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KEEPING OTHERS OUT – THE MODERN SYSTEM OF ANTI-ACCESS/AREA DENIAL WEAPONS

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ABSTRACT: Anti-access/area-denial systems and operational concepts or strategies are the products of the technological evolution of weapons. However, some of them already existed before, and the advent of modern, long range and sophisticated missiles became real game changers. With these weapons put in a well-planned system, a credible deterrence and defence potential can be provided, or the restriction of the use of domains like air, sea, or land of other countries. This article presents these weapons and the most developed of such systems.

KEYWORDS: anti-access/area-denial, A2/AD, missiles, operational concept

Since the first warships and military aircraft appeared on the horizon, coastal and air defence have become priority tasks of militaries; of course, the level of it varied throughout the history. Take the case of Archimedes: many of his inventions served the coastal defence of Syracuse. Although we can say that until the invention of gunpowder, defending a coast was not an easy task, and after it for hundreds of years, it was very restricted as the most effective reconnaissance were the human eye and a good telescope, while countermeasures included forts and some short range smoothbore cannons. The situation turned by the late 19th and early 20th centuries, when many of the basic means were on hand, e.g. long range and accurate cannons, naval mines, torpedoes, and submarines. During WWII these were supplemented by radar as a modern reconnaissance device, and guided weapons, including the very first smart bombs and cruise missiles. Air defence has much shorter but fast-paced history, as it started as shots fired from rifles toward the sky during WWI, then evolved into integrated air defence with radar guided guns, early surface-to-air missiles (SAMs) and fighter interceptors in WWII, and into the highly effective radar guided SAMs of the 1950s and 1960s.

WEAPONS OF CHOICE

For nowadays, the above-mentioned inventions have become highly sophisticated weapon systems, with a range and accuracy that can change the balance of power of a whole region. In addition, electronic and cyber warfare capabilities support these weapons, which provide soft and non-kinetic, otherwise highly disrupting means, while such kinetic weapons like anti-satellite missiles (ASAT) can devastate modern C4ISR¹ systems.

¹ Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance

If we take air defence missiles, we can differentiate on their role, since short range and medium range missiles generally serve as air defence for the troops, while long range missiles, many of which are capable to intercept short to medium range ballistic missiles, can provide theatre defence. Russia has always been a world leader of such systems as they have faced NATO air superiority. Systems like the Russian S-300 are among the most appreciated SAM systems, some types of its missiles have an estimated range between 150–200 km against aircraft, while the newer S-400 can reach 400 km. Similar Chinese system is the HQ-9, its maximum estimated range can be 200 km.² This means a considerable defence capability. On the other hand such systems can enclose areas from others, which, depending on their ranges, can mean a restrictive use of such missiles against the airspace of other countries. These ranges are also sufficient to attack high value support assets, which are usually orbiting outside the operational zone of combat aircraft, in so far stand-off range. These aircraft are the base of Western type air operations, however, their number is very limited. The above missile systems can complicate the successful operations of conventional combat aircraft (N.B. not even stealth planes are totally invisible for radars).

The other group of such weapons is the naval systems, like mines, anti-ship missiles (ASM) and submarines. Mines are the cheapest and most easily deployable, and also the most dangerous assets. The US 2010 Naval Operations Concept considered them as the most widely used anti-access weapon system in the future.³ True, mines are a very heterogeneous group, they can be deployed by ships (almost any type), submarines, or from the air. There are defensive and offensive mine laying techniques, the former means the defence of own shores against the enemy navy, while the goal of the latter is the denial of the use of the enemy's shores. For example, the combined use of submarines and offensive aerial mine laying made it very hard for the Japanese to reach their main islands from the occupied territories, and by mid-1945 the marine traffic was effectively stalled even among the main islands. In 1972 US aircraft started intensive mine laying on the approaches to the North Vietnamese ports and inland waterways, which resulted in a devastating effect on the logistics of Communist forces.⁴ Iran used mines extensively during the tanker war, damaging many ships, including the supertanker *Bridgeton* and the frigate *USS Samuel B. Roberts*, while in the Gulf War Iraqi mines damaged the amphibious ship *USS Tripoli* and the cruiser *USS Princeton*.⁵

Anti-ship missiles are also very efficient weapons, they can be launched from fixed and mobile platforms from the shores, surface ships, submarines and aircraft. Of course, these systems need adequate reconnaissance and targeting capabilities, for example over-the-horizon radars.⁶ They were used successfully in the near past: in 2006 Hezbollah used an anti-ship missile against the Israeli corvette *Hanit*; in 2015 ISIS terrorists launched one against an Egyptian warship; in 2016 Houthi rebels in Yemen heavily damaged an UAE ship and later used missiles against US warships, but in the latter case unsuccessfully.

² Foss, Ch. F. and O'Halloran, J. C. (eds.) *IHS Jane's Land Warfare Platforms: Artillery & Air Defence 2012–2013*. Coulsdon: IHS Jane's, IHS Global Ltd., 2012. 427–428, 509–520.

³ *Naval Operations Concept 2010: implementing the maritime strategy*. Washington D. C.: Department of Navy, 2010. 56.

⁴ Miller, D. and Miller, Ch. *Modern Naval Warfare*. New York: Crescent Books, 1986. 200.

