

*Transitional Fossils of the Atomic Age:
Regulus and Sea Master*

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Revolutions in strategy and military affairs happen one step at a time. “Revolution” implies a sudden shift, with old and worn ideas, and the weapon systems they support, ceding ground to the fresh and modern. The medieval castle gives way to the *trace italienne*. Panzers rip through slow-moving, “methodical,” infantry. Precision munitions guided by definitive intelligence eviscerate a veteran Iraqi Army. In retrospect, these “revolutions” can appear fated, but this paper argues that this is not always the case. The apparent discontinuity between one method of warfare and its so-called revolutionary successor is on closer inspection often filled with short-lived “failed” projects. They do not last long (or even reach active service), but they are essential evolutionary steps for later, more enduring, systems. Their most important contribution is to introduce novel ideas, often taken from outside conventional military circles, and they can be an important way for an organization to change its approach to core functions. When these intermediate systems are forgotten, they make the final step look like a revolutionary leap, as opposed to a steady advance of evolutionary development. This paper restores to visibility two overlooked parts of one such process,

¹ The views expressed are those of the author and **do not** reflect the official policy or position of the US Air Force, Department of Defense, or the US Government.

the movement from carrier-based seapower to nuclear-armed ballistic missile submarines.

The Polaris submarine launched ballistic missile (SLBM) was revolutionary when it entered service with the US Navy in 1960. It was dramatically different from the carrier-based airpower and submarines which had preceded it in the strategic role. Polaris could reach a thousand miles, to the heart of the Soviet Union. The *George Washington*-class submarines that carried 16 of the new missiles patrolled alone for extended periods, consistently available for integration into national-level nuclear attack plans. Most importantly, Polaris could credibly hold Soviet population centers at risk, as part of an emerging deterrent strategy of Assured Destruction. By contrast, its well-known predecessors, atomic-armed aircraft based on carriers, extended the range and offensive power of the fleet, but in ways recognizably related to the great naval victories over Japan. Those systems had failed the Navy in the most important way during the early Cold War. They permitted another organization, the Air Force, to displace the sea service from its role as the first line of American defense, with all the prestige — and budget share — that entailed. Judged by these criteria, Polaris was the most important victory in bureaucratic politics for the Navy during the Cold War.

This story of a “revolutionary leap” overlooks two critical evolutionary steps, the Regulus cruise missile and a seaplane bomber, the P6M Sea Master. In the sense of seizing budget share from the Air Force, they did not succeed, but these programmatic failures prepared the way for Polaris. Regulus, which reached active service in the early 1950s, introduced the potential of stealthy attack against strategic targets, but failed to live up to its promise because of technological limitations. The P6M, first flown in 1955, matched contemporary USAF medium bombers in performance, could operate anywhere on the periphery of the USSR, be difficult to detect, and could attack the USSR’s inland industrial centers. The Navy based its strategy for their employment on new ideas centered on stealth and survivability, not firepower. Regulus and Sea Master mark roads not taken. They are evolutionary “missing links” whose supporting ideas bridge the gap between carrier fleets with atomic-capable aircraft and a submarine-based retaliatory deterrent force. This paper will look at the first ideas of adapting the Navy to the atomic age, then these “transitional” programs, and finally the first SLBM.

Regulus and Sea Master are essential evolutionary steps in Polaris' development, and undermine the SLBM's apparent revolutionary credentials.

The US Navy emerged triumphant from the Second World War. Naval power was predominant in the final act against Japan, as Tokyo's representatives unconditionally surrendered on the deck of the USS *Missouri* in Tokyo Bay, and waves of carrier-based aircraft flew overhead. Fleet Admiral Ernest King reported to the Secretary of the Navy that "never before in the history of war had there been a more convincing example of the effectiveness of sea power than when a well-armed, highly efficient and undefeated army of over a million men surrendered their homeland unconditionally to the invader."² But the Army Air Force's B-29s that also overflew the *Missouri* that day foreshadowed a major change in the Navy's role in American strategy.

