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CARRIER VESSEL NUCLEAR

The Aircraft Carrier and Global Military Dominance in the 21st Century

Human communities have been fostering both peaceful and warlike relationships for millennia. At the same time, weapons and weapon systems have played a special role all times, have influences or decided wars, or lost them whenever not available. In modern times, after the First World War, not only the change of lead from the United Kingdom to the United States took place, but – in the beginning, overshadowed by other events – the importance of airspace for military operations increased as well. At the same time, the maritime great powers of that time – the United Kingdom, the United States, Japan, France, and Italy – perceived the pointlessness of a further maritime rearmament during their somewhat technological and operational deadlock, especially as far as super combat vessels were concerned, and because of the lack of material resources, too, a sea conference was summoned due to an American …

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Abstract

Human communities have been fostering both peaceful and warlike relationships for millennia. At the same time, weapons and weapon systems have played a special role all times, have influences or decided wars, or lost them whenever not available. In modern times, after the First World War, not only the change of lead from the United Kingdom to the United States took place, but – in the beginning, overshadowed by other events – the importance of airspace for military operations increased as well. At the same time, the maritime great powers of that time – the United Kingdom, the United States, Japan, France, and Italy – perceived the pointlessness of a further maritime rearmament during their somewhat technological and operational deadlock, especially as far as super combat vessels were concerned, and because of the lack of material resources, too, a sea conference was summoned due to an American initiative for the 12th November 1920 in Washington, were they tried to resolve on a common and far reaching reduction of the maritime potential. In the beginning nobody believed it – but it was possible to induce the maritime great powers mentioned before to make great reductions: "In no naval battle in history so many proud ships have been sunk."[1] At that time nobody neither assessed nor forecasted that such a direct armament and operational interrelation would develop between the military opening of the airspace and the reduction of super combat vessels. Nevertheless, the most complicated, efficient and potent (conventional) weapon system of history was to originate from it – which is quite understandable nowadays. Like in earlier times as well today, the secret of decisive weapon systems is in the amalgamation of fire (efficiency) and movement (position independence). Tanks, which were contemplated and rapidly fully developed during the period between the two great wars, ideally complied with this demand as well – at land. The aircraft carrier, at the beginning an already existing warship, due to some special gimmicks able to use small airplanes mainly for reconnaissance and for dropping torpedoes, was born in its arms technological relevance not earlier than the end of the short phase between the wars. Especially Japan and the United States, with the huge theatre2 of the Pacific Ocean in sight, began to arm up this new kind of vessel to become the main weapon system, and the success at sea was to depend on it for better or for worse. After the last major sea battles of the Second World War there has been no sea battle à la Mahan3 until today. Nevertheless, the aircraft carrier, which is propelled nuclearly (CVN) 4, with 100000 t extrusion, with five to six airborne groups (CVW, as well as CAW) 5, represents the principal item of global tactical sovereignty over the airspace, and fights on, below and above sea level today. Likewise, the carrier has become indispensable for amphibian operations as well as for the support of land forces close to the sea. If today, within the globally leading maritime power with its 10 nuclear carriers acting together as carrier strike groups, there are intensive and permanent discussions about the sustainability, necessity and future of the aircraft carrier, one will have to get to the bottom of things analytically, scientifically and unemotionally sine ira et studio and try to present the position and the necessity of the nuclear

carrier strike group in detail, clearly and objectively. Additionally, the cards are re-shuffled both in the geo-political global situation and the political global system. From the bipolar world after the Second World War, generally called “Cold War” between the Soviet Union and the United States, the latter have emerged as the “victors” because the Soviet empire imploded due to tritely economic rather than to ideological infirmities. A short phase of uni-polar dominance of the United States was followed by a rather multi-polar order with the turn of the millennium, including various movements concerning the claim of global leadership. The rise of China, which had begun in 1986, first economically-military, now hints at a new showdown concerning the global role of leadership between the United States and China. It will take place at all levels, whereas the strategic-nuclear one seems to be excluded (for the time being) as a means to an end for the present. The more important is the presence/potential in the conventional domain at all global levels, as both rivals are separated by huge maritime distances. For this reason, the maritime potential, which serves to claim a supple, position-independent and tactical sovereignty over airspace, just has top priority. Although the conception of nuclear aircraft carriers might make problems and have infirmities – it cannot be replaced in a simpler, more cost-efficient and more effective way at the moment, as far as the objective is concerned. For otherwise China, as the challenger, clearly inferior to the United States in maritime matters, would certainly not invest billions persistently and regardlessly for establishing exactly these elements.

Introduction

Seldom in the history of national security has a weapon system/weapon platform had more importance than the nuclear aircraft carrier. The chariot, the cannon – at first pushed or mounted on a ship, then more manoeuvrable on a lafette, and finally as a self-propelling gun, the tank, and naturally the aircraft carrier as well, became the supporting element of power projection in their particular range of service. Both land and sea warfare have, apart from several commonalities, very different strategic and tactical prerequisites and objectives, and thus partly depend on completely different approaches and means.

