The modern naval fortress : an additional sea denial option for coastal states

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Table 1 Comparison between Fortress and Mobile Platforms

Type	Mobility	Protection	OTH Surveillance	Firepower Capacity	Space, Weight & Energy Allowance	Repair
Fortress	Zero	High	Dependent	High	High	Onsite
Aircraft	High	Low	Independent	Low	Low	Mainly after returning to bases.
Land Vehicles	Medium	Low	Dependent			
Small Vessels		Low				
Large Vessels		Medium	Independent			
Submarine		Medium		Low	Low	

The Modern Naval Fortress: An Additional Sea Denial Option for Coastal States

Abstract

As fixed facilities, naval fortresses seem unlikely to be important in a sea denial strategy which is usually about mobility, but new defence technologies and the changing geostrategic environment may revive the concept of the fortress. Extended ranges of anti-ship means allow onshore firepower to engage enemies over distance, even beyond the economic exclusive zones (EEZ) where most maritime territorial disputes occur. In the face of size limits on missile warheads that constrain their destruction of hardened targets, various active and passive defence technologies against missiles can enhance the survivability of onshore fortresses. Furthermore, onshore locations give fortresses the advantage of being unsinkable and able to accommodate greater energy and firepower capacity in contrast to vessels, as well as other mobile platforms. The onshore nature of fortresses also gives a different political meaning to being attacked, for the clear violation of sovereignty, as opposed to vessels and aircraft in a disputed space. However, the fact those fortresses are not invincible means cooperation with other existing capabilities still necessary. The case of Vietnam demonstrates how fortresses could strengthen the inferior defence capability of a coastal state vis-à-vis. a stronger sea power.

Introduction

Regarding naval operations, fortresses might appear to be an obsolete concept which is irrelevant to modern warfare of mobility, but highlight of mobility leaves some vulnerabilities for countermeasures. As most naval weapon systems focus on precision rather than destruction, evidenced in the medium and small sizes of their warheads, they remain ineffective against hardened targets. In contrast to aircraft and vessels that are vulnerable to various types of missiles, sacrificing mobility for protection may work better for coastal states with restricted arenas of maritime interests. Despite its anti-ballistic missile purpose, the land-based Aegis system reveals the possibility of integrating existing naval weapon systems onshore, with its extensive ranges of anti-ship missiles providing more than coastal defence, and potentially even area denial. It is thus possible to combine modern fortresses and current sea denial capabilities for a more complete strategy. This paper therefore has the dual goals of examining whether naval fortresses with modern technology are indeed promising for sea denial in comparison with mobile counterparts, and the means with which they can be integrated with existing capabilities are. The case of Vietnam is used to illustrate the potential of modern fortresses for coastal states vis-à-vis a naval power.

Fortress and Sea Denial in History

Due to technological and political factors, fortresses have rarely been able to play a major role in sea denial strategies. Sea denial is often an asymmetrical strategy for small or weak navies to cope with their stronger counterparts who pursue or maintain sea control or command of the sea, and where the means of sea denial progresses with technological development. Before the invention of the torpedo, naval battles were based on guns, firearms and boarding combat, so that large vessels had great capacity for added firepower, manpower and withstanding greater damage. Thus, a weak navy's sea denial strategy was conducted using an indirect approach, disrupting an adversary's sea lines of communication (SLOCs) with cruisers, frigates and privateers, rather than directly confronting the latter's superior battleships (Till 2013, 73-76, 152) (Heuser 2010, 208-210). Although naval fortresses with onshore artillery firepower might match an enemy's battleships and partially deny an enemy's fleet in offshore waters, their limitation of zero mobility could not adapt to sea denial strategies centred on mobile warfare. Furthermore, the limited range of their gunfire was incapable of posing a considerable threat to an adversary's command of the sea or sea control, where the latter was capable of making itself into a blockade (Haskew 2008, 9-10).¹ The main value of naval fortresses at that time was that of the fortress fleet strategy, whereby fortresses provided fire support for fleets in a specific area in order to balance the adversary's fleet (Holmes 2010, 115) (Mahan 1975, 148-149). In addition, fortresses were applied for coastal defence, as adopted predominantly by Scandinavian countries during the initial stages of the Second World War and the Cold War (Speller 2014, 101) (Baker 2014).

After torpedoes became operational in the late nineteenth century, small vessels had a better chance than before of crippling or even sinking large ships, and the subsequent invention of submarines and aircraft provided further platforms that could be armed with torpedoes (Ireland 1997, 41-46). At the same time, the range of onshore gunfire was extended slightly but remained too short to compare with the range of the various torpedo platforms (Haskew 2008, 38-39, 60).² Launching torpedoes on shore is technically possible but the limited range of torpedoes makes them unsuitable for such fixed deployment, except at some strategic "chokepoints." During the Second World War, although several types of coastal guns were able to reach ranges of more than 50 km, fortresses remained part of the fortress fleet strategy (Kinard 2007, 441-444).³ The limited ranges and accuracy of flaks made fortresses incapable of dealing with aerial threats. For instance, the fortress at Pearl Harbour was not able to defend the American Pacific Fleet from the air strike carried out by the Imperial Japanese Navy's Air Service. Aside from surprise tactic, the firepower of the fortresses was technologically unable to deny Japanese air strikes (McGovern 2003, 38).

