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REPORT TO CONGRESS

Alternative Future Fleet Platform Architecture Study

27 October 2016

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Washington, DC 20350-2000

The estimated cost of this report or study for the Department of Defense is approximately $202,080 for the 2017 Fiscal Year. This includes $80 in expenses and $202,000 in DoD labor.
Generated on 2016Jun20
RefID: 9-6D51D88

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I. Executive Summary

Section 1067 of the National Defense Authorization Act for Fiscal Year 2016 (Appendix 1) directed the Secretary of Defense to conduct three independent studies, to include one by the Navy. To meet that requirement, the Chief of Naval Operations directed the Deputy Director of the Chief of Naval Operations, Assessment Division (N81) to lead a Navy Project Team that also included participants from the Office of Net Assessment within the Office of the Secretary of Defense, the Naval Surface Warfare Center, Dahlgren Division, the Naval Postgraduate School, the U.S. Naval War College, the Center for Naval Analyses, and other Navy Fleet and Headquarters staff personnel.[1] This dedicated, Navy Project Team was given guidance and wide latitude to develop an analysis that was a distinct excursion not constrained by current Navy submissions. As such, the Project Team study does *not* represent any official Navy position, but just another independent approach to the problem.

The Navy Project Team postulated that the U.S. will continue to provide strong and sustained leadership for a rules-based international order that promotes global security and prosperity through the 2030s. To support this leadership role, the Navy Project Team identified the key missions for the U.S. Navy:

- protecting the homeland
- building security globally
- establishing sea control
- projecting power
- winning decisively

To accomplish these missions, the Navy Project Team derived a ‘Distributed Fleet’ architecture designed to provide strong and sustained forward presence to influence and shape geopolitical events, respond to crises, reassure allies and partners, and deter potential aggressors. The Distributed Fleet was further conceived to deliver decisive combat power, as part of a joint force, to defeat U.S. adversaries if deterrence failed.

As envisioned by the Navy Project Team, the Distributed Fleet would encompass a widely dispersed, expansively networked set of air, surface, and sub-surface platforms capable of delivering both kinetic and non-kinetic effects and supported by survivable logistics. Navy systems would be part of an assured, agile information-sharing environment that would present opportunities to engage enemy platforms before they could attack. The Distributed Fleet would focus on fleet-wide coordination and action. That approach would enable a greater reliance on strikes delivered from combat nodes beyond the strike group, which in turn would allow the carrier air wing to focus more on surveillance, targeting, and electronic attack.

The Distributed Fleet would employ three mutually-supporting concepts of operations (CONOPS):

[1] Navy Project team members are listed in Appendix 2.

- Distributed Fleet Lethality
- Electromagnetic Maneuver Warfare
- Distributed, Agile Logistics

The Distributed Fleet would consist of 457 ships – 321 manned and 136 large unmanned vehicles – and 1,220 sea-based Navy aircraft, supported by requisite enabling capabilities and improved readiness and sustainability.

II. Report on Alternative Future Fleet Platform Architecture

1. Future Security Environment and Assumptions

Fundamentally, the world has become dramatically more globalized, and this trend is accelerating. Our way ahead must account for this new reality. In particular, this study will address three major and interrelated global forces that are increasingly used, increasingly stressed, increasingly important, and increasingly contested. These three forces energize the quickly changing environment in which the Navy must operate, and if required, fight and win.

The first global force is the traffic on the oceans, seas, and waterways, including the sea floor – the “classic” maritime system. As the global economy continues to expand and become more connected, the maritime system is becoming increasingly used by the United States and the world as a whole. Shipping traffic over traditional sea lanes is increasing, new trade routes are opening in the Arctic, and new technologies are making undersea resources more accessible. This maritime traffic also includes mass and uncontrolled migration and illicit shipment of material and people. The maritime system is becoming more heavily used, more stressed, and more contested than ever before.

A second increasingly influential force is the rise of the global information system – the information that rides on the servers, undersea cables, satellites, and wireless networks that increasingly envelop and connect the globe. Newer than the maritime system, the information system is more pervasive, enabling an even greater multitude of connections between people and at a much lower cost of entry – literally an individual with a computer is a powerful actor in this system! Information, now passed in near-real time across links that continue to multiply, is in turn driving an accelerating rate of change.

The third interrelated force is the increasing rate of technological creation and adoption. This is not just in information technologies - scientists are also unlocking new properties of commonplace materials and creating new materials altogether at astonishing speeds. Novel uses for increasingly sophisticated robotics, energy storage, 3-D printing, and networks of low-cost sensors, to name just a few examples, are changing almost every facet of how we work and live. Genetic science is just beginning to demonstrate its power. Artificial intelligence is just getting started and could fundamentally reshape the environment. And as technology is introduced at an accelerating rate, it is being adopted by society just as fast – people are using these new tools as quickly as they are introduced, and in new and novel ways.

These three forces – the forces at play in the maritime system, the force of the information system, and the force of technology entering the environment – and the interplay between them have profound implications for the United States Navy.