⁵ Russel, R. L. "Future Gulf War: Arab and American Forces against Iranian Capabilities". *Joint Force Quarterly* 55/4. 2009. 39.

⁶ Clark, B. *Commanding the Seas: A Plan to Reinvigorate U.S. Navy surface warfare*. Washington: Center for Strategic and Budgetary Assessments, 2014. 5, 15.

The high end of anti-ship missiles is the anti-ship ballistic missile (ASBM). These weapons are very cost effective, because while an average ASM is around USD 1–3 million and an ASBM is USD 6–10 million, a modern guided missile destroyer of USD 1–2 billion can be sunk by one or two such missiles.⁷ So, a credible and effective asymmetric naval defence capability can be developed easily and at low cost, in contrast to a huge, capable, and very expensive open seas navy.

Submarines can be divided into two great groups: nuclear powered and diesel-electric. Nuclear powered subs are the weapons of great powers, like the US, Russia, UK, France, China and India, while diesel-electric subs became widespread as they are more affordable. They are usually used for coastal defence, while they have the capability for open seas operations as the German Navy's Type-212 submarine proved it during a 2013 exercise, when it crossed the Atlantic underwater in 18 days and practiced attacks on a US carrier group, successfully.⁸ Submarines can be used to attrite enemy surface combatants or interdict the sea lines of communications (SLOCs), minelaying or either as a strike platform with land attack missiles against key installations inland.

A2/AD

These weapons and the doctrines and strategies written on them are called anti-access/area-denial (A2/AD). According to Air-Sea Battle doctrine, anti-access means: "*Action intended to slow deployment of friendly forces into a theatre or cause forces to operate from distances farther from the locus of conflict than they would otherwise prefer. A2 affects movement to a theatre.*" While, area-denial is: "*Action intended to impede friendly operations within areas where an adversary cannot or will not prevent access. AD affects manoeuvre within a theatre.*"⁹ These capabilities invoked a basic fear in the US military as the widespread use of such weapons deteriorates power projection capabilities, hence the possibility of an armed intervention. Also, world trade and freedom of navigation can suffer serious damage if strategic waterways and chokepoints are threatened by states or non-state actors. According to Naval Operations Concept 2010, there are four great threats that the US Navy has to face in the future: 1. the increasingly capable blue water adversaries; 2. theatre anti-access weapons; 3. area denial weapons in the littorals; 4. technologies that disrupt space and cyberspace capabilities.¹⁰ China and Russia own all of these capabilities, however regional competitors like North Korea or Iran can also develop at least 2-3 of them, and as we can see from the above examples and current trends, even terrorist groups or insurgents can own some littoral warfare capabilities.

The situation is similar in the air. While high-end weapon systems like S-400 and HQ-9 are capable of providing theatre denial capabilities, even smaller systems can provide effective denial against not so advanced air forces. For example, advanced MANPADS or short and medium range SAMs forced the Ukrainian Air Force to seriously restrict the air support of their troops in Eastern Ukraine.

⁷ Clark. 18.

⁸ "U 32 gegen US-Flugzeugträgerverband". *Europäische Sicherheit & Technik* 61/3. 2013. 84.

⁹ Air-Sea Battle: Service Collaboration to Address Anti-Access & Area Denial Challenges. Air-Sea Battle Office, 2013. <https://digital-commons.usnwc.edu/csf/1/. 2>.

¹⁰ Naval Operations Concept 2010. 53.

US Secretary of Defence Hagel said: “...*We are entering an era where American dominance on the seas, in the skies, and in space – not to mention cyberspace – can no longer be taken for granted.*”¹¹ The problem was broken down into four major fields: 1. prepositioned US bases are vulnerable to attacks; 2. major surface vessels are easy to detect, track and engage from long range; 3. non-stealthy aircraft are vulnerable to modern integrated air defence; 4. space is no longer a sanctuary.¹² This led the Pentagon to create the Air-Sea Battle concept to assure the freedom of action in restricted areas and the ability to counter hostile A2/AD forces. This paper presents three countries, which developed highly effective A2/AD capabilities and are also the main subjects of US concern, namely Russia, Iran and China.

Russia

Russia is one of the countries with the longest history in this kind of warfare. After 1945, then Soviet Union, they faced the West. In Europe their Western enemies were stronger on the seas and in the air than on the ground, and the result of a ground war would have been greatly dependent on US reinforcements and supplies through the Atlantic. Meanwhile the US could have attacked the Soviet Union from European and Asian bases, from the US across the Arctic, and by carrier-borne aircraft from the Barents Sea and Arctic Ocean. So, Moscow faced two problems, one, to defend their infrastructure from conventional and nuclear air raids, and two, to cut the SLOCs of the NATO in the Atlantic.

Starting with the latter, this was a classic anti-access task. Because of the geographic location of the Soviet Union and the clear naval superiority of NATO, it was obvious that reaching the Atlantic Ocean was safest and most possible invisibly, so the Soviet doctrine was effectively an updated version of WWII German Navy doctrine, using submarines against NATO convoys.¹³ The Soviets planned a huge submarine force with 1,200 new hulls between 1950 and 1965, but this proved to be too grandiose and “only” 350 new submarines were built. With the technological improvement, nuclear submarines also appeared and beyond torpedoes, many of them were equipped with ASMs, with conventional and nuclear warheads. By the mid-1980s 284 nuclear and diesel-electric attack and guided missile subs could have been used in the Third Atlantic Battle.¹⁴ This force was supplemented by an air component, after the Soviets were able to produce adequate aircraft, including bombers (Tu-16, Tu-22M, Tu-95) with ASMs. In both cases, aircraft and submarines would have launched their missiles (including nuclear ones) en masse, hoping that the convoys’ or carrier groups’ air defence cannot cope with such salvos and some missiles break through, causing critical damage. Therefore, NATO navies developed layered defence, with the first line of AEW&C-supported, carrier-based interceptors, the second with SAMs, and the final with point defence weapons.

