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PREFACE

Admiral Christophe PRAZUCK
Chief of the French Navy

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Translated from French

In 1994, the late Professor Hervé Coutau-Bégarie founded the Institute for Comparative Strategic Studies, or “*Institut de Stratégie Comparée*” in French. Why comparative studies? Aren’t the methods of strategy universal? In fact, they are not, for at least three good reasons.

First, strategy is shaped by history and by geography. While for example Mahan’s “decisive battle” purported to be universally applicable, in fact no concept ever achieved such full consensus. Every time a new major technical development emerges, Admiral Aube’s theories about the vulnerability of the capital ship resurface—and are heatedly debated once again.

Second, strategies arise from observations and exchange of ideas. As an illustration, German operations that combined surface forces, submarines and aircraft against merchant shipping in 1940-41 were largely influenced by the theories of Frenchman Raoul Castex.

Third, strategies need an opponent; they need friction and confrontation. To win, you must consider the strategies of your potential opponents—and then adjust your own to surpass them.

Indeed, while strategic processes may not be universal, they are based on a few principles of a higher order, as theorized by Foch, Castex and Labouerie, among others. The core principles of naval strategy—because yes, as Martin Motte demonstrates, there is such a thing as naval strategy—are very helpful in thinking about emerging strategic environments such as outer space and cyberspace, which have many physical, political and legal attributes in common with the naval environment.

Still, if there is any element that naval strategies around the globe share, it is their interest in the exponential development of the maritime dimension in world affairs, and the parallel increase in naval conflicts. Monitoring and regularly updating our understanding of the strategies of the main oceanic players is therefore an indispensable task, to which this issue of *Études Marines* brilliantly contributes.

Happy reading and see you in 20 years’ time for the award to the most visionary navy.

STRATEGIES

Bilateral amphibious assault conducted as part of Exercise *Dawn Blitz* in 2017
by Japanese and US navies. © *US Navy*.



NAVAL STRATEGY: UNITY AND DIVERSITY

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Translated from French

Martin Motte is a former student of the *École Normale Supérieure* (Ulm), a tenured university professor, and holds a PhD in history. He succeeded Hervé Coutau-Bégarie as director of studies at the *École pratique des hautes études* and head of the strategy course at the *École de Guerre*.

Should we be talking about *naval strategy* or about *naval strategies*? US Admiral Mahan (1840-1914), long regarded as the first theorist of war at sea, held that the singular was correct. According to him, the only way to win is to focus on squadron warfare, concentrating the most powerful ships to fight a decisive battle against their opposing counterparts. Once these are sunk or stuck in their harbors, you have control of the sea and can reap the dividends by running over the enemy's merchant ships or by attacking its shores. Conversely, an admiral who first disperses his forces for commerce raiding or coastal warfare missions exposes himself to the risk of opposing forces appearing unexpectedly and in force, and crushing his ships one by one.

The demonstration makes perfect sense—but it is fallacious, because naval warfare, like all others, cannot be reduced to infallible equations. It depends on too many variables: the geography of the theater of operations; the state of technology; the physical, moral and financial balance of forces and strategic cultures, etc. Things therefore should not be considered in abstract, but in concrete situations, as the following examples show.

The Athenian Thalassocracy

Athens of the fifth century BC constituted the first thalassocracy whose functioning is well known to us. Situated at about the center of the Greek world, Athens was at the head of the League of Delos, a league of defense against the Persians formed in 477 BC, which included all the Greek cities of the Aegean Sea. The league controlled the sea routes vital to the Greek economy, starting with the Dardanelles, through which wheat arrived from Ukraine. In fact, the League of Delos soon became the shield of Athenian imperialism, with the navy as its spearhead.

The league's primary function was to bring the cities that challenged the hegemony of Athens to heel. Its methods are known to us by the Pseudo-Xenophon, author (around 430 BC) of a text entitled *Constitution of Athens*. There is no mention of squadron warfare in these writings, but they speak of the blockade of recalcitrant cities and the landing of infantrymen on their coasts. The balance of power amply explained this state of affairs, as no navy at the time could rival that of Athens.

It is no surprise then that it was not a maritime power but a continental power, Sparta, that raised the banner of revolt against Athens. It was only after 15 years of

struggle, in 431 BC, that the Spartans realized the only way to defeat their enemy was to take control of the sea. The financial support of the Persians enabled them to develop a great navy, and the last decade of the war was filled with naval battles. During the last one, the battle of Aigos Potamos, the Spartan fleet crushed the Athenian one. Now in control of the Aegean, the Spartans only had to blockade Athens; seven months later, starving, Athens laid down its arms.

In short, the Peloponnesian War saw two successive phases, and only the second corresponds to the Mahanian scheme. Again, this is only true at the strategic level. At the tactical and operational levels, the distinction between squadron warfare and coastal warfare does not apply well to the ancient Aegean theater. Indeed, these two types of operations were carried out at the time by the same type of vessel, the galley, and in the same coastal environment, as galleys could hardly venture offshore for lack of autonomy. The Battle of Aigos Potamos was exemplary in this respect, since it took place in the Dardanelles Strait. Better still, there was no naval battle to speak of, since the Spartan fleet had surprised the Athenian fleet at anchor while most of its sailors had left in search of supplies. So the subsequent landing actually was the decisive battle.

English Model *Versus* French Model

The “Second Hundred Years’ War” between France and England (1689-1815) fits much better with Mahan’s conceptions, and for good reason, since Mahan based his naval thinking on the study of this conflict. Here, the distinction between squadron warfare, commerce raiding warfare, and coastal warfare is fully valid, because given the technological evolution that has taken place since antiquity, each of the three was now using different ships. Squadron warfare was the business of capital ships, whose firepower was counterbalanced by their heaviness and high cost; commerce raiding involved frigates, less well-armed but faster and cheaper; as littoral operations were the preserve of shallow-draft flotillas.

But if this triptych was to be found on both sides of the English Channel, the proportions were not the same, as the geostrategic situations of the two players differed significantly. As a predominantly continental power, France had to ensure the security of its land borders before thinking about the sea; it therefore allocated only 20 % of its military expenditure to its fleet. England’s insularity, on the other hand, required that it give priority to the Navy as the primary condition of its security. Thus, from the 1690s onward, the English navy was larger than that of its rivals.

This asymmetry was further reinforced by the division of the French fleet into an Atlantic Squadron in Brest and a Mediterranean Squadron in Toulon. The Royal Navy was concentrated mainly in the South of England; it had control of the English Channel from the outset and beat the squadron in Brest before turning against the squadron in Toulon. This explains why the English have favored the squadron war.

The French, meanwhile, had internalized their numerical inferiority as early as 1695, when Vauban wrote his famous *Mémoire sur la Caprerie* (*Memorandum on Commerce Raiding and Privateering*). He argued that the French Navy did not have the means to sustain great battles against the Royal Navy; it therefore had to opt for a commerce raiding war, less costly in capital and men, but still likely to harm the enemy. Indeed, given England's insularity and its excellent position off the sea routes linking Europe to the Americas, the English economy was more open to the sea than was the French economy.

Mahan obviously vilified France's choice of privateering, which in his opinion could only lead to defeat. The reality was more nuanced: the war of commerce raiding had a certain effectiveness when French squadrons fixed part of the Royal Navy to the benefit of French privateers, as was the case under Louis XIV. Otherwise, as under Louis XV, during the Revolution and during the Empire, the English won hands-down, and they were able to blockade French coasts at close range. In any case, the Battle of Trafalgar in 1805 marked England's victory in the Second Hundred Years' War, and it was able to seize the main control points of world navigation—Gibraltar, Malta, the Cape of Good Hope, and the Straits of Malacca, while waiting for Suez at the end of the 19th century.

Seen from Mars, the English model seems much more convincing than the French one. But that is not saying much, since France's geostrategic profile did not allow it to adopt the formula chosen by its opponent. For this reason France continued to favor commerce-raiding war after the industrial revolution, even though this revolution was likely to definitively downgrade the Squadron War. Indeed, the development of two inexpensive but very lethal coastal defense devices, the mine and the torpedo boat, now would prevent the Royal Navy from blocking French ports.

Steam cruisers could freely emerge to deal a far more formidable blow to British trade than in the past, as trade no longer involved luxury goods, as in the 18th century. Instead the British now exported the manufactured goods on which the United Kingdom lived, and imported the raw materials needed to make them, along with a growing share of the food consumed across the Channel. From then





Second battle of the Virginia Capes. © *US Naval History and Heritage Command*.

on, an interruption of this trade would condemn the British to unemployment and famine—at least in the opinion of Admiral Aube (1826-1890), the inspiration behind the *Jeune École Française de Stratégie Navale* (Young French School of Naval Strategy).

The German Model

It was in Germany that the intuitions of the Young School found their fulfilment. At the end of the 19th century, Germany became the first political, economic, and military power in continental Europe. It then understood the need to become a naval power as well, in order to protect its growing maritime trade. There was a risk that its competitor, the United Kingdom, might launch a preventive war against Germany—and Emperor William II, a great reader of Mahan, saw only one way to avert this peril: by launching a battleship fleet as powerful as the Royal Navy.

But his Secretary of the Navy, Admiral Tirpitz, knew this was impossible. With a more assertive continental tropism than that of France, and caught in a pincer grip by the Franco-Russian alliance, Germany had to devote most of its military spending to land forces. That did not leave enough money to match the British fleet.

Thus, the Reich, while continuing to assert Mahanian orthodoxy for prestige reasons, developed an intermediate model between Mahan and Aube. From Aube, Tirpitz borrowed a system of coastal defenses on which he hoped the Royal Navy would break its teeth at the outset of any conflict. This would re-establish numerical parity between British battleships and their German counterparts, after which the latter would engage in a squadron war that their qualitative superiority would allow them to win. And there Tirpitz reconnected with Mahan. The German fleet would have control of the seas and could proceed with the blockade of England, which would be forced to surrender.

Unfortunately for Tirpitz, the British perfectly understood his calculations. When the Great War broke out, they were careful not to challenge the Germans near their coasts. Instead they were content to establish a blockade from a distance, at the Pas-de-Calais and the Orkney straits, just as their most brilliant naval thinker, Sir Julian Corbett (1854-1922), had advocated a few years earlier. It soon became clear to the Germans that the only way to break this blockade was to bet on the U-boats. These submarines combined Aube's theses, since they made it possible to secure German coastlines while also dealing a formidable blow to Allied trade,

which by the spring of 1917 was brought to the verge of collapse. The development of anti-submarine capabilities and the entry of the US Navy into the war curbed the U-boat threat, but the United Kingdom never recovered from the losses it incurred. The same scenario played out during World War II, when Neptune's trident passed on to the United States.

The US Navy, From Commerce Raiding Warfare to Squadron Warfare

The United States is a good example of the variations a naval strategy can undergo when the context in which it is deployed changes. The Americans had very few ships when they began to shake off the British yoke, and so they opted for coastal defense and commerce raiding warfare. A remarkable development in coastal defenses was engineer Bushnell's *Turtle* (1775), the first hand-propelled submarine to be engaged in operations, albeit unsuccessfully. American commerce raiding, meanwhile, was illustrated by the campaigns of John Paul Jones (1776-1779). The United States persisted along this path for most of the 19th century, as its energy was consumed by the conquest of the West, with little money left over for a fleet.

Special mention must be made of the Civil War, where the asymmetry of the protagonists encouraged the weaker party to be very inventive. Faced with a North that controlled most of the US Navy, the merchant fleet and American arsenals, the South immediately found itself in a situation of tight blockade. It then took up Bushnell's intuitions, with more success; the CSS *Hunley* in 1864 was the first submarine to sink an enemy ship (though it did unfortunately sink along with its victim). More generally, the South developed a comprehensive range of coastal defense weapons (mines, armored gunboats, battering rams, etc.) and fought a very effective warfare, of which the CSS *Alabama*, which captured 65 Northern ships between 1862 and 1864, remains the best known symbol.

Of course, the Southern precedent was cited as an example by the thinkers of the Young School. But the South had nonetheless been defeated, and the blockade played a large part in its defeat, as noted in the 1880s by Mahan, who himself had served in the Northern navy. He concluded that the United States had to abandon its old privateering traditions and turn resolutely to Squadron War.

Such language would have been inaudible a few decades earlier, but it became popular from 1890 onward. With the conquest of the West completed, Americans felt the need for new outlets for their expansionist appetites. In a country located

between the two largest oceans of the world, and therefore in a central position on a global scale, these opportunities could only be maritime. They demanded that the US Navy be transformed into a powerful combat instrument, in particular by establishing itself in Guantanamo to protect the Panama Canal—a move that allowed it to switch at will from the Atlantic to the Pacific. Mahan predicted that the Pacific would eventually become the economic lung of the planet, foreseeing the importance of the Pearl Harbor naval base, from which the US Navy could stop an Asian attack as well as project itself toward Asia.

The Vain Attempts of Japan and the USSR

As early as 1905, American adventurer and geopolitician Homer Lea considered war between Japan and the United States inevitable, as both countries sought to take control of the Pacific. The Japanese navy had just defeated the Russian fleet with the spectacular victory at Tsushima (1905), celebrated like a new Trafalgar 100 years later. In fact, the Japanese admirals had been trained by the Royal Navy and claimed to be Mahanian. They argued that Japan's insular position *vis-à-vis* Asia, symmetrical to that of the United Kingdom *vis-à-vis* Europe, predisposed it to seek control of the sea through squadron warfare.

In reality, this assertion came up against the cultural fact that Japan had never thought in terms of squadron warfare prior to the 1900s. For centuries it had fought its feudal conflicts in an archipelagic environment, conceiving of its ships as vectors for projecting land forces to neighboring islands, rather than as instruments of combat to dominate the high seas. The Japanese tradition was basically amphibious, like that of ancient Greece, and so the Mahanian graft took only imperfectly. Even at Tsushima, Admiral Tōgō did not want a decisive battle; his objective was to drive back the Russians, whose incompetence gave him a victory he did not expect.

It is therefore understandable that *Kaigun* did not seek a clash of squadrons with the US Navy in 1941, but rather was content with an air-naval raid on Pearl Harbor, protecting from a distance Japan's amphibious campaign over the entire Western Pacific. The following year, the Japanese did try to fight a decisive battle at Midway, but the extreme dispersion of their forces showed they had not understood the rules of the game. They were crushed by the Americans and subsequently had to adopt a defensive posture. An aggravating factor was that the Pacific theatre was not a priority for the Japanese High Command, dominated by the Army, whose strategic priorities were in China.

It is true that the United States, far from thinking only in naval terms, committed huge land and air forces to the Pacific, North African, and then European theaters. But its astounding demographic, economic, and scientific resources allowed it to play and win on all fronts at the same time. This is a far cry from the classical Europe studied by Mahan, in which a continental power could not become a maritime power and *vice versa*. So the odds were in favor of the United States, which emerged victorious from World War II and established naval bases in almost every sea in the world.

A few years later the Cold War began, and another state-continent stood up against the United States. However, the parallel between the two protagonists ended there. The USSR was much poorer, and its maritime weaknesses were obvious. Its priority was the defense of its immense land borders, and its small fleet was divided into four squadrons—the White Sea, the Baltic, the Black Sea, and the Pacific—that were way too far apart to be able to cooperate. Because it was impossible in these conditions to assemble enough fighting ships to risk a naval battle against the US Navy, the USSR preferred submarines. In the 1970s and 1980s, however, it did create a surface force capable of projecting itself into the Third World. But it was not able to sustain the required financial effort to keep it up in the long run, and by 1991 it collapsed, leaving the US Navy in control of the world's seas.

The Navy and Nuclear Deterrence

While conventional naval strategy retained its rights during the Cold War, a new form of naval action also emerged: deterrence by nuclear-powered ballistic missile submarines. The first, the USS *George Washington*, entered service in 1960. Since then, five other countries have developed SSBN forces: Russia in 1961, the United Kingdom in 1967, France in 1971, China in 1987, and India in 2013. It is no coincidence that having such a ship defines a very closed club that includes all the permanent members of the UN Security Council, plus India, which claims a permanent seat based, among other things, on its status as a nuclear power.

SSBNs patrol permanently under the seas to deter a potential enemy from launching a pre-emptive nuclear attack. Almost invulnerable because they are very difficult to detect, they would escape such an attack and retaliate with a devastating strike. French SSBNs, for example, carry 16 missiles with 6 nuclear warheads each; they could strike 96 targets if necessary, with a maximum range understood to be around 9,000 kilometers and a cumulative power several hundred times that used on Hiroshima.

If this mode of action must be linked to a classic category of naval strategy, it is closest to coastal warfare, since in both cases a force at sea targets an objective on land. But this analogy ignores the specifics of SSBNs. First of all, neither their patrol zones nor their targets are limited to coastlines, since the range of their missiles allows them to strike inland from the high seas (as is also the case with conventional cruise missiles). Also, their purpose is deterrence, not actual employment. Finally, the apocalyptic nature of these weapons of last resort means that their use can be decided only by the top of the state, and not by the Navy hierarchy.

Still, the analogy with coastal warfare is relevant on one point: just as coastal bombing in the past required the protection of wing ships, so SSBNs need the support of other vessels. Their bases (like the Île Longue near Brest in the case of France) must be protected against hostile maneuvers—incursions by aircraft, naval or air UAVs, submarines, combat divers, mines. Their departure and return requires a highly secure environment. And even in their patrol zone on the high seas, they count on a friendly back-up presence if necessary; otherwise enemy attack submarines could sink them from the very first moments of a major conflict.

As a result, SSBN missions mobilize many ships and aircraft. To follow the French example, nuclear deterrence accounts for 30 % to 40 % of the Navy's financial, technological, material, and human resources. This is an essential aspect of contemporary naval strategy. In good times and bad, it is important to bear in mind that an SSBN patrol, combining as it does invisibility and non-use, is by nature much less media-friendly than a naval air raid.

Conclusions

Three conclusions emerge from this overview. First, the conceptual unity of naval strategy does not preclude the historical diversity of naval strategies. Conceptually, naval strategy is about properly articulating squadron warfare, commerce raiding warfare, and coastal warfare, to which nuclear deterrence recently has been added. Nevertheless, the optimal balance cannot be defined in advance; it depends on the actors and the context. Mahan's mistake was to extrapolate a model that was accessible only to a very small number of powers that had the advantage of insularity and privileged position at the heart of the busiest maritime routes—England yesterday, the United States today. The other powers have always had to fall back on alternative strategies with a strong emphasis on coastal defenses and commerce raiding warfare.

From this point of view, Putin's Russia, like Stalin's USSR, is relying massively on submarines. Today's China would be more like Tirpitz's Germany, developing an intermediate model between the Young School and Mahan.

Second, the advent of the Industrial Revolution made alternative strategies much more effective—as proven when the U-boats almost won the two Atlantic battles in 1917 and 1943, and the Allies did not take the risk of landing on the German coast. It is true that other technologies—detection and attack of submerged submarines, detection and destruction of mines, destruction of coastal fortifications by air assets, new landing craft—finally enabled them to overcome the submarine peril and then to project themselves onto the coasts of France and the Pacific archipelagos. However, the dialectic of sword and shield continues, as illustrated today by the proliferation of means of denial of access. In this respect, missiles and drones are the heirs to the mines and torpedo boats of the Young School, with common features of cost-effectiveness and the ability to act in swarms to saturate enemy defenses.

