are not just tapping into undersea resources, but using more of the sea floor itself. Ninety-nine percent of all

intercontinental telecommunications ride on undersea cables, and the number of cables continues to grow to support our insatiable (exponential) demand for data.

> ***"[C]hanges are shifting the character of naval competition and warfare, and are being exploited, to varying degrees, by a range of competitors."***

These changes are shifting the character of naval competition and warfare, and are being exploited, to varying degrees, by a range of competitors. Both China and Russia are able to compete on a global scale, in all domains, and at competitive speed. They both possess considerable space, cyber, and nuclear forces. Both are challenging U.S. influence and interests in expanding areas of the world, often in maritime spaces. They have been very explicit about their maritime intentions, and have moved out smartly to advance them. China's 2015 white paper asserted that "[t]he traditional mentality that land outweighs sea must be abandoned…It is necessary for China to develop a modern maritime military force structure commensurate with its national security and development interests…so as to provide support for building itself into a maritime power." This goal is reflected in China's shipbuilding efforts, which analysts recently characterized as proceeding at a "frenetic pace," with the fleet "modernizing at an incredible rate [that] shows no signs of abating." As just two examples, until 2009, China had a single ballistic missile submarine; it has added another three since. And the Chinese Navy commissioned 18 ships last year. China has used this growing and modernized fleet to sail all over the world, visiting ports across the globe and establishing new overseas bases.

Russia has also laid out its plans, issuing a new maritime doctrine in 2015 aimed at "strengthening Russia's position as a sea power." The Russian Navy has continued to build modern frigates and corvettes, and expanded its operating areas in the Baltic, Black, Mediterranean, and Caspian Seas. And as ever, Russia has sustained and modernized a capable submarine fleet. Just last month, the Russian Navy launched the second of its YASEN-class nuclear attack submarines, the latest step in a plan to recapitalize its submarine force.

North Korea's President, Kim Jong Un, has been equally clear about his aims, boasting that his nation can "tip new-type intercontinental ballistic rockets with more powerful nuclear warheads and keep any cesspool of evils in the earth, including the U.S. mainland, within…striking range." His relentless pursuit of nuclear-capable missiles continues to destabilize not just north Asia but the world; Asian and western naval forces are an increasingly important contributor to the international community's response. Iran presents a maritime challenge of a different nature. Its growing naval forces routinely exhibit provocative behavior in the Straits of Hormuz, Arabian Gulf and beyond. The Iranians' support to proxies throughout the Middle East shows no signs of lessening. Here, too, U.S. and partner naval forces are on station in the interest of preserving

freedom of navigation and access for trade and markets. Finally, there are terrorist groups, some of them supplied by Iran, that are firing missiles, smuggling weapons, laying mines off the coast of Yemen, and kidnapping and killing civilians in the Sulu Sea and elsewhere.

Response: Naval Forces

> ***"Complexity and pace place a premium on the ability to respond quickly, something that naval forces do well by virtue of their forward presence and ability to operate freely in international waters."***

The challenges are serious. As an important part of the solution, U.S. naval forces, acting with the rest of the U.S. joint force and with partners and allies, are particularly well suited to address the changing competition and shifting set of competitors. Complexity and pace place a premium on the ability to respond quickly, something that naval forces do well by virtue of their forward presence and ability to operate freely in international waters. National leaders can use naval forces (Navy and Marines) to react quickly, and can easily tailor that response to the circumstances at hand - to help local populations recover from natural disasters, attack terrorist encampments, or to suppress more sophisticated attacks.

The presence of capable platforms enables naval forces' inherent responsiveness; they are also uniquely persistent. The same presence the Navy maintains around the world that allows it to react quickly also provides U.S. leaders with a tool for long-term influence. This constancy deters conflict, assures our allies and partners, and offers them routine and plentiful opportunities for collaboration. Further, because U.S. ships are sovereign American territory, they offer unique diplomatic settings to conduct the nation's business if needed. Finally, because they are self-sufficient when they respond, naval forces offer useful capabilities to assist in the initial response phases of a natural disaster. As full partners with the Army and Air Force as conflicts unfold, naval forces are often first on the scene, and continue to preserve U.S. interests in the long term, after the conflict subsides, through continued and routine operations forward.

To address this rapidly changing security environment and achieve its mission, the Navy must provide a balanced fleet that offers U.S. leaders credible options, in places of strategic importance, at a relevant speed. That Navy is achieved through a fleet design and a resultant fleet architecture that is powerful enough to achieve U.S. aims without conflict, but, if deterrence fails, to win quickly and decisively. The pace at which potential competitors are moving demands that we in turn increase the speed at which we act. Our advantage is shrinking -- we must reverse this trend.