If one abstractly considers the development of the living together of the tribes, peoples, states or groups of states from 5000 BC until today, one will find out that the control of the oceans has always had a certain significance, but only since the beginning/middle of the 19th century this has increased significantly due to the technological progress. Today, in the first quarter of the 21st century, we notice that, because of the dominant geographic basis relevant for the manoeuvre of military forces, land was dominant at first, followed by sea in the middle of the 19th century, by airspace in the beginning of the 20th century, and finally space since the 1960ies – from one-dimensional to four-dimensional. One has, however, also to consider the dualism of the sea in this particular context, with theatres both on and under the surface of water.

The present showdown concerning global military dominance, which is to be considered the prerequisite for becoming/being a global leader, is thus definitely determined by the capability of control and real military power at sea. As suggested by the title of this essay, the aircraft carrier plays a decisive role here. Often people ask the question why it is not possible, with all the technological means of the present time, to find alternatives for establishing and guaranteeing this dominance. Does not the carrier – already today – play the role of the 20th century battleship, as the then seemingly invincible combination of manoeuvrability and firepower at sea in the course of the entire Second World War, not being capable of decisively contribute to dominate the sea? To that two short annotations.

In the course of the showdown concerning the naval power in the Pacific Ocean, the battleship had to yield to the aircraft carrier. The insight from the defeat of Japan, which had been victor and winner of the naval power in the Pacific Ocean from the naval battle of Tsushima 1905 onwards, proved that the final victory, under the conditions of 1941, as far as position, possibilities and *Grand Strategy* of the war makers was primarily owed to control of the sea.

This essay is supposed to prove that the very dominance at sea without, or with "smaller, cheaper, less, big and easily to run down carriers", in a foreseeable and assessable period of time – let us say until the middle of the century and beyond – cannot be established, and that for this reason the aspired objective of global military dominance cannot be upheld or achieved without the weapon system aircraft carrier with a special configuration. The present showdown for the role of leadership on earth certainly concerns the United States (USA) and the Peoples' Republic of China (PRC). At the moment, all other possible *players* in the international community, especially as far as their maritime-military powers are concerned, are assessed as not being able to interfere directly in this showdown conceivably – except by means of *bandwagoning*[6] or Alliances with one of the two key players.

There is, of course, the certain irony that the weapon system/platform aircraft carrier can only achieve the objective of global dominance – viz. unopposed power projection on the globe – by gaining maritime tactical air power. The means for enforcing this purpose in order to achieve the objective is an integrated and carrier-borne air wing (CAW/CVW, see footnote 5). In this essay we have clearly defined the three elements of military (political, economic, etc.) action according to Clausewitz. Thus, the point is that the carrier as a platform must implicitly have an integrated air wing available in order to operate in the tactical airspace above sea level. Further on, one will have to prove which functioning complex overall system must be at disposal in order to exert this military instrument on the defined scene, in the sense of global dominance.

Basics

This is not the place to have a debate on principles of real, or unnecessary, global military dominance in the showdown of decisive *players*. In the sense of realism and neo-realism, these considerations are based on the key concepts of national interest[7], the still existing anarchy[8] on the level of international relations /"global order system", and the system of *balance of power*[9] . Likewise, the strategic-nuclear component as the *ultima ratio* of national security is excluded. Sea power has to be generated, seen and assessed without this possibility. A nuclear conflict with intercontinental ballistic missiles would probably lead to such an annihilation of the existing order and biotopes on the planet that it would certainly not necessary any longer to discuss the banalities of land or naval power. One cannot, however, neglect a non-nuclear conflict, which does not seem likely between the superpowers at the moment. Especially the USA and the PRC are massively subject to the Thukydides-Syndrome[10] and are in a total conflict about the global position of leadership at nearly all levels, except the directly-military one.

Geography

Still today, as well as since H. Mackinder analysed the role of geography for politics (of the state), and described it as an important factor[11], the politics of a state and its interests have been determined by the geographical position as well as the resulting local conditions (raw materials, lines of communication, climatic conditions, operational depth, etc.). The United States have an area of 9,8 mio. km^2, two neighbouring states which can be neglected concerning security (on land), and excellent access to the two main oceans – and, particularly important, the islands/strongholds in the Pacific area.

Primarily, the USA are an absolute naval power, and in the course of their short history they have always entirely taken account of this fact, particularly since the until then first naval power, the United Kingdom (since the beginning of the 20th century), resigned in this respect. Additionally, one has to state that they have excellent operational depth, and thus *de facto* they do not have to be afraid of anybody as far as a military attack in the framework of conventional operations. In addition to these favourable basic conditions, they enjoy relative independence concerning fossil raw materials. To sum up, using a scale from 1 (optimal) to 10 (totally worthless), one can assess the component of geographic conditions with 1-2, which is an

In this context, the PRC is to be assessed completely differently. Although its area is nearly equal to that of the USA, the eastern side of its national territory is situated at the Pacific Ocean (coastline: 14500 km). The three other sides of the Chinese "rectangle" are land borders with a total of 15 (!) neighbouring states for the Cathay: at least half of the 22457 km land borders are shared with unfriendly neighbours – for different reasons, concerning Chinese foreign and security policy, in every respect India, North Korea, Russia and Vietnam are to be assessed completely different than the American neighbours Canada and Mexico.

