A Case for the Return of Patrol Bombing (VPB) Squadrons for Sea Control Using the P-8 Poseidon and B-1 Lancer

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The United States could drastically expand maritime strike capability by reviving the patrol bombing squadron (VPB) concept of World War II, pairing Navy P-8s with Air Force B-1s. The Navy is at risk of falling behind Russia and especially China in sea control capabilities after more than two decades of focusing on overland wars and almost thirty years of unchallenged US supremacy of the seas. The United States spends over $700 billion on defense, yet lacks the capability to conduct large scale war at sea – or at least, so it seems. New technology, weapons, and manned and unmanned platforms have to be developed for sea control, and there is promise in emerging programs like the Large Unmanned Surface Vehicle

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ABSTRACT

The United States could drastically expand maritime strike capability by reviving the patrol bombing squadron (VPB) concept of World War II, pairing Navy P-8s with Air Force B-1s. The Navy is at risk of falling behind China in sea control capabilities after more than two decades of focusing on overland wars and almost thirty years of unchallenged US supremacy of the seas. The United States spends over $700 billion on defense, yet lacks the capability to conduct large scale war at sea – or at least, so it seems. New technology, weapons, and manned and unmanned platforms have to be developed for sea control, and there is promise in emerging programs like the Large Unmanned Surface Vehicle (LUSV), Extra Large Unmanned Undersea Vehicle (XLUUV), Maritime Strike Tomahawk and directed energy weapons. However, the United States can drastically increase maritime strike capacity right now with existing platforms armed with existing weapons with some creative thinking, agile concepts of operation, and a relatively small investment. Sea control is a multi-domain effort now more than ever, and although ships, submarines, space, and future technology will play a role, the quickest and most effective way to increase maritime strike capability and capacity today is to revive the VPB concept.

INTRODUCTION

China's military buildup over the last twenty years threatens access to the South China Sea. Gaining sea control in the Western Pacific requires the ability to defeat or degrade large numbers of enemy ships and submarines in order to reduce the anti-ship cruise missile (ASCM) threat. However, enemy forces outnumber US Navy assets available to strike. Historically, warships have held a primary role in sea control, but ships today have to contend with both land-based anti-ship ballistic missiles (ASBMs) and ASCMs inside the First and Second Island Chains. [1] Navy aircraft are also limited by enemy anti-air capabilities and depending on how far the carrier might venture into the DF-21 ASBM range. [2] The US maintains an undersea advantage, but US nuclear submarines are high demand, low-density assets.[3] The Joint Force must address the maritime strike gap now in order to be prepared for a high-end conflict. The most rapid and cost effective solution for increasing Joint Force sea control capability is to pair US Navy P-8s with US Air Force B-1s in sensor-shooter teams to detect, target, and strike hostile maritime forces.

THE US NAVY'S MARITIME STRIKE DEFICIT

In a war with China, achieving sea control would require defeating or degrading the surface and submarine components of the PLA Navy in order to reduce the ASCM threat to US Navy ships. However, the Navy does not have sufficient platforms to perform long-range anti-submarine and offensive surface warfare strikes on the scale required to sink hundreds of ships in a couple of days.[4] Further, until the Maritime Strike Tomahawk and improved SM-6 missiles

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[1] See Appendix A, Figure 1. ONI Graphic Depicting Chinese Missile Threats. For this paper, the First Island Chain is comprised of the Philippines, Taiwan, and Japan. The Second Island Chain stretches from Northern Japan, offshore Japanese volcanic islands, Marianas islands, and the Indonesian archipelago.
[2] See Appendix A, Figure 3, Chinese Missile Threats.
[3] Werner, Ben. "Indo-Pacom Commander Says Only Half of Sub Requests Are Met." usni.org. March 27, 2019. https://news.usni.org/2019/03/27/42212.
[4] Axe, David. U.S. Navy Nightmare: The Chinese Fleet Doesn't Have 300 Ships, It Has 650.

arrive in large numbers, the Navy lacks a credible long-range offensive surface warfare capability.[5] Naval air – F/A-18s, F-35s, and the P-8 Poseidon – carry a relatively limited number of anti-ship cruise missiles and are hardly adequate for the task.