Anti-ship missiles with their extensive ranges might make fortresses important for sea denial strategies, but both technological conditions and the specific international environment during the Cold War negated this possibility. Since the mid-1940s, missiles gradually

appeared as a potential means of sea denial, and they became more feasible in the 1960s, as proven in the Six Day War (Grove 1997, 242) (Till 2013, 129). Equipped with anti-ship missiles, fortresses were supposed to be valuable for sea denial due to their combined firepower and protection. However, their static nature means that they could not extend the ranges of anti-ship missiles or provide flexibility of deployment as with mobile platforms. The threat of nuclear warfare overshadowing a bipolar power structure during the Cold War might also have played a role in eradicating naval fortresses in the late 1940s and early 1950s. In the face of the tremendous destructive power of nuclear weapons which could be applied for tactical purposes, naval fortresses would be defenceless even with heavy protection, with mobile deployment thus presenting a more feasible solution for survival from surprise attacks (Hogg 1975, 151-152) (Halperin 1961, 155). Apart from nuclear threats, most conventional wars and armed conflicts during the Cold War were both highly influenced by, as well as determined by, Washington and Moscow alike. Both superpowers usually moderated the tension of the conflict through the United Nations, along with the use of military presence and logistical supply. Thus, many coastal states could use the bipolar power structure through approaching or developing alliances with either superpower to cope with seaward threats. In fact, requirements for maritime defence were relatively low and most actual and potential naval battles existed within this bipolar context. The naval scenarios of bilateral warfare concentrated on battles in open seas rather than in littoral areas, where onshore defence is involved. One of the few exceptions was the Falklands War or the South Atlantic War, where it could be observed that Argentina did not have a long-term plan in advance for the campaign (Falklands 25: Background Briefing 2010). If Buenos Aires had been able to build a naval fortress with anti-ship missiles, air defence firepower and surveillance facilities, the outcome of the war might have been different. The Royal Navy was restricted by its limited land attack capacity, particularly with its Harrier fighters with low payload, and thus required more time to neutralise Argentine onshore defence. (Crosby 2004, 164). In short, although long range strike and surveillance means during the Cold War could have endowed fortresses with significant roles in a sea denial strategy, due to the geostrategic environment almost all naval fortresses were out of service except for some bunkers used for anti-ship missile launchers (Reuters 2016).

The characteristics of sea denial strategy in the Twenty First Century are still taking shape due to the evolving international environment and relevant technological progress, but some characteristics are emerging for the maritime defence of coastal states using a sea denial strategy. Firstly, it is likely that the disruption of SLOCs would become infeasible. Despite the practices of Nazi Germany and the US during the World Wars, as well as the Soviet Union's potential application of such tactics during the Cold War, most coastal states cannot realistically afford to carry on long-term sea denial over extensive areas of ocean using large numbers of submarines and/or other platforms with proper surveillance and logistical support, nor are they likely to be able to endure long enough to put economic pressure on their opponents. For example, Vietnam's purchase of six submarines is

considered a “significant scale” of military investment, but such a number would be insufficient to disrupt the SLOCs of its potential enemy, China, or sustain their operation if their home base were under attack (Thayer 2014). Furthermore, the rising number of merchants on the high sea, from a variety of national backgrounds, would complicate any mission of disrupting SLOCs, thus perhaps losing legitimacy and / or creating more disputes as a result of potential misrecognition of targets. In addition, the economic effects of cutting SLOCs take time to appear and may prove too slow for the rapid tempo of modern warfare. Finally, in a conflict between a relatively weak coastal state and a sea power, the latter has more resources to conduct a blockade against the former. Thus, for a coastal state’s sea denial strategy, targeting an enemy’s naval capability may be more appropriate than targeting their SLOCs.

Secondly, in terms of counter forces, littoral areas would be more suitable for military and political matters than the open ocean. The geographic complexity of littoral areas, such as fjords and deltas, would provide a coastal state with locations to hide its forces and therefore increase the difficulty of eradicating resistance for an invader (Karlratiras 2016, 167-168). Semi-closed waters, such as a gulf or strait, would further favour the coastal state because of restricting the invader’s movement. Politically, under the United Nations Convention on the Law of the Sea (UNCLOS), littoral waters would either be territorial waters, contingent zones or exclusive economic zones (EEZ). These different legal statuses present safeguards for national interests as well as rationales for the resolution of conflicts for coastal states. Available strike means nowadays are mainly similar to that of the Cold War era, comprised of aerial, surface, onshore and underwater platforms for anti-ship missiles, torpedoes and sea mines, supported by various surveillance means for targeting and controlling attacks, except potential cyber-attacks. The composition of the means used for sea denial varies according to the individual states, in terms of affordability, talent pool, infrastructure and other factors. For examples, for Iran deny external naval activity in its adjacent waters, in addition to blockading the Hormuz Strait, it focuses on its large number of missile boats and onshore launchers in addition to several submarines, for its adjacent narrow waters and its limited defence industry under the international sanction (Speller 2014, 183) (Military Balance 2017, 362, 377-378). In comparison, Finland combines fast attack craft with both missiles and torpedoes, sea mines, onshore anti-ship missiles and artillery batteries to defend its littoral waters and curved coastlines (Military Balance 2017, 109) (Pagni 2017). Further discussion will deal the suitability of naval fortresses as part of a counter force oriented sea denial strategy in littoral areas within the changing geostrategic and technological conditions.

Fortresses in a Changing Geostrategic Situation and

After two decades of unilateral US hegemony from the end of the Cold War, maritime geostrategic conditions are gradually evolving from being unilateral to multilateral. During

these two decades, no state was able to counter US unilateral hegemony concerning sea power and military presence because of the proliferation of its overseas bases at various locations worldwide. At that time, fortification was unlikely to have been adopted. American worldwide air strike capability could have neutralised them using specific conventional munitions such as bunker busters, or even taken them over by their expeditionary ground troops. However, there has been an erosion of Washington's monopoly of global power, both internally and externally. Internally, after a decade of war on terror, weakening financial conditions prevail, along with an anti-war atmosphere in addition to low dependence on external oil that would lower political leadership's willing to use force overseas. (The Heritage Foundation 2017) (Johnson 2015). Externally, despite its superior naval force, complicated economic ties and the potential danger of escalation to nuclear warfare constrain the role of the US in countering other emerging sea powers, such as China.

The modernisation of its navy has seen China increasingly use the expanding fleets overseas as part of an expansion of their national interests beyond their original sphere. Compared to the US, China is however lacking in overseas bases and naval aviation capacity so that their conventional strike capability would be relatively limited. Furthermore, most of their current projects concentrate on precision strikes rather than means of dealing with hardened targets (Carlson & Bianchi 2016, 36-37) (Military Balance 2017, 343). Although it is too early to make conclusion on the likelihood of Beijing replacing Washington as the leading sea power, the former's naval fleets have placed strategic pressure on certain coastal states. For such states with their inferior capability, a symmetrical naval strategy for sea control would be unwise, thus making a sea denial strategy more feasible. In addition to China, Russia is also displaying growing sea power and land forces, which are exerting certain strategic pressure on countries around the Baltic Sea and other adjacent areas (Kim 2017).