In addition to that, there is a much stronger dependence on fossil fuels, a decisively smaller operational depth towards the north and south-east, as well as the de facto unusable demarcation by the Himalaya to India, and – in the far south-west - just 430 km border-line with the loyal ally Pakistan. The protective opening towards the Pacific itself is to be relativized: the potential adversary concerning the claim of global power, the United States, are in an average distance of 10000 km, on the opposite coast, and, apart from the total maritime superiority now and in the foreseeable future, which China must factor in, they have a network of island and land bases as well as allied states in the region which must not be underestimated.

Thus, the geographically existing basical operational depth is reduced in this direction, but in addition, the situation along the other three axes is not better: in the south-east Vietnam (1297 km), afterwards

in the centre in the south the Himalaya massif as well as India (2659 km), in the west, in the border province of its own with the Uigurs (Province Xinjiang, ca. 7,4 Mio.), an ethnic-religious minority difficult to treat, and in the north (beginning in the north-west) Mongolia (4630 km). This length of border-line, together with that with Russia (4133 km) down to the border with North Korea (1352 km) can be classified as security-politically problematic – in total a border length of 10115 km with a topographically unfavourable structure. Additionally, there is an unfavourable situation concerning (fossil) raw materials, and as a total result, 6-7 on the scale mentioned above.

Maritime Powers/Classification

Apart from these geographical and thus unchangeable conditions we have to determine another relevant prerequisite regarding tactical sovereignty over the airspace at sea, which represents global power projection as the objective. Power projection – whether on sea, land or air and/or space – correspondent means, which in turn must be measurable and assessable. As far as maritime forces are concerned, we have, according to Groove with his *Navy-Classification* (1990), an ideal classification for our contemplation. E. Grove, together with G. Till, classify maritime forces according to strength and efficiency regarding certain tasks and geographical ranges. As we only deal with global military power projection, it is realistic that the classes III - XI can be omitted, and only the classes I and II are worth considering:

I. *Major global Force Projection/complete*

II. *Major global Force Projection/partial.*

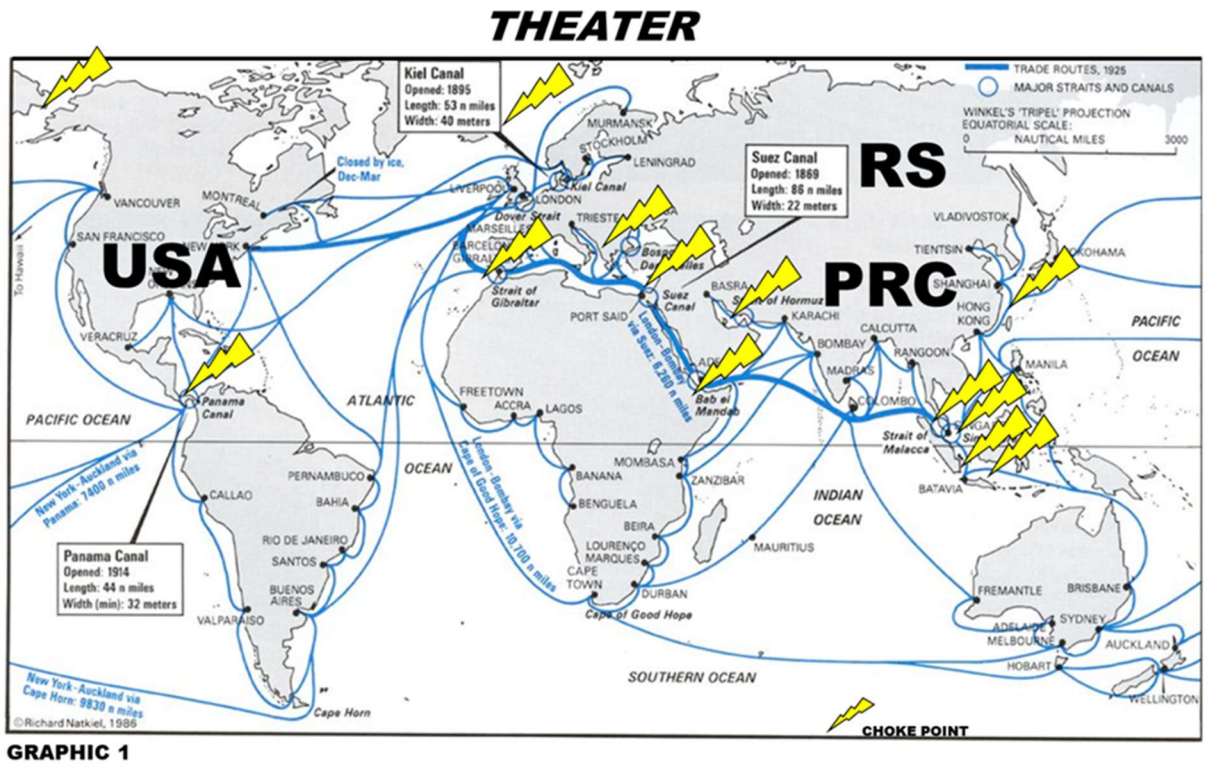
All other classes cannot be factored in, either due to the lack of strength, number of key elements (such as aircraft carriers), or structure (logistics, ranges, infrastructure, etc.). And now we have to make the observation for the first time, that at the moment – as well as in the foreseeable future (20 – 25 years) - only the maritime forces of the United States, the U.S. Navy (USN) comply with class I completely. Strictly speaking one could finish this part now already, because all other states with global-military claims, which are strong at sea, drop out (except the PRC) today as well as in the foreseeable future. The reason for this is that all prognoses might fail, even with the greatest possible efforts. There are simply too many political, technological, economical and structural imponderables which have to be assessed permanently and included according to their relevance. For this reason there is another short review why at present the naval forces of the Peoples Republic of China (PLAN)[12], the Russian naval forces (RSN), the French navy (FN), and that of the United Kingdom, the Royal Navy (RN), at least must be assessed and mentioned as well, especially the PLAN. With very good will one could classify the FN and the RSN as forces of the classes III/IV. Although there are rumours that Russia

