Present and future of aircraft carriers as a floating diplomatic and military means of deterrence

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Abstract: The aircraft carrier is the most capable offshore military warship mankind has ever build and is considered as a symbol of the absolute navy and national strenght. Construction of an aircraft carrier is having a great impact on country’s industry and economy – the production will involve thousands of components developed, produced, transported and assembled by indigenous factories. Building such a huge vessel promotes national industry and increase new job opprtunities. Therefore, development and construction of an aircraft carrier depends on strong economy and industry potential. This article deals with current and future projects of this „floating diplomatic and military means of deterrence” and points out on main criteria in decision making process when choosing new carrier designs.

Key Words: aircraft carrier, warfare, defence, security, mission, propulsion.

"If you don't have that forward deployed presence, you have less of a voice, less of an influence."

William Cohen, former US Secretary of Defense

1. INTRODUCTION

Interoperability, survivability, flexibility, versatility, deployability – these capabilities are among the key requirements laid on contemporary aircraft carriers. They are still the best means to project soft and hard power both in peace and war throughout the world oceans. Design, building and operating of aircraft carriers need involvement of the whole national industry and science. It requires new energetics, up-to-date technical system and adequate navalised multipurpose aircrafts.

The value of an aircraft carrier is viewed from both a political and military viewpoint. Aircraft carriers (amongst other weapon systems) provide a country with significant prestige value. Media coverage, the sail itself and port visits to both friends and potential enemies
usually have a very important impact. The possession of such vessels also highlights the technological capability of a nation, and the nation’s ability to undertake grand projects.

2. DEFINING THE SIZE

Parameters of an aircraft carrier like length, beam and displacement are closely related to each other. They particularly depend on size of flight deck, which further affects the weight and flight characteristics of aircraft types in service.

Statement of experts who have conducted and evaluated war games is that a vessel with displacement about 40,000 tons or less are utilisable only in short term local conflicts and only in areas reliably covered by own or allied air forces and escort ships. But such ships appear to be inefficient in a dual (multipurpose) role while defending own task force from aerial attack and delivering strikes upon coastal targets at the same time. In addition, during high intensity conflicts these light carriers could be engaged on battlefield only for several hours.

Acceptable combat level and performance in full-scale conflicts against equivalent adversary is possible only by use of multi-mission aircraft carriers with displacement at least 65,000 tons. Multipurpose supercarriers are capable to perform variety of missions: protecting of task group from aerial assaults and strategic nuclear forces from enemy’s antisubmarine warfare (ASW) means, eliminating coastal targets and cover landing operations. High importance is put on non-combat missions as regional and strategic deterrence, flag demonstration, sea area defence and security of sea lanes.

3. CHOOSING BETWEEN CONVENTIONAL AND NUCLEAR-POWERED PROPULSION

USA are the only country currently operating aircraft carriers both with conventional and nuclear-powered drive. Both types of carriers can steam at high speeds and have demonstrated this capability for extended periods of time for many consecutive hours and even days. Although the maintenance strategy for conventionally and nuclear-powered carriers are similar, nuclear propulsion maintenance requires exacting and stringent environmental, health, and safety standards.

Nuclear-powered surface ships have longer depot-level maintenance periods than their conventionally powered counterparts.

For example, the typical post deployment maintenance period for a nuclear-powered carrier lasts about six months and about two thirds of the work is related to the propulsion plant, while conventional ships spend in depot only three months.

Nuclear-powered carriers can transit long distances faster because, unlike conventionally powered carriers, they do not need to slow for underway replenishment of propulsion fuel. Unfortunately, this advantage is futile when aircraft carrier has to operate within a task force, because the vast majority of escort ships are fossil fuel-powered. So, if a given country wants to act global, it needs worldwide supply system of fuel replenishment ships and depots.

Overall, as for the total operating and support costs for conventional and nuclear carriers, the values are comparable, but the overall investments (acquisition and midlife modernisation) and inactivation costs (disposal and spent nuclear fuel storage) are much more higher for nuclear-powered ships. Decision about the type of propulsion for aircraft
carrier depends mainly on proposed missions, strategy, deployment locations and technology level of each country.