The Air Force threatened to displace a service that had led American military policy since Mahan's day, and had just won an epic victory in the Pacific. In 1947, RADM Daniel Gallery, the Assistant Chief of Naval Operations (Guided Missiles) foresaw a nautical version of atomic strategy following from the USN's use of massed carriers against Japanese land targets. He reasoned that the Navy's carriers were a mature platform from which to launch an offensive, because intercontinental range was built into the ship rather than the aircraft.

This fit well with other naval views of the bomb. Bernard Brodie, already emerging as an important nuclear thinker, compiled a contemporary study of the Navy's attitude toward the atomic weapon, based on interviews with naval officers, and approved by Fleet Admiral Chester Nimitz, the Chief of Naval Operations (CNO).³ Brodie wrote that in the atomic era, naval officers believed they required a combination of carrier groups, amphibious forces, escort craft, and submarines. Surface fleets would survive or evade atomic attack as they carried out their missions against "active" and "passive" defenses. It was cities, not navies that were vulnerable to atomic attack.

² United States, Office of the Chief of Naval Operations, and Ernest Joseph King, *U.S. Navy at War, 1941-1945. Official Reports to the Secretary of the Navy*, (Washington: United States Navy Dept., 1946), p. 195.

³ "US Navy Thinking on the Atomic Bomb," 1947, Folder - Navy - Effects on (N- Z), Box 11, General Correspondence 1941-1970, RG 200 (Papers of General Groves), National Archives and Records Administration II, College Park, MD, p. 1.

The Navy's position was conservative, as was the Air Force's. Where the Air Force integrated the atomic bomb into an existing strategic bombing framework, the Navy placed it within existing ideas about distant bases, amphibious warfare, shore bombardment, and the ability of carrier-based aviation to conduct strategic bombing on land. Brodie concluded that

It is pertinent to point out that any military organization, especially after a great war in which it has fought with brilliant success, tends to feel an enormous vested interest in the experience which it has acquired with so much pain and labor.⁴

No revolution here, just evolution.

These conservative ideas fed into conservative plans against the Soviet Union which envisioned a campaign resembling World War II, but with a nuclear prelude. The Navy's primary role, beyond defending the Western Hemisphere, was to preserve lines of communication with Great Britain, Western Europe, and the Mediterranean. Planners expected that the Red Army would likely sweep western forces from the continent, which made protecting access to the Mediterranean from Gibraltar to Suez essential for reentering a communist-occupied Europe.⁵ The Navy was in an important — and firmly traditional — role. Carriers and surface fleets would play the main part in the Navy's operations. Still, the Navy wanted more, but the service's attempt to extend the planned role of existing carriers to strategic air attack met with firm resistance.

The Navy worked to expand its responsibilities in a way consistent with a technologically-oriented service that believed it had played the decisive role in the largest war in history — it merely sought better machines to carry out its proven ideas. The Navy needed aircraft to carry the large atomic weapons of the late 1940s, and a carrier that could launch and recover them. The AJ-1 Savage, a piston and turbojet-

⁴ "Compiler's Critique on US Navy Views," 1947, Folder - Navy - Effects on (N- Z), Box 11, General Correspondence 1941-1970, RG 200 (Papers of General Groves), National Archives and Records Administration II, College Park, MD, p. 5.

⁵ Stephen T. Ross and David A. Rosenberg, "JCS 1844/46: Joint Outline Emergency War Plan 'Offtackle', 8 November 1949," in *America's Plans for War Against the Soviet Union, Vol XII: Budgets and Strategy, The Road to Offtackle* (New York: Garland, 1990).

powered aircraft capable of 400 knots, was the first carrier-borne platform that could deliver an atomic weapon. Its 750 NM radius meant that any strikes against inland targets like Moscow would have to be one-way. As the World War II-era carriers of the time were ill-suited to the ungainly new aircraft and its weapon, the Navy sought its first “supercarrier,” the USS *United States*. This radical design had no island, permitting it to carry 24 of the Savages.⁶

The *United States* was highly controversial. The price was as high as the ship’s design was radical, at a time when Secretary of Defense Louis Johnson was seeking to cut the defense budget. One study estimated that for the cost of the new ship and its escorts, which would ultimately launch a handful of Savages, the Air Force could buy 500 B-36 heavy bombers.⁷ Another concluded that the need for multi-aircraft strikes would limit the proposed carrier to attacking only five targets at a given time. At that rate, the *United States* would take a year to carry out what a land-based force could do in two weeks.⁸ Secretary Johnson canceled it five days after the keel was laid.