plans to build several carrier groups, there no results have been discernible so far. France, the only other state besides the United States using the only "other", far smaller nuclear aircraft carrier (CVN R-91/Charles de Gaulle), only has one carrier, only one CSG, something which will have to be discussed later on. Class I or II depend on at least 4 carriers as an absolute minimum. The RN, whose two carriers of the Queen Elizabeth Class (conventional propulsion) ought to be deployable from 2025/30 (?) onwards, still not has resolved on any consistent and financeable conception for the strike groups (CSG)[13] which are to accompany and protect its carriers, and thus it has to resign itself to the delivery of American F-35-B/STVOL[14] 2020-30. And the RSN, owning one single deployable carrier (CV)[15] with the necessary GSG-elements, cannot exert any effective global power projection with this maritime component, and likewise the FN. The PRC, at present without any deployable carrier (a training ship and one or two accompanying destroyers are certainly no strong *strike group*), has presented plans (without any details) for a global maritime component. Even the national complaisant experts, however, expect a deployable maritime force with three or four carriers (with at least 2 CSG) not earlier than in 20-30 years, an issue which will elaborated on later.

Global Power Projection 2019

Bevor we deal with the national capabilities of the *player* for military power, there are some remarks on the *theatre* – the oceans. **Graphic 1** shows the oceans usable for commerce and military deployments, the main *sea lanes* and the so-called *choke points*: natural or man-made isthmuses, which – well-known – (can) offer land forces a certain possibility of influence on manoeuvre at sea. At present, the United States, the Peoples' Republic of China, and Russia are the only three powers capable of claiming a co-determining military role within the global power play. Why the United States are the only power capable in terms of realisation and potential will have to be elaborated on obversely. For this part of the essay, this information, together with the potentials depicted in **Graphic 2**, will have to be sufficient.

The presented – as a comparison –military budget situation (according to SIPRI) is supposed to demonstrate the dimensions of the economical-financial outlay imposed by military power claims to the effectiveness and solvency of a nation which decides for global power projection (see also Chapter "Perspectives", example USA, p. 32 – 36).



GRAPHIC 1

CV/CVN/CGS-POTENTIALS

	CV/CVN	CR	DD	FRG	SSN	SSK	SSBN
USN	-/10	22	60	-	50	-	18
PLAN	?/?	-	23	48	8	49	4
RSN	1/-	1	12	-	16	14	17
FN	-/1	-	2	9	6	-	4

USA: ± 650 B. US-$
Budget/tendency light up (?)

PRC: ± 250 B. US-$ Budget/tendency strong up

RS: ± 70 B. US-$
Budget/tendency light down (?)

GRAPHIC 2

Strategy

Global power projection logically requires relevant potential at sea, according to the norm 70-80-90: 70% of the earth's surface are water, 80% of the population are living roughly within a distance of 150 km to the sea, and 90% of international trade takes place across the oceans. For this reason one has to take notice of this superiority of the sea, which cannot be ignored by the military nor "substituted" by technology. As a result, global power projection – provided that it is a strategic objective – compulsively requires relevant military potential. This potential – when we consider the already discussed prerequisites of the two opponents United States and China with their respective intentions concerning the global role and its military underpinning – determines the strategic finalization and consequently its operational implementation. A state lays down its desired role on the world stage in its *Grand Strategy* and aligns every further action to it. Based on the example United States this can be explained fairly well, and as far as the fundamental considerations are concerned, one can *de facto* substitute the United States by the Peoples' Republic of China, without this procedure, and sometimes even the conclusion thereof, showing any differences. For the United States, an open democratic society, this is not always so easy as with the Peoples' Republic of China with its authoritarian conglomerate system. **Graphic 3** shows the way to the *Grand Strategy* and the possible options – here for the United States.