Third, control of the sea always has required control of the geostrategic locations from which naval movements can be monitored and intercepted: the Dardanelles, the English Channel, Gibraltar, Malta, Suez, the Cape of Good Hope, Malacca, Panama, Pearl Harbor, Midway, and a few others. There is no reason to believe that things are any different today, as illustrated, for example, by the international tensions around the control of islands in the South China Sea.

Finally, the same historical perspective can be applied to other issues that currently are a source of concern for the admiralities. The new digitization of naval warfare, for example, is the latest version of the networking that was formerly handled by fast ships specially designed to carry information, then replaced by underwater telegraph cables, and eventually by radio links. Two examples include detection by satellites, which represents an extension of reconnaissance by aircraft, itself an avatar of reconnaissance by light cruisers, and the non-state actors, terrorists, or naval guerrillas of today, succeeding pirates and privateers of yesteryear. These analogies do not provide ready-made solutions, but as Admiral Castex (1878-1968) once pointed out, they do help strategists identify the nature of the issues they face.

CHINA'S NAVAL STRATEGY: AN AMERICAN PERSPECTIVE

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Given that rapid quantitative and qualitative growth of the People's Liberation Army Navy (PLAN) since the mid-1990s, Western naval strategists have focused on understanding how China plans to use its naval forces. In short, they seek to understand China's naval strategy. One difficulty with this task is the relative lack of transparency in the PLAN and the entire PRC government. There are few navy-specific, publicly available official documents. Those that are available are, by Western standards, vague. Alternatively, they are written in using terminology largely unfamiliar to non-Mandarin speakers; hence Western specialists debate the meaning of phrases and terms ranging from the "assassin's mace" to "counterintervention"¹.

Many Western navalists thus attempt to infer the PLAN's strategy from limited public documents, books and articles written by Chinese authors, and, perhaps most commonly, the specific capabilities acquired and deployed by the PLAN. A few other parse the limited operational history of the PLAN or even China's military textbooks. The following pages summarize some of the top-level conclusions about contemporary PLAN strategy.

The Evolution of PLAN Strategy

The modern evolution of the PLAN's strategic approach according to Western observers can be characterized in terms of two shifts—first from near-coastal defense to active near-seas defense and then from active near-seas defense to far-seas operations beginning in the mid-2000s². The first approach, near coastal defense, largely dates from before the PLAN's recent period of modernization and expansion. Both active near-seas defense—because it potentially threatens American allies and holds at risks Asian sea lanes—and far-seas operations – because they signal China's global intentions—have caught the attention of American and other Western scholars and leaders.

Near-Seas Defense and/or Anti-Access and Area Denial (A2/AD)?

As Nan Li explains, "near-seas active defense requires the PLAN to acquire the capabilities for capturing and maintaining sea-control in the primary operational direction of the near seas within the required time; for establishing effective control of major SLOC in the near seas within the necessary time; for operating effectively in the near seas; and for nuclear retaliation."

/...

However, achieving this aim is not solely the responsibility of the PLAN much less the PLAN's surface forces. *"China has invested in combat systems—sensors, weapons, and battle management—optimized for an anti-access campaign against America's forward-based forces projecting power in the region. The range of naval and land-based maritime capabilities supporting near seas defense is impressive: satellites, radars, short and intermediate-range ballistic missiles, long-range anti-ship cruise missiles, land-based aviation (for both strike and surveillance), attack submarines, advanced naval mines"*³. The strategic purpose of these investments is, reputedly, *"to keep any potential adversaries, including the United States, from intervening in a conflict off China's coast or from attacking the Chinese mainland"*⁴.

American navalists often interpreted this approach through the lens of classic naval strategies. As explained by Robert "Barney" Rubel, China practices sea denial: *"the idea would be, using a combination of ballistic missiles and shore-based aircraft in conjunction with submarines and surface ships, to present the U.S. or other navy with a multidimensional threat that would be too hard to deal with"*⁵. Although some Western analysts believe that China's A2/AD strategy for the near seas and perhaps beyond is an operational fact, prominent civilian analysts are less certain. Biddle and Oelrich conclude that *"by 2040 China will not achieve military hegemony over the Western Pacific or anything close to it"*⁶.

Far Seas Operations: A Blue Water Navy

Over time the emergence of a PRC Navy capable of far seas operations would potentially complicate American naval supremacy outside beyond the Asian littoral—as Chinese naval theorists recommended developing overseas bases, logistic networks, and doctrinal ideas, such as "small battle groups", that would give life to the ambition of far seas operations⁷. Long-standing and expensive efforts to build and deploy aircraft carriers may be part of a far seas operational approach. Long-time China watcher Rear Admiral Michael McDevitt (U.S. Navy [USN], Ret.) concludes, *"there is no credible information to suggest that the growing importance of 'far seas' operations is the first step in constructing a navy that I could slug it out with the U.S. Navy in a battle for sea control", but then he also warns that the "capabilities that China is fielding in no way, foreclose that option, and could be the first steps toward such a capability"*⁸.

Since these early debates over how to interpret China's naval expansion and modernization, there appears to be more evidence of an aggressive, even militaristic, national security policy approach on the part of China's leadership⁹. Such a shift

from the rhetoric of the grand strategy of a “peaceful rise” would support, in part, the notion that China wants to develop military and naval capabilities commensurate with its growing global importance. China’s defense white paper released in May 2015 “elevated the maritime domain within the PLA’s formal strategic guidance and shifted the focus of its modernization from ‘winning local wars under conditions of informationization’ to ‘winning informationized local wars, highlighting maritime military struggle’”¹⁰.

The main question remains what the PRC will do with its growing navy, potential ability to project power with aircraft carriers and amphibious ships, the developing relationship with the Russian navy, and maritime facilities ranging from its homeland to what some call an “emerging support network”¹¹ for the newly established naval base in Djibouti¹².

Conclusion

For strategists and military planners, prudence often dictates that preparations to deter war and then to defeat adversaries if war breaks out should begin with an analysis of capabilities and operational potential rather than the stated (or unstated) intentions of the potential adversaries. In the case of the PLAN this leaves observers with two difficulties. First, while it is clear that the PLAN has expanded and modernized, the military effectiveness of China’s naval forces is subject to dispute. The PLAN has conducted relatively few challenging operations in recent decades and fought no wars. Then again, neither have the other great powers been involved in large-scale, sustained sea battles, much less campaigns, since World War II. In effect, all navies are starting from zero in terms of actual high-end combat experience.

Second, the strategic intentions of China, including the PLAN, continue to be obscure. Analysts have parsed official documents, the worlds of CPP leaders, and PLAN leaders in conjunction with research into PLAN force structure and operations. Ultimately, however, the level of uncertainty remains uncomfortably high.

U.S. NAVY STRATEGY IN THE ERA OF GREAT POWER COMPETITION

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The U.S. Navy does not currently have an up-to-date public document called a strategy. This, of course, does not mean that the U.S. Navy does not have a strategy. It means that deriving that strategy from the outside requires analyzing a number of texts and actions as well as understanding the security environment in which it is likely to operate. Admiral John Richardson, who stepped down as the U.S. Navy's Chief of Naval Operations (CNO) in August 2019, published three documents aimed at maintaining maritime superiority—something that could be read as a strategy to achieve a specific maritime end. However none of those documents was specifically labelled as strategies¹. A classified strategy may exist currently, but this does not help the public, much of the U.S. Congress, or many Allies and partners understand where the U.S. Navy is headed². The last official, unclassified, public U.S. Navy strategy was issued in 2015 and was signed out not just by the Chief of Naval Operations but also by the heads of the two other U.S. sea services, the Marine Corps and the Coast Guard³.

However, official documents, labelled as strategies or not, are necessary but not sufficient to develop an understanding of the U.S. Navy's current and future strategies. This requires knowledge of the legal and organizational structure within which the U.S. Navy operates as part of the U.S. defense department and as an instrument of U.S. national security strategy. It also must be seen in the political—and budgetary—context of the U.S. domestic scene. Public documents and statements must also be viewed within a historic context of past strategies. This article will provide context and history that will allow the outlines of the current U.S. strategy to be seen as well as the trends to which it will respond. This article will also provide some thoughts on the implications of the strategy for U.S. treaty Allies and close defense partners.

U.S. Organizational and Legal Context

To understand the relevance and scope of any U.S. Navy strategy or strategy-like document issued by the Chief of Naval Operations, it is necessary to place it in the hierarchy of U.S. government strategy documents and its boundaries even within the Navy.

A strategy document by a single military service, to be effective, must nest under and support higher-level strategies. The 1986 *Goldwater-Nichols Act*, that sought to bring about greater jointness and strengthen civilian control, mandates that

an unclassified, Presidential-level National Security Strategy is delivered to Congress on a regular basis. This public document is frequently supplemented by a more detailed unclassified or classified National Defense Strategy issued by the Secretary of Defense. A yet more detailed and usually classified document normally follows—the National Military Strategy—signed out by the Chairman of the Joint Chiefs of Staff. In addition, there are frequently other reviews, such as the Nuclear Posture Review or Missile Defense Review, which can have an impact on issues of interest to the Navy.

There is no similar requirement for a corresponding unclassified or classified strategy by service. Therefore, each service issues a range of documents at infrequent periods, in many forms, and with multiple audiences and purposes⁴. The U.S. Navy documents discussed above were signed out by the Chief of Naval Operations—the head of the service but not, despite the words in his title, the admiral responsible for plans or operations of individual parts of the fleet. This is where the legal changes under the Goldwater-Nichols Act of 1986 have an impact. The job of the Chief of Naval Operations, and his largely Washington DC-based staff, is to organize, train and equip forces to provide them to fleet, component, and combatant commanders⁵. Those commanders, organized by region or function are responsible for creating plans for the use of all forces. Each of these sets of plans, and daily operations of forces in support of those plans, take place within the context of the commanders' regional or functional area of responsibility. All of the major plans are joint although each service component has a specific supporting plan to the joint plan.

What this system sets up is a bifurcation of responsibility and the competing bureaucratic requirements that affect the formation and execution of any service-wide strategy. Each regional or functional commander often sees their requirements in the near-term: what they need to operate at that moment or in support of potential wartime missions. Those needs are shaped by the regional environment and/or the function responsibilities of the command. In addition, these combatant commands request forces and capabilities through a joint requirements system through the Joint Staff. In the meanwhile, the CNO and his staff work to develop a set of forces that respond to the higher-level strategic documents and all of the individual combatant commanders and their components and fleets. A Navy strategy would ideally amalgamate all of these requirements and lay out a way in which forces would be acquired and developed and then some common concepts about how they would be utilized, given the broad range of missions and contexts required.

The Politics of Strategy and Budgeting

Developing and promulgating such a strategy would be difficult enough in an environment without politics or budget constraints. However, the CNO and the Washington-based staff understand and are closely attuned to budgetary constraints and the desires of the U.S. Congress in spending Navy funds. While many strategy discussions focus on operational-level concepts or even tactics, one sage observation is that one's budget is one's strategy. If a service is not spending resources on something—procurement, training/education, or operations—then it is not a priority or part of their strategy. The linkage here is most clear in any document that the CNO produces because one of the primary audiences for a strategy are the members of Congress who provide funds. A strategy document, and supporting testimony and public statements, are a story for what funds the Navy needs and why.

Congress is susceptible to a strategic narrative whether it is written or assembled from public statements. However, members of Congress have other interests that shape Navy budgets. One is overall defense spending within the broader federal budget. Over the past decade, these debates have become more fierce and partisan, resulting in much less steady and certain streams of funding for the Navy. Budget freezes, sequestrations, and government shutdowns have affected the ability of the Navy to carry out a coherent, long-term strategy. For the Navy, many of its purchases are large-scale capital projects that take many years to complete and support jobs in many Congressional districts. The ongoing use of money allocated to the Navy is of specific interest to Congress. One of the ways Congress holds the Navy to specific parts of its procurement strategy is through requiring the Navy to produce a thirty-year shipbuilding plan. Such a plan constrains strategic choices or, at the very least, requires the Navy to make a more formal credible case to Congress if it wants to change priorities.

Trends in Navy Strategy in the Modern Era

It is clear then that crafting and successfully implementing a Navy strategy is not simple endeavor. In the United States there is frequently misty-eyed nostalgia for the Maritime Strategy of the 1980s. That strategy, classified but with unclassified descriptions, was constructed under different political-military and legal/organizational circumstances⁶. The strategy was developed before Goldwater-Nichols was passed. It also focused on a single adversary —the Soviet Union— in a large-

scale attack on NATO. The operational strategy also was linked to the requirement to have a 600-ship Navy in order to successfully execute the wartime plans.

In the post-Cold War and post-9/11 eras, the U.S. Navy has seen an evolution of its strategy, with a number of vision, strategy, and concept documents serving a variety of purposes and aimed at a range of audiences. Navy strategy and strategy-like documents in the decade after the fall of the Soviet Union focused on how the Navy would project power from the sea, largely immune from interference, in support of U.S. interventions against relatively weak state actors. The Navy's strategy in the years immediately following 9/11 was marked by a mix of contributions to operations *Enduring Freedom* and *Iraqi Freedom*. Each showcased Navy power projection/strike capabilities. The strategy then was to support joint warfighting efforts and minimize the impact on readiness of the broader force. But even during this time of relatively clear national-level focus, the Navy debated internally its role and "proper" missions. Some senior Navy officials argued that the Navy did not have a role in the Global War on Terror and the Navy contribution was limited to non-core elements of the service—the SEALS and the Sea-Bees.

This argument—that the Navy should refocus on traditional maritime missions including warfare at sea—continued into the 2006 project by then-CNO Admiral Mullen to develop an unclassified three seas service maritime strategy. The resulting document, the 2007 *Cooperative Maritime Strategy for the 21st Century* (CS21), turned the focus back to a more traditional Navy role of protecting the freedom of navigation through global maritime partnerships and forward presence⁷. The strategy did not name an adversary, nor was it threat-focused. It also did not speak to budgets. In part because of these lacunae, it had its critics. But it was also a strategy of its time and was meant to "influence up"—setting an agenda for a new president a year later.

It took the Navy eight years to produce a successor to CS21, with then-CNO Admiral Greenert signing out another tri-seas service maritime strategy—CS21R (for revised). A three-word caption over the title highlights the shift of emphasis: forward, engaged, ready. Forward presence was still very much a focus as was the implicit cooperation with Allies and partners, but the ready part highlighted the shift to a warfighting focus. The strategy acknowledged that the sea services lived in an era of constrained resources and changed security environments including new strategic guidance—the Obama administration's "rebalance" to the Asia-Pacific. The emphasis in CS21R was on building and maintaining warfighting capabilities

and forward naval presence. It discussed the challenges of growing anti-access and area denial (A2/AD) capabilities, but it did not address the dilemma that those systems created for forward presence and basing. Instead, the strategy asserted that the challenges would be overcome with “all domain access,” without specifics. The document also acknowledged that the maritime services might have to fight in the future where they did not hold the “information high ground.” Finally, the document mentioned both China and Russia as challenges although the wording on China used the terms “opportunity” and “challenge”.

The first of Admiral Richardson’s three documents—*Design 1.0*—was framed as an exhortation to rapidly implement the aims of CS21R. Its analysis of the geostrategic environment emphasized the rapid technological change that would affect the maritime domain, particularly the use of information. The document also continued the trend of focusing more on state-based actors—adding North Korea and Iran to China and Russia. The language on China and Russia was also more hard-edged emphasizing their negative intentions and actions. The document also began the discussion about relooking at fleet design, including a mix of manned and unmanned platforms.

Eighteen months later, *The Future Navy* carried these themes forward but with more information on future fleet architecture. The document’s publication followed a December 2016 “Force Structure Assessment” (FSA) conducted by the Navy and the Marine Corps which declared a 355 ship requirement—a mix of manned and unmanned vessels. This assessment linked to the budgetary and political element of a strategy, for the buildup required significant resources but also provided a long-term plan for jobs and resources flowing to key Congressional districts. With a new administration promising increased resources for defense, both the FSA and *The Future Navy* urged a larger and more modern force structure that could address rapidly improving state-based threats, including dense land-based fires coupled with sensors that could target mobile forces at sea⁷. Admiral Richardson’s last paper, *Design 2.0*, carried forward the same themes, arguing for urgency in transforming the Navy—both in terms of platforms and systems but also in operational concepts, in face of rapid technological change adopted by state adversaries.

With a new CNO, Admiral Michael Gilday, and a new Commandant of the Marine Corps, General David Berger, taking over in summer 2019, the outlines of a Navy (and sea-service) strategy continue to take shape around a number of key themes. These are evident in the Commandant’s guidance of July 2019 as well as public statements by the CNO⁸. First, the focus, both in terms of

the preponderance of forces and in terms of the pacing threat is China. The European theater is recognized as an important area given Russia's strong underseas capabilities. Given capacity constraints, there is an assumption that naval presence in the Middle East will be reduced to service the other two theaters. However, as seen in the confrontation with Iran, real-world situations often do not allow a pullback from deployments or commitments.

Second, while there is a recognition that A2/AD capabilities challenge traditional platforms and operating methods, the leadership is committed to developing the capability to operate inside contested areas and creating dilemmas close-in for adversaries. Lastly, the commitment to developing and deploying new platforms, particularly unmanned surface, subsurface, and aerial vehicles, continues to grow. Both leaders have committed to a new FSA by the end of the calendar year, a signal that the 355-ship goal may be abandoned or at least measured differently. Such an assessment will have to be negotiated with Congress.

Implications for Allies and Partners

In all modern-day strategies and strategy-like documents, the U.S. Navy continues to emphasize the importance of Allies and partners, asserting that it will bolster interoperability as well as help friendly states build their capability to counter aggression. Three issues arise with regard to Allies and partners, none of which has an easy or direct solution. The first regards forward presence—something still sacrosanct within the Navy and part of what the Navy and the Marine Corps do to bolster deterrence, to provide assurance to Allies, and to be prepared to bring the fight to an adversary. Even though the Navy and Marine Corps are looking to improve ability to operate within contested air and water space, both the U.S. and its Allies and partners need to understand that the nature of “presence” will change in both form and frequency. Even with improvements in concepts of operations, the adversaries' increasing ability to target assets at sea and shore infrastructure will require changes¹⁰.

The second is that, even with more unmanned systems, the United States will continue to face capacity shortfalls. Complementary deployments and novel ways of interoperating with Allies and partners will help distribute the burden, enhance deterrence, and further common interests. Finally, U.S. adoption of new technology and new concepts of operations will, initially, be closely held. Information sharing, often discussed largely in technical terms, will need to be

addressed regularly at both the policy and technical levels to ensure that the U.S. Navy and its Allies can fight together, on short notice, and against state adversaries. This means that Allies and partners who do not regularly deploy to western Pacific or consider China a military adversary will still need to pay attention to its modernization and operations. Why? Because countering those capabilities is where the U.S. Navy will focus. To interoperate in the future with the U.S. Navy anywhere, Allies and partners will have to work within that framework. Allies and partners should also look for niche capabilities in operational or defense industrial base areas that could contribute to that U.S. focus. Similarly, the U.S. Navy has to actively create opportunities for Allies and close partners to become and stay involved. Dashing ahead without Allies and partners will leave the U.S. Navy with fewer options, less flexibility, and reduced capacity. In this sense, the global maritime partnership concept outlined in the 2007 CS21 strategy remains vital to nurture.

RUSSIAN NAVAL STRATEGY

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Translated from French

In the 2000s, Russia showed a renewed interest in the sea. But in contrast to the oceanic tilt taken by China, Russia's reinvestment refocused its fleet on the maritime areas adjacent to its territory. This focus on "maritime bulwarks"—a permanent feature of Russian geopolitics—is part of a stance to defend its territorial approaches.