Among the various means of sea denial, fortresses could become valuable for some coastal states to counter or deter seaward security challenges. They have the advantage of providing strong protection against conventional firepower, especially precise guided munitions (PGMs), and cover for adjacent waters, being armed with means of sea denial. Generally, conventional weapons are the main means for armed conflict involving coastal states. Nuclear weapons are unlikely used in an asymmetrical military conflict between a sea power and a coastal state, as they are mainly for deterrence. Furthermore, most sea powers are also nuclear powers in the non-proliferation treaty, which have responsibility of not attacking non-nuclear states. (United Nations Office of Disarmament Affairs 1968). In addition, the popularity of the treaty on the non-proliferation of nuclear weapons has formed an international norm which would further discourage such a scenario.

In terms of conventional arms, China and other naval powers generally enjoy certain superiority over most coastal states, thus making it important for the latter to have certain niches or multipliers in order to reshape their military imbalance between them and the

former. Beijing has concentrated its military build-up on PGMs with relatively light warheads (Kopp, Soviet/Russian Guided Bombs 2012) (Pradun 2011, 14) (Fisher 2016).⁴ Although PGMs can exploit vulnerable parts of their targets, it could prove difficult or time-consuming for light warheads to neutralise well hardened buildings. Reinforcement or sending ground troops to capture such targets may be required, but escalation or extension of warfare would be inconvenient for an attacker, particularly in the era of globalisation. Thus, onshore facilities for maritime defence such as fortresses would potentially suit the new geostrategic conditions.

Vantages of Fortresses

The modern naval fortresses discussed in this paper can be defined as hardened military buildings with the comprehensive capabilities of attack and defence, which make them distinct from bunkers and other fortified military buildings. Although traditional fortresses with guns were phased out after the Second World War, some countries do indeed construct bunkers for their anti-ship missiles and launchers to prevent an enemy surprise attack or pre-emptive strike. These bunkers do contribute to sea denial, but their ability for protection would be limited due to the lack of appropriate systematic air defence. In contrast, modern defence technology provides an area air defence capability comprised of layered interception to cope with forthcoming aircraft and missiles. It is made up of a combination of long-ranged and short-ranged surface-to-air missiles (SAMs), close-in weapon systems (CIWS), sophisticated armour with hollow structure, reactive plates, other designs to disrupt the shaped charge and other armour piercing munitions. In terms of building, concentrated or dispersed outlines would depend on a coastal state's land availability, budget, and other conditions. Whether such a modern naval fortress can provide an alternative to mobile platforms used for sea denial purposes over the course of decades can be answered by means of a comparative analysis.

For coastal states with limited resources for defending adjacent territorial waters, long-range weapon systems based on fortresses would be sufficient for sea denial, and such defence technology has indeed been available since the later phase of the Cold War. Since a Mahan style sea power is infeasible for most coastal states due to the high requirements for fleets, manpower and resources, certain ranges of weapon systems to cover EEZ and deny any adversary activity would be relatively effective. Some types of anti-ship missiles, such as the Russian 3M-54, with ranges of 300 kilometres could strike an adversary's surface asset in most areas of the EEZ of the coastal state using onshore launchers (Concern Morinformsystem Agat 2017). Surveillance over the horizon (OTH) has posed certain obstacles for such long-range means of sea denial, but maritime patrol aircraft, drones, flying boats, satellites, OTH radar and other technologies provide some solutions (Ince, et al. 2000).

There are various mobile platforms available for long range anti-ship missiles, but fortresses stand out for their larger capacity, better protection, higher potential for repairing damages and alternative political meaning (Table 1). Mobile sea denial platforms are constituted of four categories: aircraft, onshore vehicles, surface vessels, and submarines, and all of them rely on stealth or/and mobility for their survival during wartime. It must be noted that the relations between fortresses and mobile platforms are not exclusive, but present a flexible combination for defence, similar to Sun Tzu's concepts of common and uncommon forces (Tzu n.d.).

Aircraft have been included in sea denial as early as William Mitchell's 1921 experiment and their speed makes them the most mobile platforms for anti-ship missiles (Flight 1921). All kinds of aircraft, including fighters, bombers, maritime patrol aircraft and helicopters share two common characteristics, fragility to attack and vulnerable infrastructure. Regardless of size or speed, aircraft can be easily damaged or destroyed by small calibre fire or missiles, because their strict weight limitation make sufficient armoury generally infeasible. As for facilities, fixed-wing aircraft need runways for taking off and landing, but such facilities are easy targets for various kinds of attack, including unguided projectiles. Technologically, building surplus runways or airbases as well as shelters can moderate hostile attack, but disruption of operations would be inevitable. Helicopters and other vertical take-off and landing (VTOL) aircraft need smaller sized facilities, but their inferior capacity impedes their role in sea denial.

There is a wide spectrum of surface vessels ranging from missile boats to frigates. On the one end, small missile boats with less than 500 tonnages of displacement can be used for ambush from coastal hideouts to carry out hit-and-run tactics against an adversary's surface vessels, and their relatively cheap cost allows for a large procurement that is able to sustain certain losses during combat. However, their small displacement means poor durability over time and in weather, a characteristic that may constrain their role in peace time or crisis, particularly in a confrontational situation. Relatively low radar antennas and lack of facilities to accommodate helicopters or drones on these small vessels would restrict their capability to detect OTH targets, so that they would have to either rely on external sources of intelligence or engage only with relatively close targets. Moreover, their relatively small surface space may not be able to be equipped with comprehensive defence measures to compose a layered defence system comprised of SAMs, decoys and CIWS to intercept incoming anti-ship missiles. Although they could be designed to be expendable, it is unlikely that such vessels would outnumber an enemy's missiles. Small displacement also means narrow margins in managing the impact from anti-ship missile hits, after which total destruction or sinking is likely (Till 2013, 152).