Now we concentrate – and this would also apply to an analysis of the Chinese options – consciously and exclusively on the fourth option: *Primacy*. The three other options imperatively lead to different assessments and consequently to altered structures in the field of security, which not implicitly comply with global power projection or even or even take account of it. For this reason it is so important to explain this strategic foundation and regard it as the prerequisite of all further thought and action. *Primacy*, according to Merriam-Webster „*The state of being first (as in importance, order or rank)*" expresses the claim for the role of leadership. For the key element of a *Grand Strategy* this means that one wants to be dominant on the security-political level. This, in turn, regarding all relevant national possibilities, determines the security strategy and further on the maritime strategy. Since 1918, the United States slowly and hesitantly have begun to decide on a way between isolationism and a stronger influence on the world stage. Caused by the resigning of the United Kingdom as the global leading power, the strong nationalistic trends in Europe, and the rise of the Soviet Union and Japan, this multi-polarity culminated, and after 1945 it had to yield to a dual world order which collapsed 1990/91. Since the end of the First World War and beyond the Second towards the American one-polarity, another power struggle for the role of global leadership seems to have begun.

GRAPHIC 3

The challenger, the Peoples' Republic of China, claims this role as well. Naturally, here the American *Primacy*, especially the military one, is a bar… and Thukydides with his prediction of the power struggle between the established and the forthcoming leading power lives to see an absolutely remarkable Renaissance. How is this projected on the strategic level?

The Peoples' Congress of autumn 2018 has resulted in two "trend-setting transformations": the claim of global leadership, and the interminable prolongation of the presidentship of Xi Jinping. Now „*Make China great again*" openly is opposing „*America first*". And the downright USN-domain naval power is the decisive theater. Whereas China struggles for closing the huge gap especially in its military-maritime capabilities, in the United States there are vehement discussions on all relevant levels about the preservation of maritime *primacy*. Here, one can instance the discussion, in the first instance led on the political-scientific level, between the supporters of *Forward Deployment*[16] and those of *Offshore Balancing*[17]. The former, among others led by John Ikenberry (Princeton), argue that *Primacy* on the global stage, in consideration of security-political partnerships (inter alia Japan, Australia, New Zealand, Taiwan, NATO/Europe), can only guaranteed by strong military presence in situ - *forward deployment*. „Phoney!" shout the supporters of *offshore balancing* such as Christopher Layne (Cornell) and insist that exactly this superior military strength of the United States (especially that of the USN) allows for a massive withdrawal from *forward deployment,* accompanied by rearmament and taking

over military self-responsibility by the security-political partners (see above). According to their opinion, there are enough possibilities and time to get to the theatre quickly in times of crisis, the partners with stronger forces than hitherto being in situ already. „Phoney!“ is the answer of the supporters of *deployment* …

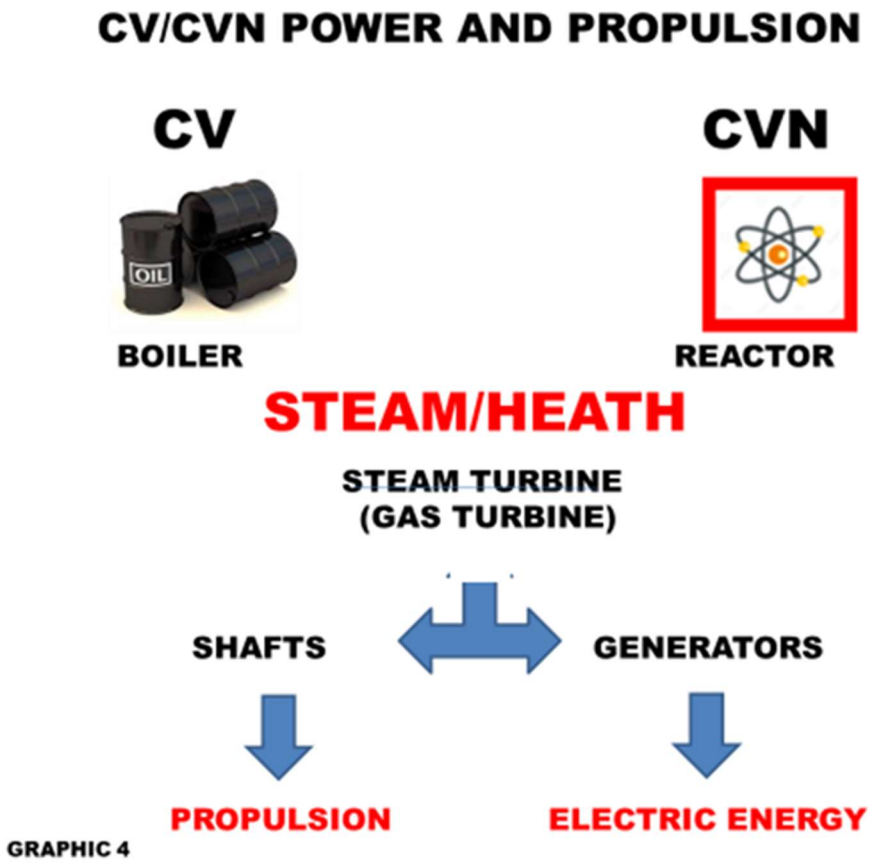
The USN, the American armed forces, are still fully in the *forward deployment*-mode, and this variant of Primacy is the determining factor of the *Grand Strategy* of the United States. As long as this maxim is predominant, one cannot to do without global power projection. Furthermore, this factor determines all further steps, especially the “how?”, or, as the Americans tend to put it, „*What do we need to do the job?*“