The sea, as a traditional provider of power, is also part of the political project carried on by Vladimir Putin since his arrival in the Kremlin: to rebuild his country as a sovereign power. So it is not surprising that in July 2001 the Russian President signed an updated version of the Russian Federation's Maritime Doctrine¹, which states in its introduction that "historically, Russia is a leading naval power". In addition, the capacity hemorrhage that critically affected the Russian Navy (VMF)² from 1990 to 2000, forced Moscow to react quickly.

In this light, the 2011-2020 armaments plan drawn up by former Defense Minister Anatoly Serdyukov can be considered a relative success, as it has both halted the erosion of capabilities and also enabled the Russian naval forces to make a definite qualitative leap forward.

The results were visible during the operations carried out by the VMF during the Syrian conflict. Of the five naval formations at Russia's disposal³, the Black Sea fleet and the Caspian Sea fleet have been particularly fortunate in this armament program, while the Pacific fleet has been relatively neglected. Since the end of the 2000s, Russia's naval system has been undergoing a period of profound change that will continue into the 2020s, transitioning it from an ex-Soviet force to a modernized navy, more versatile but also largely coastal.

To study the strategy of the Russian Navy today is to ask why it exists at all. Set against the backdrop of a plan to modernize the armed forces, this debate in Russia involves several actors: the community of maritime experts; OSK⁴; the Ministries of Defense, Trade, and Economy; the military-industrial complex; and the Kremlin. The trade-offs selected in the new 2018-2027 armament plan are unfavorable to the navy and to the supporters of the ocean fleet. At a pivotal moment between two weapon procurement plans, the purpose of this article is to demonstrate that, contrary to widely held belief, the overall posture of Russian naval forces remains fundamentally defensive.

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The Missile, Backbone of the Russian Navy

A reading of Russian strategic literature highlights their perception of danger and threat from many directions—from their western and southern flanks, from the Arctic, from Central Asia. And now, the competition among Asian powers is causing Moscow to fear a major conflict on the Asia-Pacific stage. Seen from the Russian perspective, the core of the Federation's vital interests remains concentrated in the post-Soviet space, a territory that is essentially continental in nature⁵. In the face of the colossal conventional force differential between NATO and Chinese armies on the one hand, and Russian forces on the other, Russia still relies on the atom as a power equalizer. In this context, MFVs today carry out five types of missions:

- *Ensuring the permanence of nuclear deterrence.* This mission is fulfilled by the SSBN fleet: the Kalmar type SSBNs (Project 667BDR) of the Pacific Fleet (being decommissioned), the Delfin type SSBNs (Project 667BDRM) of the Northern Fleet, and the new Borei type SSBNs (Project 955 and 955A), which have been contributed to these two formations since the beginning of 2010.
- *Guaranteeing and protecting SSBN access to the high seas and sanctuarizing their deployment zones.* This is a mission carried out by shore-based capabilities, surface ships, cruise missile submarines (SSGNs), and conventional attack submarines (SSKs).
- *Ensuring in-depth power projection and monitoring the activity of NATO fleets, in particular those of US naval air groups.* This mission is primarily carried out by SSGNs (of Project 949A) or by Project 971 nuclear attack submarines (SSNs).
- *Sanctuarizing and locking down the coastal approaches and coastline of the Russian Federation by denying access and area closure (A2/AD) capabilities.* This mission includes the protection of offshore energy infrastructures.
- *Flying the Russian flag on the waters of the globe in order to promote Russia's claim to great power status.* This mission is fulfilled by ex-Soviet high-sea vessels that participate in status projection in the waters of the Indian Ocean, occasionally in those of the Caribbean Sea, in the Far East, in Africa, and more rarely in South American ports⁶.

These missions illustrate the special role played by adjacent maritime areas that in traditional Russian naval strategy constitute “maritime bulwarks”. The need for

the sanctuarization of these seas was described as early as the 19th century—well before the advent of the atom—when Pan-Slavic historian Nikolai Danilevsky⁷ stated that “*nature offers Russia a natural maritime fortress like no other in the world: the Black Sea*”⁸. The Okhotsk, Barents, White, Baltic, and Black Seas, as well as the Caspian Sea, fit into this “bulwark” logic.

The missile is an essential vector in the missions carried out today by the Russian Navy. On SSBNs, it fulfills its traditional role as a guarantor of national interests in the ocean component of strategic deterrence. Project 667BDR’s SSBNs use *Sineva*-type intercontinental ballistic missiles (R-29RMU2), which are liquid propellant missiles. These also can be fired from 667BDRM type SSBNs, which also have been upgraded to accept another strategic missile, the *Läiner* (R-29RMU2.1)⁹. Finally, the new Boreï-type SSBNs use the *Bulava* strategic missile (R-30), a solid propellant missile. This diversity of missiles reflects both the navy’s desire to not rely exclusively on liquid-ergol missiles and the competition between Russian missile manufacturers (in this case *Makeev* for the *Sineval/Läiner* and the *Moscow Thermal Engineering Institute* for the *Bulava*).

Combat missions carried out by the Russian Navy during the Syrian campaign highlighted the rise of a new function for the VMF, mentioned in the 2014 military doctrine: conventional deterrence. Although the Soviet Navy mastered the technology behind multi-environment missiles as early as the 1980s, their use in operational settings in Syria at the end of 2015 was a first for the Russian fleet. The *Kalibr*-type cruise missiles (3M-14 for the anti-land version) manufactured by *Novator* were deployed several times in 2015-2017 by SSK and surface vessels of the Black Sea and Caspian Sea fleets. Apart from the fact that Russia has joined the club of countries whose navies are capable of carrying out this type of operation, the platforms that carried out these launches were unique and notable.

Indeed, the naval component of the 2011-2020 armament plan has enabled the launch of small-tonnage units with considerable firepower, in particular in the Black Sea and the Caspian fleets. This is the case with the small missile launchers of Project 22800 (800 tons displacement) or the slightly heavier Project 21631. The Black Sea Fleet also has received Project 11356 frigates and *Kilo*-type SSKs, all equipped with *Kalibr* missiles. This has resulted in a heavily armed green-water fleet that operates under the protection of anti-aircraft systems (S-300, S-400), anti-surface systems (coastal batteries *Bulwark* and *Bal*), and electronic jamming systems that are scattered today in the Crimea, the Levant, and Kaliningrad, and tomorrow on the Arctic and Pacific coasts.

An SSK submarine for the Pacific fleet, similar to those assigned to the Black Sea fleet in recent years, is currently under construction; the fleet also is scheduled to receive new corvettes, all equipped with the famous *Kalibr* platforms that are at the heart of the denial of access posture. While these A2/AD “bubbles” have a primary defensive vocation, their dual natures should not be overlooked. The *Kalibr* missiles on these small platforms have a range of 2,000 kilometers and can be equipped with both a conventional and a tactical nuclear warhead. Operated from Russian inland waters and the Pontic and Caspian “firing platforms”—the so-called “bulwarks”—they can hit targets located between Western Europe and Central Asia.

Russia also is continuing to modernize ex-Soviet blue-water vessels, some with new missile capabilities. The Project 1144.2 nuclear cruiser *Admiral Nakhimov*, once back in service in the first half of the 2020s, should be capable of firing not only *Kalibr* missiles, but also the new hypersonic *Tsirkon* anti-surface missiles. The same will be true for the next Project 20385 corvettes, which are supposed to use this missile¹⁰. Indeed, another aspect of the modernization of the Russian navy is the modernization of missiles toward supersonic and hypersonic missiles, always with a very pronounced anti-surface bent.

All the platforms envisioned in the 2018-2027 program—the super Gorchkov frigate developed on the basis of Project 22350, the heavy corvette projects, the possible lead unit of the *Lider* destroyer (Project 23560)—will be equipped with a large number of cruise missiles embedded in universal launchers. There is even talk of equipping future SSBNs with cruise missiles¹¹. This hybridization has not yet been decided upon, but it is still being discussed, again reflecting the competition among Russian industrialists. Undoubtedly, the missile has a bright future in the VMF.

Real but Thwarted Projection Ambitions

The stakes involved in the costly renewal of ex-Soviet offshore capabilities and Moscow’s claim to the status of an oceanic power are more generally about doctrine. Does Russia need a blue water fleet? Beyond the status projection on the “world ocean”¹², the Russian high-sea surface fleet meets relatively few strategic objectives—with one exception worth highlighting: the Arctic Ocean. This may well be the only ocean space where Russian naval power expresses itself despite proven deficiencies in the VMF’s blue water capabilities. The Arctic concentrates

a series of interests that Moscow considers vital, such as the presence of offshore energy reserves and sovereignty issues related to navigation and the exploitation of the Northern Sea Route.

Today, VMF is heavily dependent on ex-Soviet blue-water units for its presence in the world ocean. However, the process of attrition of oceanic surface capabilities that began in the 1990s continues. To date, VMF can count on a maximum of 10 blue-water vessels, divided among the Northern, Black Sea, and Pacific fleets. These are the aircraft carrier *Admiral Kuznetsov* (Northern Fleet, Project 1143.5)¹³, the missile-launching nuclear cruiser *Peter the Great* (Northern Fleet, Project 1144.2), the missile-launching cruisers of Project 1164 *Variag* (Pacific Fleet), *Marshal Ustinov* (Northern Fleet)¹⁴, *Moskva* (Black Sea Fleet)¹⁵, and five large ASW warships of Project 1155¹⁶. After 1991, the Russian shipyards did not launch a single high-sea unit, the largest platform delivered being the frigate *Admiral Gorchkov* (Project 22350, Northern Fleet), in active duty at the end of July 2018.

In this sense we can speak of the “relative” success of the naval component of the 2011-2020 armament program, as its objectives for orders of frigates (Projects 11356 and 22350), new SSBNs, and ASGNs (Project 885 and 885A Yasen) have not been achieved on schedule¹⁷. The Syrian campaign nevertheless demonstrated the VMF’s possibilities and limitations in projecting and supporting a modestly sized expeditionary force in a moderately remote area such as the Levant. In this respect, the limited performance of the aircraft carrier *Admiral Kuznetsov* during its deployment in the Eastern Mediterranean in late 2016 highlighted the challenge of converting an interdiction weapon into a tool for force and power projection¹⁸.

Also, the naval plan in Syria since the beginning of the Russian military intervention appears more akin to the projection of a littoral war than anything else. In other words, we find ourselves in an extension of the defensive scheme—but with an offensive dimension illustrated by the strikes made by the VMF—prepared in the Black Sea and projected toward the waters of the Levant.

The deployment of oceanic projection capabilities seems out of reach in the short and medium term for financial, technical and doctrinal reasons. The priority of the new 2018-2027 armaments plan is to maintain the capabilities of the strategic nuclear forces, and the funding will benefit primarily land forces and airborne troops. The Navy, which took the lion’s share of the 2011-2020 program, is expected to receive 2,600 billion rubles (about €37 billion) of the 19,000 billion

rubles (over €270 billion) allocated to the 2018-2027 plan, i.e., just over 13 % of the total budget. It therefore receives proportionally almost half as much funding as it did for the 2011-2020 plan.

Aware that the economic context was not in their favor, the authors of the new Russian Naval Doctrine¹⁹ therefore have focused on their offshore ambitions, in order to better assert them when better times come. The new armament plan does not provide for the building of an offshore fleet (destroyers, large amphibious ships, aircraft carriers); at most, the keel of the lead unit of the new generation destroyer or that of a large amphibious vessel will be laid. In order to compensate for the attrition of its footprint in the world ocean, Russia should therefore deploy modernized ex-Soviet platforms and light vessels that are fundamentally unsuitable for the high seas, even if this means putting their seaworthiness to the test and making them vulnerable²⁰.

Moscow has not given up on its long-term blue-water ambitions. Nevertheless, in the absence of a clear vision of what the objectives of a future blue-water navy should be, Russian defense industrialists are waging a war of influence to promote their projects. The *Nevsky* design office proposes its project for a nuclear-powered aircraft carrier of nearly 90,000 tons (Project 11430E Lamantin/manatee); the *Krilov* design office is promoting a light aircraft carrier—about 40,000 tons—with conventional gas propulsion (Project 23000E Shtorm).

Conclusion

The erosion of ex-Soviet blue-water capacity and the entry of small and medium tonnage units into active service are expected to continue during the 2020s. This littoralization of VMFs will be accompanied by *kalibrization*, i.e., the deployment of *Kalibr* missiles on light platforms. This refocusing of the Russian Navy around “sea bulwarks” is part of a de-concentration maneuver designed to relieve the pressure Russia believes its western and southern flanks are under today, and the Arctic flank may well be under tomorrow, from the Euro-Atlantic community. It is also the product of Moscow’s reading of the conflict on land—which prevails in the Russian perception of the threat, and to which the naval capabilities of the VMF are subordinate. As a result, Russian surface forces are expected to evolve toward a mosquito fleet, particularly in the Black Sea—a development that reflects a defensive posture and a high-seated Russian acceptance of the superiority of NATO fleets.

Still, Moscow intends to challenge this superiority locally and asymmetrically by erecting denial-of-access “bubbles”. This posture remains largely reactive in view of the challenges facing the Russian naval industry. Moreover, even in the comfort zone represented by these maritime bulwarks, VMF faces shortcomings in terms of operational effectiveness multipliers (UAVs), mine warfare, and ASW.

Beyond the financial and technical stakes, though, the lack of a clear vision on the *raison d'être* of a Russian ocean-going fleet is likely the main obstacle to the resurrection of high-sea capabilities within VMF.

JAPAN'S NAVAL STRATEGY

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Translated from French

Threats to the Japanese archipelago—identified for many years by various defense documents, including the 2019¹ white paper, are increasing. Japan's neighbors are expanding the operational areas of their naval and air forces; so is Russia in the Northern territories (the Kuril Islands) and of course China, especially around the Senkaku Islands, which it claims and calls Diaoyu. As pointed out in an article titled “Chinese Government Ships Continuously Violate Japanese Territorial Waters” the 2019 White Paper of the Chinese Defense on Taiwan does not rule out the use of force, and notes that “*China must and will be reunified*”.

There are also growing tensions with South Korea, due to unresolved historical disputes and the territorial dispute over the Dokdo/Takeshima Islands and with North Korea, whose “*military advances, such as the development of nuclear weapons and ballistic missiles pose an unprecedented, serious and imminent threat*”. And there has been an increase in the so-called “grey zones”, areas that are neither pure peacetime nor pure wartime.

In response to these threats, but also with a view to asserting itself on the regional and international scene, Japan is adapting its naval strategy. Its goal is to strengthen the capabilities of its self-defense forces; create a more offensive orientation, proportionately speaking, within its navy; and increase cooperation with its American ally and its other strategic partners.

Development and Capacity Building

According to the latest Medium Term Defense Program² (MTDP), published December 18, 2018, the Maritime Self-Defense Forces (MSDF) will receive a total of 23 ships of 66,000 tons during the period 2019-2023. These will include 10 destroyers, 5 submarines, 12 P1 patrol aircraft, 13 SH-60K/K improved patrol helicopters, 3 unmanned aerial vehicles (UAVs), and 12 MCH-101 minesweeper helicopters.

In fiscal year 2019 alone, Japan³ plans to build two new-generation FFM destroyers (its third and fourth), displacing 3,900 tons, equipped with compact hulls and enhanced multi-role capability such as mine countermeasures that were traditionally provided by minesweepers. This will bring the total number of destroyers to 54.

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The aim is to have four naval groups, one helicopter-carrier destroyer and two destroyers equipped with the *Aegis* anti-missile system, plus two groups with a new type of destroyers (FFM) with multi-mission capabilities and minesweepers. MSDF also will continue to grow its fleet of submarines, with a target of 22 units, in order to be able to effectively conduct Intelligence, Surveillance and Reconnaissance (ISR), patrol, and defense missions around Japan.

Strengthening the ISR posture is clearly a priority. In addition to the new submarines, Japan hopes to increase their number of operational days by introducing more optimal crew rotations. MSDFs also will be equipped with early warning aircraft (E-2D), submarine UAVs, and *Global Hawk* long-endurance UAVs (HALE), making it possible to extend surveillance capabilities, including those on the Pacific coast.

Another priority is the fight against ballistic missiles, through the improvement of the *Aegis* systems and the acquisition of missiles for anti-missile defense SM-3 Block IB and SM-3 Block IIA, co-developed with the United States, as well as long-range sea-to-air missiles SM-6.

Finally, there has been a major development with the first joint exercise, conducted in the South China Sea on June 26, 2019⁴ by MSDF and the Japanese Coast Guard, which is generally responsible for patrolling Japan's territorial waters. This powerful paramilitary force will be strengthened, enabling it to protect remote islands such as the Senkaku.

Development of Projection Capabilities

Aerial projection

In order to improve the capabilities and flexibility of operations, and due to the reduced number of land air bases, MSDF is adapting the 248-meter-long Izumo class helicopter-carriers ships to carry American F-35B stealth aircraft with vertical take-off capabilities. According to Tokyo, *“these ships will continue to perform a variety of missions such as defending Japan and responding to natural disasters. There will be no change in the government's position on material that cannot be constitutionally owned”*⁵.

As the modifications to the *Izumo* and its sister ship, the *Kaga*, are not unconstitutional from this point of view, the budget for fiscal year 2019 provides

70 million yen (nearly 600,000 euros) for conducting the studies necessary to adapt helicopter-carrier destroyers to vertical take-off aircraft. For the fiscal year 2020, the Ministry of Defense on August 30, 2019⁶ requested 3.1 billion yen (26 million euros) to begin work on the modernization of the *Izumo* bridge.

Certainly, it may seem that this evolution was in germ from the beginning. French newspaper *Le Monde*⁷ reminds us that “*when the Izumo was launched in 2015, the government ruled out making it an aircraft carrier and today prefers to speak of a ‘multi-purpose’ ship, occasionally used as an aircraft carrier. ‘We are thinking of putting fighter aircraft there only when necessary’, said former Defense Minister Takeshi Iwaya, stressing its ‘defensive’ vocation.*”

In reality, there has been a significant evolution in Japan’s defense policy, if only symbolically. The *Izumo* class ships, with their F-35Bs, will be the very first Japanese aircraft carriers since the Second World War. Displacing 19,500 tons (the French carrier *Charles-de-Gaulle* displaces 42,500 tons), the *Izumo* also will be able to accommodate the V-22 *Osprey* swivel rotor transport aircraft, as well as landing troops.

This development should make it possible to provide better coverage for the Senkaku⁸ even though these aircraft carriers will be smaller than American amphibious assault ships or British Queen Elizabeth class aircraft carriers, and will be able to carry only a dozen aircraft, as opposed to 23 and 24 for the above-mentioned vessels. Also, faced with a possible Chinese offensive against the Senkaku supported by squadrons of J-11 and J-10 aircraft, or even J-20 stealth fighters, Tokyo decided in 2018 to acquire nine early warning aircraft, in order to better control aircraft based on the ground as well as on aircraft carriers, and four KC-46A air tankers to extend the range of its fighters. This is a clear improvement in Japan’s defensive and offensive posture in the archipelago’s environment.

Projection and Reinforcement for Remote Islands

Amphibious Force

This ability to project toward distant islands is also illustrated by the new amphibious force created through the arrival of logistic support vessels and landing craft utilities. In addition to the rapid deployment divisions and brigades, an amphibious rapid deployment brigade was established on April 7, 2018⁹. With

2,100 men, and eventually 3,000, it is responsible for defending the Senkaku Islands, located a few hundred kilometers southwest of Okinawa, or recapturing them if necessary.