At the same time, the competitors themselves have also changed. For the first time in 25 years, in some important parts of the world, the United States is facing a contest for maritime superiority. Russia and China both have advanced their military capabilities to act as global powers. Their goals are backed by a growing arsenal of high-end warfighting capabilities, many of which are focused specifically on our vulnerabilities and are increasingly designed from the ground up to leverage the maritime, technological and information systems. They continue to develop and field information-enabled weapons, both kinetic and non-kinetic, with increasing range, precision and destructive capacity. Both China and Russia are also engaging in coercion and competition below the traditional thresholds of high-end conflict, but nonetheless test and exploit the weakness of accepted norms in space, cyber and the electromagnetic spectrum. The Russian Navy is operating with a frequency and in areas not seen for almost two decades, and the Chinese PLA(N) is extending its reach around the world.

Russia and China are not the only actors seeking to gain advantages in the emerging security environment in ways that threaten U.S. and global interests. Others are now pursuing advanced technology, including military technologies that were once the exclusive province of great powers – this trend will only continue. Coupled with a continued dedication to furthering its nuclear weapons and missile programs, North Korea’s provocative actions continue to threaten security in North Asia and beyond. And while the recent international agreement with Iran is intended to curb its nuclear ambitions, Tehran’s advanced missiles, proxy forces and other conventional capabilities continue to pose threats to which the Navy must remain prepared to respond.

Finally, international terrorist groups like ISIL have proven their resilience and adaptability and now pose a long-term threat to stability and security around the world. All of these actors seek to exploit all three forces described above – the speed, precision and reach that the maritime and information systems now enable, bolstered by new technologies – to counter U.S. military advantages and to threaten the rules and norms that have been the basis of prosperity and world order for the last 70 years.

There is also a fourth ‘force’ that shapes our security environment. Barring an unforeseen change, even as we face new challenges and an increasing pace, the Defense and Navy budgets likely will continue to be under pressure. We will not be able to “buy” our way out of the challenges that we face. The budget environment will force tough choices but must also inspire new thinking.

2. Recommended Architecture – The *Distributed Fleet*

The Demand for Naval Forces

Given this security environment, the nation will rely even more heavily on the U.S. Navy, as part of the joint force, to operate in the world's oceans to protect the homeland, build security globally, control critical seas, project power, and win decisively. Short of high-end global conflict, the Navy will continue to deliver these effects by operating forward with rotationally deployed and forward stationed ships and submarines, aircraft, and sailors to provide the geographic combatant commanders with naval forces to respond to the daily demands within their region and provide options to national leadership during times of crises. This study goes beyond the Navy's current approach to address the emerging security environment by envisioning bolder change and an alternative future fleet platform architecture.

Alternative Future Fleet Platform Architecture – the Distributed Fleet

The Navy's current fleet architecture delivers sustained combat power primarily via Carrier Strike Groups[2] (CSGs). Those CSGs operate with relatively a few nodes within a theater of operations, and rely on maneuver, deception and range to limit the risks posed by increasingly capable adversary networks of weapons and sensors. Submarines provide strategic deterrence and additional combat power, typically operating independently in areas too dangerous for surface ships or aircraft.

This approach provides robust command and control and an ability to rapidly project power and sustain attacks via aircraft and long-range missiles against an adversary's forces. However, the massing of forces, even with inherently maneuverable ships, reduces an adversary's targeting and decision making challenges (they only need to find a few strike groups) and increases the impact of a successful attack on U.S. naval forces. As potential adversaries' long range reconnaissance-strike capabilities improve, current thinking anticipates that Navy strike groups would deploy with increased defensive capabilities, often at the expense of offensive capacity, to defend against multiple attacks. Additionally, the current fleet architecture possesses limited organic capability and capacity to conduct ISR&T; instead, it relies on national and joint force assets for this mission.

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[2] A Carrier Strike Group typically consists of an aircraft carrier, a carrier airwing (44 strike fighters, 5 electronic attack aircraft, 5 airborne early warning aircraft, 2 fleet logistics aircraft, and 19 helicopters), and five cruisers or destroyers escorts.

The proposed alternative architecture would transition the future fleet to a more widely dispersed force. The Distributed Fleet would be able to synchronize operations, supported by joint and Navy-organic ISR&T, both inter- and intra- theater, to achieve awareness and mass firepower when and where required. It incorporates dispersed combat-information networks as an essential enabler of localized battlespace awareness and rapid response to new threats. The architecture integrates three existing concepts – Distributed Fleet Lethality, Electromagnetic Maneuver Warfare, and Distributed, Agile Logistics – to deliver greater effective combat power than the currently planned force.

Distributed Fleet Lethality

The Distributed Fleet Lethality concept disperses firepower delivered by ships, submarines, aircraft and unmanned vehicles throughout a warfighting theater, relying on ISR&T capability and capacity to execute the required kill chains. It replaces combat power originating from a few nodes to a netted system of nodes able to sense, communicate and act in unison. At full implementation in a major theater war the concept would provide several dispersed, netted CSGs as well as other combat nodes, supported by unmanned surface and air vehicles providing ISR&T and alternative weapons delivery options. Additionally, the concept would increase weapons capability and capacity to better engage an adversary, particularly its air and naval forces. Submarines, augmented by unmanned underwater vehicles, would continue to provide access to highly contested water space to exploit the U.S. military's undersea warfare advantage. Distributing the force expands the number of axes an adversary must defend and complicates their targeting and decision making problems.

Today's fleet possesses most of the platform capacity and payload volume to support the Distributed Fleet architecture. To enhance the capability, the Project Team prioritized increasing weapon lethality and more robust kill chains.