On the other hand, frigates and some corvettes with displacements of 2000 tonnage or even larger have a relatively large space in which to accommodate most sophisticated weapon systems for detecting targets, strikes and defence. However, their high costs and

requirement for crews constrain the numbers that can be purchased, so that having only a small number of major surface vessels would mean that the loss of any of them would pose serious problems for both substantial naval capability and morale. Their large size would also make frigates and corvettes more difficult to hide from an adversary's reconnaissance compared to small vessels, though there are some stealth designs that may moderate this drawback. Although their larger size would provide wider margins to withstand combat damage, one or two missiles only, as demonstrated with the USS Stark and several cases in the Falklands War, are still likely to paralyse a frigate and force it out of operation until repairs are carried out (Till 2013, 123-124) (Polmar 2005, 165). As shipyards, docks and other facilities are usually required for most major repairs, it would take time for damaged major surface combatants to return to service. Like small vessels, major surface combatants can also be sunk by torpedoes or sea mines.

Submarines represent the most obvious sea denial means in use since the First World War with the universally admitted value of stealth. In the later phase of the Cold War, underwater launched anti-ship missiles further extended their strike radius. Apart from nuclear submarines for sea powers only, diesel electric submarines (SSK) are the only feasible assets for coastal states. Without reactors or steam engines, they have relatively low underwater noise levels. In addition, the complex density of salt and temperatures in littoral seawaters could increase the stealth performance of SSKs. Technological breakthroughs have enabled diesel electric submarines to cruise underwater for longer periods with air-independent propulsion (AIP) systems. However, submarines are expensive in terms of procurement, operation and maintenance, and similar to major surface combatants, the margin for bearing submarine losses would be narrow. In addition, if their logistical facilities are neutralised, the sustainability of operations would be limited (Till 2013, 125-126) (Pike n.d.). Finally, submarines are vulnerable in case of mechanical malfunction, operational mistakes and enemy attack. As major repairs are almost impossible underwater, they rely on excellent skills and a degree of good luck to bring a damaged submarine back to base.

Onshore vehicles of anti-ship missile launchers are somewhat like fortresses, but mobility and protection are the main distinction. Mobile launchers have proved their survivability in several cases of air superiority of an adversary, such as Israel's inability to deny Hezbollah's "Katyusha" rockets (Samaan 2017, 159-161). Both natural and artificial environments can provide hideouts or shelters for truck-sized mobile missile launchers. However, unlike the situation with Hezbollah where strikes were carried out on area targets, sea denial tactics require the precise firepower of anti-ship missiles, not homemade rockets. Therefore, the quantitative advantages would be fewer. In order to maintain mobility, mobile launchers are usually unable to be equipped with heavy armour, leaving them open to easy destruction by either air-to-surface missile (ASM) from an enemy's aircraft, anti-tank weapons or even firearms. Laying landmines and paralysing bridges or tunnels on adjacent roads can also neutralise mobile launchers or at least constrain their sphere of movement. Finally, before

the outbreak of war, mobile launchers would be stationed at certain military bases leaving them vulnerable to pre-emptive strikes.

Nowadays, most mobile platforms can be equipped with some “soft kill” capabilities, such as electronic counter measures (ECM), as well as “hard kill” ones, such as SAMs, to strengthen their survivability from enemy attack (Till 2013, 129). However, these mobile platforms, constrained by space, weight and energy, may not be able to be sufficiently armed for self-defence, regardless of soft kill or hard kill capabilities.

In comparison to mobile platforms, fixed fortresses display the opposite characteristics. Without the matter of buoyancy, fortresses are much freer to adopt heavy weapon systems and protection systems which are limited on mobile platforms. Similarly, fortresses have no strict limitations on space or energy which are scarce in all mobile platforms. Therefore, fortresses can be armed with numerous weapon systems. In terms of attack, a variety of long-range anti-ship missiles are available for modern naval fortresses, and in special situations, such as their location at a chokepoint facing a narrow strait, army artillery systems can be applied as well. As space and weight are not restricted, fortresses can accommodate large numbers of missiles and are freer than vessels or aircraft to launch saturated salvos on enemy vessels or other maritime targets to outnumber an enemy’s response capacity. For example, so far, no naval vessel is able to carry more than 250 cells of vertical launching systems (VLS), meaning restricted firepower for offensive anti-ship missiles, both cruise and ballistic, and for defensive SAMs (Military Balance 2017, 48, 213). In contrast, fortresses onshore can easily accommodate far more cells. If electric magnetic rail guns become operational, they could also strengthen the firepower of fortresses with their shorter response time to targets, and easy access to power onshore would make such high energy consumption weapons with more suitable for fortresses than vessels (Atherton 2015). Sufficient space onshore can also provide for the installation of generators or building an underground power grid to ensure power supply.

Defence is another major difference between fortresses and mobile platforms. Fortresses can simply adopt various naval weapon systems used for ships but in much larger numbers as a result of their sufficient space and lower cost on land. As the two major parts of ship construction, hull structure and propulsion, are unnecessary for land facilities, the installation of electrics, auxiliary and outfit would be much easier for onshore buildings than vessels (Carlson & Bianchi 2016, 26-27). Considerable cost and space savings can thus be made and used to better arm naval fortresses. Since land based Aegis systems are available, it would not be difficult for fortress locations to establish layered defence comprised of long-range, mid-range SAMs, ECMs, and close-in weapon systems (CIWSs). With their much larger capacity for munitions and some planned redundancy with their surveillance systems, they would cope better with saturated attacks and withstand higher levels of war damage compared to major surface combatants, not to mention other smaller platforms (LaGrone 2015). In the future, rail guns and laser could be added to deny approaching missiles and

other forms of threat. In terms of surveillance, fortresses, like platforms on surface, would rely on some long-range means to supplement their limited height antennas. Thus, naval fortresses would face the same challenges in detecting OTH targets and protecting OTH surveillance systems from an enemy's countermeasures.