These are substantial amphibious resources, especially since they are in addition to the two Izumo class helicopter destroyers and three Ozumi class assault ships acquired in recent years, along with M22 *Osprey* tilt-rotors and AAV-7A1 amphibious heavy armored vehicles capable of carrying 21 men.

Finally, it should be noted that on September 2, 2019, NHK public television announced that a 159-strong police unit, equipped with machine guns and helicopters, will be set up to prevent the landing of individuals on the Senkaku, following the example of Chinese nationalists in 2012. The aim is thus to be able to intervene below the threshold where the Japanese armed forces act, and thus offer more flexibility to the Japanese authorities.

Long Range Target Destruction Capabilities and Observation Capabilities

Japan is acquiring long-range missiles (JSM, JASSM, and LRASM) as a complement to naval assets and as part of an overall strategy to cover distant islands. At the same time, the fiscal year 2019 budget included 13.9 billion yen (115 million euros) for research into hypersonic and anti-ship missiles, and 4.2 billion yen (34 million euros) for finding underwater UAV technology applicable to maritime surveillance and observation missions.

The Indian Ocean Horizon

MSDF ships have been patrolling the South China Sea for the past few years, and this trend will be reinforced in coming years, as recent exercises show. It is a display of Tokyo's willingness to fight against China's expansionism, which has built fortifications on the atolls of the Paracels and Spratly Islands. But the MSDFs now are going farther and are no longer precluded from having a stronger presence in the Indian Ocean.

Japan has always been interested in this area and has not hesitated to send warships to protect its maritime lines of communication (SLOCs), particularly for oil supply, which mainly comes from the Middle East. That is why, as of 2011, Tokyo has opened an overseas military base—a first since 1945—in Djibouti to combat



Japan Maritime Self-Defense Force's submarine. © Japanese government.

piracy in East Africa, with two frigates deployed in the area since 2009. At the same time, many infrastructure projects have been carried out in countries bordering the Indian Ocean that could serve as a stopover for civilian and military vessels.

By raising fears that the Japanese SLOCs would be vulnerable to attacks from PRC submarines in the event of a crisis, the expansion of the Chinese navy has caused a break in the Japanese vision of the zone: there is now a real strategy¹⁰ based on the major player, India. Cooperation with New Delhi has developed considerably since the signing of a declaration on security cooperation between the two countries in October 2008. In January 2019, for example, Japan sent Foreign Minister Taro Kono and Chief of the Defense Staff Katsutoshi Kawano to the *Raisina Dialogue*, a high-level conference in India devoted to geopolitics. This cooperation is based on a strong naval component that is reflected in particular by its participation in the *Malabar* exercises, which include the United States, but go far beyond that. In 2018, Japan participated in joint exercises conducted by its land, sea, and air self-defense forces as well as the Indian Army, Navy, and Air Force. Also, since 2017, *Izumo* and *Kaga* helicopter carriers have traveled to India and Sri Lanka. Last year was pivotal, marking the first time a Japanese naval group was deployed in the Indian Ocean.

Enhanced Anti-Submarine Capabilities

While Japan is developing new naval capabilities, it is not underestimating traditional capabilities and is working to expand its anti-submarine warfare (ASW) capabilities¹¹, in particular through its missile-launching destroyers. The second Asahi-class vessel, the JS *Shiranui*, was launched in March 2019, providing two ships, measuring 151 meters and displacing 6,800 tons, designed specifically for ASW missions with their hull sonar, towed antenna, and SH-60 helicopter.

Another example of this ASW capability is the *Kawasaki* P-1 maritime patrol aircraft. Japan, which already has 15 aircraft, plans to acquire 12 more over the next five years, as part of the approximately \$243 billion the country plans to spend on defense during that period under the MDTP. Another development in Japan's naval strategy is the strengthening of ties with the United States and its other allies.

Extensive Cooperation with the United States and Allies

As Céline Pajon pointed out in 2013¹², the MSDFs “*have over the years and through joint training achieved a good degree of interoperability with the US Navy*”. This cooperation is set to be strengthened, as outlined in the Guidelines for Japan-US Defense Cooperation issued in April 2015. The areas of space and cybernetics, global defense against air and missile threats, joint training and exercises, and joint SRI activities are particularly targeted.

A new dimension has been added since 2014, when Japan reinterpreted Article 9 of the Constitution. The archipelago now believes it has the right to collective self-defense, not just individual self-defense, enabling it, for example, to support its American ally if one of its ships were attacked.

This cooperation is not limited to Washington; it also is developing with other countries. In line with the vision of a “free and open Indo-Pacific region”, Japan is indeed committed to promoting bilateral and multilateral cooperation and exchanges in the field of maritime safety. Tokyo thus supports initiatives relating to joint training and exercises, technical cooperation, or support for maritime capabilities. The latter aspect has been implemented for many years, particularly with the countries of Southeast Asia. In 2012, Tokyo transferred 10 patrol boats it no longer uses to the Philippine Coast Guard, and in 2014 six patrol boats to Vietnam. Bilateral cooperation has since been extended to other countries, such as Indonesia.

Examples of multilateral cooperation in joint naval exercises are equally numerous. For example, in May 2019¹³, a joint exercise led by the *Izumo* brought together Japanese, Philippine, Indian, and US naval forces in the South China Sea. In the same month, Japan participated in the first naval exercises in the Western Pacific¹⁴ with American, Australian, and South Korean warships. Finally, in the Bay of Bengal, MSDF was involved in exercises conducted by French, American, and Australian ships.

These various examples show that naval cooperation is growing, in line with Tokyo's naval strategy, which aims to secure maximum support against China and at the same time develop its ability to act in concert with several countries, first and foremost the United States.

Conclusion

While Japanese Prime Minister Shinzo Abe was boosted by the July 2019 senatorial elections that gave him a comfortable majority in Parliament (the *Diet*), the Navy is rapidly evolving toward even more substantial capabilities.

Will Article 9 of the Constitution, which prohibits all offensive weapons, be revised before the end of his term of office, as Shinzo Abe wishes? He does not have a two-thirds majority to do so but, despite this constraint, the measures taken to strengthen the defense capability of remote islands are gradually changing the character of Japan's naval forces. In the coming years, Japan may seek to create a fleet with a broader spectrum of defensive and offensive capabilities. At this stage, it is difficult to say whether the country's position on the use of force also will change. But what seems certain is that if China maintains its maritime pressure in the East China Sea and continues the rapid development of its army, the *Izumo* and *Kaga* probably will not be the last aircraft carriers built by Japan, especially since South Korea announced in July 2019 that it too had decided to acquire an aircraft carrier capable of carrying F35-Bs.

It is likely that Japan's naval strategy increasingly will assert the importance of maintaining naval superiority over its adversaries in order to ensure territorial integrity and the security of its maritime communication channels.

THE UK AND MARITIME POWER

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As the UK enters the third decade of the 21st century, it is confronted by multiple challenges. In particular, a rapidly evolving strategic environment, characterised by the resurgence of great power rivalry—highlighted by the renewed Russian threat, the shifting of the global balance of power from the Euro-Atlantic to the Asia-Pacific, the rise of China as a global power, regional instability in the Middle East, and wider geopolitical shifts. In the maritime domain, the UK once again faces the challenge of having to balance the requirements of countering the Russian threat in the Euro-Atlantic against those of protecting wider global interests, for example, in the Middle East and Asia-Pacific. Moreover, the legacy of the post-Cold War, and especially post-9/11 periods, particularly the campaigns in Iraq and Afghanistan, and the 2008 global financial crisis, serves as a significant constraint on the Royal Navy, and wider UK maritime forces. However, despite the perceived diminished relevance of maritime capabilities in light of the Iraq and Afghan campaigns, the UK will in the course of the next decade or so, benefit from extensive investment in maritime capabilities, most notably, including the Queen Elizabeth-class aircraft carriers, Dreadnought-class ballistic missile submarines, Type 26 City-class and Type 31 frigates, the F-35B fifth-generation strike fighter, and the P-8A maritime patrol aircraft. In this context, how does the UK view the strategic utility of maritime power? What are the core priorities driving the development of, and challenges affecting, British maritime strategy?

British Defence Policy and Maritime Strategy

Before discussing the detail of current British thinking on maritime strategy, brief comment on the policy context is required. This is provided by the *National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosperous United Kingdom*¹ (hereinafter SDSR), subsequently reviewed and where necessary, developed by the 2018 *National Security Capability Review (NSCR)*². The SDSR states “*Our vision is for a secure and prosperous United Kingdom, with global reach and influence*”³, with a new joint, expeditionary warfighting capability at its core, Joint Force 2025:

“... [a] highly capable expeditionary force of around 50,000 (compared with around 30,000 planned in Future Force 2020) will include:

- A maritime task group centred on a Queen Elizabeth Class aircraft carrier with F35 Lightning combat aircraft.
- A land division with three brigades including a new Strike Force.

- *An air group of combat, transport and surveillance aircraft.*
- *A Special Forces task group.*"⁴

Joint Force 2025 is intended to provide "*enhanced capabilities that offer [...] choice, agility and global reach*"⁵, in order to underpin the defence contribution to three high-level, enduring and mutually supporting National Security Objectives: "*protect our people, project our global influence, and promote our prosperity*"⁶. More broadly, as explained in the *National Security Capability Review*, the UK is committed to the defence of the rules-based international order:

*"The rules-based system we helped to develop has enabled global cooperation to protect shared fundamental values of respect for human dignity, human rights, freedom, democracy and equality. As a permanent member of the United Nations Security Council, a leading contributor to NATO, a European country sharing fundamental values with our partners and a champion of the Commonwealth, we are committed to upholding and renewing the rules-based international system."*⁷

The UK therefore seeks to possess globally deployable armed forces that are "*effective in the full range of environments and across all five domains—land, sea, air, space and cyber*"⁸. The core maritime contribution will be a maritime task group centred on a Queen Elizabeth-class aircraft carrier. The importance of the maritime domain to the UK is articulated in the current fifth edition of British maritime doctrine, *UK Maritime Power*:

*"Although often obscured by an apparently shrinking, but increasingly interconnected, complex and uncertain globalised world, the UK was, and remains, a maritime state. The UK National Strategy for Maritime Security [...] acknowledges this and reinforces that as a nation we continue to depend on the sea for our prosperity and security to a high degree, relative to other states, and that it is critical to sustaining our way of life."*⁹

Further, and drawing on the 2015 SDSR, which establishes the connection between economic and national security, and thus, as *UK Maritime Power* states, the "*national requirement to influence and shape the maritime environment in pursuit of the UK's national objectives*"¹⁰. *UK Maritime Power* describes maritime power as an "*inherently broad concept*", encompassing "*economic, political, military and influence elements—realised through the ability of a state to use the sea*"¹¹. In military terms, this is defined as "*the ability to apply maritime military capabilities at and from the sea to influence the behaviour of actors and the course of events*"¹². *UK Maritime Power* articulates 'the enduring utility of maritime power', in the following terms:



Maiden sea voyage of HMS *Queen Elizabeth* in June 2017.
© Ministry of Defence.

*“Maritime forces provide a national global presence through three classical roles—war fighting, maritime security [...] and Defence Engagement. The unique attributes of the maritime environment allow maritime forces to provide a persistent and versatile military capability, free of the liability of extensive host-nation support”*¹³. Moreover, and highlighting the rationale for the UK’s strategic commitment to the rules-based order, *“the long-standing principle of freedom of navigation in international waters allows maritime forces to poise without commitment, to project national influence and develop understanding, while remaining highly mobile to exploit opportunities or to counter emerging threats”*¹⁴.

At the core of British maritime strategy, and wider defence posture, is the concept of deterrence, that is, the prevention of conflict through dissuading *“a potential opponent from adopting a course of action that threatens national interests”*¹⁵. The maritime contribution to deterrence is twofold, first, through the provision of the nuclear deterrent—the submarine-based continuous at-sea deterrent, and secondly through contributing to conventional deterrence. Central to the effectiveness of deterrence are the: “capability of the system; credibility of the intent to use it; communication of these to any potential aggressors; and comprehension of the effect of deterrence on our adversaries”¹⁶. In this regard, *UK Maritime Power* recognises the central role of influence, defining it as the summation (replacing leverage) of the attributes of maritime power—access, poise, mobility, persistence, and versatility, and as: *“the capacity to have an effect on the character or behaviour of someone or something, or the effect itself. The ability to influence is intrinsically related to the ability to project military power”*¹⁷.

In order to deter, and if necessary defeat an adversary, the Royal Navy and wider UK maritime forces have three core functions: war fighting; maritime security (including such roles as humanitarian assistance/disaster relief, non-combatant evacuations, and contributing to maintaining good order at sea); and Defence Engagement (that is, supporting diplomatic activity). War fighting itself involves three tasks: sea control, maritime manoeuvre, and maritime power projection. Although contingent on the mission, and presence (or not) of a threat, sea control is the enabler for maritime manoeuvre and power projection, and requires: “*control of the surface and subsurface environments (including the seabed), the air above the area in which sea control is required [...] the electromagnetic environment and potentially areas of the land where that part of the land dominates the sea*”¹⁸. At the core of Britain’s maritime war-fighting capability will be a task group centred on a Queen Elizabeth-class aircraft carrier (or an amphibious ship), with accompanying surface combatants, support vessels and submarines, to “*deliver sea control and maritime power projection*”¹⁹.

It is intended that the “*future maritime task group should be capable of delivering a joint, sea-based military force able to operate globally*”²⁰, and provide “*political and military options including: deterrence or reassurance prior to a crisis developing; forward presence free from political commitment to intervene; and a scalable range of intervention capabilities and command and control centred on Carrier Enabled Power Projection*”²¹. Moreover, “*in their contribution to joint action, maritime forces will support land and air forces with cross-domain logistic support, ISR [intelligence, surveillance and reconnaissance] and power projection as part of a full spectrum approach*”²². However, given the nature of the shifting strategic environment, and the resource constraints on the Royal Navy and wider UK Armed Forces, can the competing requirements of delivering a high-end war-fighting capability centred on a carrier task group be balanced against the requirements of maintaining forward presence in support of defence engagement, and upholding the rules-based order, for example, in the Asia-Pacific?

The Evolving Strategic Environment

The international system is in a period of flux, with both the contemporary and prospective strategic context and operating environment characterised by “*complexity, instability, uncertainty and pervasive information*”²³. The *Future Force Concept* highlights the challenge in the maritime domain in the following terms:

*“Potentially hostile actors could target areas of strategic importance to the UK, challenging maritime security and freedom of navigation, destabilising the free flow of global traffic. International chokepoints will remain crucial to the free flow of trade and energy security. Protecting transportation links, energy infrastructure and contributing to regional stability will remain vital maritime tasks.”*²⁴

Further, in May 2019, the then-head of the Royal Navy, Admiral Sir Philip Jones stated with regard to the rules-based order, that:

*“[...] the continual erosion we are seeing of the rules that govern the international system—the system that has for so long provided the basis for our security and prosperity especially through what has become known as ‘grey zone’ activity, but we in the Ministry of Defence will perhaps more accurately describe that as activity that sees a perpetual state of conflict where actions are just below the threshold of traditional conventional conflict but nevertheless pose a significant challenge.”*²⁵

Admiral Jones also noted with particular regard to the implications of disputes in the South China Sea:

*“Now, there are those who would question why a territorial dispute half a world away matters in the UK. But I would say that UNCLOS is one of those cornerstones of international peace and security that provides a neutral mechanism to allocate the world’s maritime resources. And if we allow UNCLOS to be undermined in one area, wherever that area may be, whatever the case may be, it will be weakened everywhere.”*²⁶

The result would be: *“a world where countries feel free to ignore international treaties which don’t suit them and then of course no agreement is safe: international order and international security could easily begin to break down”*²⁷. Responding to this challenge, as argued by Admiral Sir Philip Jones, emphasises *“the importance of a maritime strategy for the UK, one that is inherently global in outlook and one that seeks to preserve the rules based order”*²⁸. Admiral Tony Radakin, Sir Philip Jones’ successor as First Sea Lord, emphasised in his speech at Defence and Security Equipment International (DSEI) 2019, that *“we are a Global Navy, supporting a Global Britain”*²⁹. This is also reflected in the five principal priorities for the Royal Navy set out by Admiral Radakin, namely, the North Atlantic, Carrier Strike, the Future Commando Force (focused on developing an enhanced littoral strike capability)³⁰, Forward Presence and Technology and Innovation³¹. Regarding forward presence, Admiral Radakin states:

*“This is about being able to demonstrate a Global Navy, project influence and respond to threats more quickly. We have already seen the success of forward basing in Bahrain. Now I want to have a conversation about whether we could deploy more ships, permanently stationed forward in areas where we have significant interests. This is a real manifestation of Global Britain.”*³²

In this regard, in a February 2019 speech at the Royal United Services Institute for Defence and Security Studies, then Secretary of State for Defence, Gavin Williamson, announced that a Littoral Strike Group, centred on a new Littoral Strike Ship with escorts, support vessels and helicopters would be based in the Indo-Pacific³³. Given the growing strategic importance of the Indo-Pacific³⁴, and UK commitment to upholding the rules-based order, the rationale for a greater presence in the Indo-Pacific is understood. However, this ambition must be balanced against the need to be able to respond to the challenge posed by Iran and its proxies in the Middle East, and the threat posed by Russia. Stating with regard to his prioritisation of the North Atlantic, Admiral Radakin highlighted the need *“to ensuring the freedom of movement of the nuclear deterrent, but it is an area where we are facing increasing pressure, especially from Russia”*³⁵.

Russia poses *via* the ships and submarines of its Navy, bombers and strike aircraft of the Aerospace Forces, extensive missile forces, augmented by special forces’ operations, cyber warfare, and ground operations, a distinct and multi-faceted threat to the Euro-Atlantic, which could, in the event of conflict, cause significant disruption to Allied operations, critical military and economic infrastructure, and transatlantic shipping as well as directly threaten the British Isles³⁶. The Russian Navy’s submarine force, comprising SSKs, SSNs, SSGNs and SSBNs in the Northern, Baltic and Black Sea Fleets³⁷, plus special-mission boats, poses arguably the most significant challenge to the UK and NATO. Admiral Radakin, in his DSEI speech, noted the development of the ASW [anti-submarine warfare] *Spearhead*, a defence-wide approach that *“seeks to change ASW from delivery by individual platforms, to a battlespace of networked sensors”*³⁸. Whilst Russia’s growing fleet of small, cruise missile-armed surface combatants, operating from protected areas under the cover of extensive land-based anti-ship and surface-to-air missile defences and land-based airpower (for example, off Kaliningrad), yet capable of targeting the UK, highlights the complex and multi-directional nature of the Russian threat. Achieving a balance between maintaining forward presence, such as in the Middle East and Asia-Pacific and contributing to deterring Russia in the Euro-Atlantic, will be a long-term challenge for British maritime strategy.