4. SKI-JUMP OR CATAPULT

There are two methods for conventional aircraft to take off from the deck – by free run method from ski-ramp and by catapult (steam or perspective by electromagnetic one). Both possibilities have, of course, pros and cons. The ski-ramps are incomparable cheaper to develop and construct, do not need steam generating plant, repairs and maintenance. It saves important weight and capacities, which affect an overall carrier’s cost and displacement. On the other hand, ski-jump requires high thrust/weight ratio for take-off, so only several types of aircrafts are eligible for this carriers. As for the catapult, main advantage of is its low threshold of sensitivity to take-off conditions. Simply said, aircraft carrier equipped with catapult can operate in such ship’s motion, wind and sea disturbance conditions, whereas ski-ramp cannot. Another substantive advantage of catapult is higher take-off rate and much more bigger deck parking space (for given hull size). This is because aircraft using ski-jump have to use almost the whole flight deck, while catapult launched aircraft needs only about 300ft.

5. INDIA

It seems now, that Delhi’s long-time struggle for a three carrier force will not be an utopia. India has chosen similar way to the Chinese one and purchased ex-Soviet vessel. The 44,500 ton ex-Admiral Gorshkov, which is undergoing an extensive modernization (about 70 percent of the structure is being completely renewed) will carry 16 new naval Fulcrums, as well as an assortment of Russian origin helicopters. The future Vikramaditya is expected to enter the service in 2012 or 2013 at the furthest. Hopefully, soon after 2015, the second and this time India’s first truly indigenously built aircraft carrier (IAC) would be commissioned. This type will be significantly lighter and able to accommodate smaller air wing composed of naval Fulcrums or domestic LCAs. After its launch, the Indian navy is expected to officially unveil their plans for a second home-built vessel (IAC-II). The second home built carrier, unlike its predecessor, would be both larger and more formidable, equipped with modern (probably electromagnetic) catapult. The expectations, although very unlikely, are that India could boast with three operational carrier groups by 2020. Their mission, citing India’s Maritime Strategy, will range from “distant credible sea denial over large areas of the Indian Ocean” to “distant sea control in selected areas of the Indian Ocean to protect economic interests and mercantile traffic” to conducting “phased operations” - the use of maritime power to support land and airborne strikes.

6. USA

American economic development and security stability depends upon on protecting its overseas interests as well as encouraging peace and stability around the world. The US Navy’s aircraft carrier force consists of 11 nuclear-powered ships—the one-of-a-kind Enterprise (CVN-65) and 10 Nimitz-class ships (CVNs 68 through 77). The most recently commissioned carrier, the George H. W. Bush (CVN-77), the final Nimitz-class ship, was procured in 2001 and commissioned into service on January 10, 2009. CVN-77 replaced the
CV-63 *Kitty Hawk*, which was the Navy’s last remaining conventionally powered carrier. The Gerald R. Ford (CVN-78) class carrier design is the successor to the Nimitz-class carrier design. In comparison to the Nimitz-class, the Ford-class design will characterise several improvements, like the ability to generate substantially more aircraft sorties per day and features permitting the ship to be operated by several hundred fewer sailors than a Nimitz-class ship, significantly reducing life-cycle operating and support costs. Latest Navy plans call for procuring at least three Ford-class carriers—CVN-78, 79 and 80.

As stated in U.S. Code 10 USC 5062(b), „The naval combat forces of the Navy shall include not less than 11 operational aircraft carriers“. Five of them are now assigned to Pacific ocean, one of which is permanently stationed in Japan.

USA is nowadays not regarding any of countries operating or preparing to operate an aircraft carriers as an adversary. However, China is by some sources mentioned as a potential threat for neighbouring countries and for its aim to conquer the western Pacific. That is the reason why US Navy is reallocating its fleets as for numbers and home ports, giving the importance to Pacific Ocean, namely Guam and Japan to protect their allies and thus its own interests.

For example US Seventh Fleet headquarters are based in Yokosuka, Japan, making it the only forward deployed nuclear carrier base in US Navy. Pacific fleet vessels permanently float waters of western Pacific, milking the Taiwan, Korean and Australian naval installations. Besides the Pacific, other primary areas of responsibility for US fleets are Atlantic, Mediterranean and Indian Ocean.

US carriers, alone, are capable to support variety of aircraft, including fighters, strike fighters, logistic aircrafts, airborne early warning, electronic warfare and antisubmarine aircrafts, as well as multi-role helicopters. They conduct the full range of Maritime Operations and Theater Security Cooperation missions in concert with coalition, joint, interagency and other countries and thus building international military partner capacity.