China has between 313 and 342 warships today, including over 70 attack submarines and over 115 destroyers, frigates and corvettes.[6] By contrast, as of 2018, the US Navy had 285 "deployable battle force ships." [7] Furthermore, US ships are spread across the globe, whereas PLA Navy forces are concentrated in near-China seas – within the umbrella of DF-21 ASBMs, making the surface striking disadvantage even more pronounced. The disparity in US Navy assets available versus the number of PLA Navy combatants means the Navy cannot win alone today.

Ross Hobbs and Will Spears published a paper in April 2019 highlighting the potential of the B-1 as maritime strike platform.[8] The concept of B-1 as a naval bomber should be expanded. Over the last two decades, B-1 missions have been overland. Air operations in maritime surface warfare (AOMSW) and dynamic maritime targeting have not been a primary focus. The P-8 has the sensors, data links, range, and experienced aircrews to perform maritime search and targeting, but lacks the weapons capacity and ability to carry the LRASM. Paring the P-8 and B-1 as maritime strike sensor-shooter teams is a more exquisite solution for sea control than employing either platform alone. Maritime strike capability and capacity would be drastically increased by pairing the P-8 with the B-1.

The National Interest. January 30, 2019. Available at: https://nationalinterest.org/blog/buzz/us-navy-nightmare-chinese-fleet-doesnt-have-300-ships-it-has-650-42822.

[5] See Appendix A, Figure 2, Surface-Launched Missile Threats to U.S Surface Combatants.

[6] Myers, Steven Lee. "With Ships and Missiles, China Is Ready to Challenge U.S. Navy in Pacific." The New York Times. August 29, 2018. https://www.nytimes.com/2018/08/29/world/asia/china-navy-aircraft-carrier-pacific.html

[7] Erickson, Dr. Andrew S. "Maritime Numbers Game: Understanding and Responding to China's Three Sea Forces." Indo-Pacific Defense Forum. January 28, 2019. http://apdf-magazine.com/maritime-numbers-game/.

[8] Hobbs, Ross and Will Spears. "A Bomber for the Navy." OTH Journal. 16 April 2019. https://othjournal.com/2019/04/15/a-bomber-for-the-navy/.

HISTORICAL PRECEDENT FOR LAND-BASED AIR IN SEA CONTROL

Aircraft have been vital to sea control since the advent of Naval Aviation. In 1928, Bruce Leighton highlighted the importance of aircraft in gunnery observation, scouting, and as tools "to project destructive agents at a distance."[9] During World War II, patrol bombing squadrons played an integral, if unheralded, role in the victory over Axis powers. Navy and Army Air Force (AAF) land-based aircraft conducted sea control operations in both the Pacific and European theaters. Over the course of WWII, patrol bombers found, targeted, and sunk over 1500 maritime targets.[10] Initial Navy patrol planes lacked robust self-defense capabilities, so the Navy eventually acquired faster and more heavily-armed AAF B-24s.[11] The Navy B-24s, initially re-designated PB4Y-1 Liberators, were further adapted for a sea control role with better armament and sensors, resulting in the PB4Y-2 Privateer. These VPB planes served with distinction during WWII.

Post-war drawdown, inter-service rivalry, new technology and platforms, and a changing threat landscape led to the abandonment of the patrol bombing squadron as an instrument of sea control. Navy patrol (VP) squadrons, owing to the burgeoning Soviet threat, shifted focus to anti-submarine warfare (ASW) and intelligence, surveillance, and reconnaissance (ISR).[12] The freshly-minted US Air Force grappled with the advent of the jet age and requirements for air superiority and nuclear strike. The requirements of the post-war period, coupled with the

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[9] Leighton, Bruce G. "The Relation of Aircraft to Sea-Power." U.S. Naval Institute Proceedings 16, no. 4 (November 1928): 730.

[10] Carey, Alan C. Above an Angry Sea: United States Navy B-24 Liberator and PB4Y-2 Privateer Operations in the Pacific, October 1944-August 1945. Atglen: Schiffer Military Publishing, 2001, 141.

[11] Carey, Alan C. The Reluctant Raiders: The Story of United States Bombing Squadron VB/VPB-109 in World War II. Atglen: Schiffer Military Publishing, 1999.
Clark, Bryan. The Emerging Era in Undersea Warfare. Washington, D.C.: Center for Strategic and Budgetary Assessments, 2014, 8.