If approaching attacks could not be fully neutralised, passive protection as a means of withstanding bombardment is a unique advantage for fortresses. As mentioned before, all mobile platforms fitted with either light or no armour protection is vulnerable to most forms of kinetic attack. This can be seen in the small weight of warheads in most PGMS which provide enough power to achieve their function of destroying or paralysing such targets. It is possible to construct buildings immune from attack by warheads of less than a ton (Polmar 2005, 491-496, 513, 515, 529) (Gormley, Erickson and Yuan 2014) (Kinard 2007, 300-301) (Kopp 2012).⁵ During the Second World War, the German U-boat bunkers were designed well and built with sufficient concrete to withstood the direct hits of five to ten ton bombs, not to mention normal armour piercing munitions (Williamson 2003, 32-50). Modern technology could therefore build even more robust concrete structures. In addition to concrete, active armour and layered armour, which have been popular for equipping tanks and armoured vehicles, may be applied to fortresses in an expanded version, in order to detonate approaching warheads before they reach an optimal point of explosion. The latest active protection of Russian T-14 tanks indicates a similar potential for naval fortresses (Ross 2015) (Defence Industry Daily 2012).

Since fortresses would have better survivability than its mobile counterparts, the dynamic of battle between a coastal state and a naval power would be reshaped. Anti-ship missiles with ranges of several hundred kilometres from fortresses may not be able to effectively annihilate an enemy's surface vessels, but such efforts could act as a strategy to deter them from entering into certain waters, and bring warfare to a standoff. A standoff situation could prolong warfare and prevent a quick victory or a fait accompli which may be unfavourable for coastal states. Furthermore, if the enemy launches a strike on onshore targets, it could present a more complicated political issue than attacking vessels or aircraft at sea would (Holmes 2010, 126). Attacking vessels or aircraft might be interpreted as limited or accidental armed conflicts, especially where the site is on the high sea or an area of territorial dispute, but attacking onshore facilities in the homeland might be seen as an act of intervention or invasion due to the clear violation of sovereignty. Another political difference relates to losses sustained. In some countries, major naval ships may be icons of national pride, meaning that their loss during combat may have a strong political effect. In contrast, fortresses can never be sunk and can be repaired in a shorter time than vessels. Finally, with zero mobility, the building of fortresses is not likely to be considered as an act of aggression, so that this kind of defensive strategy would make a coastal state less likely to be accused of provocation or destabilising the situation in the regional and global

community. Undeniably, a strong response from a potential enemy, like China's upset over South Korea's deployment of the Terminal High Altitude Area Defense (THAAD), would however be inevitable (Harrison 2017).

This distinction as to the protection capabilities between fortresses and mobile platforms can thus influence the military structure of coastal states, and the balance between defence and offence. As a sea power would need to deploy its mobile platforms to challenge a coastal state, it is possible that the latter's fortresses, with strong protection, may compensate for the former's superior forces, particularly regarding its surface vessels. If both the sea power and the coastal state use vessels and aircraft, the latter's quantitative inferiority, in combination with possible poor training and integration, would most likely result in a disadvantageous outcome. Given that the coastal state establishes high quality fortresses, and that both sides were to suffer direct hits during combat, the sea power's mobile platforms would lose more combat capability due to their relatively fragile nature and the difficulty of immediate repair onsite. This could permit a relatively favourable outcome for the coastal state compared to a battle involving mobile platforms only.

Challenges for Naval Fortresses

Although fortresses with distinct characteristics are likely to contribute to a coastal state's sea denial strategy, there are four challenges to the modern fortress concept, destruction, remote blockade, flexibility and integration. Clearly, naval fortresses are not indestructible. The US has developed several types of bunker buster munitions which are in service, although with certain limitations. GBU-28 5000lb guided bombs can penetrate 20ft of concrete and GBU-57 30000lb guided bombs can breach up to 200ft. Such destruction could at least paralyse, if not destroy, any makeshift building. However, such heavy bombs can only be carried by a few types of land based combat aircraft, such as B-2 bombers (Cenciotti 2013). This suggests that the current arsenals of aircraft carrier strike groups would not be able to deal efficiently with naval fortresses. However, Washington can launch aerial bombardment from its various overseas airbases. In other words, naval fortresses in coastal states may not significantly deny all US military means, but merely constrain the options of operations.

The anti-bunker capability of China and other naval powers is less available due to their lack of suitable munitions and naval aviation capacity. Without steam or electromagnetic launch systems, ski-jump flight decks adopted in Chinese, Indian and Russian aircraft carriers would constrain the payload of their naval combat aircraft, thus constituting an obstacle to carrying bunker busters, when they develop or acquire them (Erickson and Wilson 2006, 19-20). Furthermore, the relatively small size of the new sea power's naval aviation wings may mean that they are occupied with other missions such as air superiority and reconnaissance rather than attacking fortresses. If naval fortresses are set on a high priority for the naval

aviation to strike, other targets would face fewer attacks. Limited margins for sustaining any loss of aircraft may lead commanders to avoid striking targets with intense air defence firepower, such as naval fortresses. Coastal states within the strike ranges of land based aircraft would be concerned with either Beijing or Moscow which possess guided bombs heavier than 1500kg (NORICO n.d.) (Karnozov 2013) (Military Balance 2017, 216-217, 283-284). Undeniably, the development of bunker busters is not impossible for these powers with their considerable defence industries, but delivery is another challenge. China lacks adequate aerial platforms and the payload of its H-6 bombers may not suffice. As a benefit from its Cold War legacies, Russia has several bombers with high payloads, such as the Tu-160, but, in the face of NATO's air defence firepower, the delivery of bunker busters may not be certain (Military Balance 2017, 217, 283-284) (Crosby 2004, 242-247) (Roblin 2016).

As the most salient feature of modern fortresses is their durability from hostile attacks using conventional warheads, their defensive abilities would be undermined by significant technological breakthroughs, and flaws or weaknesses in design or building. Currently, technology is generally equal on sides, attack and defence, so that a well-designed fortress could withstand strikes up to a certain extent. However, if developments progress more rapidly in attack technology compared to that of defence, fortresses would become invalid, just as they did in the early years of the Cold War. Since PGMs can be aimed directly at the weak points of a target, inadequate design or building of fortresses would leave vulnerable points that could be exploited.