Conclusion

During the Cold War, the UK developed and maintained a range of capabilities focused on contributing to the struggle for sea control in the North-eastern Atlantic. For the first half of the Cold War, this was balanced with the wider requirements of maintaining a global maritime power projection capability; from the mid-1960s onward, however, the focus shifted decisively in favour of the Atlantic. By the end of the Cold War, this had resulted in *“a single scenario for conflict; force provision based upon a single threat; a ‘contributory’ strategy, if it could be called a strategy; dubious assumptions on the likely duration of conflict; [and] a constricted and strategically unrealistic sea area”*³⁹. The UK again faces the challenge of having to balance the requirements of countering the Russian threat in the Euro-Atlantic against those of protecting wider global interests. In both cases, the UK requires broad-based capabilities and globally deployable, credible forces. Given the UK’s global interests and the national policy intent to maintain the ability to project power and influence globally, the issue of commitments versus resources will become even more pressing. This emphasises the requirement for versatile, flexible and adaptive forces, that provide the broadest range of credible options for responding to a highly dynamic strategic environment and contingencies across the spectrum from sub-threshold, “grey zone” threats through to, *in extremis*, combat against Russian forces.

It also warrants highlighting with regard to developing an enhanced global presence, particularly in the Asia-Pacific, the challenge for British strategy of developing a persistent, credible presence that provides reassurance and support to allies, whilst deterring potential adversaries, yet does not result in misunderstanding or miscalculation. This is especially with regard to China-UK relations, where there are differences in perspective, particularly toward freedom of navigation and sovereignty in the South China Sea but also a growing economic relationship⁴⁰. In this respect, the implications of China’s growing ability to project maritime power globally, especially over the mid-to-long term, will need to be considered. Leveraging the attributes of maritime forces, in particular, the ability to operate forward, providing presence in a region of interest, without being dependent on access, basing and overflight, and logistically self-sufficient and combat-ready, as a force for influence will provide the UK with a cost-effective and versatile capability. Ultimately, credible maritime forces, capable of delivering power across domains, will constitute an effective deterrent, and contribute toward Britain’s strategic aim of upholding international order.

THE ESSENTIALS OF INDIA'S NAVAL STRATEGY

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India's navy was carved out of the Royal (Indian) Navy soon after Indians freed themselves from the colonial yoke in 1947. For many years, with British material and training support, India's new navy continued to steer the course set by the Royal Navy, pursuing the strategic purpose of dominating the high seas of the Indian Ocean, the British Lake of the yore. This was premised on New Delhi's realization of its historical omission, best summarized by the Indian strategist KM Panikkar. He wrote in 1945,

*"Millenniums before Columbus sailed the Atlantic and Magellan crossed the Pacific, the Indian Ocean had become a thoroughfare of commercial and cultural traffic (with undivided India being the pivot)... India never lost her independence (to the colonial powers) till she lost the command of the sea (and thence the ability to control events in the neighboring seas) in the first decade of the 16th Century."*¹

Panikkar's advice remains relevant to this day, but after an Indian Admiral took over the reins of his Navy in 1958, India's naval strategy began to evolve along a path that diverged from the ancestral imperial service. Miles Law says *"where you stand depends on where you sit"*. India's strategic reorientation was underpinned by unique circumstances, relating to its distinctive history and geography. One factor was the resurgence of India's hitherto-suppressed civilizational and cultural ethos. Another was the landward military incursions against India since millennia, leading to a continental psyche of the government, despite its peninsular geography endowed with extensive island territories. The location of New Delhi—its capital—1,000 kilometers from the nearest sea was both a corollary and proponent of this mindset. The third one was the emergence of new insecurities apropos India's "prime location" in the ocean named after it. With the onset of the Cold War, the Indian Ocean became the center-stage of a heightened naval rivalry. The later years witnessed a power vacuum in the Ocean—real or perceived—that Beijing saw as a geopolitical opportunity, with weighty ramifications for New Delhi.

Civilizational and Cultural Ethos

While conceiving a navy of "free India" in 1947, London "expected" New Delhi—"as the principal sovereign state in the Indian Ocean"—to continue "receiving (security) assistance from the Royal and other Dominion Navies" under a treaty binding the "British Commonwealth of Nations"². However, India's erstwhile civilizational ethos forbade military alliances, and for good reasons. Such alignments divide the world into opposing camps, which—as adequately recorded

in world history—has caused much bloodshed. Besides, as a civilizational-cum-Westphalian entity, India aspired for “sovereign liberty” to formulate its own national strategy without foreign encumbrances.

Such autonomy is becoming increasingly relevant today with India’s emergence as a major power. Its increasing stakes in good order in the Indian Ocean region and beyond need to be secured through its native political visions of Vasudhaiva Kutumbakam (world as one family)³ and “SAGAR” (ocean), an acronym for Security And Growth for All in the Region⁴. The Navy’s strategy also conforms to these elements of national ethos.

Geopolitical and Security Environment

Treading the road of sovereign autonomy—non-alignment during the Cold War, and strategic autonomy later—has not been easy for New Delhi. Since its existence as a sovereign State, five military conflicts have been thrust upon India—all across its land frontiers—beginning with tribal militia incursions from Pakistan in 1947, and later, the wars involving China in 1962 and Pakistan in 1965, 1971 and 1999. India had to respond to its insecurities all alone, in an adverse geopolitical environment. The foe was either a member of a military alliance, or a permanent member of the UN Security Council, and few western powers were inclined to assist India.



INS *Viraat* approaching the fleet tanker INS *Deepak* for replenishment at sea. © Aswin Krishna Poyil.

It was against this backdrop that India evolved its naval strategy. The first formalized endeavor appeared in 1988 as a classified document called “A Maritime Military Strategy for India 1989-2014”. The first publicized strategy emerged two decades later as the “Freedom to Use the Seas: India’s Maritime Military Strategy” (2007). This was refined more recently, and titled “Ensuring Secure Seas: Indian Maritime Security Strategy” (2015)⁵. The strategy is based on a clear conceptualization of India’s strategic frontiers enclosing its areas of maritime interest. Roughly, the primary areas of interest coincide with the northern and south-western Indian Ocean, including all its contiguous seas and choke points. The secondary areas lie in the rest of the Ocean and the western Pacific. Together, these conform to the present-day Indo-Pacific vision, first conceptualized in 2006⁶.

Military Missions Optimized for Continental War

The Navy’s strategy formulation owes much to the writings of Alfred Mahan and Julian Corbett, which have been analyzed with keen scrutiny by the Indians, notably Raja Menon⁷. Accordingly, the core of India’s maritime-military doctrine—as inherited from the erstwhile western concept of “command of the sea”—lies in “sea-control”, based on aircraft carriers. It implies that the contrarian “sea-denial” doctrine applies to limited scenarios, wherein it is either operationally advantageous, or indispensable. However, the similarity with the erstwhile western doctrines ends here.

India’s Doctrine⁸ says, “*since humans and societies flourish on terra firma, the nation’s political aims—and thus its military objectives—are inextricably linked to events on land*”. It means that the Navy must be able to shape the outcome of a continental war in India’s favour. One way is to deny “strategic commodities” to the adversary by interdicting his Sea Lines of Communication (SLOC). Traditionally, this mission—called “Blockade” in legal parlance—has sought to stymie the adversary’s war-waging ability. The effectiveness of SLOC-interdiction is being questioned today due to the mushrooming of national strategic reserves and the reduced probability of protracted wars. Nonetheless, this mission has not fallen into disfavor among navies since it exerts pressures upon the adversary, depending upon his critical vulnerabilities. For instance, China is so dependent on imported oil that its denial may lead to a perceived (virtual) energy crisis. Further, since China is a major civilizational power, such denial may lead to an unacceptable loss of face.

Another way to influence the land war—and with prompt results—is force-projection against the adversary’s littoral. Such horizontal escalation—for instance, through an amphibious assault—could effectively stall the enemy’s continental offensive across India’s land-border. Of course, present-day technological advances are shifting the offense-defense balance in favor of littoral defense. So, it will not be easy to achieve littoral sea-control for undertake such an assault. Nonetheless, it remains a worthy option, if military asymmetries—in time, space and technology—are suitably exploited, for instance, through maritime maneuver.

Another variant of force-projection is sea-based missile strikes against critical assets in the adversary’s littoral. In December 1971, the Navy undertook innovative and devastating missile-boat strikes against Pakistan’s Karachi port. However, the vintage Soviet missiles were optimized for anti-shipping rather than land-attack. The current technology enables precision sea-based missile strikes deep into the enemy littoral. This is best exemplified by the US *Tomahawks*, which turned Afghanistan virtually into an Arabian Sea littoral in 2001⁹. Such punitive land-attack strikes could reinforce India’s “active” deterrence against Pakistan, who—premised on India’s overwhelming military superiority—has been using terrorism for proxy-war, thereby blunting India’s “passive” deterrence. In recent years, New Delhi has been forced to resort to such “compellance”¹⁰ through surgical and precision strikes against terrorist camps in Pakistan-held territory, using Special Forces (2016) and ground-attack aircraft (2019)¹¹. Submarines armed with land-attack missiles provide another viable option to New Delhi, which merely awaits political consent¹².

For the Navy to undertake any surface-based military mission—ranging from SLOC-interdiction to force-projection—sea-control is a necessary prerequisite. The Navy intends to retain the ability for carrier-based sea-control in the entire Indian Ocean against all potential adversaries. This implies that in the event of any Pakistani or Chinese aggression across India-China land border, horizontal escalation of the conflict to the sea could save the day for New Delhi. However, it may not be feasible for India to establish sea-control in the western Pacific. This necessitates the employment of nuclear attack submarines (SSN) for distant missions, including land-attack. Accordingly, the Navy seeks to induct six indigenous SSNs¹³.

Coastal Security: A Renewed Role

As a constabulary function, coastal security has traditionally been the Navy’s secondary responsibility. The Indian Coast Guard was raised in 1978 as a force

dedicated to law-enforcement in “brown waters”, so that the Navy could focus on its primary “blue-water” missions. However, a single event changed all that. In November 2008, Pakistan-based *Lashkar-e-Tohiba* (LeT) terrorists—specifically trained for seaborne infiltration, and equipped with advanced gadgets and weapons—crossed the Arabian Sea and attacked India’s commercial capital of Mumbai¹⁴.

This was a rude awakening for the Indian government. The Navy was seen as the most capable force to reassure the nation against the emergent threat of maritime terrorism. In 2009, it was designated as the “*authority responsible for overall maritime security, including coastal and offshore security*”¹⁵, and asked to lead the *National Maritime Domain Awareness* (NMDA) Project, assisted by the Coast Guard and other agencies. The backbone of NMDA is the *National Command Control Communications and Intelligence Network* (NC3IN) administered by the Navy. The Navy was allowed to forge “white shipping” information-exchange pacts with 36 countries. By the fall of 2018, 21 agreements had been signed¹⁶, including with France, the UK, the US and western Pacific littorals like Singapore, Japan and Vietnam. In 2014, the Navy established the *Information Management and Analysis Centre* (IMAC) near Delhi as the MDA hub for information-sharing¹⁷. In December 2018, within the IMAC complex, the Defence Minister inaugurated the *Information Fusion Centre—Indian Ocean Region* (IFC-IOR), which will soon host naval Liaison Officers from the partner countries¹⁸.

Whereas the new “brown-water” responsibility has stretched the Navy’s resources, the enhanced MDA in the Indo-Pacific region—through IMAC, IFC-IOR and information exchange—amounts to a substantive capacity-accretion for its military missions.

Navy as Instrument of Foreign Policy

By virtue of their operating medium, navies are potent instruments of foreign policy. Accordingly, the Navy seeks to shape the maritime environment in India’s favour. The most compelling task is to prevent an overbearing influence of an inimical power in India’s “backyard”. Likened to the 19th Century US *Monroe Doctrine*¹⁹, this has become an academic “enigma”. Whereas the potential adversary is evidently China, the geographical extent of “backyard” is dynamic since India’s primary areas of maritime interest are constantly expanding. Besides, the term incorporates India’s immediate land neighbors.

Among the aims of shaping operations is strategic deterrence²⁰, including nuclear deterrence. Convinced that there will be no winners in a nuclear war, the Navy maintains sea-based nuclear forces for the political purpose to deter, rather than as a means for coercion or warfighting. The latter is based on the belief that there lies adequate space below the nuclear threshold to conduct conventional military operations. The Indian nuclear doctrine of 2003 is premised on the principles of “*no first use*”, “*credible minimum deterrence*”, and “*massive and unacceptable retaliation*”²¹. This makes survivability of nuclear forces essential for a punitive second-strike, assured by a triad of land-, air- and sea-based forces. Evidently, nuclear ballistic missile submarines (SSBN) constitute the most survivable leg²².

The Navy also has the blessings of its government to spearhead Constructive Maritime Engagement (CME) with the regional and stakeholder countries. CME aims to strengthen political and defence relations; foster mutual understanding, professional interface and interoperability with the navies; MDA; and so on. It involves overseas deployments, reciprocal warship port visits, technical military support, combined exercises and training exchanges. The Navy also regularly undertakes maritime security assistance and humanitarian missions for the regional neighbors to showcase the benign and benignant intent of India as nation that seeks to fulfill its normative obligation as a regional power²³.

The Navy is also forging functional bonds in the multilateral format. In 2008, it initiated the *Indian Ocean Naval Symposium* (IONS), which seeks to foster co-operation among the regional navies by providing an open and inclusive forum for discussion on issues like maritime security, information sharing and interoperability and disaster relief. It currently has 24 member countries, including France, which will soon chair the IONS (2020-2022). India is also an observer of the *West Pacific Naval Symposium* (WPNS). Through these groupings, the Navy supports the evolving multilateral structures at the political level, such as the Indian Ocean Rim Association (IORA)²⁴, the ASEAN-centered forums, and even the Australia-India-Japan-US Quadrilateral Dialogue, thereby giving effect to the broader Indo-Pacific vision.

Mission-Based Deployments

The Navy has lately begun to optimize its overseas deployments. In the “hair-pin bend” model used until recently, the warships returned to their home bases rather frequently for maintenance, training and logistics. The new “hub and rim” model

involves permanent bubbles of India's overseas naval presence radiating outwards from its home-bases. The training needs are met by combined exercises with foreign navies. Force sustenance is achieved through standing logistic-exchange agreements, providing access to the US, French and Singaporean military bases. More such pacts are being inked, such as with Australia, Japan and South Korea. The warships in the bubble are periodically rotated with those at home base, essentially for maintenance. As the Navy inducts Fleet Support Ships (FSS) with dedicated maintenance facilities²⁵, the turn-around frequency would be reduced substantially.

With the warships now virtually “positioned” overseas, their functional tasking has also changed to “mission-based” deployments²⁶. The concept draws from the “versatility” of navies to switch mission-readiness across the spectrum of contingencies. The “mission-ready” ships and integral aircraft are now ready for any mission, ranging from counter-piracy to disaster response. Whereas the warships are always combat-ready, these also equipped for low-intensity missions and carry “palletized” stores for humanitarian assistance²⁷.

Force Development

For addressing all conceivable contingencies, India seeks a well-balanced three-dimensional naval force. The present force-level of 137 ships and submarines is being increased to a 200 by 2027²⁸. The aim has always been to attain a 60:40 mix between blue-water and brown-water platforms. This process was punctuated after the 2008 Mumbai terrorist attack when the Navy was given the lead role for coastal security, but is back on track.

Over the years, the Navy has been beset by some critical capacity voids such as the constant availability of two aircraft carriers—for both maritime theatres—sub-surface nuclear deterrence, nuclear attack submarines, submarine-rescue facilities²⁹, precision land-attack capability, distant anti-submarine capability, sealift platforms for stand-off amphibious operations and humanitarian missions³⁰ and logistic support ships. Most of these shortfalls have been addressed, or are in the pipeline.

Cutting-edge technology has always been of the essence. Raja Menon avers, *“in naval warfare, technology plays a greater role than it does in land warfare since the sea—being devoid of (attenuating) influences like terrain—is a purer medium*

to exploit technology”³¹. Arun Prakash says, the Navy critically needs top-notch technologies to conform to the latest transformational concepts of space-based network-centric operations, information-dominance, combined arms battle, over-the-horizon amphibious operations, maritime maneuver, joint operations, precision strikes, unmanned or remote operations, stealth, *et al.*³² The US, Russia, France, Israel and the UK are providing valuable assistance to India. However, India’s manifest destiny lies in indigenous research and development, and domestic shipbuilding, which translated into national policy of “Make in India” in 2014. This will make India self-reliant to avoid strategic dependence on foreign sources, and ensure that its Navy is not unwittingly preparing to fight the last war.

Conclusion

In the foreseeable future, continental military threats—including proxy war through terrorism—will continue to hold New Delhi’s attention. However, owing to its geographic location and disposition, the maritime domain has always shaped India’s destiny, and will continue to do so. As KM Panikkar said in 1945, “*while to other countries, the Indian Ocean is only one of the important oceanic areas, to India, it is the vital sea*”³³. The present-day imperatives are making these words as relevant today, as 75 years ago. China’s growing geopolitical footprint in this “vital sea” makes it critically important for India to be able to influence events in its areas of maritime interest, both in peacetime and during war. This needs to be enabled through a whole-of-government approach, including an effective naval strategy.

KM Panikkar had cautioned in 1945, “*an exclusively land policy of defence for India will in future be nothing short of blindness*”³⁴. Many sage voices have since counselled India to put an end to its “sea-blindness”³⁵ and pay more attention to its “Cinderella service”³⁶. Given India’s resource and technological constraints, New Delhi will continue to struggle to strike the right balance while developing its land and sea-based military power. However, hopefully, India’s apex policymakers are now coming to grips with the—*hitherto* unrealized—fact that investment on land-based forces and naval power does not represent an “either-or” situation. Far from this, for India today, a strong navy is indispensable to achieve the desired outcome of a continental war. This is leading to enhanced jointness of the armed forces *inter alia* through the recent political directive to institute the post of the Chief of Defence Staff (CDS)³⁷. Besides a single-point military advice to the government, this augurs well for integrated military operations and planning, and should soon percolate down to the level of India’s (eastern and western) maritime theatres.

Meanwhile, India's national interests—and consequently, its “geo-strategic frontiers”—are steadily dilating southwards and eastwards to encompass the entire swath of the maritime-configured “Indo-Pacific” region. Accordingly, India's ability to project soft and hard power beyond its sovereign territorial confines would need to expand progressively. As the key proponent of the “Indo-Pacific” vision and to realize its aspiration to be the “*net security provider in the Indian Ocean and beyond*”³⁸, New Delhi must abide by the advice of KM Panikkar.



NEW CHALLENGES



Launch of a NOAA's satellite. © NOAA.

CYBER, A PARTICULAR FIELD OF NAVAL THOUGHT

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Translated from French

For the first time in 2019, the huge annual *DefCon* conference—now in its 27th edition—included an area called “Hack the Sea”, dedicated to cybersecurity issues in the maritime sector. Events like these highlight the growing importance of the cyber issue in the maritime world, where the ever-increasing integration of communicating systems into naval platforms has given birth to “cyber-at-sea”.

This vision extends to both the civilian and the military maritime domains, as ships of all navies must constantly transmit and receive data, over both long and short distances. While the problem of naval communications is far from new, it has undergone a major change in recent years with the growing importance of networked combat capabilities, at the levels of naval groups and of each vessel individually. These communication challenges are now finding a domain in cyberspace, offering both new capabilities and new threats.

The aim here is to consider cyberspace in a broad sense, as a particular domain of combat within the maritime space, and also as a technological family that includes autonomous robotics, artificial intelligence and connected objects. All these technologies rely on a cyber base linked to an operation and based on data exchanges—permanent or not—among several platforms. In this sense, many current or prospective technological developments fall within the definition of cyber within armed forces. The announcement of the commissioning of 1,200 drones in 2030 by Chief of the French Navy Admiral Prazuck, for example, requires us to consider the related cybersecurity issues as one of the core elements of their integration within Navy units. And even beyond the integration of technologies within ships, the question of integrating the cyber domain into naval strategy is all the more relevant because, while some elements seem similar, others are opening up new challenges.