Implementing this concept would require increased investments in the quantity, quality and types of weapons required to strike adversary targets. Priority was given to next generation offensive surface warfare weapons for sea control within a contested maritime area, as well as multi-mode weapons capable of striking multiple types of targets.[3] To the maximum extent practical, Distributed Fleet weapons would be limited to those able to fit into existing Vertical Launch Systems (VLS) cells or on planned aircraft. Future platform designs were assumed to accommodate the use of larger weapons, including prompt global strike-type capabilities.

[3] Multi-mode weapons can target multiple types of targets such as aircraft and ships. Examples of multi-mode weapons currently in development include the SM-6 and the Tomahawk

The concept would employ unmanned air vehicles on as many platforms as possible to give ships the ability to conduct continuous, organic ISR&T at sufficient ranges to employ advanced weapons available to the fleet – something the current fleet cannot do. The concept would also call for the development and fielding of armed unmanned surface vehicles, transported and deployed from ships with well decks, to further distribute shooters within a theater.[4] Additionally, the concept would expand the use of unmanned underwater vehicles from submarines, as well as independently deployable large unmanned underwater vehicles,[5] to provide theater commanders with options to deploy sensors and weapons into highly contested, previously denied waterspace.

Electromagnetic Maneuver Warfare

Another key element of the Distributed Fleet is accelerating development and fielding of capabilities to support Electromagnetic Maneuver Warfare. Realizing this capability more quickly will deliver the assured communications required to net the fleet and enable required kill chains. It will also accelerate the fielding of key capabilities to counter adversary surveillance and targeting systems, improving fleet survivability. Finally it will deliver improved electronic warfare systems to better protect ships and aircraft and increase the range of potential warfighting effects.

The planned investments in Electromagnetic Maneuver Warfare (EMW) would allow the Distributed Fleet to increase its offensive capacity by increasing reliance on electronic warfare and/or directed energy to disrupt adversary targeting or defeat a weapon. EMW concept improvements would enable the fleet to attack all aspects of an adversary's kill chain. It would deliver the capabilities to disrupt and deceive an adversary's surveillance and targeting network, hindering their ability to detect and target U.S. naval forces. It would also deliver capabilities to disrupt and defeat weapons via electromagnetic warfare, which would allow an increase in the number of offensive weapons platforms, particularly ships, could carry.

The concept would require improvements in protected, assured datalinks and communications paths, particularly beyond-the-line-of-sight communications capacity required to support a geographically distributed force with significantly more nodes than planned today. In addition to supporting legacy ships and aircraft distributed throughout a theater, the network would also be required to support large numbers of unmanned vehicles. To fully implement the Distributed

[4] This unmanned surface vehicle is a concept to use a Mk-V/Mk-VI Special Operations Craft or U.S. Coast Guard 65 ft patrol boat sized vessel outfitted with anti-ship cruise missiles, mines or torpedoes with an operating range in the hundreds of nautical miles.

[5] The large unmanned underwater vehicle is a concept for a pier deployed platform capable of self-deploying within the theater (it is not trans-oceanic) and outfitted with sensors or weapons.

Fleet Lethality concept, the Project Team recommends increasing investments that would expand integrated fire control capability beyond those currently planned as part of Navy Integrated Fire Control – Counter-Air (NIFC-CA).[6]

While the Navy's current fleet architecture calls for investments in these core enabling capabilities, the Distributed Fleet would accelerate fielding and the research and development required to develop next-generation capabilities. Adopting this more robust counter-surveillance and targeting approach would require CONOPS development similar to the Distributed Fleet Lethality effort. The current fleet employs similar capabilities, and the Navy Project Team would expand ongoing lessons learned efforts to align them with the dispersed operations the future fleet would conduct during combat.

The Navy Project Team anticipated that greater use of improved "soft kill" capabilities to defeat adversary weapons would change the nature of defensive weapons, particularly on surface ships. Such a change could allow for more offensive – or at least dual-use – weapons (even a reduction of two or three VLS cells per ship could add dozens of offensive weapons to the fight).

Distributed Agile Logistics

Finally, Distributed Agile Logistics enables Distributed Fleet Lethality by sustaining combat operations in a contested environment. The U.S. Navy has not been called upon to do this mission since World War II. It shifts reliance from vulnerable shore bases to more survivable afloat and ashore hubs to improve delivery options. It would also improve the Navy's ability to conduct expeditionary maintenance in theater, and to reload weapons within the theater, including an expanded ability to rapidly reload weapons at sea.

The Distributed, Agile Logistics concept combines new technologies, more secure shore-based hubs, afloat sea-bases supporting maneuver forces, and increasingly assured and resilient logistics command and control networks to sustain distributed fleet operations in a contested environment.

Employing this concept would involve continued use of existing dry cargo and ammunition auxiliaries (T-AKEs) and auxiliary oilers (T-AOs) as the core of logistics task groups, protected by dedicated escorts. The logistics task groups would operate forward to resupply the fleet. The concept would also involve employing Expeditionary Sea Base (ESB) and Expeditionary Transfer Dock (ESD) ships as supply and distribution centers or mobile intermediate and depot level maintenance providers afloat. Full realization of the concept would require new crane

[6] NIFC–CA provided integrated fire control between properly equipped surface ships, strike-fighter aircraft, and airborne early warning aircraft.

control technology to facilitate the use of select sealift platforms to provide VLS rearming at expeditionary locations.