And now we have arrived again at the introductory statement and the role of the aircraft carrier: global power projection requires maritime tactical airpower, or in other words, an integrated carrier air wing (CAW/CVW), and this in turn compulsively needs swimming infrastructure. An alteration of this conception – political, technical/technological, organizational, financial-budgetary, etc. – ought at least to be aligned with the posed task from the *Grand Strategy*, in particular *Primacy* and power projection. This fact, too, will still have to be explained and reconsidered.

CVN/CSG

The Carrier

Swimming airport, platform, and combat system – no other element of military *hardware* is more sophisticated, has strategic and likewise tactical-operational effects on the final aim, namely preserving or achieving global dominant military power. Here, we must first provide an explanatory statement for insisting on the word *“nuclear”*. Concerning the generation of primary energy (warmth), one must differentiate between a *carrier vessel* (CV) and a *carrier vessel nuclear* (CVN): with the CV energy comes from a system which generates steam, based on fossil fuels (oil/kerosene), whereas the CVN uses a nuclear reactor. **Graphic 4** demonstrates how, whereas one has to mention that a big aircraft carrier (with more than 70000 t displacement) almost inevitably must be *nuclear*, because the need of electric current increasing with the size and technology of the flight (starting/landing aids) and security (radar units) installations is a main factor. As far as propulsion is concerned, both models are put in motion by either a steam turbine or a gas turbine by means of shafts and propellers. This question of “nuclear” does not directly concern propulsion, but rather the size, tasks and steady state for generating primary energy (warmth/current).



GRAPHIC 4

An excellent example for a modern, the most modern CVN is the first carrier of the new Ford-class, the CVN 78/Ford. With the first ship of this class – recently it has replaced the CVN 65/Enterprise (Nimitz-class) carrier – naturally some issues have become obvious which will be examined later on: the "price", and some technological initial problems as compared with the Nimitz-class. The most prominent are:

1. A new warplane of the 5th generation, the F-35-C
2. A new electromagnetic catapult system (EMALS)
3. A new landing aid system *advanced arresting gear* (AAG)
4. A new *dual band radar* (DBR)
5. New drive reactors of the A1B type.

The „size" (displacement) is equal to that of the Nimitz-class with 100000 t, but Ford-carriers manage with approximately 500-700 PAX less crew (Nimitz-class 5800, Ford class 5000), have a higher *sortie generation rate* (SGR), meaning a higher frequency when deploying the *Air-Wing,* and as opposed to

the Nimitz-carriers (with the warplanes of the 4th generation F/A-18E/F), 33% more combat value. The other nuclear carrier in the global environment is the CVN R-91 Charles de Gaulle, although with approx. 50000 t half as big as the Nimitz- or Ford-carrier, most likely "compatible" with these – in the course of exercises, *Rafale* warplanes have landed on and started from Nimitz-carriers, as both carriers have a steam-driven catapult (CATOBAR)[18]. The other *navies* (RN, RSN, PLAN) which have carriers (with variable combat suitability) in service, deploy CV, the RSN and PLAN carriers being based on the first model of the Kusnezow-class (RSNS Riga/ today, PLAN-Liaoning) which had been built in the Ukraine in the 1980ies. **Graphic 5** provides the survey:

CV/CVN IN SERVICE start build/commissioned		L/m	TONS	PROP. /SPEED/. NO. max. AIR-CRAFT 1 kn= 1,85 km/h		
	PLAN LIAONIG/+02 Varyag class 01/ 1985/2012 02/-2020?	306	67500	STEAM 8K/4T	29 kn	21/23
	RSN KUSNEZOW Varyag class 1982-1991	306	62000	STEAM 8K/4T	29 kn	21/23
	FN C.D.GAULLE R-91 1989-2001	261	42500	NUCL. 1R/2T	27 kn	30
	USN CVN-75 H. TRUMAN Nimitz-class 1993-1998	317	100000	NUCL. 2R/4T	30+ kn	85

GRAPHIC 4

CVN 78, which are not in full service so far, and the two QEC-carriers of the RN are not included.