[12] Reade, David. "New Developments: Worldwide P-3 Status Report." Maritime Patrol Aviation. September 1992: 62.

unchallenged supremacy of other US Navy instruments of sea control, led to an atrophy of land-based air maritime strike capability.

In the late-1970s and 1980s, the utility of land-based aircraft for sea control re-emerged. The advent of over-the-horizon (OTH) cruise missiles like the Harpoon and Tomahawk necessitated third-party-targeting solutions. The Navy armed the land-based P-3 Orion with the Harpoon anti-ship missile, making surface warfare (SUW) a primary mission.[13] Additionally, the P-3 began serving as an OTH battle space awareness and third-party-targeting platform. During the first Gulf War, the Outlaw Hunter and subsequent Over-the-horizon Sensor Information System (OASIS) programs proved that a P-3, using onboard sensors coupled with improved GPS, SATCOM, and data links, could drastically enhance battle space awareness and proved OTH targeting for a carrier battle group.[14] Today, updated technology, communications, and data links continue to allow the Navy P-8 to serve in battle space management and OTH targeting roles for the Navy. Combining that P-8 capability with the B-1's speed, survivability, and ordnance capacity, would make the patrol bomber construct lethal against any enemy maritime force.

BRING BACK VPB – A FRAMEWORK FOR JOINT SEA CONTROL

In the scenario, war has just commenced in the Western Pacific. China has sortied its surface and submarine force into the waters of the First and Second Island chains. In order to gain enough sea control to sail US Strike Groups into an area of operations, the Hughes-ian tactical rule suggests putting "every threatening enemy ship out of action first."[15] The US could plausibly need to find and sink or mission kill0 as many as 350 enemy naval forces in the first

[13] Reade, David. "P-3 Operations in the War on Terrorism." Wings of Gold. Summer 2002: 70-72.
[14] Reade, David and Rick Burgess. "Outlaw Hunter," Naval Aviation News. November-December 1992: 20.
[15] Hughes, Wayne P. and Robert P. Girrier. Fleet Tactics and Naval Operations, 3rd ed. Annapolis, MD: Naval Institute Press, 2018, 158.

days of the conflict.[16] Is the US Navy capable of such a feat? The answer is, 'quite possibly,' but only when the VPB construct is considered. Just like WW-II, the B-1 and the P-8 would bring Navy and Air Force assets to bear in sea control.

The P-8A Poseidon is a land-based, long-range maritime patrol aircraft with a radius of 1200nm and four hours on-station, or 4000nm one-way, unrefueled. Top speed is 490 knots. The P-8's primary mission is ASW. The P-8 can search a volume of water, detect, classify, and track submarines from altitudes from 200 to 40,000ft. The Poseidon also has a robust ISR and targeting capability, equipped with radar and an electro-optical/infrared camera for detection and classification of surfaced submarines and ships. With its electronic support measures suite, the P-8 can passively detect and geo-locate emitters at long range. The P-8 carries up to five MK-54 torpedoes and four AGM-84 Harpoon anti-ship cruise missiles, making the Poseidon a credible sea control aircraft.

The B-1B bomber is a supersonic bomber with a nearly unlimited range with aerial refueling. The B-1's massive weapons bay has the capacity for up to 75,000lbs of ordnance and has the flexibility to carry up to 24 standoff weapons like the LRASM, and a variety of gravity weapons including the MK-65 mine. [17] The B-1 has a ground-mapping radar and can be fitted with the electro-optical Sniper Advanced Targeting Pod, allowing B-1 crews to search for and classify targets at range.[18] As good as the B-1 radar is overland, it was not optimized for the maritime environment.

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[16] Freedberg, Sydney J. "US 'Gets Its Ass Handed To It' In Wargames: Here's A $24 Billion Fix." Breaking Defense, 7 Mar. 2019, breakingdefense.com/2019/03/us-gets-its-ass-handed-to-it-in-wargames-heres-a-24-billion-fix/.