Cyber-at-Sea: The Difficulties of Technological Integration

Integrating a cyber layer into sea objects moving above and under water is a much greater technological and economic challenge than deploying telecommunication networks ashore. The use of cyber technologies onshore has grown exponentially over the past few years, thanks to major advances in logistics linked to high-speed networks and the growing popularity of appropriate terminals. In parts of the world, such as Africa, mobile broadband has enabled the significant use of cyberspace. In the space of 10 years, from 2007 to 2017, the proportion of the

world's population using the Internet increased from 20 % to nearly 50 %, in line with mobile broadband subscriptions (from 4 % to 62 % over the same period), according to the UN¹. Networks (3G, 4G and soon 5G), terminals, telephones and tablets have enabled this global expansion—but their promise of optimal and continuous coverage is based on installing fixed infrastructure at relatively short intervals. Thus, broadband telephone base stations have emission radii ranging from a few hundred meters to around 30 kilometers, which imposes a relatively tight mesh of the territories. Other wireless remote connection protocols also are limited in reach: WiFi (IEEE 802.11 standard) has a range of a few hundred meters, WiMax (IEEE 802.16) about 10 kilometers, ZigBee (IEEE 802.15) about 10 meters.

In this context, the maritime domain—where the kinds of fixed communication relays available on land are not possible—is much more demanding when it comes to connecting to cyberspace. Maritime platforms rely mainly on satellite



View of a member of French Navy in the Combat Information Center of the multipurpose frigate *Normandie*, janvier 2020. ©Terence Wallet/Marine Nationale/Défense.

technologies to provide data links for voice and image communication, navigation, etc. Cyber links are operated in France through *Inmarsat* systems for civilians, and *Telcomarsat* or *Syracuse* for the military. Satellite links in the cyber domain are extremely rare, about 10 % of global communications, mainly because of their cost. Maritime cyber is thus much more expensive than terrestrial cyber, particularly in the communication aspect, thus forcing embedded information systems to process as much information as possible onboard ships².

This situation does not prevent the very fast development of “cyber floating objects”, however. Cyber offers the promise of optimizing the functioning of systems through the use of technologies related to data collection and processing. In this context, the maritime world appears to be particularly relevant for the deployment of cyber systems designed to optimize the operation of ships. Like any “industrial” system, a ship must be able to handle a number of tasks related to its missions in the most automated possible way. In the military context, these range from propulsion to combat missions under the sea and above the surface. Cyber can play an even more important role in this context because it is both suitable for the integration of multiple different subsystems—a ship being first and foremost a systems hosting platform—and because it allows human gains, and therefore space savings. This is a fundamental paradigm shift in the naval field. Where it hitherto was based on the scarcity of communication, it now is moving toward abundant communication, at least locally or at short range.

Thanks to this advanced automation, ships—military or not—have gained ever more important functionalities. The current FREMM frigates have a crew of just over 100 sailors with a range of 6,000 nautical miles and an extremely wide range of missions. Their ancestors, the Tourville class frigates, had a crew of nearly 300 and a range of 4,500 nautical miles. The more than 30 years that separate them is the time it took to enter the digital age. The last ships to enter service are floating industrial control systems, often supported by multiple protocols, making them complex multi-sensor information systems—a kind of factory connected to the sea.

In the field of maritime economics as well, cyber technologies offer particular advantages that need to be taken into account, particularly in terms of predictability. One of the major advantages of the digitization of “industrial” systems is the ability to anticipate, thanks to massive datasets that enable better anticipate flows and improve global logistics, which is essentially maritime. In addition, the autonomous ship, for which research is already well under way

within the International Maritime Organisation³, offers fascinating promise in terms of the logistics of the future, with significant savings in human capital and fuel. However, the emergence of large autonomous systems on the seas raises many questions in terms of technological maturity and safety and legal liability, particularly with systems that carry artificial intelligence.

Beyond the ship itself, with the evolution of missions and needs, the cyber-naval environment increasingly is being integrated with secondary or remote platforms, such as aerial or submarine drones. With these new devices, surface ships (and submarines in the near future) are no longer just floating information systems, but also the core of local mini-grids. The growing number of sensors deployed in unmanned platforms, designed to give the ship a greater visibility of its environment, thus transform the future military ship—and some civilian ones—into a gateway for connected objects. In the same way as new and future generations of aircraft (F-35, SCAF, etc.) are designed as the center of a system in the air domain around which autonomous sensors/actuators evolve, the ships of the future above all will be gateways for processing the Internet of Things, probably also acting as data centers⁴.

This vision is reflected in the French CNO's speech, where he referred to the rapid development of on-board UAVs that can be used in many missions in the maritime field (SRI, combat, electronic warfare, mine warfare, etc.). Thanks to drones, in swarms or not, combat ships could thus become extended multi-mission platforms, capable of covering a much larger three-dimensional territory (air, surface, submarine). This integration of new sensor-actuators would have a dual effect, providing a partial answer to the dilemma of territorial control and the puzzle of naval strategy, and at the same time creating new risks and strategic challenges related to digitization.

Naval and Cyber Strategies: Many Common Points

A Question of Territory

The two spheres of the sea and cyberspace have a number of similarities. Among these is the question of the permanence of control over a territory that is essentially marked by fluidity. In cyberspace and at sea, it is impossible to have continuous control over all territories, if only because it is impossible to ensure a permanent human presence there. The vastness of the territory plays a fundamental role here.

It was therefore quickly necessary to make choices about what to control and what was incidental.

The history of naval strategic thinking thus has been marked by the need to defend specific lines of communication or areas, with the possibility of carrying out occasional offensive actions to mark one's superiority. At the end of the 19th and beginning of the 20th centuries, A. Mahan, like J. Corbett, defended a vision of naval superiority based on the control of communication lines, as well as on military force in the service of the sustainability of these lines. In a certain sense—in a very historical perspective, moreover, if we take up Mahan's work again—the sea is seen as a network whose nodes and major lines must be protected. As for cyberspace, it is also based on this network logic, particularly in the physical layer, which must be dominated in order to have a techno-industrial superiority. The major powers of the 21st century understand this well. The confrontation between the United States and China in cyberspace probably would not be the same without this struggle for network technology, illustrated in 2019 by the thorny issue of acceptance of 5G, led by China's Huawei; it is a dividing one, even within NATO countries. However, there is a major difference at this stage between the “natural” (or almost natural) nature of the maritime network and the “artificial” nature of the cyber network.

The issue of the law of armed conflict also arises in the case of the integration of cyber in the maritime environment. If we consider the legal and ethical debates surrounding autonomous systems, armed or not, it is interesting to consider the latter in the maritime world. One of the main obstacles to the use of these systems in a military context comes from the sheer difficulty, even for humans, of discriminating between combatants and non-combatants in contemporary conflicts. This problem, which is particularly prevalent on land, is much less important in the underwater world, where most of the mobiles and the men are military. It is therefore highly probable that the submarine domain will be the first to host autonomous systems, possibly armed, if only for experimental purposes. Indeed, the variety of missions that can be entrusted to these systems (intelligence, subsurface combat, mine warfare, etc.) makes it possible to greatly increase the capabilities of a naval force—if not in terms of performance, at least in terms of permanence—thus making it possible to partially solve one of the major challenges facing naval strategy.

Beyond this question of cyberspace within the naval strategy itself, it is also important to consider that cyberspace is largely based on submerged maritime

territory. Indeed, the overwhelming majority of cyberspace communications pass through an ever-increasing number of submarine cables. Because of the ease of implementing these infrastructures, making it possible to have high data rates at reasonable costs, the sea has very quickly overtaken space as a transit territory for global communications. This gives rise to a maritime understanding of them, albeit a distinctive one. The strategic understanding of submarine cables, as infrastructures laid at the bottom of the sea along fixed routes, is as much a matter of logic as it is of pipelines. But it also is a naval vision, with the challenge of laying and protecting them. Nevertheless, the paradox of communication at sea means that while cyberspace is mainly based on the maritime domain, ships have access to this same cyberspace through space systems. This particularity induces a particular vision of the stakes of cyber conflict on or under the seas.

Naval Cyber-Combat

With the progressive digitization of ships, naval cyber-combat tends to move from a logic of disruption, as in the cyber domain in general, to a logic of immobilization/sabotage. With highly automated military and civilian ships, the risks associated with the loss of a ship's information subsystems are becoming increasingly critical. With a ship connected in multiple ways, by several types of wireless protocols, it is theoretically possible to launch more pernicious targeted attacks.

Embedded cyber systems are more strategically oriented to the logic of production computing (OT) than processing computing (IT). Naval platforms are thus complex industrial objects, with a lifespan of decades, that must house cyber sensor/effector systems whose obsolescence is much faster. This leads to a technological paradox, well known in the industrial world, between the load-bearing structure whose safety comes from its stability and the control system, which is by nature always in evolution. The challenge of cybersecurity of the embedded system must take into account this specific aspect, with frequent updates, complex with regard to connectivity at sea. In addition, the vision of the ship as a cyber-industrial entity also needs to be further developed with the planned appearance of the cyber appendages that will be the various air, marine and submarine drones. They will use wireless communication protocols among themselves or with the carrier vessel, bringing the carrier vessel closer to a connected factory type 4.0⁵.

Given the importance of wireless communications, but also the use of electromagnetic spectrum data (AIS, GPS, UHF, etc.) for data transmission, it is

possible to consider a merger of the cyber and electronic warfare domains at the naval tactical level. Embedded electronic warfare capabilities, including at the level of drones, should in this context become significant in denying access to data transmission systems, offering superior command and control to those who have such capabilities. For many years, the US Navy has been fostering programs of airborne UAVs (*X-47*, *ScanEagle*, etc.) with modular carrying capacities, paving the way for such types of electronic warfare systems in the fleets.

Autonomous civilian and military naval systems will be prime targets for cyber attackers. Indeed, their dependence on data produced by their own sensors or received (GPS, AIS) makes them sensitive to sophisticated forms of jamming or deception. The planned introduction of artificial intelligence to assist in the control of the ship and the accomplishment of its missions also opens up opportunities for attack, since it too can be the subject of specific attacks (code injection, misuse of recognition schemes, etc.).

Pirates and Privateers, Towards New Threats

Beyond the traditional state actors of maritime conflict, other dangers threaten military or civilian ships *via* cyberspace and could change the perception of the threat. In recent years, the cyber domain has seen the emergence of categories of actors whose behavior reminds us of the history of naval conflicts. Pirates are well known to sailors, but so far, they have been limited by an asymmetry of means and objectives that gives regular forces the advantage. In cyberspace, in view of the rapid learning of sophisticated attack techniques and the potential gains, non-state malicious actors are multiplying. Cyber pirates who obey a financial logic—in this sense, cybercriminals or cyber-mafiosi, depending on their level of organization—could be tempted to attack merchant ships and hold them for ransom, given the sums at stake in global maritime logistics⁶. Even if they represent only a limited danger to military forces, their impact on the maritime world could be significant in the coming years, if the stakes are not properly assessed.

More dangerous are cyber privateers⁷ who work for the benefit of a given country that outsources its actions, either to avoid detection or for lack of skills. Cyber corsairs are used to limit the risk of retaliation if the origin of the attack is discovered. Paradoxically, this situation makes it possible to maintain both a high level of conflict in cyberspace and the fog of war through uncertainty about the

real motives and identity of the attacker. A particularly dangerous hypothesis would be the emergence of groups specializing in attacks against maritime systems—or even against connected industrial systems more generally—renting their services to the highest bidder. In this case, cyberattacks on hot spots like the Strait of Hormuz, or the Black or China Sea, may increase, with a corresponding increase in maritime insecurity.

Remote control of a connected or autonomous vessel could cause significant or even critical damage. Large ships, bulk carriers or giant chemical tankers of more than 100,000 tons, loaded with potentially harmful or explosive substances or carrying thousands of passengers⁸, represent objects whose inertia could be diverted from a distance and launched against the quays of a port. Stopping them would be a very perilous task. Cybersecurity is thus becoming an important issue in the maritime world, since the risks associated with the diversion of fixed maritime platforms such as oil platforms, or of mobile platforms such as container ships, are particularly high. Cyber could thus create particular threats in the field of maritime terrorism⁹. Given the magnitude of the risks, the challenge of securing connected maritime systems and objects is a critical issue.

Naval and cyber strategies have many similarities. First, of course, is the control of a space where omnipresence is by nature impossible, which implies considering it as a network with hubs, lines and nodes of importance. The question of capacity is also significant. Cyber and marine are thus based largely on the intersection between technology, whose share is preponderant, and the wishes of human actors. In short, if cyberspace is the only artificial strategic domain, the presence of Man in the maritime space also takes on a form of artificial nature. This similarity between the naval and cyber domains makes it possible to identify a number of common points or shared challenges.

While cyber has never been able to avoid thinking about its maritime aspect, if only for the question of cables, the maritime domain needs to further integrate cyber within the considerations on opportunities and, especially, threats. Strategic thinking must consider data collection and processing platforms, sensors and effectors, and communication systems in order to best integrate cyber systems throughout the maritime domain. Beyond these very immediate issues, a whole complex chain must be set in motion within the Navy and in shipping companies, since digital transformation involves industrial externalities as well as human ones (skills, training). For example, the evolution of energy requirements to meet the consumption of data transmission and processing requires a profound rethinking

of the architecture of the electrical system (storage, efficiency, production) of ships, leading to new challenges in naval architecture. Cyber-maritime is thus far from being limited to a “simple” communication issue.

"NO BATTLE PLAN SURVIVES CONTACT WITH THE ENEMY"

Interview with Olivier Dauba and Éric Simon
VP Editorial and World Logistic Designer, Ubisoft

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Translated from French

Études marines: When were the first wargames developed?

Olivier Dauba / Eric Simon: Probably in the mists of time. In the *Mahābhārata* we already find traces of an episode of wargame, where Indian sovereigns engaged in a fake battle to determine the most valid combinations and the most effective formations for their armies. This is one of the oldest documented sources on conflict simulation as a tool for conflict preparation.

Closer to us, it is undoubtedly the *Kriegsspiel*, imagined by the Prussian von Reisswitz in the aftermath of the battle of Jena, that forms the matrix of all the wargames to come. This game takes the terrain into account—woods and rivers that can slow down movement, bridges or roads that facilitate it, as well as the characteristics of the different weapons, the speed of movement of the cavalry and infantry. A referee can influence the course of the game and chance is part of it as well, with a way to simulate transmission errors in messages, etc. Moltke, who became Chief of the Prussian General Staff in 1837, promoted it, noting that “*no battle plan survives contact with the enemy*”. He was well aware of the need to simulate as many situations as possible in order to be ready for D-Day.

The 1862 version of the *Kriegsspiel* was used to prepare for the war against Austria in 1866, the one against France in 1870. As a result, the staffs of the major nations began to take an interest in it, and soon France, Great Britain, and the United States, were developing their own systems. By 1906 we see a naval wargame, by Fred Jane, that had more success with the publication of his famous *Jane's*.

When did this type of simulation become open to the general public?

In the aftermath of World War II. The bloodletting of World War I did not make these kind of games particularly attractive; it was only at the turn of the 1930s that attractive creations, and Fletcher Pratt's naval wargame in particular, emerged. *Fletcher Pratt's Naval Wargame* earned a small amount of fame for the way it managed to simulate the battle of the Rio de la Plata of December 13, 1939, with a result identical to that of the real confrontation. But it was really Charles S. Roberts, then aged 22, who succeeded in the feat of combining the *Kriegsspiel* and *wargame* in a marketable product, *Tactics*, in 1952. His company, *Avalon Hill*, reached the top with *Panzerblitz*, released in 1970, which sold more than 100,000 copies. It is the ancestor of tactical games that, with the arrival of computers, became the real-time strategy games (RTS).

The computer age will make the paper universe disappear...

Actually, no. There's going to be a progressive decoupling between tactical games, which will end up on the PC, and pure wargame that will go back to paper. It's actually the same thing that happens when a new species appears: first you have mammals, quite close to each other, and then they evolve until in the end you find whales as well as giraffes. It's exactly the same in the field of PC wargames: we've had protean games that gradually specialized to fill niches.

It's true that in the beginning it seemed that the paper game was going to disappear completely. Almost all the publishing houses went bankrupt, and even *Avalon Hill* was bought out in 1998. Apart from the fact that the computer has entered most homes, this is also due to a brain drain: many of the developers of paper wargames had switched to computers. But very quickly, constraints appeared. To make a paper game you only need one or two developers, and it's quite light in structure and budget. But a PC game requires multiple developers, graphic designers, the development of an AI, and, if it's an online game, you have to develop the network layer in addition to the other components. We are in niche markets, but the budget goes up quickly. And let's add that many developers were recruited by the US Army, like John Hill, who disappeared for a while and then reappeared after retirement. He actually had worked for the Pentagon, creating simulations. Finally, the market found its balance in real-time strategy games (RTS), some of which now reach tens of millions of people or more.



Screenshot of the video game *Assassin's Creed Odyssey*. © Ubisoft.

So the pure wargame has found a new youth on paper?

Yes. In France, for example, there is *Vae Victis*, a fortnightly magazine whose every issue offers a wargame. But it is especially in the United States that the market is buoyant, with companies such as *GMT* and *MMP* offering a wide variety of games, ranging from recreational, light simulation games, to much deeper games that take into account logistics, population morale, etc. There are games about the World War II where you have to manage your country's production and take into account delays; if you opt to build *Panzers* or an aircraft carrier program, you know you will not have them until year N+. In this area, World War II offers an infinite field of possibilities. *Admiralty*, for example, is played with a referee who can generate a breakdown on a ship, an inoperative flak, etc. *Pacific Wars* deals with the entire War of the Pacific at a level where each token is an infantry regiment, and you must manage both logistics—fuel, etc.—and the problems of operational command. The difficulty right now is that we're falling back on very complex paper games because they include all the issues such as stealth, electronics, missiles, and so on. The typical example is *Harpoon*, unplayable on paper but excellent on PC.

So we're going to see a new development of wargames on PCs?

The market is probably bigger nowadays than it was originally. With hindsight, and if we take Freud's view of human nature shared between Eros and Thanatos, we see that the majority of games are based on Thanatos, confrontation, war. The difficulty for wargames has always been the personal investment of the player: learning a strategy game, being good at a strategy game, requires a very long involvement. When you're in this type of game, you enter logical phases that require investing for the long term, planning long-term actions. Players stay connected for tens of hours. It's not a "popcorn" game where you're going to spend five minutes, because in five minutes you'll just begin to grasp a very small number of your system's parameters.

We are therefore seeing player profiles that typically belong to the high-income bracket, with a good level of education. And then we start to identify the markets, the countries that are more sensitive to this type of game. Scandinavians, Germans, Americans are very fond of it, for example, probably for historical reasons. In addition, other nations are emerging through the team games competitions. It is always the same ones who take the first places in the *League of Legends* World Championships or in the various trophies in this field. We find the Germans,

the Russians, and increasingly the Chinese, with teams often financed by their governments. So, the market exists. But we need to be able to adapt our offer.

At what level?