As difficult as the Navy’s role would have been *with* the new carrier, it was even more difficult *without*, as a series of exercises held in 1950 at the Naval War College showed. An observer reported that in one exercise, a judge ruled that two Soviet atomic bombs on the densely packed bridgehead of an amphibious invasion force had implausibly inflicted only “light damage.” In another exercise simulating operations in the Eastern Mediterranean, however, over 100 Soviet aircraft attacked three carriers. Although the Soviets lost many bombers, the judges decided that in *this* case the carriers *had* been destroyed. The exercises demonstrated a key weakness of carrier in the atomic age: vulnerability in enclosed waters. Soviet reconnaissance aircraft could find fleets while avoiding protective fighters. As carrier-borne attack aircraft had limited range, they had to maneuver close to the coast where they were vulnerable. An otherwise effective anti-aircraft formation was vulnerable to an attack by high-altitude aircraft

⁶ Roger Chesneau, “United States (CVA-58),” in *Aircraft Carriers of the World* (Annapolis, Md: Naval Institute Press, 1984), p. 263.

⁷ Francis V. Drake, “The Case for Land-Based Air Power,” *Reader’s Digest* (May 1949), p. 65.

⁸ “The Super-Carrier Decision” by Col James F. Whisenand, April 1950, Call No. 168.7006-16, IRIS No. 125848, in Orvil Anderson Papers, AFHRA, pp. 20-24.

with atomic bombs.⁹ The conclusion was clear: the carrier force that had assaulted Japan was ill-suited to an atomic campaign.

The Navy reacted to its straitened circumstances following the cancellation of the USS *United States* by campaigning against the Air Force's B-36 heavy bomber. In the resulting hearings, popularly known as the "Revolt of the Admirals," the Navy not only alleged fraud and waste in procuring a marginal weapon, but it also attacked the ideas behind the strategic air offensive. The hearings ended badly, with the Chief of Naval Operations fired, and ill-will caused with the other services. The Navy was at an impasse. Its first attempt to regain a leading role had foundered. At the hearings, it had failed to undermine the strategic air offensive as an overarching concept, or in the specific form of the B-36. Outside the hearings, the Navy's role in war plans was decidedly subordinate to that of the other services, with the Air Force directly attacking the USSR while the Army defended Europe. Its existing equipment was unsuited to a war with Moscow, and would have been so even with new carriers. The Navy's first postwar attempt at restoring itself to first-line relevance had tried to use familiar equipment in familiar ways, and had failed. Carrier-based aviation, even atomic-armed, was not the solution to the military environment in the atomic age.

The setbacks of the 1940s left the Navy frustrated, but not defeated. The increase in defense spending that followed the Korean War and NSC-68 bought the Navy its first postwar carriers, the angled-deck *Forrestal* class. This successful ship hosted a new, more sophisticated, nuclear-capable bomber, the Douglas A3D Skywarrior, which had a radius of action close to 1,100 NM. The Navy launched one *Forrestal* into service every year between 1952 and 1957.¹⁰ Nonetheless, the new combination of improved aircraft and ships was still better suited to the Navy's traditional roles and missions than to taking the strategic lead.

Nowhere was this plainer than in the continued lack of a maritime role in the strategic air offensive. As the *Forrestals* entered service, the JCS directed the intelligence chiefs of the three branches to formalize a "mutually acceptable arrangement" for joint

⁹ "Memorandum for Colonel Noel F. Parrish, Some Navy Attitudes and Problems of Interest for the Air Force," 13 Aug 1951, Folder - Correspondence 1951, Box 1, Nathan Twining Papers (MS 22), US Air Force Academy Special Collections.