The other task was also assigned to naval and air elements, since the mission was to keep out enemy surface, submarine and air units from the Soviet coastlines. Again, submarines had a crucial role in the interception and destruction of US carrier groups. The use of US

¹¹ Martinage, R. *Toward a new strategy offset: Exploiting U.S. long-term advantages to restore U.S. global power projection capability.* Washington D. C.: Center for Strategic and Budgetary Assessments, 2014. 23.

¹² Martinage. 23.

¹³ Martin, L. *NATO and the Defense of the West.* New York: Holt and Winston, 1985. 57–59.

¹⁴ Miller and Miller. 32, 112.

carriers in the northern wing was a possibility after WWII, but with the evolution of Soviet anti-ship missiles, which were deployed on the shores, and technically new ship and aircraft, this possibility turned into a suicide mission, however in the late Cold War these plans were revived.¹⁵ Anti-submarine warfare also became crucial, because with the advent of SSBNs,¹⁶ NATO subs appeared on the Barents Sea to track and, in case of war, destroy Soviet ballistic missile submarines from the point of sail out. For this, Moscow kept strong sea and air ASW¹⁷ groups on alert to create safe zones for their own submarines and also to prevent NATO subs from launching land attack cruise missiles against Soviet targets.

Air defence has always had a distinctive reputation in Russia, lifting it to a service equivalent branch of the armed forces. Because of the vast territory of the Soviet Union and even Russia, the country is hard to be covered entirely. But the fast evolution of Soviet SAMs, supported by interceptors, made the Soviet airspace more and more dangerous to reconnaissance aircraft. Such systems caused hard times for the US aircraft over North Vietnam, and decimated the Israeli Air Force on the Sinai in 1973. So, the survivability of conventional strike aircraft was very far from assured, this is why electronic warfare was strengthened, low flying profile was developed, and one of the results of these trends was the creation of stealth aircraft.

By nowadays, Russian air defence is on the top again and created various A2/AD zones around the strategic territories like Moscow, St. Petersburg, the Kaliningrad exclave, the Kola, Kamchatka and Crimean Peninsulas, and the Arctic region, just naming a few. Russians provide layered defence to balance the advantages and disadvantages of these systems, therefore they use the S-300 and S-400 for theatre defence, while medium range Buk-M2/M3 and short range Pantsir-S1 are used to defend the former complexes. The ground-based assets are also supported by Su-27/30/35 and MiG-29/31 fighter interceptors to cover the gaps. Russian experts analysed the wars of the recent past fought by the West, and created their air defence systems upon these lessons learned. The air defence got new radars with long range reconnaissance capability, passive detection and tracking, and automatized C2 systems are also emphasized with the goal to undermine the combat effectiveness of the yet few US stealth and many vintage combat aircraft, and to have the capability to destroy high value assets like AWACS, JSTARS, U-2, Global Hawk, and tankers, and also to intercept cruise or longer range tactical missiles. An S-300V4 SAM can track 200 targets and attack 24 simultaneously, while the newest S-500 can reach the lower space and orbiting satellites.¹⁸ The clearly defence capabilities can be hardly condemned, but these systems can deny airspace to other countries. Good examples are Crimea or Kaliningrad as A2/AD bastions, or after the shooting down of the Russian Su-24 by Turkey, Moscow deployed the S-400 systems in Latakia, Syria, which can cover the whole airspaces of Syria, Lebanon, Israel and Cyprus, and cover a huge territory of Turkey, Jordan and the Eastern Mediterranean. Russia's current advanced long range SAM complex inventory consists of at least 400 S-300PM/PS, 20+ S-300V and 304 S-400 launchers.¹⁹

Russia acquired many new multi-role fighters like the Su-30 and Su-35. The latter seems to be a very formidable aircraft with fielded R-37M (280 km) air-to-air missiles, posing a

¹⁵ Martin. 64.

¹⁶ Ship Submersible Nuclear Ballistic missile – Ballistic missile carrier, nuclear powered submarine

¹⁷ Anti-Submarine Warfare

¹⁸ Mladenov, A. "Access denied: Fortifying Putin's Skies". *Air Forces Monthly* 334/1. 2016. 70–73., 77.

¹⁹ The Military Balance 2015. London: The International Institute for Strategic Studies, 2019. 196–202.

great threat to conventional aircraft and high value mission support assets.²⁰ Future Su-57 will provide a stealth platform, which can be used in more offensive roles, like precision strikes on high value ground, sea or airborne targets.