Sabotage represents a further feasible option for neutralising naval fortresses, as amphibious or airborne invasion would prove too risky. Sending special operation units to penetrate a fortress and explode its key facilities may work temporarily, but the limited explosive loading of such manoeuvres may not be sufficient to destroy the target. Explosion of stored missiles and other ammunition in the fortress aimed at attacking vessels and aircraft would not be powerful enough to act as bunker busters either, with properly separated storage reducing the risk of explosion even further (Global Security 2013). Furthermore, despite excellent training, trivial mistakes or simple misfortune may cause the failure of the taskforce's mission to outnumber defenders. For example, the North Korean operation of raiding the Blue House in Seoul failed due to such an error (Krause 1999, 4). As there are only a few entrances to fortresses, the opportunity for penetration would also be constrained. In sum, the effect of sabotage against a naval fortress would be uncertain. Historically, an amphibious or airborne invasion to conquer a fortress was a common campaign goal, such as in the Russo-Japanese War, but the current long-range of anti-ship and air defence firepower launched from coastal states would make such operations risky (House of Representatives 2011, 22). Besides countermeasures, the limited sizes of the amphibious fleets of most naval powers may not have sufficient margin to absorb the loss during operations (Military Balance 2017 2017, 214-215, 282, 292). A land invasion beyond the range of fortresses could be a tactical solution, but it would look even more aggressive

and expand the scale of the land battle further, producing even longer timeframes and more casualties.

A remote blockade tactic beyond the range of the fortress firepower presents an effective countermeasure, but various factors would moderate the effect. Economic shock due to a blockade cannot be totally avoided, but coastal states with reserves of strategic materials may not be forced to submit in the short term. Prolonged blockades may backfire economically or politically on the sea power conducting them due to the disruption caused to global trade. Furthermore, some coastal states have alternative means, such as land transport, to access their strategic resources and further reduce the effects of blockades. Militarily, remote blockades beyond the range of long-range anti-ship missiles would considerably enlarge operational areas and require a sea power to deploy more naval assets. Such extensive operations may exceed the sea power's capacity, lower the efficiency of the blockade, or make their sparse deployment of vessels vulnerable to a coastal state's counterattack. Despite the technological potential, remote blockades may not be the best solution for a sea power to neutralise a coastal state's fortresses.

It is possible that defence planners may not choose to install fortresses due to their lack of flexibility for other-than-war purposes and technological integration. Unlike mobile platforms, fortresses are unable to join in military parades to demonstrate deterrence capability and build national pride. By the same token, fortresses cannot participate in overseas missions, such as joint exercises, humanitarian assistance or disaster relief. Although an open-house activity can be held in a fortress, a coastal state would be loath, for military reasons, to reveal too much information about its internal details. In other words, a modern naval fortress is unable to contribute to diplomacy or to act as a showcase. Moreover, fortresses are totally useless in conflicts of low intensity, which occur predominantly in the East and South China Sea nowadays. War-oriented fortresses would not be the answer to so-called salami-slicing tactics, for example (Haddick 2014). As for technological integration, putting in various systems with low weight and space requirements should be easier than building major surface combatants. However, for many coastal states with weak industrial capacity, integration, damage and control would still be a critical challenge, as there has not yet been any precedent. These disadvantages may indeed push decision makers to continue to purchase mobile platforms rather than undertake fortress construction.

A New Version of Fortress Fleet Strategy

A combination of both fixed and mobile sea denial capabilities could form a modern version of fortress fleet strategy. Traditionally, the fortress fleet strategy referred to a naval fleet that operated only within the range of land based artillery, so that its small operational areas made fortresses less important, as stated in Mahan's theory (Mahan 1975, 398-399).

Since global sea power is unrealistic for most coastal states and land-based weapon systems can now reach further than ever, the firepower of fortresses, with the assistance of several aerial and surface platforms, would endow a coastal state with full spectrum capability, for low-intensity conflicts up to large scale naval battles.

Despite some advantages, it is impossible for naval fortresses to fully replace mobile platforms. Traditional naval roles based on mobility, including showing the flag, friendly visits and protecting maritime activities, still require vessels to carry out such missions. Thus, a coastal state needs a certain number of vessels to deal with issues during peace time. If warfare is not of great concern, coast guard oriented vessels have the advantage of being cheaper than fully equipped corvettes, frigates and destroyers. Such fleets would focus on stability operations, humanitarian assistance, maintaining good order at sea, naval diplomacy and other “post-modern” missions, except for engagement with missiles and other sophisticated weapon systems (Till 2013, 38-40).

When the conflict escalates to levels where mobile platforms would be exposed to significant threat, fortresses can take over the gravity of combat, meaning that relatively fragile vessels would only need to operate in safe or essential circumstances. Certain aerial assets, such as drones, can be used to detect and locate targets for the firing of long-range missiles from fortresses. Despite the difficulty of OTH surveillance during wartime, most coastal states would only engage an enemy in their adjacent waters and not in the open ocean, enabling such a relatively narrow sphere to decrease the challenge of targeting. Since no vessel is onsite, targeting would be easier than in conventional naval battles, because there is no need for identification of friend or foe (IFF). As for the hostile fleet, staying within range of fortresses would be dangerous. They may lack retaliation capability because most ship based weapons with small warheads are only suitable for attack on mobile platforms rather than on hardened facilities. If the enemy’s aircraft carrier group is involved, the situation would not be very different because the limited payload of naval aircraft taking off from a ski-jump flight deck would not allow the projection of bunker buster munitions, if available. Therefore, a hostile naval power is less likely to establish command of the sea or sea control in the face of a coastal state with a new fortress fleet strategy which has more capability and capacity for sea denial.

Naval fortresses would also provide certain protection and share the burden with the air forces of the coastal state. As air superiority has been crucial to naval warfare since the Second World War, the hostile naval power would attempt to establish its air superiority by defeating or even annihilating the coastal state’s air force and other air defence units. SAMs on naval fortresses can be used to engage the enemy’s aircraft and missiles, with the bonus that their SAM batteries have better protection than mobile ones. As a result, both the coastal state’s aerial assets as well as their bases would face fewer attacks. In other words, fortresses with long range SAMs may also achieve some “air denial” effects to prevent opponents from gaining command of air or air control.