¹⁰ Stefan Terzibaschitch, *Aircraft Carriers of the U.S. Navy* (London: Conway Maritime Press, 1980), p. 309.

targeting within the existing Air Force intelligence organization, but this never reached fruition.¹¹ That failure led to the establishment of “Joint Coordination Centers” (JCC) in the European and Pacific theaters, but these bodies served only to deconflict wartime action, not prewar planning.

The distance between ideal and real targeting is clear. In June 1955, Air Force Chief of Staff General Nathan Twining scolded Strategic Air Command (SAC) Commander General Curtis LeMay for failing to keep the JCS informed of his operational plans. As the most recent SAC plan available to the JCS was dated 1951, other commands could not determine the support they should offer SAC.¹² If SAC plans were opaque to the Air Force outside SAC, they certainly were to the Navy.

The recalcitrance went both ways. When questioned in 1954 about Navy coordination, LeMay vented his frustration. In the Mediterranean, for example,

I have yet to be able to pin down one definite target that the Navy is going to hit ... [I] don't know where the fleet is going to be....I have a vague idea by talking to people that they will be operating around some place, but I haven't been able to get together to get a communications plan whereby we can pass information... All the Navy plans I have read are so general that they are worthless...¹³

Without operational coordination, and with the Air Force near-monopoly on nuclear-armed assets, the Navy was frozen out of the strategic air campaign. It needed a wedge to win back part of the first-line mission. Until then, the victor of the Pacific would take a back seat in the next war.

A conventional view of this period would now cite Polaris as the next important step in regaining Navy influence, but that misses two important intermediate — “transitional” — programs. Regulus and Sea Master paved the way for Polaris, and the ballistic missile can be better understood in their context. Each system was a more

¹¹ “JCS 2056/35: Joint Arrangement for G-2 and ONI Participation in the Directorate of Intelligence, U.S. Air Force,” 9 September 1952, Folder - CCS 373.11 (12-14-48) Sec. 9, Box 131, Central Decimal File 1951-53, RG 218, National Archives and Records Administration II, College Park, MD.

¹² “Letter from Twining to LeMay,” 9 June 1955, Folder - Twining, Box B-60, Curtis E. LeMay Papers, Manuscript Division, Library of Congress, Washington DC.

¹³ “The Strategic Air Command,” pp. 6-7.

radical departure, technologically and doctrinally, from carriers. They took unconventional ideas and applied them to advance the Navy's interests in its interservice fight to gain back budget share and prestige.

The first, the Regulus cruise missile, was an outgrowth of the German V-1 and subsequent postwar Navy test programs. Regulus was designed for submarine launch, and carried an atomic weapon out to 500 NM at subsonic speed. If required external guidance throughout its flight. The launching submarine, surfaced, could guide out to the horizon, about 200 NM away in calm seas, but then another platform would have to take over. The Navy placed between two and five Regulus missiles on each of five submarines, beginning in 1952 with converted World War II types, and eventually on purpose-built boats. While under development for submarine launch, the Navy armed several surface ships with Regulus, which began operational deployments with the fleet in 1955.¹⁴ The first independent submarine deterrent patrols with Regulus did not begin until late 1959. This was already after the 1958 cancellation of the supersonic follow-on, Regulus II. Admiral Arleigh Burke, the CNO, chose to fund Polaris over Regulus II because it promised more long-term viability. Nonetheless, Regulus submarines continued deterrent patrols in the Pacific until the Navy withdrew them from service in 1964.

Regulus was technologically incapable of filling the Navy's need for a strategic weapon. It was slow, short-legged, easy to intercept, easy to jam, and required the launching submarine to stay surfaced, and therefore vulnerable, while guiding the weapon. Moreover, an individual submarine could carry only a few missiles at a time, and the weapons were expensive. It was, as the previous discussion implies, also not integrated into the Air Force's existing plans for strategic attack, and could not even be so until it began deterrent patrols (as opposed to operating with the fleet).