[17] Hobbs and Spears, https://othjournal.com/2019/04/15/a-bomber-for-the-navy

[18] Pate, Kristen. "Sniper ATP-Equipped B-1B Has Combat First." af.mil. 379th Air Expeditionary Wing Public Affairs, 11 Aug 2008. https://archive.fo/20121212203544/http://www.af.mil/news/story.asp?id=123110313

The primacy of the VPB force in SUW lay in the ability to strike enemy surface ships at long range, outside the range of ship-based surface-to-air missiles. The striking power consists of the LRASM and Harpoon anti-ship cruise missiles. The LRASM is precision guided, and carries a 1,000lb warhead and has a range of 200+nm.[19] The Harpoon missile employed by the P-8 is fire-and-forget and carries a 500lb warhead in excess of 67nm.[20] The LRASM carries twice the warhead 2.5 times as far. Together, the VPB force packs a considerable OTH SUW capability. Although either platform could do SUW alone, lethality is maximized by the P-8 and B-1 working together due to the combination of sensors, experience, and weapons.[21] Table 1 shows example weapon load outs.

EXAMPLE VPB WEAPON LOADOUTS				
TYPE	**MK-54**	**HARPOON**	**LRASM**	**MK-65**
P-8				
ASW	5	-		
SUW	-	4		
MIXED	2	2		
B-1				
ASW			-	12
SUW			24	-
MIXED			16	6

Table 1. Example Weapon Loadouts

VPB AND SEA CONTROL – A VIGNETTE

The following is a notional concept of operations (CONOP) that is meant to highlight the utility of the VPB concept. Numbers are included for illustrative purposes only. In the vignette, there are 300 PLA Navy surface combatants and 50 submarines that need to suffer mission kills in the first three days of the conflict. An assumption for the vignette is that US Navy surface and

[19] Freedberg, Sydney J. "Navy Warships Get New Heavy Missile: 2500-Lb LRASM." Breaking Defense, 26 July 2017. https://breakingdefense.com/2017/07/navy-warships-get-new-heavy-missile-2500-lb-lrasm/.
[20] United States Navy. "Fact File: Harpoon Missile." navy.mil. https://www.navy.mil/navydata/fact_display.asp?cid=2200&tid=200&ct=2.
[21] Rojas, Yash. "Air Force, Navy Join Forces for B-1 Naval Mine Development Training." acc.af.mil. 28th Bomb Wing Public Affairs, 10 June 2014. https://www.acc.af.mil/News/Article-Display/Article/661216/air-force-navy-join-forces-for-b-1-naval-mine-deployment-training/.

submarine forces together account for 25% of red surface attrition, carrier aircraft account for another 10%, and ship-based ASW helicopters (MH-60R) attrit 10% of red submarines. There are 60 P-8s and 30 B-1s available to mission kill 225 ships and 45 submarines in the vignette.[22] Using an example from Hughes, with the Exocet missile as a surrogate weapon, two LRASM are required the mission kill each surface target.[23] Two MK-54 are required for each submarine. In total, VPB need a minimum of 450 LRASM and 90 MK-54 to achieve the desired number of mission kills.[24]

VPB planes would operate loosely together in designated areas between the First and Second Island Chains, notionally around 15-100nm apart. The P-8s primary responsibility would be ASW, but would simultaneously search for enemy ships while transiting and on-station. With B-1 taking on the primary SUW strike role, additional dedicated surface surveillance P-8 flights could be provided. For every P-8 sensor, there would be one or two B-1 shooters. The B-1 would remain at best altitude and use radar and Sniper pod for surface search and cross-cueing with the P-8.

Table 2, below, highlights the significant decrease in the number of sorties required provided by the VPB construct, allowing P-8s to focus on the ASW task while freeing up additional P-8s to serve as dedicated surface targeting platforms for B-1s. Mixed-loads are possible but reduce sortie generation efficiency. Maximum sortie efficiency occurs when the P-8s, with MK-54, prioritize submarine strikes and B-1s prioritize LRASM strikes. Based on the

[22] Aircraft availability considers total inventory minus a portion of each type down for maintenance or other contingency.
[23] Hughes, *Fleet Tactics and Naval Operations*, 3rd ed, 158. Hughes used "F-Kill" but in this paper the term mission kill is substituted.
[24] Numbers are notional for fictional scenario. Actual numbers required would vary drastically based on environmental and operational considerations and is likely much higher than listed here.

assumptions for required number of mission kills and B-1/P-8 weapons capacity, VPB would be required to generate total 13.75 sorties a day for three days.[25]

Additional employment assumptions must be considered. The vignette takes place outside the first island chain, beyond the range of Integrated Air Defense (IADS). The vignette also assumes a moderately-contested environment, with combat air patrol providing cover from long-range enemy fighters as needed. Further, VPB assets would mitigate ship-launched anti-air threats by striking maritime targets at long range. In fact, one of the primary benefits of the VPB concept is that with LRASM, VPB can detect and strike enemy ships outside the range of ship-based surface to air missiles.