Among aircraft, the Tu-22M bomber fleet should be mentioned, which is armed with Kh-22 anti-ship missiles. The Tu-22M3 can carry three missiles, with the combat range of 4,500 km, while the missiles have a further 270-550 km range and claimed speed of Mach 4.5.²¹ Besides lauded great ambitions, the Russian Navy has probably more an A2/AD role, than a traditional blue water offensive capability. It can be the extension of land based A2/AD forces and can provide credible defence close to their shores or in the Baltic and Black Seas or maybe as far as the Mediterranean.²² This means a layered defence, where the first line is composed of nuclear submarines (attack and guided missile), major surface vessels, and aircraft out to 1,000 nautical miles. Much closer to the Russian coast, smaller missile-armed surface combatants and diesel-electric submarines would take up the fight, supported by shore-based anti-ship missiles and naval minefields. The Russians also create strategic bastions, which are nothing else, but safe places with strong ASW forces and deployed sensor systems, where their own SSBNs can patrol in relative safety.²³

Although the vast sub force of the Cold War is the past, the Putin era brought slow but steady development, including brand new submarines. The new Yasen-class guided missile submarine is a very potent one. It has 11,800–13,800 t displacement, and strong missile armament, including 32 Kalibr anti-ship or land attack cruise missiles²⁴ and P-800 ASMs in VLS tubes, beyond the traditional torpedoes. According to US Naval Intelligence, the Yasen-class is quieter than the Improved Los Angeles-class.²⁵ The vintage, but remaining Akula-class attack submarines also get the Kalibr missiles during their overhaul. Such missiles were used effectively from diesel-electric Kilo-class subs against targets in Syria in December 2015.²⁶ The successor of the Kilo-class is the 2,700 t Lada-class, which is quieter, and equipped with air independent propulsion, which increases its submerged endurance to 45 days, with a cruising range of 13,500 km. The class is armed with up to 18 torpedoes and Kalibr missiles.²⁷ NATO naval forces have experienced the highest Russian sub activity since the Cold War, and it is said that Russia executed a technology leap in terms of new capabilities and operating close to NATO ports.²⁸

In the field of ASMs Russia was always a leading nation. One of the current examples of it is the 3M-55 Onyx (P-800, Brahmos) with a 300 km range (export) at a Mach 2.5 speed

²⁰ The Military Balance 2015. London: The International Institute for Strategic Studies, 2015. 162.

²¹ Kopp, C. "Soviet/Russian Cruise Missiles: technical report APA-TR-2009-0805". <http://www.ousairpower.net/APA-Rus-Cruise-Missiles.html>, Accessed on 9 January 2017.

²² Galeotti, M. „Red Alert: Russian military underpins foreign policy". *Jane's Intelligence Review* 28/7. 2016. 14.

²³ The Russian Navy. Suitland: Office of Naval Intelligence, 2015. X.

²⁴ The Russian Navy. 18.

²⁵ Majumdar, D. "U.S. Navy Impressed with New Russian Attack Boat". 28 October 2014. <https://news.usni.org/2014/10/28/u-s-navy-impressed-new-russian-attack-boat>, Accessed on 9 January 2017.

²⁶ Novichkov, N. and Felstead, P. "Russian Project 971 submarines to be armed with Kalibr missiles". *Jane's Defence Weekly*, 24 March 2016. <http://www.janes.com/article/59030/russian-project-971-submarines-to-be-armed-with-kalibr-missiles>, Accessed on 14 December 2016.

²⁷ "Project 677 Lada Class / Project 1650 Amur Class Submarines". <http://www.naval-technology.com/projects/project-677-lada-class-project-1650-amur-class-submarines/>, Accessed on 9 January 2017.

²⁸ De Larrinaga, N. "Russian submarine activity topping Cold War levels". *Jane's Defence Weekly*, 10 February 2016. 8. <http://www.janes.com/article/57650/russian-submarine-activity-topping-cold-war-levels>, Accessed on 7 January 2017.

and the capability of evasive manoeuvres. It can be deployed on surface ships and the Yasen-class submarines, while its coastal defence variant is the K-300 Bastion, and it can be carried by Su-30/33 fighters too. The Kalibr/Klub cruise missile has anti-ship (3M-54), land attack (3M-14) and anti-submarine (91R) versions, it can be deployed on surface ships, submarines, aircraft and shore-based batteries. As its predecessors, it would be launched in salvos and multiple missiles can attack the same target from various directions to overwhelm enemy air defence. The land attack export version has a 450 kg warhead and the range of 275 km, but the domestic type may have multiple times the range up to 2,000+km. The anti-ship variant (export) has a 275 km range, and during the terminal approach it manoeuvres and accelerates to supersonic speed.²⁹

As a quest for two strategic bastions, Moscow has built up considerable A2/AD capability in the Kaliningrad exclave and the Crimea, being able to influence large parts of the Baltic and Black seas. Russia deployed shore-based missiles to the Kaliningrad exclave (Bastion-P, range 300 km; Kh-35 Bal, 260 km; ASMs, S-400 SAMs, 400 km; and Iskander tactical ballistic missiles),³⁰ which can provide A2/AD ability in the eastern Baltic Sea, therefore ranging to the Swedish coast they are able to deny access to the ports of the Baltic states, Finland, and the main ports of Poland. An S-400's range covers half of the airspace of Poland and Latvia, whole Lithuania, a huge territory of the Baltic Sea, and reaches some offshore islands of Sweden. In Crimea, Bastion-P, Bal, S-300 and -400 systems were deployed, which can reach the coasts of Rumania and Turkey, and can totally close the access of Ukraine to the sea, or NATO's naval access to the Caucasus.³¹ Russia used effectively her A2/AD capabilities against Ukraine after the seizure of Crimea.³² Both A2/AD bastions are accompanied with naval forces and modern fighter bombers, strengthening the layered defence.³³