Doctrinally, at least before the start of deterrence patrols in 1959, Regulus was designed to strike targets on the "maritime frontiers," extending the reach of the fleet,

¹⁴ David K Stumpf, *Regulus, the Forgotten Weapon: a Complete Guide to Chance Vought's Regulus I and II* (Paducah, Ky.: Turner Pub. Co., 1996), p. 88.

but still focused on targets of traditional naval interest.¹⁵ By the time it had gained a deterrent role independent of the fleet, Regulus was badly outdated and could reach few vital Soviet targets from its patrol stations in the Pacific. Strategic attack, understood as credibly threatening rapid destruction of Soviet centers of power to compel a favorable decision, was simply beyond the technological or doctrinal capacity of Regulus.

By conventional definitions, Regulus can be called a failure. However, seen as a “transitional fossil,” Regulus shows more value. It was an important advance over carriers. Technologically, it was stealthier, even though it had to be launched and guided from a surfaced submarine. It introduced the idea of operating in bastions, although whether that was an outgrowth of parallel thinking for Polaris employment is not clear. Regulus submarines also pioneered the mechanics of deterrent patrols, giving the Navy valuable pre-Polaris practical experience. For example, Regulus submarines had a single crew which had to rest and refit in port, taking the missiles out of service; Polaris submarines had two crews who swapped out in port, maximizing time at sea for the missiles. And, at the strategic level, Regulus highlighted the need to coordinate strikes with the Air Force, which later became a major point of conflict between the services during Polaris’ development. Regulus may have been short-lived, but it helped set the stage.

While the Air Force never saw Regulus as a threat to its dominance of the strategic mission, the P6M Sea Master was a different matter. The idea of the seaplane for strike emerged in the 1920s and developed rapidly in following decade. Although the PBY Catalina had a mixed record in the Pacific, some in the Navy thought a new generation of technology could revive the idea for the atomic age.¹⁶ The Martin XP6M Sea Master combined the carrier’s mobility and the Regulus submarine’s elusiveness with range and performance similar to the contemporary B-47 medium bomber. The jet powered aircraft promised 0.9 Mach flight at low-level, flying from coastal inlets. Although it was to launch its missions independently, the P6M was to be part of a

¹⁵ CAPT W T Kinsella, “Memo for Record, Subj: Minutes of VCNO Meeting, 1045, 17 June 1957,” June 18, 1957, Document NH00578, U.S. Nuclear History, National Security Archive (Digital), p. 2.

¹⁶ William F Trimble, *Attack from the Sea: a History of the U.S. Navy’s Seaplane Striking Force* (Annapolis, Md.: Naval Institute Press, 2005), ch 2.

larger “Sea Plane Striking Force” (SSF) that included floating repair facilities and submarine tenders, and even an interceptor for escorting the Sea Master.¹⁷

The Navy justified the aircraft with a synthesis of the arguments made for traditional systems and original ones. Its mobility combined with its small footprint to make more realistic the carrier’s promise of invulnerability through stealth. Although Soviet aircraft could find a carrier task group in the North Atlantic and track it, a task the USAF had practiced, the XP6M was almost impossible to find. It could thus credibly weather a surprise attack and then inflict painful retaliation. It combined the advantages of manned aircraft carrying heavier payloads than possible from carriers, with greater accuracy and less vulnerability than Regulus fired from surfaced submarines. Technologically, it was more capable than either carriers or Regulus.

Doctrinally, Sea Master promised a different kind of deterrent. Contemporary nuclear forces depended on rapidly-delivered firepower to disarm an opponent before he could launch an attack, and then tried to compel him to surrender by destroying industry and fielded military forces. A justification for Sea Master declared, “The way to prevent a nuclear war is to have absolute capability to deliver retaliatory nuclear attacks.”¹⁸ “No rational enemy would initiate a nuclear war unless he had a reasonable chance to win. Certainly he would hesitate if destruction of his country was assured.”¹⁹ While the Air Force strained to outrun surprise attack on vulnerable land bases in the 1950s, the Sea Master could evade one and constitute a second-strike force. Its deterrent potential stemmed from invulnerability and the threat of punishment for surprise attack, not raw destructive power.