The recent body of studies leads to some common conclusions about naval forces most effectively providing credible options. One is that numbers matter. The number of ships in the Navy's fleet determines where we can be, and being there is a key to naval power. As well, mere numbers are not enough: what a platform can do - how capable it is to create an effect - is increasingly important. Generally speaking, most analyses take an evolutionary approach that would seek to expand the current Navy much as it is, using current operating concepts, platforms, and modestly incorporating technological upgrades as they unfold. The Navy's most recent Force Structure Assessment (FSA) was an evolutionary assessment. Using today's fleet design and architecture and current platforms, the 2016 FSA estimated that the Navy battle fleet should grow to 355 ships.

"[A] 355-ship Navy using current technology is insufficient for maintaining maritime superiority… we must also implement new ways of operating our battle fleet, which will comprise new types of ships."

Many of the ships currently in the fleet or under construction will be part of our future success, particularly as they are modernized. In parallel, Navy is already starting to implement a fleet design that portends significant changes in fleet architecture, and is seeking to deliver future capabilities more quickly to the waterfront. Put another way, a 355-ship Navy using current technology is insufficient for maintaining maritime superiority. We must grow, yes. But we must also implement new ways of operating our battle fleet, which will comprise new types of ships. The clear conclusion is that linear expansion and improvement will not achieve the exponential pace that will enable us to win in the future.

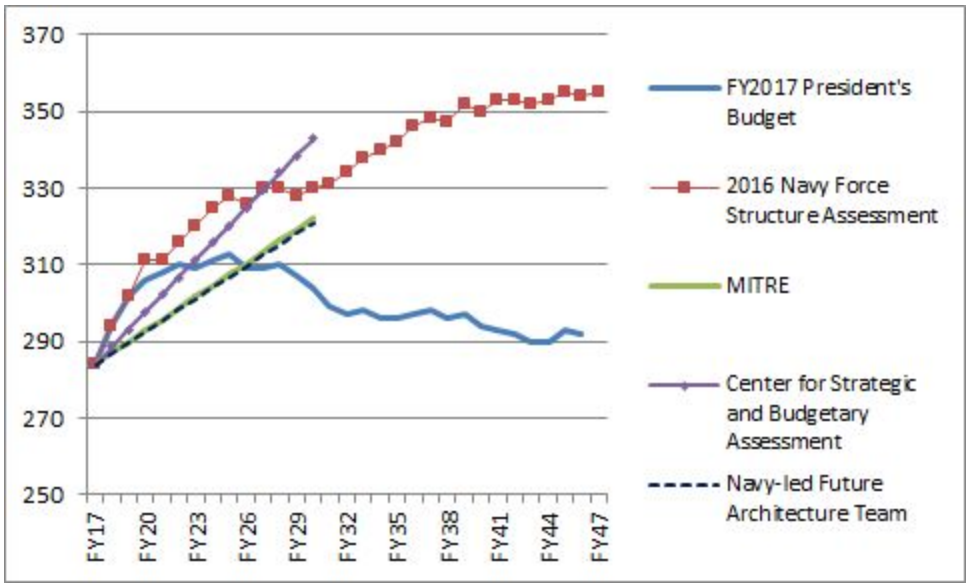

Figure 1: Proposed Navy Battle Fleet Sizes

This view is shared by many recent studies, which recommend some degree of non-linear change. Most put forth what could be characterized as moderate departures from the linear: larger fleets that incorporate some new technologies and capabilities, and in some cases different methods of employing the fleet. The studies vary in their reliance on particular technologies, reflect different views on how quickly those technologies might be integrated, and explore a range of possible implications for how the fleet might fight. While not all of this variation is captured in Figure 1 above, it does illustrate the range of proposed future battle fleet sizes in comparison to the Navy's latest budget submission, and how those recommendations compare to the evolutionary approach taken in the 2016 FSA. What the figure also makes clear is that while the Navy has been on a growth path in recent years, a change will be required to reach and sustain sufficient numbers.

Shape of the Future Navy

> ***"Greater connectivity and capability will enable new ways to combine ships, aircraft, and undersea forces that may enable adjustments to the battle group and other formations."***

So which of the above proposals makes the most sense for the future Navy? At the strategic level, as stated above, the complexity of the environment and the inherent applicability of naval capabilities indicate that the Navy must be larger in order to continue to provide timely options for national leaders in areas that matter. Furthermore, platforms must be accompanied by adequate stocks of repair parts, maintenance programs, and sufficient numbers of trained people to stay balanced and capable. This reality is seen every day in the continued strains on the current fleet. The Navy must be able to operate in the blue sea outside the range of shore attacks, where there is primarily fleet-on-fleet action. Moving closer to land, the Navy must be effective in the intermediate seas, where long-range shore-based missiles contribute to the threat, and in the littoral zones where the variety and density of fires is more intense. In each zone, the Navy must be able to operate with sufficient numbers of the right kinds of capabilities to attack, deceive, and defend against adversary missiles, submarines, and cyber and electronic attack. So the future fleet will need to be larger and more capable, and arrive more quickly, than recent studies suggest.