The concept would deliver the logistics support required to sustain a large, deployed force during sustained combat operations. This would include sufficient weapons, spares, parts and fuel to support decisive combat operations and maintain a forward presence in non-engaged theaters.

Distributed Fleet Contributions to Enduring Missions

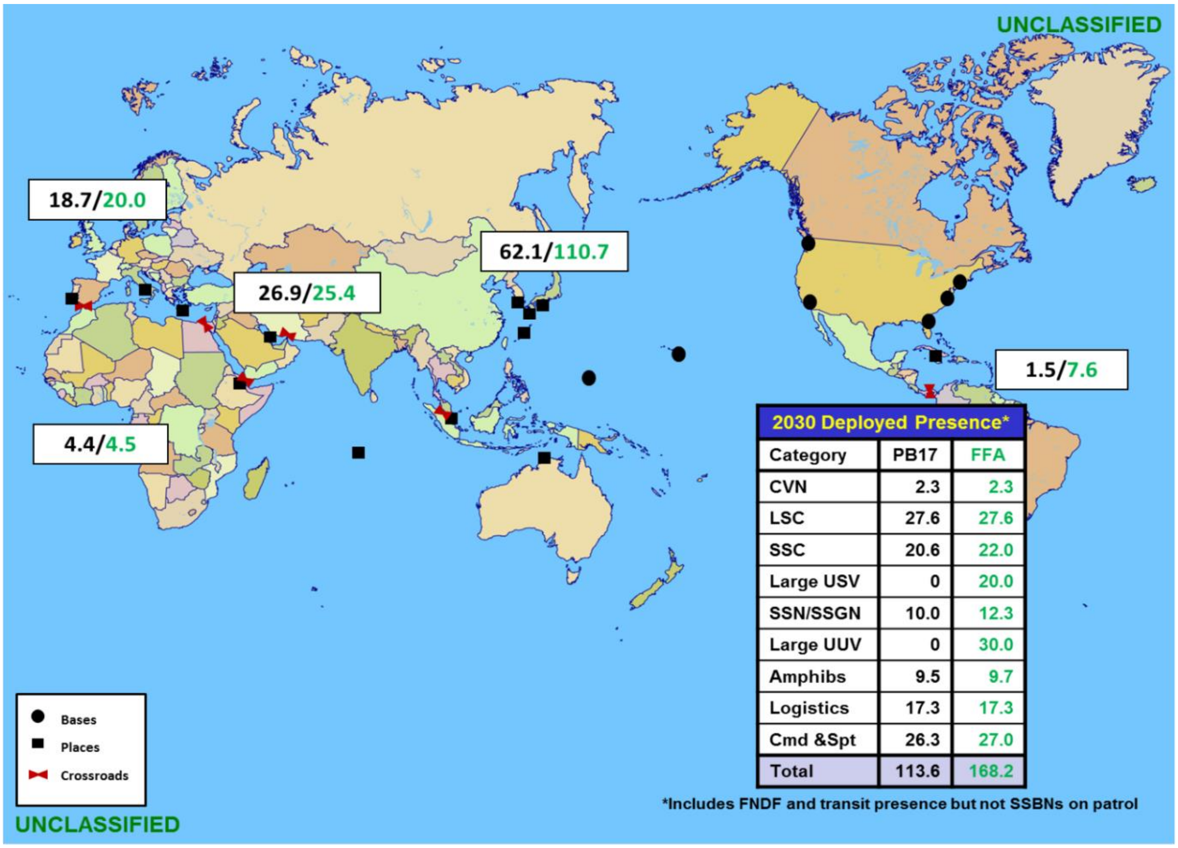
Although additional resources will be required to realize the Distributed Fleet, the transition from today's fleet also offers opportunities for future cost avoidance. Specifically, the composition of the fleet would change by reducing legacy platforms, whose functions would be fully or partially assumed by a larger number of unmanned platforms, and by divesting in capabilities not directly aligned to the Navy's core functions of deterrence, sea control, power projection, all domain access, and maritime security.[7] The Navy would continue to operate forward with rotationally deployed and forward stationed forces, though at a reduced level. Where possible, the Navy would expand its Forward Deployed Naval Forces[8] (FDNF) rotational footprint.

In the future security environment, the Distributed Fleet would continue to deploy forces forward, both in support of warfighting requirements (addressed below) and of enduring missions. In particular, the Navy Project Team anticipated that future Navy forces will be called upon to provide sustained, "steady-state" support of exercises and operations to address terrorist threats in the European and African theaters, as well as to counter illicit trafficking networks in the U.S. Southern Command area of operations. To provide the routine forward presence necessary to immediately respond in a potential conflict scenario as well as support enduring missions, the Navy Project Team estimated that the Navy of 2030 would require a forward deployed fleet of approximately 118 ships and submarines, four more than currently envisioned. Under a Distributed Fleet architecture, ships would deploy with many more unmanned surface and air vehicles, and submarines would employ more unmanned underwater vehicles. The Distributed Fleet would also include large self-deployable independent unmanned surface and undersea vessels (USV and UUVs), increasing unmanned deployed presence to approximately 50 platforms. Those unmanned vehicles would improve U.S. situational awareness and provide additional options to achieve maritime security during steady-state operations and the initial transition to contingency operations and crisis response. The increases in forward presence that

[7] These functions were first articulated in *A Cooperative Strategy for 21st Century Seapower (*2015). The Navy Project team assumes these functions will remain relevant in the 2030 timeframe.