Here, ignored by historians and strategists, lay the birth of arguments about second strike capacity and Assured Destruction. The seaplane promised another advantage. Because it operated at sea, any Soviet surprise attack would at worst destroy the aircraft in open ocean. A similar attack on SAC would hit not only the bases but inflict grave civilian casualties, even if the aircraft survived. The base system, which

¹⁷ Trimble, pp. 94-97.

¹⁸ “Memo from Lindsay to Twining, Subj: Naval Warfare - Key to Survival in the Thermonuclear Age,” 15 January 1955, Folder - 045 (22 Jan 48) Sect 1 A, Box 28, 335, RG 341, National Archives and Records Administration II, College Park, MD, p. 1.

¹⁹ “Naval Warfare,” p. 5.

formed SAC's "Achilles Heel," could be reduced or eliminated by adopting the seaplane, because the "vast seaplane operating areas are available on a year round basis, require no rights or agreements, no construction costs, no large air and land forces to defend [them], are indestructible, and, contrasted to land bases, do not invite attack."²⁰ Sea Master was a finely honed weapon against not only the Soviet enemy, but also the Air Force one.

While an Air Staff study, guided by years of planning and experience, retorted that these operations were more complex than the Navy assumed, the XP6M nonetheless alarmed most Air Force generals. In 1954, as the aircraft advanced toward its first flight, Vice Chief of Staff General Thomas White said, "An airplane of this type ... presents a much greater threat to the Air Force mission than any number of carriers."²¹ The Sea Master represented a dangerous Navy attempt to use "R and D" to wedge its way into the Air Force mission.

Concern over the XP6M, however, was not universal. At the 1956 Commanders' Conference, General Orval Cook, Deputy Commander of European Command, expressed disdain: "All of this story about 75 per cent of the Earth's surface being water, and that seaplanes are very economical and easy to operate, in my opinion is just so much undiluted crap."²² In mid-1955, as the Air Staff furiously worked out its strategy, LeMay urged calm, saying that "the subject is being given disproportionate emphasis." The Sea Master might have the performance of the B-47, but it would not be operational until 1960. By then, the B-47 would be obsolescent, in the process of being replaced by the B-58.²³

In the end, LeMay proved right. The Navy publicly announced the Sea Master in November 1955, but also pragmatically denied that it had a strategic mission in an effort to soothe the Air Force. Disaster followed. The first prototype crashed on 7

²⁰ "Naval Warfare," p. 7.

²¹ "Memorandum from White to DCS/Operations," 7 December 1954, Folder - 1954 Organization (2), Box 70, Nathan F. Twining Papers, Manuscript Division, Library of Congress, Washington DC, p. 1.

²² "Commanders Conference, Ramey Air Force Base, Puerto Rico, 23-25 January 1956 (Verbatim Transcript), Vol I," 23 January 1956, Folder - Secretariat Air Force Council Commanders Conference 1956, Box 1, Air Force Council Commander's Conferences 1954-1956, RG 341, National Archives and Records Administration II, College Park, MD, p. 26.

²³ "Letter from LeMay to Everest," 25 July 1955, Folder - Everest, Box B-52, Curtis E. LeMay Papers, Manuscript Division, Library of Congress, Washington DC.