There are many elements of this fleet that exist today, and that will continue to be relevant in the future. We will continue to rely on undersea superiority to guarantee a survivable leg of the strategic nuclear deterrent triad. As well, manned and unmanned submarines can penetrate deep inside most reconnaissance networks to perform a number of missions.

Naval aviation will continue to observe, orient, decide, and act against enemy forces, leveraging the maneuverability and proximity that can only come from being aboard a carrier. As technologies continue to advance, the future air wing must continue to adapt as it always has, particularly to increase its capacity to contribute to the sea control mission, conducting both kinetic and non-kinetic operations. To support this capability evolution and deploy the air wing to relevant places in the world with sufficient capacity, the Navy will need 12 aircraft carriers to enable deployment of 5-6 carrier strike groups within relatively short time frames. In the short- and mid-terms, these will include a mix of 4th and 5th generation strike fighters, increasing numbers of unmanned air vehicles, and maritime patrol and electronic attack aircraft.

Changes in the air wing will be integrally linked to changes in the carrier strike group. Greater connectivity and capability will enable new ways to combine ships, aircraft, and undersea forces that may enable adjustments to the battle group and other formations. Very important here is the potential for increased capability and flexibility of amphibious ships, enabled by new aviation and weapons systems. Over the longer term, the range of possibilities will expand to more fully integrate space, surface, air, undersea, and cyber and electronic warfare capabilities.

The pace of change also demands that we design ships with modernization in mind. The “core” of those future ships - the hull, and the propulsion and power plants - will likely be built to last for decades. To leave room for future modernization, we should buy as much power capacity as we can afford. On top of that hull and power plant, we must plan from the outset to modernize the “punch” -- the combat systems, sensors, and payloads -- at the speed that technological advances allow. Future ships should be made for rapid improvement with modular weapons canisters and rapidly swappable electronic sensors and systems. Related, future designs must aggressively go after ways to drive down the costs to operate and maintain the future fleet, no matter its composition.

There is no question that unmanned systems must also be an integral part of the future fleet. The advantages such systems offer are even greater when they incorporate autonomy and machine learning. And these platforms must be affordable enough to buy them in large numbers, and networked in order to expand our presence in key areas.

To complement these capabilities, directed energy technologies, cyber tools, and advanced missiles can cripple potential adversaries’ abilities to track or target our forces. Directed energy will also play a crucial and much more affordable role in defending against high rates of fire.

Netting the battle fleet together in ways that are reliable and secure will allow for maximum flexibility. Strengthening and extending our nets will “raise all boats.” Those networks will support multiple functions, but increasingly will also be a key enabler of artificial intelligence-enabled tools, informed by data analysis, that will allow our commanders to make better decisions faster than our enemies.

Getting and Staying There

If these are key features of the future fleet, what can we do now to make that fleet real, as fast as possible? The short answer is that we must simultaneously build and innovate.

> ***"There are other ways to get more capability for the dollar. Thinking hard about the number and type of performance requirements for future platforms can help find the "knees" in the cost-performance curves."***

Let's start with what we know. Multiple shipbuilding and aircraft production lines are "hot" - currently producing. They can do more, building additional ships of the types already under construction, more economically. Buying aircraft carriers at the economically-optimal rate - three or four years apart instead of the current five or more years - will not only get us a more powerful fleet faster, but also will save considerable money. The same is true of surface combatants; an analysis of the industrial base shows we could build up to seven additional destroyers in the near term, and up to 14 more small surface combatants. We know we will need the inherent flexibility of a larger amphibious fleet; the industrial base could build five more than we are currently planning over the next six years. Finally, we could also speed construction of up to 12 more combat logistics and command and support ships in the same time period.

In all, analysis shows that today's industrial base has the capacity to construct 29 more ships and almost 300 more aircraft over the next seven years than our current plan. Those platforms are ones that we are confident will continue to be relevant in the coming decades, and can better incorporate the modular approach described above.

We should also assess how much additional capacity and capability we can get by upgrading and extending the lives of platforms we currently have and are planning to retire.

There are other ways to get more capability for the dollar. Thinking hard about the number and type of performance requirements for future platforms can help find the "knees" in the cost-performance curves. A meaningful discussion to discover this optimal point would involve a team of industry leaders, technologists, our defense labs, the requirements officers, and our budget people. The conversation would determine the most achievable path to improve performance in a way that's affordable, with low technological risk, on a well-understood schedule. The derived "cost-performance point" would then define the next improvement step, with the understanding that the following step would occur much sooner than it has in recent history - defining a rapidly iterative approach to improving performance. This requires acquisition practices that are far more agile than the ones we have now.