Finally, Russia has one of the most advanced electronic and cyber warfare capabilities in the world, which is a strong non-kinetic element of the A2/AD system. They tried to create a general system to neutralize the advanced technology of the West. This includes for example the disruption of operational support capabilities like the GPS, which is not only crucial for navigation, but for targeting, too. EW systems were used to paralyze Ukrainian communication capabilities.³⁴ It was also used against the USS Donald Cook in the Black Sea in April 2014, by a Su-24 fighter bomber with claimed success.³⁵ In Syria, alleged

²⁹ The Russian Navy. 34–36.

³⁰ Sukhankin, S. „David vs. Goliath: Kaliningrad Oblast as Russia's A2/AD 'Bubble'". *Scandinavian Journal of Military Studies* 2/1. 2019. 95–110. DOI: <http://doi.org/10.31374/sjms.20>

³¹ The Military Balance 2019. 172.

³² Lokshin, J. "Russia's Anti-Access Area Denial". July 2016. <https://missiledefenseadvocacy.org/missile-threat-and-proliferation/todays-missile-threat/russia/russia-anti-access-area-denial/>, Accessed on 11 February 2020.

³³ Ryall, J., Dominguez, G. and Gibson, N. "Russia deploys Bal and Bastion-P missile systems to disputed Kuril Islands, says report". *Jane* 360, 23 November 2016. <http://www.janes.com/article/65714/russia-deploys-bal-and-bastion-p-missile-systems-to-disputed-kuril-islands-says-report>, Accessed on 7 January 2017.

³⁴ Freedberg, S. J. Jr. "Red Electrons: Army Rapid Capabilities Office Fights Russian GPS Jamming, Cyber, EW". *Breaking Defense*. 22 November 2016. <http://breakingdefense.com/2016/11/red-electrons-army-rapid-capabilities-office-fights-russian-gps-jamming-cyber-ew/>, Accessed on 7 January 2017.

³⁵ "AEGIS Fail in Black SEA, Ruskies Burn down USS Donald 'Duck'". 13 November 2014. <http://www.veterans today.com/2014/11/13/aegis-fail-in-black-sea-ruskies-burn-down-uss-donald-duck/>, Accessed on 7 January 2017.

Russian EW is very active even against US forces, jamming radars and GPS signals, shutting down communications, and operating against drones successfully.³⁶

Iran

During the Iran-Iraq war, both sides attacked the oil industry of each other, since this is the leading industry of the region, and the produced oil is pre-eminently transported via tanker ships from the Persian Gulf. This was Iran's main advantage, because the gate of the Gulf, the Strait of Hormuz was controlled by them from three sides. Although the Iranian Navy inherited considerable equipment from the Shah, they quickly ran out of spare parts after the war broke out, yet it was enough to push Iraqi Navy back into their ports. To compensate for the required, but definitely inadequate naval power and to continue the attack on marine traffic,³⁷ which served the Iraqi war machine, Tehran turned to simple and cost effective techniques, and in 1985 the IRGCN³⁸ was established as an irregular naval force. Speedboats with RPGs, heavy machine guns, autocannons, naval mines, and the newly acquired Chinese made HY-2 anti-ship missiles were used. Speedboats were successful with swarming tactics against lone freighters, however after the US agreed to reflag the Kuwaiti tankers and provided armed escort for the convoys, anti-ship missiles and mines became the primary weapons. Iran deployed ASMs into the strait and to the occupied Faw Peninsula, attacked the Kuwaiti ports from the latter location, and also laid mines on the main routes of ships, which resulted in the heavy damage of the Bridgeton tanker and other commercial vessels, and later the USS Samuel B. Roberts frigate. In retaliation, the US Navy attacked Iranian oil drilling platforms in the Gulf, which were used as stationing and supply bases of the IRGCN. These operations were the Nimble Archer in 1987 and the Praying Mantis in 1988, which halted the effective Iranian naval operations.

On the other hand, Tehran knew that in spite of its inferior forces and defeats, Iran had many successes in naval warfare, so if they improved skills, they could expect more successes in future conflicts.^{39 40} This became an anti-access/area denial strategy, the goal of which is to close the strait in case of conflict, which means both deterrence and because of the heavy dependence on Gulf oil, an economic weapon. Although they are still not in a condition to fight conventional battles against the US Navy, but asymmetric tactics, including hit-and-run and raiding, plus mass assaults and missile salvos in enclosed waters, provide some space for success.⁴¹ To ease operating, Tehran divided the areas of responsibility of the IRIN⁴² and IRGCN. In effect IRIN has the major combatants in the Caspian Sea

³⁶ Varfolomeeva, A. „Signaling strength: Russia's real Syria success is electronic warfare against the US". <https://thedefensepost.com/2018/05/01/russia-syria-electronic-warfare/>, Accessed on 11 February 2020.

³⁷ After Iraqi were cut off, Baghdad used the tanker ships of the Gulf Arabic states to transport oil, who otherwise supported Iraq's war efforts against the Shiite Iran.