December. After a redesign, test flights resumed in May 1956, and abruptly halted when the second prototype crashed on 9 November. Flight testing resumed in January 1958. The Navy pushed the program hard, training crews and setting up a development unit in Hawaii, which had three production aircraft with all-Navy crews in August 1959 when the Navy finally canceled the program. Although the P6M achieved its design goals and was remarkably advanced, it fell victim to the same Soviet defenses that pressured Air Force bomber development.²⁴ It was also suffered from major cost overruns and program mismanagement. A 1964 Government Accounting Office report cited the Sea Master program as a prototypical “example of waste and mismanagement in defense procurement.”²⁵

Like Regulus, the Sea Master’s longer term significance lies in the arguments the Navy tested in its justification. There are undeniable continuities with earlier systems. All of them depended on the safety of the weapon in the vast ocean, a quality that set these naval systems apart from aircraft at fixed bases. The Sea Master was also well understood technology, particularly in comparison with cruise or ballistic missiles. The aircraft may have been at the avionic cutting edge, but it was *still an aircraft*. In contrast to Regulus, Sea Master’s conventionality may have increased its viability as a program. Stakeholders could more easily imagine an airplane dropping a bomb than a submerged submarine firing a missile.

However, the changes — which are most prominent in the realm of ideas — are more important than the technological continuities. A force based on retaliatory threat against Soviet targets broke new strategic ground. For one, it surrendered the initiative to the Soviets. The P6M’s threat relied on being prepared to act second, not first. Sea Master was also novel because it operated independently of the rest of the fleet. While the entire SSF had other vessels on which the P6M would rely for supply and maintenance, it was expected to strike independently, or in concert with other aircraft. It was not dependent on an aircraft carrier or its supporting fleet for launching its wartime mission. Moreover, the notion that deterrence flows from an invulnerable Assured Destruction force was a key departure from the Navy’s rationale for carriers. It rejected the orthodox position that the role of atomic weapons was to destroy an

²⁴ John Pike, *P6M*, <http://www.globalsecurity.org/military/systems/aircraft/p6m.htm>.

²⁵ Trimble, p. 164.

enemy's force-in-being or military potential, and substituted for it a hazily defined punishment. Although not explicit in the Navy's justification, a second strike against empty airfields and ports would not be effective as the Soviet weapons based there were likely to have already been used. These ideas hinted at in Sea Master's early years prepared the way for the well-developed arguments behind finite deterrence. Later articulations of punishment named Soviet population as the primary target, and it is a reasonable conclusion that Sea Master would have followed the same path. This new conception of deterrence bridges the decade of Navy advocacy for carriers with that for Polaris.

Polaris was a more radical weapon, and unlike Regulus or the Sea Master, it was a long-term success, opening a new era in Navy strategic warfare. Polaris began development in 1956 and had remarkably trouble-free progress, reaching operational status by late 1960. Unlike Regulus, Polaris was intended for submerged launch, and did not need any external guidance to the target. In its first form, Polaris had a range of 1000 miles, was relatively inaccurate and had a smaller warhead than land-based weapons, but could be fired underwater. Because a retaliatory attack could be launched against Soviet cities without a tight timeframe, even slow command and control procedures were acceptable. Inaccurate and low-yield missiles, incapable of blunting Soviet nuclear forces or even perhaps for destroying industry, could still threaten to kill civilians. The Navy threatened not only to gain a role in the strategic attack mission but also to redefine the requirements of deterrence. If deterrence came to hinge on invulnerable forces – which only the Navy could provide – then the Air Force would be hard-pressed to find a satisfactory substitute. For the first time, the Navy threatened to combine new ideas and weapons to regain a dominating position. At its most basic, the question was simple: Is the goal of nuclear warfare victory or vengeance? Contemporary nuclear strategy implausibly promised the former, and the Polaris-armed finite deterrence advocates – with arguments primed by the thinking behind Sea Master – offered the latter.

Admiral Burke justified Polaris with finite deterrence arguments. Finite deterrence proposed that past a certain number of weapons, one or both sides would have a secure second-strike capability. That is, even after the most disastrous surprise attack, retaliation could inflict unacceptable devastation on an aggressor. Here,

deterrent power grew from the ability to inflict an unspecified amount of damage, rather than to destroy the enemy's military potential or force-in-being. This idea fell outside contemporary nuclear strategy – and arguably, of orthodox military thought – because it aimed for sufficiency or stalemate, not victory.