As well, if we build with faster improvement cycles, the inherent cost of our systems and platforms can come down. Shifting more heavily to unmanned surface, undersea, and aircraft will help us to further drive down unit costs. Energy-based weapons can be both more effective and put the Navy on the right side of the cost curve. Designing in the ability to modernize - plug and play hardware matched with software-programmability - will make upgrades quicker and more affordable even as we stay more capable.

"We need this more powerful fleet in the 2020s, not the 2040s ."

Two thoughts as we get started. First, we need a year to consolidate our readiness and achieve better balance across the Navy. 2018 will be that year, and even as we restore wholeness, we'll ensure that we continue to grow the Navy and establish a firm foundation for accelerating growth in following years. Next, as we move forward, we must remain open to the likelihood that achieving the Navy we need cannot be accomplished within historical levels of funding for ship construction -- more will be needed. Arresting the coming decline in fleet size means we must get more capable ships to sea as quickly as we can. We need to determine the best way to get the most overall capability in relevant timeframes, which will result from a mix of new and modernized hulls. From that starting point, we must focus our intellectual energies on defining the optimal mix of platforms for the future, within a timeframe appropriate to the dynamic complexity we face now and that will only intensify in the future.

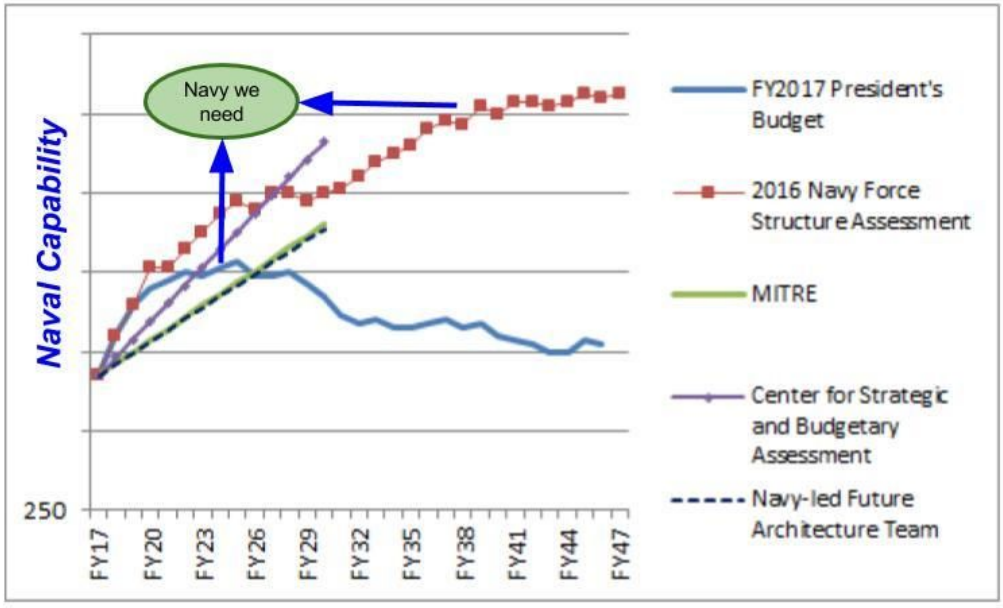

Figure 2: Resultant Capability of New Fleet Design and Architecture

Determining the eventual fleet composition - with the size and capability to deliver the required

naval power - is important. The fleet must be larger and more powerful. But the urgent problem before us is that all studies show the need for *more* naval power, and without determined action, we will indeed see the Navy becomes less powerful. So we must rapidly increase the number and capability of platforms: we must get to a higher build rate from which we continue to work our way forward. We must arm those platforms with more effective, modernized payloads. We must make better use of sensor and communications apertures. We must operate on networks that will degrade more gracefully and heal faster than those of our rivals. Most importantly, the future fleet must be on station ASAP! We need this more powerful fleet in the 2020s, not the 2040s. To do that, we must get more capability out of what we already own, and bring new technologies and platforms into the mix as rapidly as possible. Figure 2 depicts the kind of fleet we must pursue: one that is larger, yes, but more capable than any of the recent analyses have suggested, and arriving much more quickly. In short, a Navy that achieves an exponential rate of improvement.

Given the attention that has been focused on the future Navy, many different thinkers have independently arrived at similar conclusions - the writing on the wall is clear. The competition is on, and pace dominates. In an exponential competition, the winner takes all. We must shake off any vestiges of comfort or complacency that our previous advantages may have afforded us, and move out to build a larger, more distributed, and more capable battle fleet that can execute our mission. The foundation of that fleet will be leaders and teams who learn and adapt to achieve maximum possible performance, ready for decisive operations and combat.

Time is of the essence.

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