First of all, from the point of view of the themes addressed. Most wargames today are set in the context of World War II, the Napoleonic Wars, or colonial conquests; this is still very a very Western view, whereas the market is global. *Total War*—undoubtedly the series that comes closest today to what could be a real wargame, with a tactical and strategic—level offering, such as the possibility of economically stifling its opponent—has tried to break away from this model; its *Three Kingdoms* is situated in China in the second century BC. But for now that is an exception. *Sega* is now the owner of that franchise, by the way; as the market has evolved, its model evolved from action and platform game publisher—with characters like *Sonic*—to leadership in strategy games.

Another point to work on in wargames is accessibility. Video games are mostly entertainment nowadays, gamers want an immediate start and are no longer ready to read pages and pages of instructions. For wargames that are complex by nature, it is therefore a question of working on accessibility, the player's grasp. To do this, it is necessary to succeed in making the first moments of play simple and to give the more complex elements progressively. It is necessary to offer an experience that resembles an initiatory course with first of all the command of a small infantry unit, which makes it possible to lead a small battle; then add cavalry, artillery; and then go beyond the stage of the battle to the stage of the campaign to manage, etc.

We could have imagined that the player commanded a patrol boat, then a frigate, an aircraft carrier... Why do you think there are so few naval or even maritime games?

It's true that the games that deal with the sea are ultra-minority, whether in the United States or Europe, we must be around 5%. *Tom Clancy* succeeded with *Red October* but probably more because of the heroes, the individual figures, than because of the universe as such. If you want to develop a game in this area, you have to assume that the majority of people do not know the sea, do not have immediate curiosity and therefore it is necessary to find an individual as a teaser—it can be

the French privateer Jean Bart, the English admiral Nelson, etc.— that allows the player to identify with a character to enter the game. That's the logic we followed when we tackled piracy in *Assassin's Creed*: we started with the character, who was well identified, but also with the ship that was going to be the player's means of action, that was going to allow him to progress by developing it, equipping it, recruiting the crew.

Another element to be taken into consideration is the technological difficulty: the sea is a shifting terrain that will be hard to recreate by computer. In the 1980s, for example, it was a blue line, at the extreme limit of sky blue and dark blue. Informally, we began to see things that worked around 2004-2005, at the time of the *PS2* platform, with algorithms that came from the world of cinema, used for computer graphics. But it's a constant challenge: the video game player is demanding and wants realistic graphics. In a sea game, he has to get wet in some way when he plays.

Slowness, the passage of time, shouldn't be easy either...

This is not necessarily the major difficulty in the sense that you can have different types of games. We've had, for example, racing games on sea scooters, the *Wave Race 64* for *Nintendo*, where you have about the same frequency of interaction as in a car race. The regatta games are on a different *tempo*: you log on to the website, you have the position of the boat, the weather situation, you set the course for the next X hours and you go back to your professional activity before logging on again X hours later. And there's an audience for this kind of games. We also had submarine driving simulation games where you could, if you wanted, be woken up in the middle of the night in the event of an alert, because a Japanese freighter was coming or whatever. After that, let's be fair, in terms of military simulation, what works is the flight simulator, probably because the fantasy of flying a plane is more present than that of sailing a ship. And then a ship, you're not alone, there's the crew, it is immediately more complex.

Is it something that can evolve with the development of networked gaming?

There are certainly things to imagine indeed because it's true that the image of the geek alone in front of his PC is really behind us: the video game now is a bit like a school with small rooms that would each welcome a child who, suddenly,

would all get together to play at recess. It's an explosion of interactions and virtual communities and a game that is often team against team, an evolution that can facilitate the creation of naval strategy games, because there you have the notion of crew. If you take *World of Warcraft*, as an example I remember a team member who originally ran a family business by day and the largest French guild by night, planning training, activities... I guess there must be some parallels with the commander of a frigate. A lot of gamers are now living this experience of networked wargames that allows them to immerse themselves in elements of strategy, to assume command, to learn how to react quickly... Generally speaking, the military world has a lot of influence on video games: we mentioned the wargame designer recruited by the Pentagon, but the movement also works in reverse, with *Navy SEALs* who advise us on several *Tom Clancy* franchises for example.

For the sake of realism?

Exactly, and this is also due to a strong demand from players. Without anyone realizing it, with the practice of different types of games, players have become accustomed to a military environment. They now master its codes, they flow without difficulty into a hierarchical, pyramidal system. Even the different types of weapons are mastered with some fairly sharp exchanges on the advantages or disadvantages of the *Tiger I* compared to the *Sherman M4* or the T-34. In short, these wargamer communities have given rise to very demanding players regarding the realism of our games. A few years ago, we could still use actors for the movements of our characters, the animations. Today, we only work with veterans in order to have the right gestures, the right positioning, the right dialogues, to be credible. This means a lot to players who are looking for authenticity and immersion. It's a big trend: in the 1980-90s, gaming was quite playful; now you really want to enter a universe. This is also a difficulty for a global group like ours: it is a question of smoothing out the language used—the raw version is not always politically correct!—while not losing any of the realism.

It is a difficulty present in all your productions, this tension between a global market and a local, deeply rooted creation?

It is clear that we develop our games to be distributed around the world, which implies taking into account the cultures, stories, representations of the world of each of the countries we are likely to touch. In Saudi Arabia, for example, it is

quite obvious that we will not show alcoholic drinks in any sequence of a game. In China where the representation of death is unwelcome, we forbid ourselves to show visuals of human or animal bones, etc. However, that does not mean we're going to curb our inspiration or produce sanitized games: we are still among the first game publishers to have taken hold of neglected historical periods with our *Assassin's Creed* series, which, at the time, was a real gamble! It is of course adapted to our universe, but in the same way as a book or a historical movie, the player and the teacher build on the discovery of a certain time period to deepen their knowledge of an era. We are, of course, an entertainment media. But we also, not seeming much, transmit some of the foundations of our European civilization, be it Egypt or Ancient Greece, the Renaissance or the French Revolution. And in our global world, it is also means broadcasting our vision of the world: the video game, through its audience, is also a significant instrument of soft power.

Interview by Cyrille P. Coutansais and ASP Mahmut Sarp

CHALLENGES IN ARTIFICIAL INTELLIGENCE

Éric DOSQUET

Chief Innovation Officer, Reservist

—

Translated from French

Just as steam, electricity, and the microprocessor in their time enabled the transition to a new industrial era, today artificial intelligence is revolutionizing a wide range of sectors, including in our own daily lives.

In industry, the use of artificial intelligence already has begun, increasing productivity, reducing costs, and bringing a high level of services through rich and varied use cases. An instrument of growth in its own right, artificial intelligence challenges established practices and pushes the players in the value chain to renew and adapt. Rich in customer knowledge, many companies have adopted the business paradigm shifts offered by data collection and aggregation. Today, the benefits of artificial intelligence are real and within reach.

This transformation poses concrete challenges, however, for companies and employees, legislators and philosophers. Part of the workforce will have to be redefined and requalified to work with artificial intelligence. Ethical and legal questions also must be raised and regulated in order to promote its adoption under the best conditions. In short, we need to draw a new map for this new territory.

Elements of Understanding

The starting point of artificial intelligence lies in the work of Alan Turing, who laid down the paradigm of a machine that can think in his article “Computing Machinery and Intelligence”, published in 1950. He proposed a test, now known as the Turing test, to define whether the machine is capable of reasoning and creating autonomy for itself. The very notion of AI then was conceptualized and developed by John McCarthy of Stanford University and Marvin Minsky of MIT, among many others.

Of the several ways to explain AI, we will develop three:

- *Artificial intelligence is a field of computer science.* It brings together several technological building blocks that are very different from one another, including algorithms.

In a discussion on artificial intelligence, it is important to get rid of the anthropomorphic vision that often is conveyed by the media. To simplify, let's say that artificial intelligence is a computer program and so, by definition, has neither thought nor will, and does not define its own goals.

But artificial intelligence is a computer program different from any other. Unlike traditional computer software, AI is not programmed; instead it “educates” itself. This “education” is done through machine-learning methods, a necessary component of artificial intelligence. The learning phase results in the software’s parameterization. This learning, which is continuous over the life cycle of the program, results in an adaptive effect to the environment that simulates human intelligence.

- *Artificial intelligence is an interface.* It adapts to humans and allows easy and intuitive communication with the machine. It’s a technology that makes technology disappear.

There is no artificial intelligence without prior machine learning, a computer discipline that allows AI to use algorithms designed by humans to produce other algorithms from its own knowledge and experience. Old-fashioned computing was not intended to adapt. Excel and Powerpoint are automata that wait for and execute orders. AI, on the other hand, thanks to machine learning, has a certain capacity for adaptation, which it uses to recognize and process sound, voice, image, video, and text, in order to create programs (in short, machines) that behave intelligently or simulate intelligence.

- *Artificial intelligence is part of cognitive sciences.* Increasing computer capabilities and power allow AI to model and simulate natural operations based on biological models. Today the objective of AI is to reproduce four human cognitive abilities that correspond to groups of technologies: perceive, understand, act, and learn.

Perception: All types of perception and all senses are involved. From a technological perspective we talk about the input signal: language, text, sound, image, video, acquired signals.

Understand: The data captured in the previous step is analyzed (conversion of voice to text, identification of intent, detection of particular or risky behaviors on a video or risky terrain on an image, etc.).

Act: Deterministic at this stage, the data is configured for a group of parameters that give rise to a specific action that can be automated, either by a physical robotic process or by software robotics. We talk about intelligent automation.

Learning: This notion is transversal and very effective for repeated behavior. It is non-deterministic, i.e., it is close to human learning because it is based on a parallel comparison of input and output values. The action will have a fraction of failures and a fraction of successes.

Weak and Strong AI, Specialized and General AI

There is one aspect of artificial intelligence that raises as many questions and fears as robots: the advent of an intelligence superior to human intelligence could sound the death knell for man.

The reality is that artificial intelligence today remains highly specialized, no matter how spectacularly its demonstrations are relayed and amplified in the media. All AI solutions deployed today meet specific needs and perform specific tasks: automatic translation, bank fraud detection, tumor detection in medical imaging, simple dialogue with a conversational agent, Go game, and soon, driving software for autonomous cars.

Each solution is a collection of algorithms adapted to achieve a single predetermined goal. The program behind a spam filter, for example, cannot play chess. Image recognition or natural language systems are the most representative of what AI is today, but often, as soon as an AI technology provides a practical service to man and becomes part of daily life, it loses its name of “artificial intelligence”—and with it, part of its magic.

Let's take the example of computer vision, a class of algorithms that specialize in image analysis. Some of these algorithms are specialized to locate and/or recognize faces, others specific objects or animals, others to read characters and then transcribe them into text. Algorithms that are effective for images are not effective for sound; they cannot hear or parse a signal into sounds representing words, nor transcribe them into text. Depending on the senses at play, man must adapt the algorithms and invent new methods of algorithmic analysis.

For this reason, we sometimes talk about the gradations of artificial intelligence:

- *Low intelligence.* The ability of a machine to deal with problems in a specific area. All examples of current solutions fall under low AI; they are specialized and limited to a single competency.

- *Strong intelligence.* Competent in all areas that equal and surpass an individual's intelligence. This is the kind of AI usually represented in science fiction movies.
- *Super intelligence.* Stronger than the collective intelligence of all mankind.
- *Ambient intelligence.* In recent years so-called “intelligent” objects, whose function goes far beyond simply executing fixed programs, have emerged. They use AI and machine learning to communicate in a more relevant way with each other and with biological interfaces, such as human beings. These objects—for example, autonomous drones—simulate “intelligent” behavior.

All these evolutions, combined with the miniaturization of components and the multiplication of communication channels, contribute to an ever-closer integration of the Internet and AI in our daily lives. Like electricity, these technologies would become ubiquitous, but invisible, leading to “ambient intelligence”.

This concept is based on three main components:

- *Ubiquity.* The possibility for the user to interact, actively or passively, with an infinite number of devices and sensors interconnected through networks and distributed-computing architecture (Internet of Things).
- *Contextualization.* The ability to take context into account thanks to sensors that mimic the five human senses, including cameras, microphones, radars, biometric sensors, etc.
- *Natural interaction.* Unlike traditional computer interfaces, services must be used in a natural and intuitive way, by voice, eyes, and gestures.

These all are endowed with the key characteristics of intelligence: the ability to analyze and adapt to the context based on learning from past experiences and user behaviors. Through its ubiquitous and universal nature, ambient intelligence would become a niche for innovation and economic growth, capable of promoting less energy-consuming lifestyles, fostering productivity gains in business, and improving living comfort. As Nicholas Negroponte of the MIT Lab famously said, “*Computing is not about computers anymore. It's about living*”. In the same way, AI will fuse into every aspect of our lives and transform them.

Operational Purposes of Artificial Intelligence

Productivity Gains

Robotic automation refers to the use of software robots to automate administrative tasks and back-office processes performed by humans. The software frees employees from monotonous, repetitive, low value-added tasks, performing them faster and with fewer errors, so employees can focus on the tasks that require uniquely human skills (interaction with customers, sense of relationship, emotional intelligence, reasoning, judgment).

Automation can be complete (Robotic Process Automation—RPA) or partial (optimization of workflows by RPA, robotic automation of jobs). Automation aims to industrialize manual operations with low added value (data entry, invoice reconciliation) in order to gain operational excellence. It has become a must for both “blue collar” and “white collar” workers.

The benefit of automation is calculated in hours of work saved. The ROI is immediate and varies between 30 % and 200 % in the first year. RPA brings substantial benefits: error reduction, data quality, compliance, cost reduction, productivity, and competitiveness gains across many processes. Europe is home to two of the world’s leading publishers of RPA solutions, *UiPath* (Romania) and *BluePrism* (UK).

Autonomy

A second field of use for artificial intelligence results from “computer vision”. From monitoring to maintenance, from the deckhand to the senior officer, this technology “amplifies” the operator from the micro level all the way up to the macro level. For example, the analysis of micro impacts and micro cracks can be automated through a high-definition camera whose signal is evaluated by a machine, making defects and weaknesses in tools, equipment, and infrastructure scannable in large numbers, at any location, at any time. Once consolidated at the national level, these data points are evaluated and used in so-called “predictive maintenance”.

Railway operator *SNCF Île-de-France*, for example, has “dronified” some of its locomotives by attaching cameras that film the railroad tracks. By analyzing the images, passage after passage, it now can detect micro-cracks and anticipate

material breakage. Where once this part of the company relied on planned maintenance, which was limited administratively by the supply of skills, it now has switched to predictive maintenance, limited only by the need to align skills and stocks for better availability and life expectancy of the equipment.

Hearing and speech also can be amplified by artificial intelligence, with three simple military applications:

- Submariners will be able to focus the attention of the Golden Ears only on abnormal perceptions that require a high level of expertise.
- Electronic intelligence will be able to multiply the number of flows analyzed tenfold, and cross-check larger masses of information. Natural Language Processing (NLP) shows very rapid progress and is opening up interesting perspectives, not only regarding the grammatical understanding of intercepted statements but also regarding their intent, the “warmth” of the feelings expressed.
- In the coming months, French Navy Fusiliers will see advances in technologies embedded in wearables such as glasses. Paris-based startup *5thDimo*, in cooperation with *INRIA*, has developed a device that can be embedded in the stems of glasses that can spatialize, select, and amplify sounds in a 360° open scene. These are then restored by bone conduction, leaving ears open to other auditory signals from the operating field.

Workplace Wellness

Industrializing repetitive tasks is also possible today, with error rates that are lower than those produced by human processing, especially in computer vision. This is how other perspectives, such as empowerment, are opened up. Seafarers know the biological and psychological limits of life on the high seas and of family distance. At headquarters, the struggle is against other headwinds—budgetary ones.

It is now possible to arm surface and submarine drones; combining technological tools including AI makes it possible to decoralate “time at sea” from human limits. And this perspective comes at a time when new challenges are emerging, and our maritime sovereignty calls for a new permanence for the exploration, exploitation, and surveillance of our mining and fishing reserves, and our communications infrastructure.

While we are in the subject of sovereignty, let's pause to think about what that means in the age of artificial intelligence. The *Larousse* dictionary defines sovereignty as “*absolute independence in the international order*”. The word appears five times in the French Constitution, including in the very first sentence of the preamble. Can our nation, our European ambition, exist when the data that drives the algorithms, the processors, the OSes, the terminals, and part of the infrastructures that process them are not European? Isn't it a paradox to fund schools that train some of the world's most brilliant engineers; to govern the world's largest economy; and yet to fail to create and align a European value chain?

SPACE: THE CHALLENGES OF A CHANGING ENVIRONMENT

Xavier PASCO

Director of the Strategic Research Foundation

The maritime world has had its eyes on the skies for several decades now. Space systems offer great promise to maritime companies. They alone can provide global service, even to the most sparsely inhabited areas such as the oceans. Satellites already provide two key sea-related services: long-range telecommunications that link ships to one another and to their operating centers, and surveillance of maritime traffic. The latter function is set to become increasingly important given the share of maritime traffic in global trade (at least 80 %) and the proliferation of criminal organizations operating at sea, which has become a major area of concern.

There is a natural affinity between the world of the sea and the world of outer space. Both are global activities carried out in areas subject to very specific international laws and regulations; both are environments where interests are shared by mankind and where activities are by their very nature global. Thus the 1967 Treaty on the Peaceful Uses of Outer Space enshrines the principle of non-appropriation of outer space, while the launch of *Sputnik* in October 1957 established the principle of non-sovereignty of space. The regulations also reflect the global need for mutual assistance and survival. An agreement on the rescue and return of astronauts (and the “*return of objects launched into outer space*”), also signed by many countries in 1967, establishes the duty of mutual assistance in outer space in a manner that is ultimately quite similar to the rules established by the law of the sea.

A Little History

Still, this very early “globalized” approach to the space environment does not mean the absence of any government. Quite the opposite. From the outset, space activity was rooted in a context of possible military and nuclear confrontation between the two blocs, a sovereign context par excellence. Thus the 1967 treaty, while indeed establishing the principle of non-sovereignty in space, in no way prevents the development of military activities. The “*peaceful uses*” it promotes are understood by all signatories to be “*uses useful to peace*”, which of course includes military uses. And if the United States and the Soviet Union signed this treaty without hesitation in the middle of the Cold War, it was first of all because it offered both powers the possibility of spying on one another as part of the mutual surveillance of their intercontinental nuclear ballistic missiles.

As the American government had theorized in the late 1950s, the primary purpose of space was to prohibit any “*threat of surprise attack*”. Early warning, optical

surveillance, electromagnetic interception, and telecommunications satellites at the time played a major role in the deterrent posture of the two blocs. The only explicit prohibition in the treaty (which is still in force today) refers to the deployment of weapons of mass destruction in orbit. Here again, when introduced at the peak of the Cold War, this prohibition may have appeared to be an ambitious step toward peace in space. But in fact the two powers had no reason not to agree to it, as ballistic missiles fired from the earth's surface were the most operationally feasible and therefore most effective weapon—and there was therefore no need to put bombs into orbit.

Over time, space did become a relatively safe environment, spared from direct or indirect confrontations in orbit. Of course, at the very beginning of space history, American and Soviet systems were developed that could destroy orbiting satellites. Soviet test campaigns to develop killer satellite systems even took place rather late, from 1968 to 1972 and again from 1976 to 1982¹. The Americans, for their part, also invested heavily in ground-based interceptor systems, borrowing from the anti-ballistic missiles already developed in the 1950s and 1960s². They also responded to Soviet displays of strength in 1985 by destroying a target satellite with a missile launched from an F-15 fighter jet.