Burke argued that the US must have enough retaliatory strength to convince an enemy he risked destruction by starting general war. He proposed a finite deterrent aimed at the Soviet government, party controls, industry, and war-making capacity. Only an invulnerable force could carry out such a strategy. The CNO told his senior officers that “invulnerability ... can only be achieved by true concealment and mobility.”²⁶ Burke had just such a platform in mind in Polaris, but the roots in Regulus and Sea Master are clear.

How does this compare with the Sea Master? Technologically, both systems could credibly hold Soviet cities at risk. Both could reliably survive a Soviet first strike in adequate numbers to retaliate. Both preserved tactical and operational independence from the fleet. Doctrinally, the Navy sold both as retaliatory weapon systems, for use after a Soviet attack had already happened. In that role, both would aim to punish the Soviets by inflicting pain, not necessarily to disarm them. For Polaris, this was with an explicit justification of finite deterrence and for Sea Master it is a plausible reading of intent. The reality of a trans- or post-attack environment would make targeting anything other than fixed installations nearly impossible, and Soviet nuclear bases were bound to be “dry holes,” suggesting that economic and population centers were the intended target system for both seaplane and SLBM. Of course, there were important differences between the systems. For one, the Polaris was technologically radical, even if Regulus had proven the idea of launching missiles from submarines. Of course, Polaris had all the advantages of a ballistic missile including speed and immunity from interception. For its part, Sea Master was far more flexible than Polaris and could, in theory, be used to strike any number of targets at any level of hostilities. Realistically, Polaris was technologically limited by its nuclear warhead and low accuracy to a second-strike role against soft targets in a nuclear conflict. However, the similarities are

²⁶ “Memorandum for All Flag Officers, Subj: Views on Adequacy of U.S. Deterrent/Retaliatory Forces as Related to General and Limited War Capabilities,” 4 March 1959, Folder - 3-9 Mar 59, Box 5, Arleigh Burke Papers (Rosenberg MDR), Operational Archives Branch, Naval Historical Center, Washington DC.

more striking than the differences. Both Sea Master and Polaris are the same doctrinal ideas in a different technological package.

Polaris was the tremendous success for the Navy that earlier systems were not. It regained the sea service a lasting place at the table for strategic warfare against the USSR, and the budgetary share that involved. It also broke the Air Force's monopoly on control of strategic attack. Strategic Air Command's Emergency War Plans of the 1950s gave way to the first Single Integrated Operations Plan (SIOP) planned jointly with the Navy. While the first SIOP still had the Air Force in control of the most important decisions, the Navy was no longer shut out. The key to this success was not only Polaris' credible threat to punish a Soviet first-strike, enabled by its stealth, but also on a weapon system designed with the idea of punishment in mind. This second, doctrinal, innovation was not new at all. It was born with Sea Master.

Regulus and Sea Master were a great success for the Navy, but only counterintuitively. They failed technologically, but that is not important. They succeeded because they helped the Navy assemble its arguments based on finite deterrence and a secure second strike capability that worked so well for Polaris. From a larger perspective, both systems were a typical organizational response to a challenge: incremental adjustment. The technological and doctrinal gap from short-range carrier aviation to ballistic missile submarines loses its revolutionary appearance when Regulus and Sea Master become visible as stepping stones. They bridge the distance from carrier aviation servicing naval targets to ballistic missile firing submarines threatening a second strike. Regulus and Sea Master also highlight that tepid success or complete programmatic failures are not necessarily organizational failures. These transitional systems prepared the way technologically and doctrinally for Polaris' triumph.

This kind of intermediate "missing link" has implications for other seeming "revolutions in military affairs." Regulus and Sea Master suggest that programmatic failures might explain the development of doctrinal thinking for other apparently rapid developments. Forerunners, even short-lived ones, may provide clues to the origin of mainstays of strategic discontinuity such as precision attack, cyber warfare, and the "system of systems." Regulus and Sea Master point in a direction of evolution in military affairs, with all that implies for evolutionary dead-ends in development,

missing links, and even perhaps mass extinctions. Revolutions may be spectacular, but the Sea Master example suggests they are less frequent than their proponents proclaim.