The range of both type aircraft can be significantly extended with aerial refueling. With or without refueling, P-8 and B-1 would not necessarily have to be collocated at the same base – although collocation would be helpful for coordination and planning. Coordination and targeting between the P-8 and B-1 would be done via Link-16 or secure line-of-sight (LOS) and/or satellite communication (SATCOM) voice circuits. Loss of voice coordination nets would require VPB crews to fall back on Link-16 and prior coordinated training doctrine as practiced in the recommendations below.

The platforms would require Link-16 connectivity or LOS radio to pass targeting and coordination information. High Frequency and SATCOM radios are other coordination options. Jamming LOS communications and data links would degrade coordination, but jamming would be mitigated by range from land-based jammers and the ability of the P-8 and B-1 to search for and strike surface targets independently if required.

[25] Numbers are based solely on weapons required for F-kill and do not account for transit times, search area sizes, and aircraft returning to and from station with unused weapons. Actual weapon requirements are likely much higher. However, based on aircrew turnaround times, the number of sorties per day are fairly representative for this narrow scenario.

MISSIONS REQUIRED, P-8 ONLY vs VPB MISSION KILL 225 SHIPS, 45 SUBS				
	P-8 ONLY		VPB	
	P-8 ASW	P-8 SUW	P-8 ASW	B-1 SUW
TYPE MISSION/DAY	7.5	37.5	7.5	6.25
TOTAL/DAY	45		13.75	

Table 2. Daily Missions Required.

While far from a comprehensive review, this notional vignette shows that the VPB force has the capability and capacity to mission kill or sink enough PLA ships to achieve to get other Joint Force assets into the fight. Three times as many sorties are required when only P-8s are used than with the P-8/B-1 VPB construct. The point of the vignette is to lend enough credibility to warrant a more comprehensive study of the concept. The Joint Force would be far more effective when working together in a war at sea scenario than when working as individual services.

CONSTRUCTING VPB – THE WAY AHEAD

There are two possible courses of action for forming VPB squadrons. The first course of action (COA 1) is a virtual VPB construct. The Air Force keep B-1s in service with existing modernization efforts. The Air Force places a high emphasis on the B-1's role in Joint sea control by allocating flight hours to training in the maritime environment with P-8s. In return, the Navy would agree to purchase a percentage of LRASM missiles for the B-1. Further, the Navy and Air Force would work jointly to improve survivability and countermeasures for both aircraft including improved towed decoys and sensors. The B-1 would benefit from an infusion of Navy money toward improved survivability, while the P-8 could be fitted with an Air Force-provided AN/ALE-50 towed decoy system (something it currently lacks). The B-1 and P-8 Weapon Schools would coordinate closely. A permanent B-1/P-8 Weapons and Tactics Instructor billet exchange could be established at the respective Weapons Schools.

There are downsides to COA-1. The Navy and Air Force would have to agree on funding priorities for training, flight hours, and weapons procurement; no small task in any budget environment. Disagreements between service priorities would jeopardize the virtual VPB construct. The clear and present need to close the maritime strike gap, coupled with the relatively inexpensive cost and rapid speed with which the construct could be employed, should be enough to overcome inter-service rivalry.

The second course of action (COA-2) would be for the Air Force to turn over the B-1's to the Navy, which would then create Navy B-1 VPB squadrons, (break up into two sentence with the help from dedicated Air Force personnel for a defined transition period. The Air Force would save money that could be used for B-21 procurement or for B-52 modernization, and would also benefit by focusing on traditional Air Force missions. The Navy would increase long-range maritime strike capability by orders of magnitude and would have control over the training and efforts of the VPB force. Shifting B-1 to the Navy would cost money, but would retain maritime strike capability within the Joint Force quicker at less cost in time, procurement, and training, than buying an all-new platform.