7. RUSSIA

Russia, like the other military powers, has identified the advantages of aircraft carriers. After more than fifteen years of crisis, Russia is slowly starting to overhaul the whole Navy and aircraft carriers are considered as its inherent part. To guarantee its security against the threats and to defend the coastline are the main reasons why Russia is trying to rebuild the Navy and infrastructure.

The plans were great on paper – building a two strike groups with three aircraft carriers in each group, homeported in North and Far East. But Moscow has halted current funding and there are no plans to build carriers by 2020. Only after completing the advanced designs, exhaustive evaluation of the proposed and potential missions, the Navy senior officials will examine the expediency and necessity of building new vessels.

This verdict is undoubtedly right, especially when compared to other countries reckless decisions wasting billions. Russian Navy is currently operating only one 67,000 ton, conventionally powered carrier Admiral Kuznetsov with navalized versions of Flankers and Frogfoots at its disposal. In 2012, huge refurbishment of Kuznetsov is expected, which would result the ship will be fit for next about twenty years. Replacement will affect the propulsion system, upgrade of air defence installations, enlargement of the aircraft hangar and probably new Fulcrum fighters.
8. CHINA

Past newspaper articles concerning Chinese efforts to build an aircraft carrier have ranged from “China does not have an adequate technology base to build an aircraft carrier” to “China is to build Nimitz class supercarriers“. The truth is that nowadays we can clearly see first pictures and videos of China’s first aircraft carrier Shi Lang (ex Varyag) undergoing tests on sea. The decision to buy and refurbish old Soviet carrier was simple and smart. The Varyag represented a relatively modern design, with a sister ship in active service, and a vessel that could potentially be made usable. For a nation without experience in operating aircraft carriers the outlay for purchasing this ship was negligible, and combined with the ability to take her time, the ideal way for China to develop an aircraft carrier capability. Owning the Shi Lang the PLA has a good device to obtain required abilities to manage complex maritime operations and naval warfare.

Some observers point out that China’s carrier program is focused to face the US Navy fleet in possible future conflict in Pacific waters. However, this is highly unlikely, because if China wanted to target US carriers, it is far more likely to employ conventional submarines, long-range cruise missiles, and tactical ballistic missiles. More probable usage of aircraft carriers is to control vital sea lanes mainly in the Indian Ocean and to conduct operations out to the “second island chain“ (area from Japan, the Bonins, the Marianas, the Carolines, through to Indonesia) and the possession of aircraft carriers would provide the air support that would be required for such operations.

It is apparent that Shi Lang will be used only for test purposes, with an emergency operational role, so we can expect another two similar carriers to follow in a few years. According to a senior source in the Russian Navy, saying that Russia has sold to China four deck landing systems capable of handling heavy deck-based fighters. Kanwa (Hong Kong defense news agency) experts suggested that one landing system was probably studied and copied, another one was installed on the Varyag and two other deck landing systems will be installed on two new carriers China unconvincingly denies it is going to build. Also the purchase of a T10K, the prototype of the Su-33, from Ukraine, demonstrates that China also plans to build its own deck-based long-range fighter.

Restoration of the aircraft carrier is only the first step for China to build a high seas Navy with global reach. Beijing now needs to handle interoperability missions and to integrate with the joint battlespace to the extent required to support various air and navy group operations.

9. UK AND FRANCE

British Royal Navy has long been a naval power, but now is dramatically affected by defence cuts. With HMS Ark Royal withdrawn from service not long ago, HMS Illustrious (both Invincible class) remains the only carrier with more than limited capabilities until its retirement in 2014. After decommissioning the SeaHarrier and subsequently Harrier GR.09, the British Royal Navy is now operating only helicopters aboard. The Invincible class of carriers were designed for Cold War anti-submarine warfare operations with limited air defence capability provided by small number of SeaHarriers. The emphasis of the new Elizabeth class is on increased offensive air power and on ability to operate a wider range of roles. The plan was to build two aircraft carriers (Queen Elizabeth and Prince of Wales), but after strong critics to the overpriced program is the fate of second vessel still unknown. The
Rumours announced that only one carrier would become operational in around 2020 with the second being sold off. Anyway, both vessels will be completed due to being less expensive to do so than cancel one of them, as that would incur massive costs to penalty clauses. The drastic change in British defence strategy has also made reassessment in procurement of reduced number of F-35C carrier variant instead of the previously planned F-35B short take-off and vertical landing (STOVL). Concerning its development troubles and ominously rising acquisition costs, it is apparent that the UK will not have a deck suited fighters nor the carrier until 2020. While Harrier operations as a STOVL aircrafts involved minimal additional training for pilots, the F-35C version require advanced skills and practice. It is apparent, that procurement of aircraft carrier and suitable aircraft type is nowadays more political than professional decision.