[8] FDNF are ships, submarines and aircraft homeported in other countries. Currently, FDNF locations include Japan, Spain and Bahrain.

would be delivered in 2030 by the Distributed Fleet relative to the 2030 fleet proposed in the President's Budget request for Fiscal Year 2017 (PB17) are summarized in Figure 1 below.



2030 Deployed Presence*		
Category	PB17	FFA
CVN	2.3	2.3
LSC	27.6	27.6
SSC	20.6	22.0
Large USV	0	20.0
SSN/SSGN	10.0	12.3
Large UUV	0	30.0
Amphibs	9.5	9.7
Logistics	17.3	17.3
Cmd &Spt	26.3	27.0
Total	113.6	168.2

Figure 1 – Notional forward presence in 2030, Planned vs. Distributed Fleet

The Navy Project Team estimated that operating and support (O&S) costs to support the Distributed Fleet architecture would likely be higher than the presently-envisioned fleet. The Distributed Fleet would continue investments currently underway aimed at regaining readiness and capability wholeness that has been lost in the past ten years. It would be supported by a sustainable readiness-generation model similar to today's Optimized-Fleet Response Plan (O-FRP), as well as by investments in in modernization, weapons and spare parts to ensure the fleet trains and deploys fully ready to meet all expected missions. The Navy Project Team anticipated that the Distributed Fleet's operations and sustainment costs would continue to be a function of fleet size. The increased numbers of unmanned vehicles would require operations and sustainment (O&S) funding; however, the costs per platform are expected to be lower than would be the case for manned platforms. In addition, the Navy Project Team anticipated that larger buys of a relatively limited number of unmanned vehicle designs would result in lower per-unit acquisition and O&S costs.

The Distributed Fleet in Action

The readiness posture of the Distributed Fleet would generate the same response capacity as O-FRP generates today. Two aircraft carriers would be continuously deployed, with another three ready to surge; the remainder of the fleet would also retain readiness postures similar to today's. Amphibious Ready Groups would deploy as they do today in non-contested waters, but would disaggregate as described below when needed to gain sea control.

The Distributed Fleet would provide a theater commander with ten times the number of strike groups compared to currently-planned aggregated combat operations. Combat nodes would include augmented CSGs, Long Range Strike SAGs, Integrated Air and Missile Defense (IAMD) SAGs, independent submarines, defended logistics task groups and hundreds of unmanned vehicles to conduct major combat operations. It would also retain sufficient capacity to provide a "deter-deny" force in non-engaged theaters. A description of the combat nodes follows:

- Augmented Carrier Strike Group
  - Composition: 1 CVN, 1 short takeoff and vertical landing (STOVL)-only carrier LHA or CV-LX,[9] 5 DDGs (including one DDG-51 Flight III), 2 Littoral Combat Ship (LCS) (for ASW), 27 strike-fighters (F-35C and F/A-18E/F), up to 23 STOVL strike fighters (F-35B), 14 Electronic Attack (EA) aircraft (EA-18G), 6 Airborne Early Warning (AEW) aircraft (E-2D), 14 maritime strike helicopters (MH-60R), 6 sea control helicopters (MH-60S), 2 carrier logistics aircraft (CV-22), 10 UAVs dedicated to tanking, and up to 6 ISR UAVs.[10]
    - The increased strike capacity gained by additional surface combat nodes beyond the carrier strike group allows for a shift in the ratio of carrier air wing assets from kinetic strike to ISR and a nearly three-fold increase in electronic attack capacity. Placing more of this capability in the strike group is favored over land-based forces because it avoids vulnerability of fixed bases. This air wing still provides the minimum capacity necessary for defensive counter-air and offensive strike.
    - Unmanned aircraft augment the lower number of strike fighters by taking over the tanking role and providing ISR and possibly increased weapon capacity during offensive strikes.

[9] CV-LX is a concept for an aircraft-focused follow on to the LHA-class of ships.

[10] The size of the UAV will determine how many can fit onto existing CVNs; if the UAV is F/A-18C/D-sized, 16 would be the maximum.

- Concept of operations: Each CSG would operate continuously for ~2 days, with the CVN conducting strike-fighter operations for 12 hours,[11] and the LHA/CV-LX conducting defensive strike-fighter operations for 12 hours. CSG down times would be staggered across the theater to support crew rest, maintenance and resupply.

- Long Range Strike SAGs
  - Composition A: 1 DDG-51 Flight IIA or DDG-1000 supported by an amphibious ship LPD-17, LSD, or LX(R). All support ships would deploy with 4-6 UAVs for Over the Horizon Targeting (OTH-T). Well-deck capable support ships deploy with up to 4 USVs for long range strike.
  - Composition B: 1 DDGH[12] with 2 helicopters and 4 UAVs for OTH-T.
  - Concept of operations: The SAGs would deploy throughout the theater using a combination of organic sensors and the netted common operational picture to engage enemy forces – particularly naval targets.
- Submarines. SSNs will deploy to the theater and operate primarily in highly contested waterspace areas to gather intelligence and strike both maritime and land targets. The architecture would emphasize SSNs with the VPM (23 by 2030). SSNs would deploy with tube-launched UUVs to provide additional ISR&T and offensive capabilities, such as mining, potentially into previously denied waterspace.
- IAMD SAGs. Two Ballistic Missile Defense (BMD) capable DDGs will deploy to provide IAMD of critical infrastructure in the theater, particularly in the early days of conflict before land-based IAMD systems arrive.
- Logistics task force.
  - Composition: 2 T-AKE, 2 T-AO, 1 DDG-51 Flt IIA, 1 LCS (ASW)
  - Concept of operations: The logistics task forces will support the distributed fleet using the distributed, agile logistics concept previously described. Non-traditional logistics platforms would support expeditionary maintenance and resupply.
- Land-based aircraft. The study did not identify alternative requirements or CONOPS for land-based naval aircraft employment. Maritime Patrol and Reconnaissance Aircraft (MPRA) (manned and unmanned) will continue to support distributed operations with appropriate CONOPS.

