Winning a war at sea, without ships

Some thinking about Elon Musk and naval automation.

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RESEARCH NOTE
19 SEPTEMBER 2023

Here is Edward Bear, coming downstairs now, bump, bump, bump, on the back of his head, behind Christopher Robin. It is, as far as he knows, the only way of coming downstairs, but sometimes he feels that there really is another way, if only he could stop bumping for a moment and think of it. And then he feels that perhaps there isn't.

— A. A. Milne, *Winnie-the-Pooh*, Chapter 1, McClelland & Stewart, 1926.

September has seemed a pivotal month in the conduct of modern warfare, even if we just focus on the ongoing Russo-Ukrainian War. Consider the score of the past two weeks:

- The Ukrainian Air Force destroyed the Russian landing ship *Minsk* and submarine *Rostov-on-Don*, with standoff missiles of the Storm Shadow type. Both ships were destroyed in graving docks in Sevastopol, which also rendered the two docks useless for a long time.

- The Ukrainian Navy destroyed coastal radars and S-400 missile batteries on the west side of Crimea, with Neptune missile batteries ashore, in concert with decoy drones. The entire event was filmed overhead from a seemingly unbothered drone.

- The Ukrainian Navy damaged the Russian hover-corvette *Samum*, in Sevastopol Bay, with Sea Baby drone boats, requiring its towing back to port. The drone boats are yet to sink a Russian warship, but they have damaged several.

- Ukrainian naval commandos seized two offshore oil platforms which had been lost to Russian landing parties well back in 2014, and cleared them of Russian surveillance equipment. Just as the Russians could not hold Snake Island, they could not hold man-made islands closer to Crimea. (Chinese naval strategists might take note.)

- Commercial bulk carriers have begun loading and moving grain from Odessa, despite Russian threats to interdict the shipping.

- The Russian Black Sea Fleet has continued its retreat, begun early in the summer, into the Sea of Azov and its eastern base at Novorossiysk (see reporting by Jon Jackson and by Riley Bailey *et alia*.) Pulling three landings ships into the Sea of Azov may help ferry

supplies along the southern coast if rail lines become interdicted by Ukrainian missile fire. Eventually, however, those ships must moor somewhere, if only to refuel—and thus become targets for another precision strike, as on their sister ship *Saratov* in March 2022. As Christopher Stuart wrote yesterday in the *Kyiv Post*, this "so-called 'mini-Pearl Harbor' may turn out to be more of a 'Waterloo' moment."

All this work to secure the Black Sea against Russian naval activity has been undertaken without access to a single large ship. The Russians have lost a submarine, but only in port. For many navies, this begs the question, when does a navy actually require surface ships? What radical change would that suggest? Let us analyze that question through the framework of what Elon Musk calls his "algorithm" for breakthrough performance improvement:

1. Question every requirement
2. Delete any part or process you can
3. Simplify and optimize
4. Accelerate cycle time
5. Automate

I have not yet read the new book by Walter Isaacson, but recent essays by Alexa Corse *et alia* and Paolo Confino have been illuminating.

Question every requirement — Do large surface warships provide good value for money?

At the Defence and Security Equipment International show in London last week, First Sea Lord Admiral Sir Ben Key described the results of these realized advances in autonomous weapons as a "dreadnought moment" for navies worldwide (see the article by Sam Skove). Albert Palazzo of the University of New South Wales wrote earlier but more assertively that land forces now effectively control the seas hundreds of miles from shores. Despite the breathless newness of the statements, much of this has been predicted for some time (and see below for more). Even so, action has been uneven. As Jonathan Caverley and Peter Dombrowski of the US Naval War College wrote in 2020 in *Security Studies*, defense may be dominant at sea, but "the US Navy remains a fleet designed for an offensive approach of power projection and sea control." Such imbalance in the fleet, they continued, can "endanger the US fleet, potentially leading to the loss of the very military advantages underpinning American hegemony that its navy seeks to defend."

Delete any part or process you can — Should navies avoid building large surface ships for littoral operations?