³⁸ Iranian Revolutionary Guard Corps Navy

³⁹ Haghshenass, F. Iran's Asymmetric Naval Warfare. Washington: Washington Institute for Near East Policy, 2008. 6.

⁴⁰ Hilburn, M. "Asymmetric Strategy: Growing Iranian Navy relies on 'unbalanced warfare' tactics". *Sea Power* 49/12. 2006. 14–17.

⁴¹ Ward, S. R. *Immortal: A military history of Iran and its armed forces*. Washington D. C.: Georgetown University Press, 2009. 315–316.

⁴² Islamic Republic of Iran Navy.

and the Gulf of Oman, while IRGCN got the Persian Gulf, where their smaller vessels are more effective in the shallow and enclosed waters.⁴³

They created a decentralized system to protect their forces from concentrated air attacks and to preserve their operational capabilities,⁴⁴ and if necessary, to act on their own with minimal logistic demands.⁴⁵ Dedicated units, such as IRGCN, get high quality training and according to US and British naval personnel, the Iranian forces seem to be well trained with good quality weaponry.⁴⁶ Despite the relatively simple and many times obsolete weapons of the Iran-Iraq war, by today the Navy has gone through considerable improvement. They bought advanced ASMs, including the Chinese C-701, C-704, C-802, and the vintage HY-2, which are also copied, improved, and produced domestically. Beyond shore-based static and mobile launchers, smaller and major surface combatants and fighter jets are also armed with these missiles. Tehran procured a large number of fast attack crafts with missile weaponry. IRIN acquired three Kilo-class diesel-electric submarines, too, from Russia, and the production of midget submarines is ongoing in Iran. According to a 2019 US estimate, Iran has 5,000 naval mines. Iran also developed the Khalij Fars and Hormuz 1/2 anti-ship ballistic missiles with a 300 km range.⁴⁷

The IRGCN has 20,000 seamen, including 5,000 marines, and has an inventory of more than 130 coastal combatant craft and probably hundreds of inshore miscellaneous, but combat capable boats of which 56 are ASM equipped, and also owns shore-based batteries. IRIN has 18,000 sailors, three Kilo-class diesel-electric and 18 midget submarines with torpedo armament, and at least 60 coastal combatant craft with half of them ASM equipped, and further ASM coastal defence batteries.⁴⁸

Despite the obsolete air defence capabilities of Iran, including fighters and SAMs, the recent past brought some important news. One of the most important developments is the long desired S-300 system which was sold by Russia; not only can it protect strategic Iranian facilities (such as nuclear reactors), but can also provide an air defence umbrella above the strait, which would significantly complicate effective air strikes against shore- or inland-based anti-ship batteries. In 2016 Iran acquired four battalions (32) of S-300PMU2.⁴⁹ With the UN arms sanctions against Iran expiring in 2020, Tehran probably seeks purchase of modern Russian and Chinese weapon systems, including surface-to-air and surface-to-surface missiles, and modern fighter jets, such as Su-30/35, J-10 or FC-1.

Iran knows that victory against US and allied forces is a remote possibility, therefore their primary goal is the attrition and exhaustion of enemy forces to a point, where casualties become unacceptable. Their doctrine calls for joint operations, where the different services launch attack with different weapons at the same time, for example ASMs, fast attack craft,

⁴³ Himes, J. "Iran's Two Navies: a maturing maritime strategy". Institute for the Study of War. 2011. 12. www.jstor.org/stable/resrep07900, Accessed on 7 January 2017.

⁴⁴ Iran's Naval Forces. Suitland: The Office of Naval Intelligence, 2009. 7–8.

⁴⁵ Haghshenass. 19–20.

⁴⁶ Ripley, T. "Gulf of distrust: Naval stand-offs and the Persian Gulf". *Jane's Intelligence Review* 20/3. 2008. 10.

⁴⁷ Iran Military Power: ensuring regime survival and securing regional dominance. Washington D.C.: Defence Intelligence Agency, 2019. 32, 56.

⁴⁸ The Military Balance 2019. 341–342.

⁴⁹ Binnie, J. "Iranian S-300 deliveries completed". <http://www.janes.com/article/64615/iranian-s-300-deliveries-completed>, Accessed on 7 January 2017.

submarines and UCAVs.⁵⁰ Their aim is to overwhelm the enemy defence with missile salvos and coordinated surface, undersea and air attacks, which would be a hard task for even the very advanced Aegis system to deal with, further the ranges of the Gulf is relatively short and there would be little time for effective countermeasures. Meanwhile marine traffic can be denied by mines on the shipping routes, and by missiles.⁵¹ Although this system is not as advanced (as we will see) as that of the Chinese, but very effective in its own space and this was confirmed by the Americans themselves. In 2002 this kind of clash was simulated on Exercise Millennium Challenge '02, where 16 US ships, including an aircraft carrier and two amphibious assault ships „sank” within minutes.⁵²

China

During the Cold War, China did not have a considerable naval capability compared to the US, Soviet, or Japanese forces in the region, as the People Liberation Army Navy (PLAN) were held solely for coastal defence. The situation changed significantly after the 1995–96 Taiwan Strait Crisis and led to the creation of the A2/AD system. The Chinese part lacked the means to give a considerable answer to the US challenge, but left the painful feeling of an offense against her sovereignty. Although PLAN has improved a lot, their blue water force does not match the US forces so far, and probably will not do in the coming years despite their spectacular achievements.