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[11] The CVN would operate EA Aircraft, AEW and UAVs continuously.

[12] The DDGH concept is a modified DDG-51 Flt IIA with the VLS section removed and fitted with additional aviation capacity.

The Deny Force

The Navy Project Team envisioned that the Navy will continue to be required to provide forward presence in theaters less likely to produce major combat operations, to deter aggression and when required, defeat an adversary or deny their objectives. If deterrence fails and conflict erupts, these forces would employ the Distributed Fleet Lethality concept, supported by the Electromagnetic Maneuver Warfare and Distributed, Agile Logistics concepts described above; total fleet size would provide forces available to fight in a second theater. A CSG, an Amphibious Ready Group (ARG), independently operating DDGs and submarines, mine warfare capable LCS, ESBs and logistics ships would remain forward deployed outside of the conflict theater. All of the platforms would be equipped with the capabilities – including the unmanned vehicles – previously described.

3. Implications of adopting the Distributed Fleet

The table below compares the numbers of surface, subsurface and large USV/UUVs from the currently-planned inventory and those of the proposed Distributed Fleet. The column labeled Baseline in 2030 is the Battle Force Inventory as projected for 2030 per the Navy's Fiscal Year 2017 Long-Range Plan for the Construction of Naval Vessels (Shipbuilding Plan (SBP)). The column labeled FFA is this study's proposed Battle Force for the 2030 timeframe, to implement the Distributed Fleet architecture described above.

The most significant changes between the Baseline and FFA-derived Fleets include additional FFs and SSN (VPM) and the implementation of CV-LX, DDGH and USV/UUV to implement the Distributed Fleet CONOPS.

Fleet Composition

Ships

Category	Type / Class	30-Yr SBP in 2030	Distributed Fleet in 2030
Carriers	CVN 68	8	8
	CVN 78	3	3
	CV-LX	0	3
Large Surface Combatants	CG 47	11	0
	DDG 51 Flt I/II	17	17
Category	**Type / Class**	**30-Yr SBP in 2030**	**Distributed Fleet in 2030**
	DDG 51 Flt IIA	45	45
	DDG 51 Flt III	19	21
	DDG 1000	3	3
	DDGH	0	5
Small Surface Combatants	LCS	29	28
	FF	11	20
	Large USV	0	88
Submarines	SSN 21	2	2
	SSN 774	29	28
	SSN 774 VPM	11	23
	SSBN	11	12
	Large UUV	10	48
Amphibious Warfare Ships	LHD	7	7
	LHA	4	3
	LPD	12	12
	LSD	9	9
	LX(R)	5	4
Combat Logistics Force	T-AOE	2	2

	T-AKE	**12**	**12**
	T-AO	**16**	**16**
Expeditionary Fast Transports	EPF	**12**	**10**
	HST	**1**	**0**
Command and Support Ships	T-ATS	**8**	**0**
	Commercial ATS	**0**	**8**
	AS	**2**	**1**
	T-AGOS	**6**	**7**
	LCC	**2**	**0**
Category	**Type / Class**	**30-Yr SBP in 2030**	**Distributed Fleet in 2030**
	CHAMPS	**0**	**3**
	MPS T-AKE	**2**	**2**
	T-ESD	**2**	**2**
	T-ESB	**3**	**5**
	Total	**314**	**457**
	Manned	**304**	**321**
	Large Unmanned	**10**	**136**

Sea-based Manned Navy Aircraft

Category	Type / Class	Baseline in 2030	Distributed Fleet in 2030
Strike Fighters	F-35C & F-18	**812**	**470**
Airborne Electronic Attack	EA-18G	**121**	**198**
Airborne Early Warning	E-2D	**73**	**79**
Carrier Onboard Delivery	CMV-22B	**44**	**30**
Anti-Submarine Warfare	MH-60R	**265**	**198**
Logistics/Search and Rescue	MH-60S	**240**	**245**
	Total	**1555**	**1220**

Unmanned Vehicles

Category	Baseline in 2030	Distributed Fleet in 2030
Conventional Take-Off UAV	**55**	**255**
Vertical Take-Off Wing UAV	**64**	**157**
USV	**0**	**88**
Med UUV	**16**	**183**
Large UUV	**10**	**48**
UxV Total	**145**	**713**

The resultant Battle Force in the 2030 timeframe based on this Distributed Fleet Architecture is 321 ships and 136 large unmanned vehicles (457) and 1,220 sea-based Navy aircraft.

New Manned and Unmanned Platforms

The following list provides a description and estimated capabilities of each new class of manned and unmanned platforms that the Navy Project Team considered.