Some other military establishments have begun asking questions. Thorough rethinking of the entire US Marine Corps has been well underway for at least four years now, including a preferred shift to larger numbers of smaller landing ships. In Australia, Defence Minister Richard Marles recently stated that the Defence Strategic Review (DSR) is similarly rethinking the commitment to large, multifunctional surface warships (see reporting by Ben Fenton). The pursuit through the AUKUS arrangement of nuclear-powered submarines in place of shorter-ranged diesel subs may retain reach that large surface warships were presumed needed to provide. At the same time, "the DSR has has observed that navies around the world are moving in the direction of having a larger number of smaller vessels." All this casts doubt on the program for nine 10,000-ton, *Hunter*-class (Type 26) frigates. This begs the further question of how much sense is made by British and Canadian purchases of Type 26s—and American purchases of more 9,000-ton *Arleigh Burke*-class destroyers or 7,000-ton *Constellation*-class frigates. The US Navy has made easier moves in this direction, opting to retire much of its 3,000-ton *Freedom* class of littoral combat ships, as the propulsion systems are basically broken and their defensive systems inadequate for fighting in the Western Pacific. How many large surface ships are really needed for how many missions, which cannot be undertaken by other weapons, less expensive?

Simplify and optimize — Can aircraft and missiles handle these tasks ashore?

For the Australian Army, the DSR would trade away most of the planned new armored vehicles for new landing craft and wholly-new land-based anti-ship missiles. What is less clear is whether all those smallish ships—landing and otherwise—for the US or Royal Australian Navies, the Australian Army, or the US Marine Corps—will be survivable either. As Byron Callan of Capital Alpha Partners ventured in a recent research note, buying another 300 or so cruise missiles to clean up the smaller targets may not be too expensive. After all, the Russian Black Sea Fleet could not keep Snake Island resupplied, whether with large surface ships or small boats. On the other hand, the Ukrainian-Not-Navy did manage to clear to oil platforms close to Crimea, with the top cover of the Ukrainian Air Force. The difference may be found in the size of the wager: small craft and small crews are easier to replace in a war of attrition than large landing ships and cruiser-sized crews. (Actually, building small craft may proceed faster to training small crews, but large ships are at least a three-year proposition with long-standing methods.) Note further how, in response to the Ukrainian attacks, Russian drones attacked Ukrainian air bases, to uncertain effect. Ukrainian Air Force Colonel Yuriy Ihnat subsequently explained the motivation as a matter of "what the enemy is looking for—where the command has hidden our bombers". In short, aircraft can be hidden; ships, hardly at all.

Accelerate cycle time — Is there any good way to defend ships at sea?

Could accelerating decision cycles for the defenders save the day? After all, at least we know when the missile are coming. US Space Command has tracked 11,000 missile launches during the Russo-Ukrainian War, so perhaps the US Seventh Fleet would at least see all those inbound Chinese missiles. As William Williamson notably wrote in Naval Institute *Proceedings* in 2020, this makes naval warfare more a game of chess than battleship, in that the board is fully visible all the time. If ship crews could ten observe, orient, decide, and act (all that OODA stuff) faster, could they solve the massive missile salvo problem? The problem lies not with timing, but perfection. The latest missiles know to seek vital points, such as the bridge, operations center, missile magazine, or engine room. The impact of a large warhead on any of these will incapacitate most any large warship. Recent photos of the damage to the *Minsk* and the *Rostov-on-Don* make this clear (see reporting by ordnance expert Steve Brown). Thus, any ship facing salvoes of sea-skimming missiles has at most a minute for successfully engaging every inbound target.

Note how Russian reports of the attack on the two ships in Sevastopol speak of downing seven of ten attacking missiles. In this case, two or three were enough to eliminate two ships and their dry-docks. Still, seventy percent is a common wargaming assumption, following historical experience. Even with layered defenses, engagements are not necessarily independent events, so simply doubling or tripling up on inbound missiles does not guarantee success. As Israeli Admiral Yedidia Ya'ari wrote twenty-five years ago in *Naval War College Review*, the "moving weapon-islands" of obvious and slow-moving surface ships have been "designed with the open ocean and distant defensive perimeters in mind; to keep deploying them to a playing field where, under the most optimistic assumptions, their survival requires as a normal operating mode the highest level of everything, all the time, is unhealthy and unrealistic in the long run." As I argue in a separate paper, historical experience also suggests that ships will continue to get sucker-punched in war, to devastating effect.

Automate — "Why on Earth Are We Still Building Aircraft Carriers?"