These factors forced China to turn to alternative methods to create a strong defence posture and deny the immediate and for now extended sea territories. However, this umbrella can be used not only to defend mainland China, but also to enclose areas where the PLA can operate in the future, like Taiwan and the South China Sea, creating a safe space for own operations with the decreased chance of a low-cost foreign intervention. To execute this strategy China developed a three-layer defence to keep out the US forces from Chinese shores. The first one is composed of submarines and ASBMs at 970–1,800 km from the Chinese coasts. The second line consists of submarines and combat aircraft at 480–970 km. In the third line, the joint force of aircraft, submarines, plus all the surface combatants and shore-based ASMs would take the fight. This is also called ‘non-contact warfare’ which depends on long range precision strike weapons.⁵³

China develops and produces many types of ASMs, which are mounted on aircraft, ships, submarines and shore-based launchers. One of the newest is the YJ-18 supersonic cruise missile with a 537 km range, similar to the Russian Kalibr with the capability of supersonic speed on the final approach phase. The DF-21D ASBM is developed to provide precision attack capability on the Western Pacific against enemy ships out to 1,500 km range. The DF-21D is equipped with a manoeuvrable warhead, and its accuracy is enough to hit major surface vessels. But the successor is already coming with the estimated extended range of

⁵⁰ Cordesman, A. H. and Seitz, A. C. “Gulf Threats, Risks and Vulnerabilities: Terrorism and Asymmetric Warfare”. Center for Strategic and International Studies, Washington D.C. 27 August 2009. 24. https://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/090827_gulf_terror_assym.pdf, Accessed on 7 January 2017.

⁵¹ Gunzinger, M. and Dougherty, Ch. *Outside-In: Operating from Range to Defeat Iran’s Anti-Access and Area-Denial Threats*. Washington: Center for Strategic and Budgetary Assessments; 2011. 47–18.

⁵² Borger, J. “Wake-up call”. *The Guardian*, 6 September 2002. <http://www.guardian.co.uk/world/2002/sep/06/usa.iraq>, Accessed on 7 January 2017.

⁵³ The PLA Navy. Suitland: Office of Naval Intelligence, 2015. 8.

4,000 km, this will be the DF-26. China also invests a lot of money in over-the-horizon-radars to get proper reconnaissance, tracking, and targeting capability to exploit the maximum range of the missiles because in this field they still have difficulties.⁵⁴ According to Military Balance, in 2019 China had 30 DF-21D ASBMs, 72 YJ-62s, and 54 CJ-10 cruise missile launchers on the ground. The newer Type-052Ds and -055s get the YJ-18, which will be also fielded on various Type-039 class submarines, while the Type-091 and -093 nuclear attack subs currently use the vintage YJ-82, and the Kilo-class uses the Klub.⁵⁵

The vast, but obsolete submarine force of the Cold War has been swapped for a more modern and increasingly capable fleet. The current tactical fleet consists of three Type-091, two Type-093 and four Type-093A nuclear attack submarines, eight obsolete Ming, twelve Kilo, twelve Type-039G, four Type-039A and twelve Type-039B⁵⁶ modern diesel-electric subs. Apart from ASMs and torpedoes, submarines can carry and lay mines silently. For this China owns approximately 50,000 mines, including obsolete moored mines and very advanced rocket-propelled ones, too.⁵⁷

Although the technological level of Chinese subs is definitely inferior to the US, Western or Russian designs, it would be a great mistake to underestimate them. Their stalking capability was proved by a Type-039G diesel-electric submarine in 2006, which closed in on the USS Kitty Hawk carrier group within 5-9 nautical miles undetected, well within firing range, and emerged to the surface. In 2015, the USS Ronald Reagan carrier group was shadowed by a Chinese sub and reportedly it conducted a simulated missile strike on the carrier.⁵⁸

While China has serious disadvantages and capability gaps in the field of anti-submarine warfare, it takes steps to counter the enemy sub threat to the shores. For this reason, an early warning, surveillance, and targeting system is developed to detect the enemy surface ships and submarines. This system includes land-based over-the-horizon-radars, electro-optical and radar satellites, and seabed sonars.⁵⁹ The latter is called 'Underwater Great Wall' project, which is similar to the US SOSUS, and beyond the above mentioned assets, it would be supported by towed-array sonars, unmanned underwater vehicles, ASW aircraft, plus shore- and ship-based ELINT systems, which can track and target enemy submarines.⁶⁰

Chinese bombers and fighters also have a strong A2/AD capability with anti-ship and air-to-air capabilities. For example, the obsolete H-6 (Tu-16) bombers, which can be equipped with four to six modern cruise missiles.⁶¹ Furthermore, the upcoming H-20 will provide stealthy strike capability. China leapt forward in the field of modern fighter jets, many of them produced indigenously, like the J-10, J-11, J-15 and J-16, while also possessing a considerable number of Russian Su-27/30/35s. The Chinese versions are improved and the

⁵⁴ O'Rourke, R. China Naval Modernization: Implications for U.S. Navy Capabilities: Background and Issues for Congress. Washington: Congressional Research Service, 2016. 5–6, 10–12.

⁵⁵ The Military Balance 2019. 256, 260.; O'Rourke. 11.

⁵⁶ The Type-039A/B is also called Type-041 or Yuan-class I/II, an improvement over the Type-039G.