The downside of COA-2 is sizable. A significant re-programing of money would be required to shift B-1 manning, training, and maintenance responsibilities to the Navy. Funding for the B-1 would be at risk during budget negotiations as the Navy and Air Force buy future weapons like the B-21, Columbia-class submarine, and future surface combatant. Moreover, the learning curve for the Navy would be steep, as pilots and aircrew would have to be procured, trained and sustained. COA-2 is more risky that COA-1, but could still be a viable COA that retains maritime strike capability at a relatively small cost.

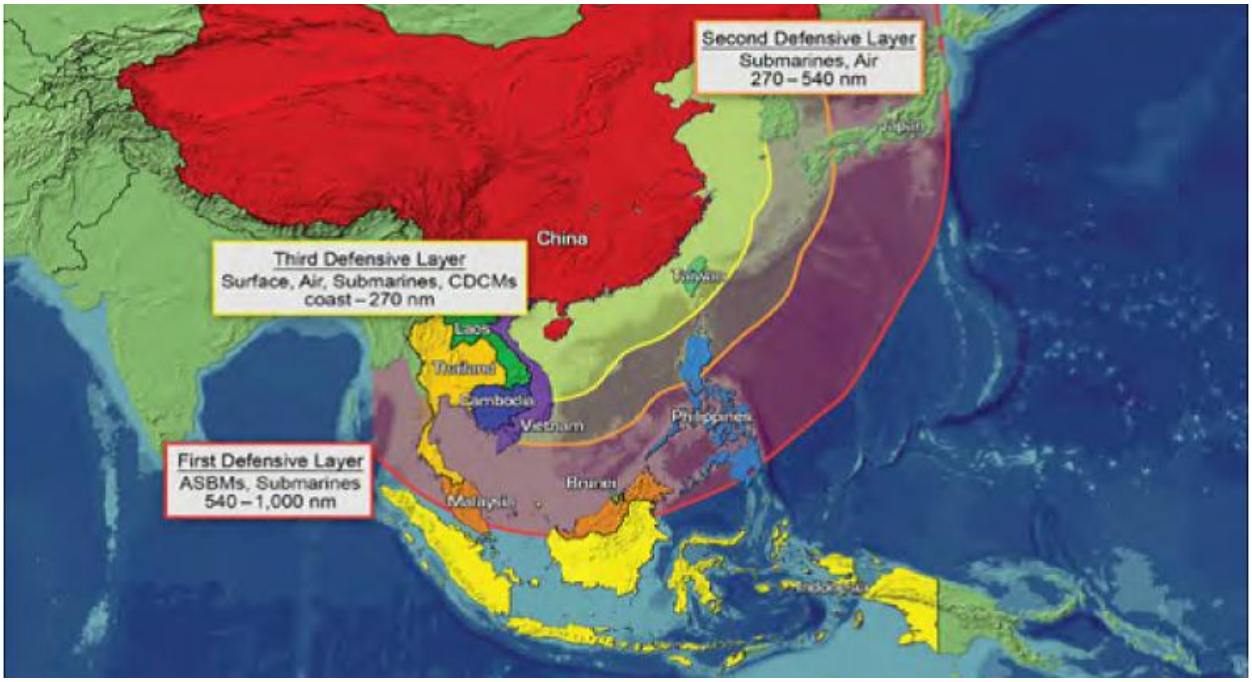
The best course of action to rapidly and drastically increase maritime strike for the Joint Force is COA-1. The Air Force should not retire the B-1 prior to the 2030s. The Joint Force

cannot afford to lose the maritime strike capacity provided by the B-1. The cost of maintaining the B-1 for fifteen or twenty more years is relatively small when viewed in light of the importance of the sea control a high-end war at sea. The virtual VPB concept in COA 1 should be formalized and implemented by the end of 2020. The virtual VPB concept should be tested at Composite Training Unit Exercises (COMPTUEXs) in late-2019 and early-2020, as well as exercises like VALIANT SHIELD 2020. The culmination of the first phase of training and coordination of the construct should be employed at the Distributed Maritime Operations Large Scale Exercise in 2020. By the end of 2020, the P-8 and B-1 Weapons Schools should take the lessons learned from those exercises and publish tactics, techniques, and procedures (TTP) for the virtual VPB construct. A critical requirement is continued procurement of LRASM to outfit VPB squadrons. Together, using P-8s and B-1s in the virtual VPB construct would significantly and immediately make the Joint Force more lethal.