In explaining its stealth-ship programs, the Swedish Navy used to say that invisibility is easier than invincibility. Stuffing ever-larger ships with yet-more defensive missiles—the approach of naval architecture for decades now—was not a winning strategy, and is yet worse now. With constant ocean surveillance, invisibility is now at best a fleeting matter. Like tanks on the Pontic steppes, ships on the surface of the oceans are in some ways obsolescent. Their offensive potential and maneuverability has increased only incrementally over decades now, while that of aircraft—especially unmanned—has increased relatively much faster. That does not mean that armies and navies will stop buying either tanks or surface ships, or even that they should. As a retired US Air Force general reasoned to me after a debriefing on that series of Taiwan wargames about Taiwan at the Center for Strategic and International Studies, navies can find plenty of use for large surface ships for ancillary strategic tasks. They will certainly be needed for protecting commerce and military movements across open oceans. Even so, the clear

directionality of the dominant technology trajectories will require less reliance on surface ships. They have become bad investments for fighting over or close to hostile shores.

How should this change fleets? One obvious change should be eschewing large-caliber guns, as unworthy of the weight. Shore bombardment will be largely foolhardy proposition. Accordingly, the *Constellations*, intended for open-ocean escort anyway, have but a single 57 mm auto-cannon. Of course, this constitutes a small part of the cost of any large warship, much less fleet.

Perhaps less obvious but certainly more moving should be the impact on naval aviation. If fleets should not attempt sustained combat close to enemy shores, then designing and building aircraft carriers for operations over the shore is a very bad investment. The carrier then has at least two possible residual roles: (1) fighting enemy fleets at sea, or (2) providing air cover for other ships, whether submarines operating forward or surface ships firing from further afar. Either answer invalidates the objective function underpinning the US Navy's move from the *Nimitz* to *Ford*-class ships: maximizing the sortie rate of aircraft off the deck with heavy offensive weapons. In role (1), as Wayne Hughes of the Naval Postgraduate School long argued, with further work by Michael Armstrong of Brock University, what matters at sea is not firing consistently over time, but firing first with a massive pulse of weapons. In role (2), what matters is not offensive anti-ship or land-attack missiles, but defensive anti-aircraft missiles. Overturning a recent argument in *Proceedings* by Talbot Manvel, this argues for smaller and less-expensive aircraft carriers, operating yet further into the oceans, that keep enemy aircraft away from the work of the missile ships. (For a view supporting the point, see Norman Polmar, below.)

None of this addresses at least two other remarkable deficiencies in the American aircraft carrier fleet. Its air wings are largely composed of F-18E/F/G Super Hornets, but as I heard American admirals admit behind closed doors about ten years ago, those are not suitable for defending the ships against the latest Chinese fighter jets. A decade into the F-35 Joint Strike Fighter program, the American admiralty has seen fit to order, thus far, only enough stealth jets to outfit a single carrier. For some reason, the Pentagon and the Congress indulged this until just recently, with the final demise of Boeing's program. Separately, the manpower requirements of these ships with their 1990s fighter jets are impressive. At 5,000 sailors and aviators each, eleven such ships require crews exceeding those of the rest of the Navy's surface fleet, which would deliver a far greater pulse of instant firepower. We might then ask, as Timothy Noah entitled his essay in *The New Republic* at the end of May, "Why on Earth Are We Still Building Aircraft Carriers?"

Again the madness of Musk provides scope for thought. In every launch, SpaceX sends a rocket booster to the edge of space, returns it to the sea-surface, lands it vertically like a tail-sitter on a ship at sea, and secures it to the deck for transport back to port. All this is accomplished without anyone on either the rocket or the ship. Perhaps in place of Noah's sharp question, we can at least ask, why do navies land their jets horizontally, trapped by arresting wires? Why do they manhandle them into place with large deck crews that go in harm's way? Is there not a better way?

Implications for investors, industrialists and technologists

Byron Callan has noted the slow pace of naval automation at sea, and navies insist that then problem lies with equipment reliability. Commercial organizations have been more enthused and more successful. Cargo ships routinely motor across oceans with fewer than twenty sailors aboard. Commercial turbine engines differ not greatly from their military kin, but sometimes soldier on for years without shutting down. Perhaps this requires a new approach to human capital in navies, with much smaller, highly expert, multi-talented crews—almost astronaut-mariners. Much can be learned from the Ukrainians; during an event last week at the Center for a New American Security, Under Secretary of Defense Bill LaPlante called them "masters of tele-maintenance." (I will be taking analysis of that issue, and of the data-management questions at issue, as homework for a later note.) And, well, there I go again. Get yourselves to Kyiv, industrialists, to learn how modern war is managed! Conveniently, many of you already have your invitations. President Zelensky announced this past weekend that Ukraine would hold next month a Defense Industries Forum, with 86 firms from 21 countries participating.

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