With a clear boundary between low and high intensity armed conflicts, the new fortress fleet strategy acts not only for operational or tactical purposes, but also for sending a clear message of deterrence. Firstly, withdrawing vessels from the site of an increasingly intense conflict can prevent the accidental exchange of fire that can occur in a military confrontation. It can consequently eliminate the political excuse of blaming provocative actions. Secondly, it would provide time for reflection for the opponent's decision makers as to whether they should escalate or not, rather than being pushed to make quick decisions because of rapid combat between fleets on both sides. They would need to reflect on the added meaning associated with attacking fortresses and other onshore targets and the increased invasiveness compared to attacking vessels or aircraft. A final factor for consideration is that of the likelihood of warfare of longer duration when neutralising a coastal state's naval fortresses compared to air or sea battles due to the tougher protection of fortresses compared to mobile platforms.

Application Example: Vietnam

Vietnam would be a suitable coastal state to adopt naval fortresses for ameliorating its maritime strategic surroundings. In recent decades, China, the most salient rising sea power with broad territorial claims, has been putting strategic pressure on its neighbouring countries. Among coastal states in the face of the Chinese sea power, Japan, South Korea and the Philippines are American allies which are under the umbrella of the US Navy. In contrast, despite its improving relations with the US, Vietnam's non-alliance position means that it is still reliant predominantly on its own military capacity for defending its territorial water from China's expansion. This is evident since the end of the Cold War in its concentration of military modernisation on naval and aerial capabilities (Ministry of National Defence 2009, 21) (Military Balance 2017, 240). Due to the nine-dash lines drawn by China, which overlap considerably into Vietnam's EEZ along with other territorial claims, various low intensity conflicts regarding fishing and drilling have occurred since the mid-2000s (Do 2017, 138-142, 200-203). If a conflict escalates into an armed conflict, Beijing's sea power would mean more than Hanoi losing its maritime interests in the contested EEZs but also exposing its vulnerable coastal areas to attack or even invasion. Furthermore, if China's control over the nine-dash lines, Vietnam's sea lines of communication would be seriously diminished.

Currently, Hanoi's investment in sea denial capability is made up of mobile platforms only, thus indicating a good opportunity for the introduction of fortresses. From the mid-1990s, the Vietnamese Navy and Air Force obtained Russian fighter-bombers, submarines, missile boats, frigates, coastal defence systems with a variety of anti-ship and cruise missiles, as well as Israeli rockets (The Stockholm International Peace Research Institute 2017). Although Hanoi's defence investment makes it one of the top states in Southeast Asia in this regard, their deterrence capability would be insufficient for several reasons (Abuza 2014).

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3 Firstly, the entirety of Vietnam's combat aircraft number less than half of that of the
4 Chinese Southern Theatre Command, meaning that the former's aerial platforms for sea
5 denial may not be able to exert their full effect due to their lack of air superiority. By the
6 same token, Vietnam's surface vessels for sea denial could be neutralised either by Chinese
7 ASMs, anti-ship missiles or torpedoes. Beijing's large armed forces and financial capacity
8 allow it to withstand far greater losses than Hanoi, whose narrow margins to withstand
9 attack leave it vulnerable in the face of the former's greater power. Although submarines
10 are less subject to a quantitative difference, the small number of maintenance facilities for
11 Vietnam's six Project 636.3 submarines could mean their neutralisation by Chinese attack
12 and subsequently constrain their operation. The PLAN's possession and operation of similar
13 submarines types (Project 636M) may allow Beijing to find solutions to counter Hanoi's
14 underwater force (Military Balance 2017, 281, 287, 339-340) (Vietname Net 2013) (Naval
15 Today 2016).

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18 Secondly, if Hanoi's sea denial force were to survive a strike by Beijing, its commanders
19 would face the tactical dilemma of whether to attack the latter's fleets or disrupt its SLOCs.
20 Except for submarines with better stealth characteristics, attacking Chinese surface vessels
21 protected by air cover, destroyers and frigates with regional air defence systems may result
22 in serious combat loss for Vietnam's sea denial platforms, with the result that its sea denial
23 strategy becomes unsustainable. In the process, Beijing's fleets may suffer certain damages,
24 but reinforcement from its East Sea and North Sea Fleets could rapidly compensate for such
25 losses. Furthermore, China may manage to avoid simultaneous armed conflict with other
26 states so that its combat loss would be less of a strategic one than that of its Vietnamese
27 counterparts. If Hanoi were to decide to deny Beijing's sea transport, Chinese merchants
28 would still be able to access the wider West Pacific as a detour to avoid the South China Sea.
29 Most of Hanoi's sea denial platforms would then have difficulty carrying out long distance
30 sea denial, such as surveillance over large sea areas and logistic support. In other words, the
31 threat value of Vietnam's mobile platforms on China's SLOCs would present more of a
32 psychological deterrent rather than a substantial one.

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35 In view of these conditions, naval fortresses would strengthen Vietnam's sea denial
36 strategy. Hanoi has the advantage of developing several naval fortresses on the mainland.
37 China's major naval base on the adjacent Hainan Island presents a niche opportunity for
38 Vietnam to adopt naval fortresses. In recent decades, the Yulin naval base has become one
39 of the major home harbours for the South Sea Fleet of the People's Liberation Army Navy
40 (PLAN), housing Chinese nuclear ballistic missile submarines (SSBN), the amphibious fleet
41 and other combat fleets. In the future, Beijing can deploy its aircraft carrier(s) to this base to
42 project power into the South China Sea (Office of the Secretary of Defense 2016, 58). This
43 highly strategic naval base is just under 300km away from the Vietnamese coastline, where
44 a Vietnamese fortress or a group of them could be established (Office of the Secretary of
45 Defense 2015, 84).