CONCLUSION

The US Joint Force faces a serious maritime strike gap should war at sea break out with a high end adversary. New technology, platforms, and weapons will eventually fill the gap but are years away from hitting the fleet in meaningful numbers. Since Leighton's time in the earliest days of Naval Aviation, history provides examples of the importance of aircraft in sea control. Land-based airplanes proved their worth in projecting power – scouting, targeting, protection, and strike – during World War II and ever since. Establishing virtual VPB squadrons is feasible and is the most cost-effective way to increase maritime striking power. Maintaining VPB squadrons through the 2030s would bridge the gap until future systems and platforms can be fielded. The Air Force should keep the B-1 operational, refocused primarily in the maritime strike role, in close coordination with the Navy, as outlined above. The virtual VPB construct can and should be implemented now to address the maritime strike deficit.

APPENDIX A


Second Defensive Layer
Submarines, Air
270 – 540 nm
China
Third Defensive Layer
Surface, Air, Submarines, CDCMs
coast – 270 nm
Laos
Thailand
Cambodia
Vietnam
Philippines
Brunei
Malaysia
First Defensive Layer
ASBMs, Submarines
540 – 1,000 nm

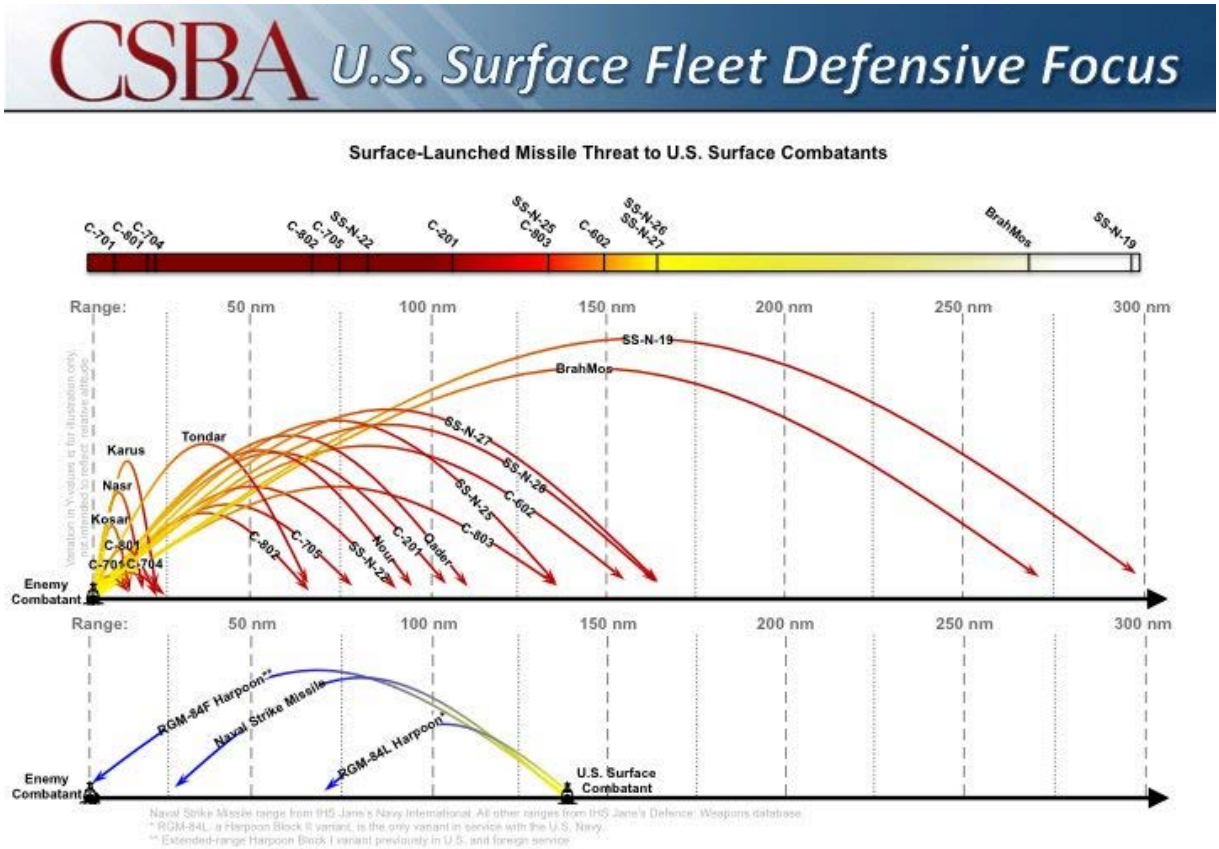


Figure 2. Surface-Launched Missile Threats to U.S Surface Combatants. Source: CSBA.