- CV-LX: As described in RAND’s 2016 Alternative Carrier Study, CV-LX is a Short Take-Off Vertical Landing (STOVL) variant based on the LHA-6 class but modified for a larger flight deck, fuel, and aviation ordnance, weighing approximately 43K tons. It would carry up to 23 F-35Bs and would generate 30-40 sorties per day but not be able to support the Navy’s program of record airborne early warning or electronic attack aircraft. It would be paired with a CVN for high end conflict, providing Fifth Generation F-35B to the carrier air wing (CVW) and benefitting from the AEW and EA aircraft in the CVW.

- DDGH: This ship has characteristics generally similar to the DDG Flt III including a robust air and missile defense radar (AMDR). The differences from current DDGs are that it: 1) has only has a forward missile launch system which can be rearmed at sea, 2) is High Velocity Projectile (HVP) capable, 3) has an increase in aviation assets for up to six vertical takeoff aircraft – notionally 2 helos and 4 unmanned aerial vehicles (UAVs) due to the absence of an aft missile launch system. This provides organic continuous long range ISR, and 4) ASW system that leverages the LCS ASW mission module capabilities.
- LX(R) SVR: This recapitalization of the LSD-class amphibious ship is produced using steel vessel rules, which reduces resiliency but thus reduces costs.
- Common Hull Auxiliary Multi-mission Platform (CHAMP): This flexible common hull with mission and configuration modularity would leverage containerization to increase mission agility across a broad range of fleet support missions, to initially augment and then replace the LCC-class command and control ships and submarine tender AS. The modular nature of the ship would replace aging mission specific designs with a common hull to stabilize the industrial base, reduce life cycle costs and leverage tailored payloads.
- Commercial ATS: In a recapitalization of the salvage and rescue ships, commercially available ships could be used to increase availability at reduced maintenance/sustainment costs.
- Large Unmanned Underwater Vehicle: This large (~90 ton submerged displacement) pier-launched autonomous vehicle will be capable of transiting to preprogrammed points with a large payload volume (~1,300 ft3). After mission completion or payload delivery it returns to the original launch point for recovery and preparation for its next mission.
- Medium Unmanned Underwater Vehicle: This is an autonomous vehicle capable of conducting pre-programmed independent operations once launched from a surface or subsurface host platform or shore facility.
- Unmanned Surface Vehicle: Similar to the UUV, this large (~80 ft length) pier-launched or well deck-launched autonomous vehicle can transit (200-300 NM) following pre-programmed points with a large payload capacity (~6,500 lbs). After mission completion or payload delivery it returns to the original launch point (pier or well deck) for recovery and preparation for its next mission.
- Conventional Takeoff Unmanned Air Vehicle (X): An autonomous aircraft carrier-based unmanned aerial vehicle, this is designed to provide aerial refueling duties to the CVW to

extend the range of manned fighters. This aerial vehicle could also be configured to provide a long-endurance ISR platform to enable extended range strike capability to the fleet.

- Vertical Takeoff Unmanned Air Vehicle (X): This semi-autonomous unmanned aerial vehicle is capable of launching and recovering from surface combatants to provide for medium-altitude long-endurance command, control, communications, intelligence, surveillance and reconnaissance.

4. Options to address ship classes that begin decommissioning prior to 2035

As the defense industrial complex delivers the platforms that make up the *Distributed Fleet*, the Navy Project Team envisioned that those enduring capabilities resident on retiring platforms would migrate to more flexible, agile and combat capable platforms. Specifically: as the CG-52 class cruisers are decommissioned, DDG-51 Flt III class destroyers would bridge the gap until the fielding of the next Air Defense ship. As the LCC command and control ships and AS submarine tenders retire, they would be replaced with the reconfigurable Common Hull Auxiliary Multi-mission Platform (CHAMPs) to provide mission agility based on the needs of a future conflict. As the LCS small surface combatants are decommissioned, they would be replaced by FFs, which would provide greater lethality and combat capability.

III. Way Ahead

This study describes the basic contours of a *Distributed Fleet* architecture; follow on work remains. To inform its work, the Navy Project Team relied upon existing concepts and associated studies and analysis; however, timelines did not allow for a detailed performance assessment of the proposed fleet. To further understand that performance, the *Distributed Fleet Lethality* concept would require extensive CONOPS development, including a robust wargaming, analysis, experimentation, and exercise effort. (The Navy Project Team assessed that there would be sufficient time to develop the required doctrine over the next fifteen years.)

The *Distributed Fleet* architecture describes an alternative with the potential to provide improved warfighting performance against increasingly capable adversaries. Additional analysis is required to determine the effectiveness, risks and benefits of this *Distributed Fleet* platform architecture, to include an evaluation its potential contributions as part of the joint force.

Executing the *Distributed, Agile Logistics* concept would also require additional CONOPS development and fleet experimentation, and continued investments – political and fiscal – in allies and partners who provide shore-based logistics support. The Navy Project Team did not consider potential increased support requirements for dispersed land bases.

Many of the technologies that enable the D*istributed Fleet* architecture require technical maturation. The Navy Project Team incorporated assumptions about the time to required to develop and field new technologies to support a 2030 fleet, but the robustness of those assumptions is difficult to accurately evaluate.

Finally, the Navy Project Team recognized that the naval industrial base would be impacted by implementing this architecture. The unmanned vehicle industrial base would have to grow to supply more than 600 vehicles by 2030. Developing and delivering the required electromagnetic maneuver warfare capabilities, expeditionary logistics capabilities, and unmanned vehicle capacity likely would stress corresponding industrial capabilities as they attempt to meet expanding Navy, and probably concurrent DoD demands.