The French Navy, on the other hand, not affected by such a huge defence cuts like the Royal Navy is now operating the only aircraft carrier – Charles de Gaulle. It is the largest European, catapult equipped and the only nuclear-powered carrier outside the US Navy. The ship has been suffering from various technical problems mainly with its propulsion system and has spent many months repairing and overhauling during the operational life. The carrier proved its important role, rapid deployability and versatility during the recent campaign over Libya. The French Navy’s goal is to have two carriers at its disposal to ensure that at least one vessel would be operational at all times while the second one will be under maintenance. The defense treaty signed in November 2010 between UK and France agreed to share aircraft carrier resources by keeping at least one vessel at sea between the two countries at any one time. In addition, it is possible that France would cooperate with UK and the next carrier will be made on British Queen Elizabeth class design, with the difference that French side will probably choose the nuclear propulsion.

10. CONCLUSION

Meanwhile, the costs of a carrier and its supporting air wing are very high and steadily grow so only few countries can afford it. The general rule of thumb is that a country would need three aircraft carriers in order to maintain at least one operational carrier at any time. It is interesting to note however that apart from the USA no other country has more than two carriers at the present time and for the foreseeable future only China and India, if ever, would create the exception. China, the most rapidly growing economy and military, is wishing to have three warships till the end of this decade. However, even if its carrier programme proceeded as expected, China would still have only limited proficiency and capabilities by 2020. It is certain that the US Navy, with its 11 supercarrier fleet, for next decades will enjoy the total dominance as for the total number and overall displacement (Important to know that Washington is retaining several carriers after decommissioning in active reserve). The number is, of course, not including the amphibious assault ships due to its fundamentally different role from a standard aircraft carrier. Although they can serve as a smaller carriers, their primary mission is to support ground forces on enemy territory by an amphibious assault on tactical level.

Although an aircraft carrier presents a high value fighting machine, in case of global conflict outbreak, its capabilities are almost zero, because they would become number one target for adversary attack submarines, fighter aircrafts and anti-ship ballistic missiles (ASBMs). With rising number and maximum range of mainly Russian and Chinese origin new generation anti-ship means, aircraft carriers would create only sitting ducks in a real warfare and will not be able to get to close proximity of desired theater area.
Modern aircraft carriers should display a high degree of tactical flexibility to be capable promptly reconfigure its multipurpose air wing to actual needs and accomodate the tactics and strategy on the nature of the crisis. Among the huge spectrum of combat missions already mentioned, the carriers provide also many internationally valued tasks e.g. counter-piracy, surveillance, intelligence, reconnaissance and as a humanitarian platform. Growing importancy appreciated worldwide lies on tasks like disaster relief, humanitarian emergency and evacuation. A carrier can be a source of fresh water or provide medical assistance in distress.

Since WW2, aircraft carriers have represented the utmost degree of naval power. Big, heavily defended and embarking an air wing more potent than most countries’ entire air forces, able to quickly deploy and remain on station for months while capable to strike targets in the air, at sea and on land. The design of current carriers is rooted in the Cold War when countries expected high-density combat with heavily armed enemy. Their goal was simply to put as many aircraft into the air as possible and as quickly as possible. 21st century is, by contrast, an era of global, low-intensity assymetric warfare. Aircraft carriers no longer need to launch dozens of sorties per day. Instead, fighters fly fewer, but longer-duration missions targeting terrorists and insurgents with precision strikes. The demand for a high sortie ratio would be further reduced by introduction of unmanned aerial vehicles (UAV), which will replace manned aircraft in some roles. Next generation of aircraft carriers (nowadays still on drawboards) would use UAVs as its main weapon, so we can expect the dramatic change of their design and reduced size.

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