Still, these activities were never going to result in an arms race in space during the Cold War period. Records published a few years ago in the United States³ show that any escalation of weapons in space was considered potentially destabilizing, to the detriment of both sides, at a time when space systems were already seen as pillars of the strategic nuclear balance. The destruction of American and Soviet surveillance satellites was simply not an option⁴.

It was not until Ronald Reagan announced the so-called “Strategic Defense Initiative” (SDI) in March 1983 that this “pact” was explicitly called into question. The Republican President’s idea was precisely to render obsolete the very notion of mutual deterrence by putting in place a strategic shield that would free the United States from the discomfort of a perpetual threat. The initial SDI plans called for space systems to play an important role in the overall mechanism, in the early identification of the nature of a ballistic firing sequence and the possible interception of warheads traveling through space. This effort was second to none in contemporary history in contributing to the destabilization of the Soviet political system. However, over time the many difficulties in developing such a system delayed its deployment and led to a downward revision of formats and ambitions⁵.

While there was talk at the time of potential “Star Wars”, where the targeting of space assets would change the strategic balance, this was never the case. Defensive programs simply did not work and could not change the main tenets of mutual deterrence. In this context, and despite policy shifts, the nuclear balance has so far remained, and space has continued to enjoy its sanctuary status.

A Changing Picture

But the picture is shifting. Military uses of space systems have changed dramatically over the past 20 years. With Russia’s decline in the 1990s, the Clinton Administration recognized a new strategic environment, one that might allow the United States to become the primary power regulating regional conflicts. This idea of intervening more directly in “major regional conflicts” (Major Theater Wars) had major effects on the very structure of American forces and their mission⁶ and had far-reaching implications for the defense role of space systems. Rather than simply strategic-level intelligence resources, satellites would henceforth become true operational tools capable of assisting fighters in operational theaters.

The first Gulf War in 1990 was a dress rehearsal that quickly demonstrated the shortcomings of the systems that had developed for strategic surveillance. From monitoring moving targets to detecting the launch of short-range theater missiles that were very different from Soviet ICBMs, Cold War capabilities proved to be unsuited to the needs of modern combat. The 1990s saw a massive US investment in new space-based systems designed to meet tactical combat requirements on the ground. The most frequently cited example of this is the satellite-guided ordnance used to a considerable extent in recent conflicts—but the changes also affected all the other functions performed by satellites. These activities, which ensure control of the information chain, quickly became research and development priorities with very high ambitions, sometimes at the cost of considerable delays and astronomical costs overruns. Still, US efforts to upgrade the military space sector have not waned through successive administrations.

Another change factor is the development of a new space sector. A sea change in the mix of players in the aerospace world has led to massive public investment in aerospace and information technologies, and a wave of new companies envisioning new economic opportunities. Known as “New Space”, this movement—again, mainly American—covers both launchers (*Space X*, *Blue Origin* by the tycoons Elon Musk and Jeff Bezos) and satellites (*Planet*, *Black Sky Global*, and others).

While the financial soundness of these projects has yet to be shown, governments are paying close attention to their progress, and hoping to use the results to their own benefit. This is the case in the United States in particular, but now China, Japan, Europe, and other countries are trying to develop a new industrial space sector. Public backing for some of these players has led them to propose increasingly successful projects that will constitute one of the essential resources of tomorrow's space "supply"—and obviously have an impact on the defense side of space activities.

The Shape of Tomorrow's Defense in Space

Military leaders today face a new challenge, due to two factors: the growing role of space systems in conventional conflicts, and the spread of space technologies that eventually will be accessible by a great number of people. All the space powers have learned the lesson of new ways of using outer space for military purposes. And while the Cold War ultimately resulted in a form of moderation in the balance of power in orbit, the new role played by satellites now makes them potential targets, like any other key component of conventional military assets. It is the price of glory, perhaps, but it is also the end of a form of space exceptionalism.

Such is the meaning of the message sent by China in January 2007, with the first destruction of one of its satellites in orbit, demonstrating its new capability to target hostile systems. This event rekindled mistrust at the political and diplomatic level and generated a new form of competition. The American "response" in February 2008, with the destruction of one of its own satellites, obviously did not help ease tensions. The Indian anti-satellite test in March 2019 finally confirmed the gradual "de-sanctuarization" of outer space.

For all the major powers with military space assets, including France, these events sound like a wake-up call. Given the importance of space assets in modern warfare, early destruction can decide the fate of a conflict even before it has taken place. Some might consider the destruction, or even the disruption, of satellites to be one of the least deadly forms of modern conflict, and it would in fact have far-reaching implications for the very functioning of the forces of the targeted country.

The challenges of dealing with such an occurrence are manifold. The first, and probably the most politically and militarily significant, challenge is to know precisely and quickly what exactly is happening to a malfunctioning satellite.

Detecting an orbital problem early enough and being able to attribute its cause accurately is a prerequisite for a modern defense capability. There are no shortcuts. There are many possible events in orbit (direct and indirect attacks, accidental events, breakdowns, etc.) and the ability to characterize such events is the heart of a viable space systems as part of an overall military system (and C4ISR, according to experts). They must be precisely monitored and protected.

Wargames now have a space component. For almost 12 years American strategists have been simulating confrontation situations with the *Schriever Wargame* to simulate the dynamics of a conflict in orbit. The final goal is clear: it is to help in the design of future American military space assets capable of dealing with the threat of attacks—and also, more broadly, with all kinds of risks. In Europe, too, some French manufacturers in 2019 initiated a move in this direction, a first for the old continent.

A detailed knowledge of the space environment and of the behavior of space objects has become a priority for all major military space powers. The task is an ambitious one, and most national surveillance systems provide only partial information on the space environment in the light of these new requirements. The French Defense Space Strategy document published in July 2019⁷ made a priority of sustained investment in this area. Cooperation through the exchange of data, as has been the practice for years with the United States, for example, remains an essential aspect; this will have to be further developed with the aim of forming a virtual community of exchanges through intergovernmental agreements, whether bilateral or more multilateral.

But of course, while situational awareness in space is a vital prerequisite for modern military space activity, it also must lead to the capability to protect oneself, to resist a disruptive event, and even to recover quickly in the event of problems (this is called resilience). The protection of space systems requires technological progress and new operational procedures. This is the thrust of France's new strategy. But beyond that, a country's overall ability to quickly deal with a problem in orbit also depends on its ability to draw on the many different resources now being deployed by a broad array of non-military actors. This is undoubtedly the second challenge for a modern military space.

The proliferation of systems with ever-improving performance can be a genuine operational alternative for military users, offering a greater volume of information, for example, in the field of terrestrial observation. While their performance cannot

rival that of systems specifically developed to meet military requirements, these new resources and their integration into complex information systems creates a new state of affairs that the military world cannot ignore. The main asset of these new systems is their ability to respond to rapidly changing requirements. Combined with other sources of information, the data flows they produce will increasingly be of use to anyone who wishes to interpret a situation, whether in the world of the media, research or, of course, military or intelligence. On the other hand, these means may appear quite intrusive if they offer a source of intelligence to the other side, be it a state or non-state actor. Government support for the development of such systems may thus seem somewhat paradoxical in a defense context. But the point of these open policies lies in their ability to minimize the risks in light of the advantages they offer for defense and security.

Long-Term Adjustments to a Changing Environment

The space environment, like the maritime environment, combines growing industrial and commercial activity with increased demands on anyone entrusted with security and defense. Space is becoming increasingly central to defense missions, while new state and non-state actors add a new level of complexity. As a result, its strategic future is becoming more difficult to understand. This dual dynamic produces a “shear effect” for defense, and largely explains the various national projects to reorganize military space organizations and initiatives (even if not all space powers have plans to create their own “Space Force”, a concept so dear to President Trump’s heart).

Beyond short-term adaptation, the challenge is twofold: first, to make outer space a secure area and enable an appropriate environment for the development of new economic activities, and second, to ensure that this development does not lead to new threats and risks, or call into question the principles of international coexistence that have been the hallmark of international coexistence since the Cold War.

NOTES

La stratégie navale chinoise : un point de vue américain

CHINA'S NAVAL STRATEGY: AN AMERICAN PERSPECTIVE

— *Peter Dombrowski*

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La stratégie de la marine américaine à l’ère de la compétition entre les grandes puissances

U.S. NAVY STRATEGY IN THE ERA OF GREAT POWER COMPETITION

— *Andrew C. Winner, PhD*

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La stratégie navale russe
RUSSIAN NAVAL STRATEGY
— Igor Delanoë

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Northern, Baltic, Black Sea, Pacific, and Caspian Sea fleets.
4. Consortium russe des constructions navales.
Russian Shipbuilding Consortium.
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See “On Approval of the Concept of Foreign Policy of the Russian Federation,” 30/11/2016.

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We should mention the circumnavigation of the world by the new frigate Admiral Gorchkov (Northern Fleet, Project 22350) and its escort group in 2019. The vessel will have covered 35,000 miles in five months, between February 26 and July 24, including an Asia-America Pacific crossing, a first for the post-1991 Russian Navy.

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A modified version of the *Sineva* that joined the navy in 2014.

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“Corvette *Gremyashchy* Will Be Equipped with Hypersonic *Zircon* Missiles,” RIA Novosti, 31/10/2019.

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“The Defense Ministry Is Thinking about Building Two *Borei Ks* with Cruise Missiles,” *Vzgliad*, 20/04/ 2019.

12. Les zones maritimes sont généralement regroupées dans la littérature maritime russe en trois groupes: les zones dites proches (ou БМЗ pour Близкая морская зона), qui comprennent les mers et golfes adjacents au territoire russe; les espaces maritimes éloignés (ДМЗ pour дальняя морская зона), comme la Méditerranée; et l'océan mondial, qui recouvre le reste. On retrouve la notion d'océan mondial dans la littérature anglo-saxonne.

Russian naval literature generally divides maritime areas into three groups: the so-called near sea areas (or БМЗ for Близкая морская зона), which include the seas and gulfs adjacent to Russian territory; the far sea areas (ДМЗ for дальняя морская зона), such as the Mediterranean; and the world ocean, which covers the rest. The notion of the world ocean is found in Anglo-Saxon literature.

13. Actuellement à quai à son port base, le *Kouze* doit subir une IPER avant de revenir au service actif en 2021. Cette modernisation a été compliquée par un sérieux incident qui a endommagé le pont du PA en octobre 2018. «ВМФ рассчитывает получить единственный авианосец после ремонта в 2021 году» [«Les VMF comptent recevoir l'unique porte-avions après son entretien en 2021 »], *Interfax*, 25/06/2019.

Currently berthed at her base port, the *Kouze* must undergo heavy maintenance before returning to active duty in 2021. This modernization was complicated by a serious incident that damaged the PA bridge in October 2018. “ВМФ рассчитывает получить единственный после в 2021 году.” [“The VMF Expects to Receive the Single Aircraft Carrier after Its Maintenance in 2021”], *Interfax*, 25/06/2019.

14. Ce croiseur aura subi une modernisation en profondeur entre 2011 et 2016 au chantier naval *Zvezdochka* (Severodvinsk), puis plus de 2 années de tests avant d'être admis de nouveau au service actif en 2019.

This cruiser underwent a thorough modernization between 2011 and 2016 at the Zvezdochka Shipyard (Severodvinsk), followed by more than two years of tests, before being admitted back into active duty in 2019.

15. Placé en réserve de deuxième catégorie en janvier 2016, le *Moskva* subi depuis octobre 2018 une préparation au cycle technique après avoir fait l'objet d'un entretien régulier. Sa modernisation en profondeur – un temps envisagée – ne semble plus à l'ordre du jour.

Placed in second-category reserve in January 2016, the *Moskva* has been undergoing preparation for the technical cycle since October 2018, after undergoing regular maintenance. Its in-depth modernization—for a time envisaged - no longer seems to be on the agenda.

16. Trois unités sont à différents stades d'un programme de modernisation.

Three units are at different stages of a modernization program.

17. Il était question que les VMF reçoivent d'ici 2020 6 frégates du Projet 22350 et 6 du Projet 11356. Elles en auront reçu respectivement 2 et 3. De même, pour les 6 SNLE, les retards accumulés font glisser leur admission au service actif jusqu'au milieu des années 2020. Pour les SSGN, les retards sont encore plus importants et la dernière unité du lot de 6 SSGN du Projet Yasen envisagés sera livrée après 2025.

The plan was to have six frigates from Project 22350 and six from Project 11356 by 2020. They will have received two and three respectively. Similarly, for the six SSBNs, the accumulated backlogs are dragging their admission to active service to the mid-2020s. For GSMS, the delays are even more significant and the last unit of the envisioned Yasen Project's batch of six GSMS will be delivered after 2025.

18. L'emploi du porte-avions en URSS s'inscrivait dans une logique de verrouillage visant à sanctuariser les zones de déploiement des SNLE, et non pas dans une logique de projection de forces. Le déploiement du *Kouze* en Méditerranée orientale devait être mis à profit pour tester le groupe embarqué composé de MiG-29K/KUB et des Su-33 sur des missions de frappes en Syrie. Toutefois, 2 appareils – un MiG-29KUB et un Su-33 – ont été perdus lors des phases d'appontage.

The use of the aircraft carrier in the USSR was part of a logic of lockdown aimed at sanctuarizing the areas of deployment of SSBNs, and not a logic of force projection. The deployment of the *Kouze* in the eastern Mediterranean was to be used to test the onboard group of MiG-29K/KUB and Su-33 aircraft on strike missions in Syria. However, two aircraft—a MiG-29KUB and a Su-33—were lost during the landing phases.

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This is the case of the escort *Yaroslav Moudriy* (Project 11540), which was deployed to the Caribbean in 2016. “Сторожевой корабль “Ярослав Мудрый” выполнил все в Карибском море” [“Mission Accomplished for *Yaroslav Moudriy* in the Caribbean”], *RIA Novosti*, 02/12/2016.

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— *Edouard Pflimlin*

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Le Royaume-Uni et la puissance maritime

THE UK AND MARITIME POWER — Dr James Bosbotinis

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Fondements de la stratégie navale de l'Inde

THE ESSENTIALS OF INDIA'S NAVAL STRATEGY

— Gurpreet S Khurana

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Le cyber, domaine particulier de la pensée navale

CYBER, A PARTICULAR FIELD

OF NAVAL THOUGHT

— Dr. Nicolas Mazzucchi

1. Données Banque mondiale et Union internationale des télécommunications.
World Bank and International Telecommunication Union data.
2. C'est partiellement cette logique qui explique que le domaine maritime ait vu la mise en service des premiers systèmes d'armes automatisés, tel le système *Aegis* aux États-Unis ; sur celui-ci voir :

It is partly this logic that explains why the maritime domain saw the commissioning of the first automated weapon systems, such as the *Aegis* system in the United States; see:

P. SCHARRE, *Army of None*, New York, Norton, 2018.

3. <http://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx>
4. Eu égard à la problématique de la connectivité cyber, la question de la pertinence du *cloud* se pose bien plus dans le domaine naval que dans les autres domaines, d'où un traitement au plus près du capteur suivant le modèle dit *fog computing*.
With regard to the issue of cyber connectivity, the relevance of the cloud arises much more in the naval domain than in other domains. Hence a processing as close as possible to the sensor according to the so-called fog computing model.
5. Les usines du futur dites, selon l'appellation allemande, « 4.0 » font un usage extensif des données dans la gestion du fonctionnement de l'entité, y compris par le recours à de multiples robots et cobots comme capteurs ou effecteurs.
The so-called factories of the future, or as they are called in German, "4.0", make extensive use of data in managing operations, including through the use of multiple robots and cobots as sensors or effectors.
6. Des précédents existent dans ce domaine, comme ce fut le cas pour le port d'Anvers où un piratage a

permis entre 2011 et 2013 à des narcotrafiquants de camoufler leurs activités :

There are precedents in this respect, as was the case with the port of Antwerp, where hacking allowed drug traffickers to hide their activities between 2011 and 2013: <https://www.lalibre.be/economie/entreprises-startup/comment-anvers-a-ete-pirate-et-s-en-est-sorti-5269e7ea35708def0d93513c>

7. Ces catégories sont bien évidemment poreuses, il est tout à fait possible qu'un pirate œuvrant par appât du gain un jour, soit stipendié par un pays quelconque le lendemain pour conduire des attaques à but géopolitique.
These categories are obviously porous. It is quite possible that a pirate working for profit one day may be called upon the next day by some other country to conduct attacks that have a geopolitical purpose.
8. Le Symphony of the Seas, lancé en 2018, accueille à son bord plus de 8000 personnes.
The Symphony of the Seas, launched in 2018, has more than 8,000 people on board.
9. Cette vision reste néanmoins prospective, le cyberterrorisme n'existant pour l'instant pas :
However, this vision remains prospective, as cyber-terrorism does not yet exist :
N. Mazzucchi, « Le cyberterrorisme à l'épreuve de la réalité », *Cahiers de la sécurité et de la justice*, n°35-36, 09/2016.

L'espace: les défis d'un milieu en mutation

SPACE: THE CHALLENGES OF A CHANGING ENVIRONMENT

— Xavier Pasco

1. Sur l'ensemble de la période, dix-neuf tests dits « d'interception co-orbitale » seront tentés pour détruire des satellites cibles par explosion de proximité à partir d'un satellite intercepteur.
Over the entire period, 19 so-called "co-orbital interception" tests will be attempted to destroy target satellites by close-range detonation from an interceptor satellite.
2. Les systèmes de missiles *Nike-Zeus*, *Nike-Ajax* ou *Safeguard*.
Nike-Zeus, *Nike-Ajax*, or *Safeguard* missile systems.
3. Il faut noter à ce sujet l'accord conclu en 1972 par le traité de limitation des armements SALT 1 qui contraindra le nombre autorisé de systèmes de protection anti-missiles dans chacun des deux pays, manifestant une volonté mutuelle identique de renforcer les mécanismes de la dissuasion.
It should be noted in this respect that the agreement concluded in 1972 by the SALT 1 arms control treaty, which limited the allowed number of anti-missile protection systems in each of the two countries, is a sign of the same mutual desire to strengthen deterrence mechanisms.
4. Les documents les plus éclairants sur ce point ont été reproduits en 2009 dans l'ouvrage dirigé par :
The most enlightening documents on this issue were

published in 2009 in the book edited by:

William B. ALLISTER, *Foreign Relations of the United States, 1969-1976, vol. E-3, Documents on Global Issues, 1973-1976*, United States Government Printing Office, Washington D.C., 12/2009.

5. George Bush Senior passera alors au système dit *Global Protection Against Limited Strikes* (GPALS) dont les ambitions défensives seront régulièrement réduites, conduisant son successeur, le président démocrate Bill Clinton, à soutenir un programme dit de *Theater Missile Defense* (TMD), essentiellement utilisable pour protéger des théâtres d'opération.
President George W. Bush then moved on to the so-called Global Protection Against Limited Strikes (GPALS) system, whose defensive ambitions were gradually scaled down. As a result, his Democratic successor, President Clinton, supported the Theater Missile Defense program, which was mainly limited to theater defense.
6. C'est l'époque de la *Bottom-Up Review* (revue de fond en comble) lancée par Les Aspin, alors Secrétaire d'État à la défense de Bill Clinton.
This is when President Clinton's Defense Secretary Les Aspin launched the Bottom-Up Review.
7. *Stratégie spatiale de défense* [*National Space Strategy*], <https://www.defense.gouv.fr/actualites/articles/florence-parly-devoile-la-strategie-spatiale-francaise-de-defense>

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