Appendix 1: Reporting Requirements

Section 1067 subsection (a) of the National Defense Authorization Act for Fiscal Year 2016, S.1356, directed the Secretary of Defense to conduct three independent studies of alternative future fleet platform architectures in 2030 timeframe.

ENTITIES TO PERFORM STUDIES. The Secretary of Defense shall provide for the studies under subsection (a) to be performed as follows:

(1) One study shall be performed by the DoN and shall include participants from—

> *(A) the Office of Net Assessment within the Office of the Secretary of Defense; and*
>
> *(B) the Naval Surface Warfare Center Dahlgren Division.*

(2) The second study shall be performed by a federally funded research and development center.

(3) The final study shall be conducted by an independent, non-governmental institute which is described in section 501(c)(3) of the Internal Revenue Code of 1986, and exempt from tax under section 501(a) of such Code, and has recognized credentials and expertise in national security and military affairs.

PERFORMANCE OF STUDIES.

(1) INDEPENDENT PERFORMANCE. The Secretary of Defense shall require the three studies under this section to be conducted independently of each other.

(2) MATTERS TO BE CONSIDERED. In performing a study under this section, the organization performing the study, while being aware of the current and projected fleet platform architectures, shall not be limited by the current or projected fleet platform architecture and shall consider the following matters:

> *(A) The National Security Strategy of the United States.*
>
> *(B) Potential future threats to the U.S. and to U.S. naval forces in the 2030 timeframe.*
>
> *(C) Traditional roles and missions of United States naval forces.*
>
> *(D) Alternative roles and missions for United States naval forces.*
>
> *(E) Other government and non-government analyses that would contribute to the study through variations in study assumptions or potential scenarios.*
>
> *(F) The role of evolving technology on future naval forces, including unmanned systems.*
>
> *(G) Opportunities for reduced operation and sustainment costs.*

(H) Current and projected capabilities of other United States armed forces that could affect force structure capability and capacity requirements of United States naval forces.

STUDY RESULTS. The results of each study under this section shall:

(1) present the alternative fleet platform architectures considered, with assumptions and possible scenarios identified for each;

(2) provide for presentation of minority views of study participants; and

(3) for the recommended architecture, provide—

(A) the numbers, kinds, and sizes of vessels, the numbers and types of associated manned and unmanned vehicles, and the basic capabilities of each of those platforms;

(B) other information needed to understand that architecture in basic form and the supporting analysis;

(C) deviations from the current Annual Long-Range Plan for Construction of Naval Vessels required under section 231 of title 10, United States Code;

(D) options to address ship classes that begin decommissioning prior to 2035; and

(E) implications for naval aviation, including the future carrier air wing and land-based aviation platforms.

Appendix 2: Navy Project Team participants and minority views

A. Participants

Organization	Senior POC	Title/Position
Navy Project Team Lead	Mr. Chuck P. Werchado, SES	Deputy Director, Assessments Division
Naval Surface Warfare Center Dahlgren	Mr. Steven E. Anderson	Principal Scientist
Naval Postgraduate School	CAPT Jeff F. Hyink	Chair, Master of Systems Analysis Course
U.S. Naval War College	Prof. Paul S. Schmitt	Associate Professor, Halsey Alfa Group
OPNAV, N9 DAG	Ms. Jill F. Ballard	Warfare Systems Strategy & Communications
OSD Net Assessment	CDR Phillip E. Pournelle	OSD Net Assessment
U.S. Fleet Forces Command	Mr. Steven C. Cade, SES	Director, Fleet Capabilities and Force Development
Center for Naval Analyses	Dr. Keith M. Costa	Vice President and Director of CNA Advanced Technology and Systems Analysis (ATSA)
OPNAV, N2N6	Ms. Margaret G. Palmieri, DISES	Director of Integrated Fires
NAVSEA HQ, SEA 05	Mr. Frank D. Pearce	Future Force Architecture Cost Analyst
OPNAV, N81	Mr. Jeffrey R. Ermert	Operations Research Analyst for Force Structure

B. Minority views

Mr. Steve Anderson (NSWC Dahlgren): Only one "operating concept" was considered. This operating concept assumed "geographic distribution" in itself had offensive and defensive benefits, because an enemy would have a more difficult time to track/target/localize more ship groups over a larger geographic region.

Plausible Alternative Assumptions could have been used, including:

(1) Enhanced coalition warfare could allow for facilitated maritime warfare options. U.S. could pursue comprehensive regional coalition engagement management, and take full advantage of Joint and Multi-national resources

(2) Move from solely kinetic based objectives; to pursue a range of highly discrete kinetic and non-kinetic actions to achieve operational and strategic objectives. Deter whenever possible,

and disrupt when necessary. Platforms must play, but entirely new types of platforms and facilities could be envisioned to implement national policy by rapidly identifying and enforcing whole of government solutions. Consider using highly netted, global OTH systems, Big Data, and brilliant agents capable of deriving hyper timely and actionable information to drive a broad range of discrete actions.

(3) Explore ways and means to flip the “cost to counter” relative to RED vs. BLUE military engagements. Highly expensive weapons have their utility, as well as limitations. A range of new capabilities could be explored to affordably conduct warfare; but at an economic exchange rate that may be significantly more favorable to BLUE.