As Vietnam's armed forces have experience in operating long range SAMs, such as the S-300s, and anti-ship missiles onshore, such as the K-300Ps, less additional training would be required compared to other coastal states. Regarding the location, it is essential that there be sufficient power supply, suitable terrain to conceal the fortresses and appropriate firepower ranges over the Yulin naval base. Building fortresses on islands, whether natural or artificial, would be less appropriate in the East / South China Sea. There would be no terrain to conceal the construction, and power supply would be more limited than on the mainland. The overall space would also be constrained, and thus affect the capacity of firepower and protection. Furthermore, the political significance of an attack on a country's mainland is not present for fortresses located on islands. There are pros and cons regarding the construction of fortresses separately or in concentrated formations. Separate locations would complicate any operation by Beijing, but the total cost of construction and/or maintenance would be higher. A concentrated fortress formation would be relatively economic but attacking it would be easy, thus perhaps providing shorter overall durability. No matter what formation is used, the critical aspect is protection, especially passive armour and the concrete structure. All of the current Chinese means of land attack firepower would be ineffective in destroying hardened targets in a short period of time. Comprised of ballistic and cruise missiles, ASMs from air strikes and naval guns would not work well, because of the sizes of the warheads on both ballistic and cruise missiles, as well as the considerable circular error probability (CEP) of ballistic missiles. (O'Connor 2012) (Gormley, Erickson and Yuan 2014) (Marusaki 2015). It is also unlikely that Beijing would apply nuclear warheads to neutralise fortresses, particularly against non-nuclear states. As fixing war damage can extend the durability of fortresses, how Vietnam's repair capacity during wartime would be critical as well.

As long as China constrains its use of force in the conventional sphere, their combat efficiency against fortresses would be inferior to what can be achieved against mobile platforms. In addition, Hanoi can procure SAMs and other air defence capability to make approaching its fortresses more difficult. Beijing may mobilise its military industry to provide improvised or quickly developed bunker busters, but suppressing air defence and lack of intelligence would have an effect on its campaign planning, because the unusual nature of the target would cause reduced clarity for planners in terms of force required (Deptula 2001, 11-13). Furthermore, Vietnam's fortresses could pose the threat of blockade on the naval bases on Hainan Island and would disrupt PLAN operational procedures. As Hanoi's fortresses would also attract a certain attention from Beijing, the former's mobile platforms would therefore face fewer attacks, thus permitting better opportunities to conduct their missions. **If China's operation regarding Vietnam's fortresses is prolonged, other powers, such as the US, may have more time for response, such as direct intervention or an indirect pinning-down of the former's force.**

Air strikes using bunker busters would appear to be the easiest solution for the invader, but it would be difficult for non-American sea powers to conduct such operations due to their

lack of adequate munitions and delivery platforms. If the hostile sea power eventually comes up with bunker busters, the coastal state can also take countermeasures, such using jamming or disrupting bomb guidance systems, as active or layered armouring of fortresses, and CIWS to decrease the effect of bombs, in addition to camouflage and decoys. Furthermore, as long as the strike does not achieve total or crucial destruction, some repairs could be conducted, thus prolonging warfare (Gray 2012, 280). The ability of naval fortresses' to prolong warfare, an unfavourable outcome for an invader, would contribute to Vietnam's deterrence against China in an asymmetrical approach (Mearsheimer 1983, 29-30).

China's existing, and most likely expanding, military building on its artificial islands in the South China Sea is a different case. Beijing has deployed SAM, anti-ship missiles and built shelters making such buildings somewhat qualified to be called naval fortresses (Hanna 2015) (Shim 2017) (LaGrone 2017). Such installations certainly contribute to its sea denial capability in the area, including putting more pressure on Vietnam. However, Chinese fortification is more about defending its maritime facilities to enhance its sea control over the South China Sea, instead of simply providing a means of sea denial for its large territorial claim. The firepower from those positions is unable to cover all the waters inside the nine-dash lines, and is installed more as the protection to ensure operations of the wharves and airstrips for Chinese aircraft and vessels. If Beijing really wanted to focus on fortresses to deny other countries' maritime activities, the number would need to be higher for comprehensive coverage. Undeniably, Chinese naval fortresses would contribute to its sea power, but their deployed mobile platforms would remain more important. Technologically, Chinese fortresses would not be able to resist American bunker busters, and thus their tactical value would be lower than that of those in coastal states. Furthermore, as long as airstrips or wharves are paralysed, the fortresses fail in their purpose of supporting power projection, even if they are still functional.

Conclusion

The remerging potential for naval fortresses with modern technology is related to the reshaping of the landscape of global naval powers. In the face of more recent sea powers and the uncertain situation of US retention of its global naval power, coastal states may face more unstable maritime environments where aggression may indeed occur. Fortresses with available military technology including both attack and defence present relatively weak states with an alternative for defence of their territorial waters, in addition to the traditional options of mobile platforms. Except for a few types of bunker busters with restrictive conditions of delivery, conventional munitions are ineffective in destroying heavily hardened fortresses, especially where modern technologies are adopted. The likelihood of higher survivability of fortresses over mobile platforms, especially for major surface combatants, would make them the ideal niche defence method. This new weapon system

would complicate the gambit of a sea power's plan for using force against a coastal state, thus strengthening the latter's deterrence. Due to their lack of mobility and war-orientation, fortresses cannot fully replace mobile platforms for various scenarios other than war. Thus, the new version of fortress fleet strategy, using a combination of fortresses and mobile platforms, presents a distinctive framework for coastal states to deal with both conflicts at low and high intensity. It would therefore mainly suit those coastal states with strong perceptions of external threats. Vietnam presents a case in point for the potential application of modern naval fortresses to reshape the balance of military power between a coastal state and a sea power.

Notes:

1. For example, the maximal range of the successful British Armstrong 12 pounder in the mid-19 century was slightly more than 8 km.
2. During World War One, a variety of field guns were able to reach ranges more than 10km.
3. During the Second World War, two kinds of German coastal guns, 305mm SK L/50 and 406mm SK C/34, and one American model of 16-inch, M1920, could reach more than 50 km.
4. Most warheads of precision guided munitions are less than 1500kg.
5. The largest naval gun in service is the American 155mm advanced gun system, and its shells would be about 50 kg. The largest warhead of land-attack or cruise missile is about 500kg, except for several types of Soviet/Russian heavy anti-ship missiles.

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