Figure 1. ONI Graphic depicting China missile threats.

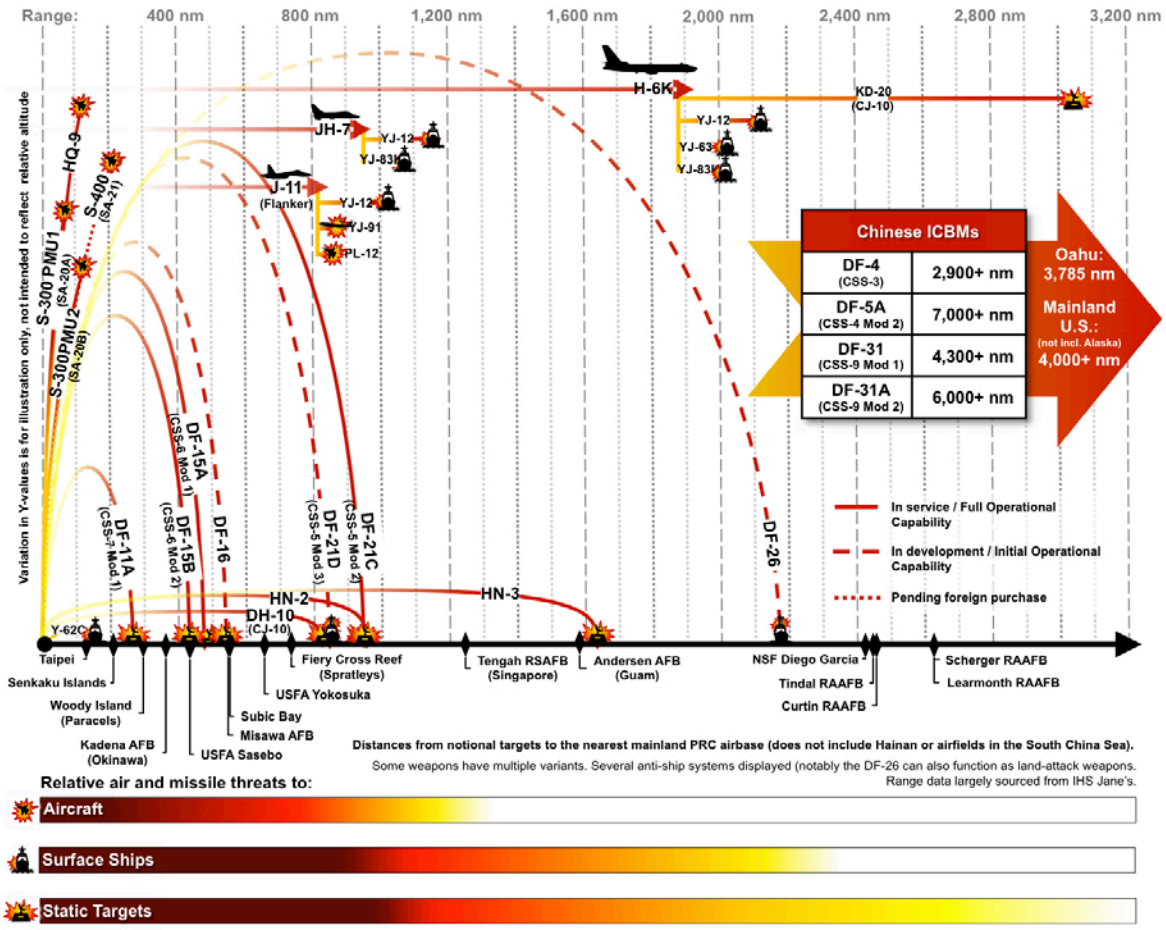


Figure 3. Chinese Missile Threats. Source: CSBA.

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