Another clarification of the question concerning the carrier asked time and again: speed. The nuclear carrier generates its primary energy atomically, and from this issue onwards there are in principle not any differences to a CV. One of the many legends about the CVN attributes phantastic speed to it, as it is "driven atomically"… In the course of the last years, CVN were attributed speeds up to and even more than 50 knots (92,5 km/h), and many official statements nurtured this legend by using the well-

tried killer argument "no information due to ‚*security reasons*' ". The maximum speed of USN CV's (before the Nimitz-class, 1950/60ies) are officially known today; it was 33 knots (61 km/h). In all of these cases, the ships has four shafts/propellers. With the CVN – we have stated that already – the reactor does not drive the propellers directly; on the contrary, the steam generated by its warmth (as with the CV) drives the shafts/propellers. The (steam-) turbine of a CV or CVN drives the ship, and the procedure/materials/principle are the same: e.g. a steam drive with four shafts and a maximum power of 280000 shp (*shaft horse-power*) – and it is irrelevant whether this power drives a CV or a CVN. Principally, a CVN can generate considerably more steam via its reactor(s) – but, concerning drive, there is no (mechanically tougher) acceptor. Thus it seems impossible that – concerning the implanted driving technology – a CVN is faster than a CV (equal shafts implied). Generally the Nimitz-class was built for 260000 shp, but later was upgraded and also has 280000 shp today – thus a range of speed of approximately 33 kn.

To make another complicated matter understandable – for the speed of such big ships, the very complicated construction of the ship's body, *the hull*, is decisive. The top speed, however, and this may sound surprising, is not the decisive one, it is the *cruising speed* which is relevant for the moving of carrier strike groups, which is linked with several factors (non-nuclear accompanying ships, etc.), and which is about 20 Knot (37 km/h) with CV. The hull is built exactly for that, and not for top speed. The CVN, on the other hand, due to its fuel independence, can *de facto* run with top speed (mechanical factors out of consideration), that is constantly at approx. 50+ km/h, and thus it is highly superior to the CV in this respect. So the transit speed of a CV (approx. 37 km/h) is considerably lower than that of a CVN (approx. 55 km/h) – and let us not forget that we talk about global power projection with the pertinent distances.

The CVW/CAW

The *carrier vessel wing* (CVW) or also *carrier air wing* (CAW) thus is the purpose which the carrier, the *carrier strike group* (CSG) has to carry out and deploy movably. As the platform – as has been proved now – is a highly and rapidly moveable "airport", all tasks which are to be carried out by the CVW must be accomplished with the structural means of the CSG. In a nutshell, these tasks are:

1. Protection of the carrier against: submarines *anti-submarine warfare* (ASW) hostile air/missile attacks *anti air warfare* (AAW) maritime attacks *anti surface warfare* (ASuW)