⁵⁷ O'Rourke. 17–19.

⁵⁸ O'Rourke. 71.

⁵⁹ O'Rourke. 45.

⁶⁰ Fisher, R. D. Jr. "China proposes 'Underwater Great Wall' That Could Erode US, Russian Submarine Advantages". Jane's Defence Weekly, 25 May 2016. 6. <http://www.janes.com/article/60388/china-proposes-underwater-great-wall-that-could-erode-us-russian-submarine-advantages>, Accessed on 7 January 2017.

⁶¹ Annual report to Congress: Military and Security Developments Involving the People's Republic of China. Washington D. C.: Department of Defense, 2016. 31.

newest batches are thought to have AESA radars and sophisticated avionics. These fighters are equipped with BVR air-to-air missiles like the PL-12 or the PL-15 with the estimated range of 150–200 km. Every current and future 4th and 5th generation Chinese fighter will be equipped with the PL-15.⁶² In practice it means that if the USAF wants to save its tankers in case of a Taiwan contingency, they should be kept in 1,350–1,800 km standoff range from the Chinese coasts to defend them from the J-11 fighters and their PL-12 missiles. The problem is that stealthy platforms, like the F-22 and F-35, do not have the combat radius to reach even Taiwan from such distance without external fuel tanks or aerial refuelling in restricted airspace.⁶³ BVR weapons can also endanger other high value assets like AEW&C, RC-135, JSTARS aircraft or HALE UAVs, like the MQ/RQ-4, which have a crucial mission support role, however their number is very limited. The situation is worsened by the advent of Chinese stealth fighters J-20 and J-31, which are becoming operational, and with BVR missiles providing a good hit-and-run capability against high value assets, which can at least temporarily disrupt the air operations of the adversary.

Fighters with BVR weapons are the extended arm of the Chinese air defence, but if that layer is pierced, closing in on the shores the situation does not become better. At an estimated range of 550 km from the coastline, an integrated air defence receives the intruders with fighter interceptors and long range SAMs. China acquired S-300/400 systems, and also developed its domestic version, using the technologies of S-300 and Patriot. It has an estimated maximum range of 200 km and an altitude of 30,000 m; it is claimed to be able to track and home the electronic radiation of the target and according to tests it has a high hit probability, the newest versions have the claimed capability to intercept low-orbiting satellites.⁶⁴ The HQ-9 is based on the ground, and on the newest vessels, like Type-052D destroyers and Type-055 cruisers. China's current inventory of them is one of the largest on the Earth, with 16 S-400, 160 S-300PMU/1/2 and 202 plus HQ-9 launchers.⁶⁵

China used these systems also in the island disputes of the South China Sea, for example the PLA deployed HQ-9 and YJ-62 missiles on Woody Island creating an A2/AD bastion,⁶⁶ which can deny the sea and airspace to the enemy on a vast territory around the tiny piece of land, in case of a conflict. Such bastions can provide safer access also for the Chinese forces to further territories.

CONCLUSION

It is justifiable that major countries like Russia and China intend to prevent foreign interventions and strikes on their soil and maritime territories, but they can also draw their borders on international waters and airspace which can be considered as a missile umbrella over territories where their own troops can operate safely against other countries. However, declaring them as only offensive moves would not be appropriate either, as these steps are part of an “aggressive look alike” deterrence strategy. On the other hand, many of the

⁶² O'Rourke. 67.

⁶³ Martinage. 30.

⁶⁴ Foss and O'Halloran. 427–428.

⁶⁵ The Military Balance 2019. 260–262.

⁶⁶ Fisher, R. D. Jr. “Imagery suggests China has deployed YJ-62 ASCMs to Woody Island”. *Jane's Defence Weekly*, 30 March 2016. 14. <http://www.janes.com/article/59003/imagery-suggests-china-has-deployed-yj-62-anti-ship-missiles-to-woody-island>, Accessed on 7 January 2017.

sophisticated weapon systems which were listed above are available for non-state actors who lack every responsibility or moral barrier that otherwise Russia, China or Iran own. These guerrilla or terrorist groups can purchase modern SAMs or ASMs, or they can snatch them in the future via such big collapses that happened previously in Iraq, Libya, or Syria, where armouries were quickly emptied.

Today more and more countries develop their own A2/AD systems at various levels to defend their territories and maritime exclusive economic zones, and such activities heavily intensified in Southeast Asia against the assumed Chinese threat. Others, like the United States try to develop doctrines and field technology to counter the A2/AD threat, e.g. through establishing new operational concepts, strengthening the air defence of naval groups, acquiring stealth platforms, improving EW and precision strike capabilities, plus SEAD/DEAD⁶⁷ through joint efforts.

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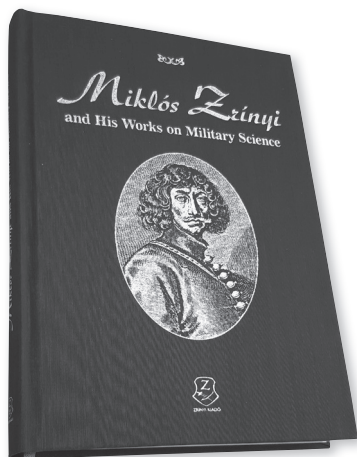
⁶⁷ Suppression of Enemy Air Defense/Destruction of Enemy Air Defense

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