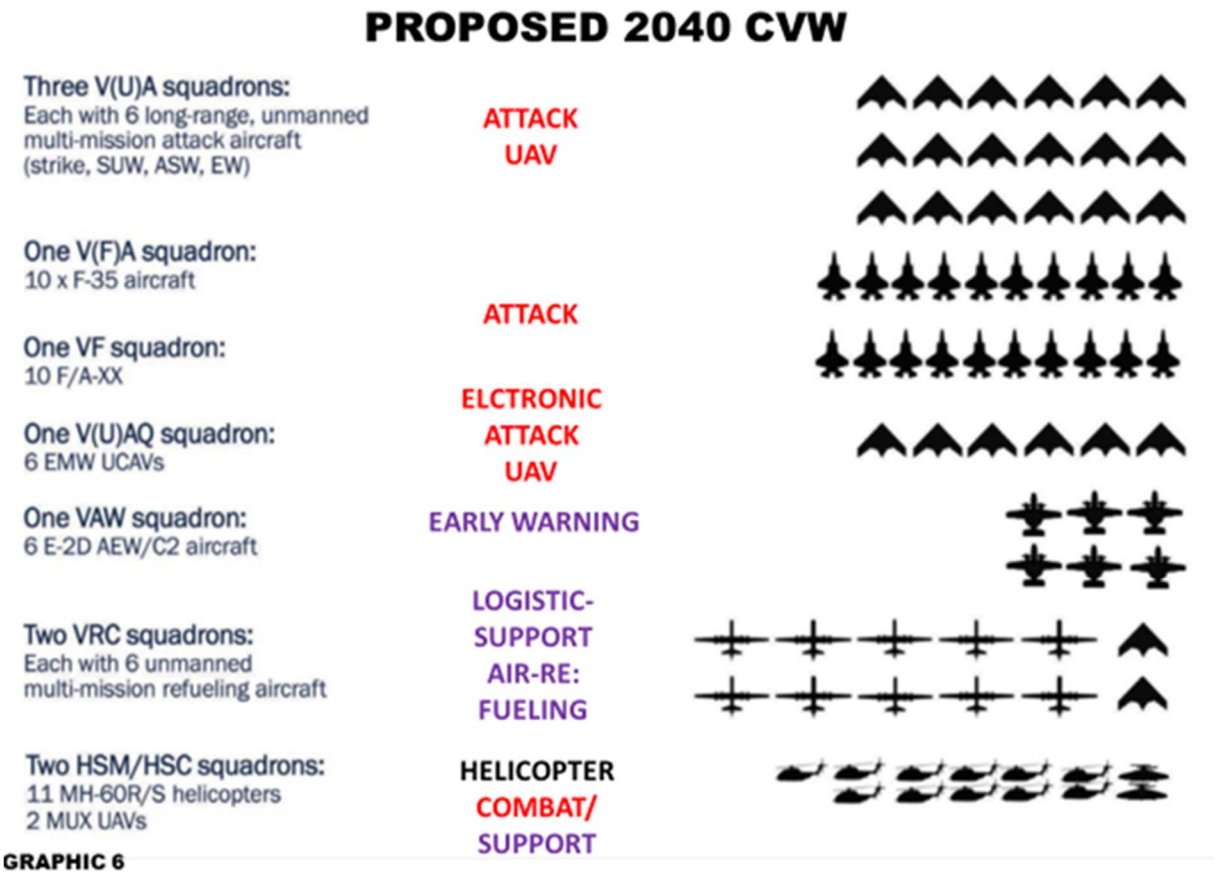
2. Attacks against: hostile CSG/CVW hostile positions/maritime bases air support for own forces on land(interoperability)

3. Permanent surveillance of all areas: air – sea – under water in theatre (*surveillance*)

4. Air reconnaissance over near – medium – great distances(*reconnaissance*).

Both the Nimitz- and the Ford-class can be deployed with both F-35-C and F/A-18E/F (which are still in service in high numbers) in the CAW, even in hybrid squadrons. The other elements – reconnaissance/early warning, logistics (primarily in-flight refuelling) and helicopter squadrons for submarine defence, are deployable 1:1.

Another topic discussed fiercely is the deployment of unmanned aeroplanes: *unmanned aerial vehicle* (UAV). The increasing use of these meanwhile highly technological and permanently refined elements is a topic of high relevance within the USN. Some people – those fascinated by technological progress - even talk about the complete deployment of unmanned warplanes; one has, however, to question the usefulness and the kind of operation, without the human assessment of the situation in theatre, as well as the electronic controllability in combat situations without any "big picture". In one respect, however, the supporters of UAV are right: the present warplanes of the 4th and 5th generation are capable of flying spiral speeds and spiral radii which the human body could hardly endure because of the accelerating forces.



GRAPHIC 6

A topical study of the CSBA (2018)[19] now suggests a mixes CAW consisting of – about 2040 – three attack/combat squadrons UAV with 6 drones each, a manned squadron with 10 F-35-C and 10 F/A-xx each, as well as with the necessary support squadrons manned/unmanned and the HS-ASW component. **Graphic 6** (CSBA) shows a good portrayal of this new possible CAW-composition.

CSG

With the carrier strike group, which is commanded by a *Combatant Commander* (CC) in the case of the USN, we now have to take a closer look at an organisation which has to establish this tactical sovereignty over the airspace in case of deployment – from surveillance and deterrence to combat at different levels as well as political-diplomatic presence. **Graphic 7** presents a pattern of the CSG 5, with its flagship CVN 76 Reagan (Nimitz-class); each main element – carrier, cruiser, destroyer, support ship, as well as the accompanying nuclear fighter submarine (SSN) – has a fixed role within the formation.

In the case of an amphibious deployment (e.g. together with the U.S. Marine Corps [USMC]), this formation can be converted into a *naval task group* (NTG) by integrating amphibious forces. The fighting strength of such a CSG is high, and its configuration is determined and compiled by the fleet, in the case of the USN with no combat, but with a mere command structure, based on the availability of forces, on the mission and urgency. New conceptions, above all for missions near the adversarial mainland, have high relevance in respect of interoperability with other U.S. services, especially the Air Force (USAF), and are in the centre of all subordinated considerations.

All this holds equally true for all naval forces which, like the USN, strive for global power projection – above all the PLAN. Here it becomes definitely clear that a carrier alone is not enough. A carrier will only be able to develop its force – generating manoeuvrable tactical sovereignty over the airspace – if the CSG is strong and seasoned, which represents another element puzzling the PLAN, apart from the *hardware*. If one now considers the real capabilities concerning global power projection with the potential available at the moment, one will first have to determine the basics:

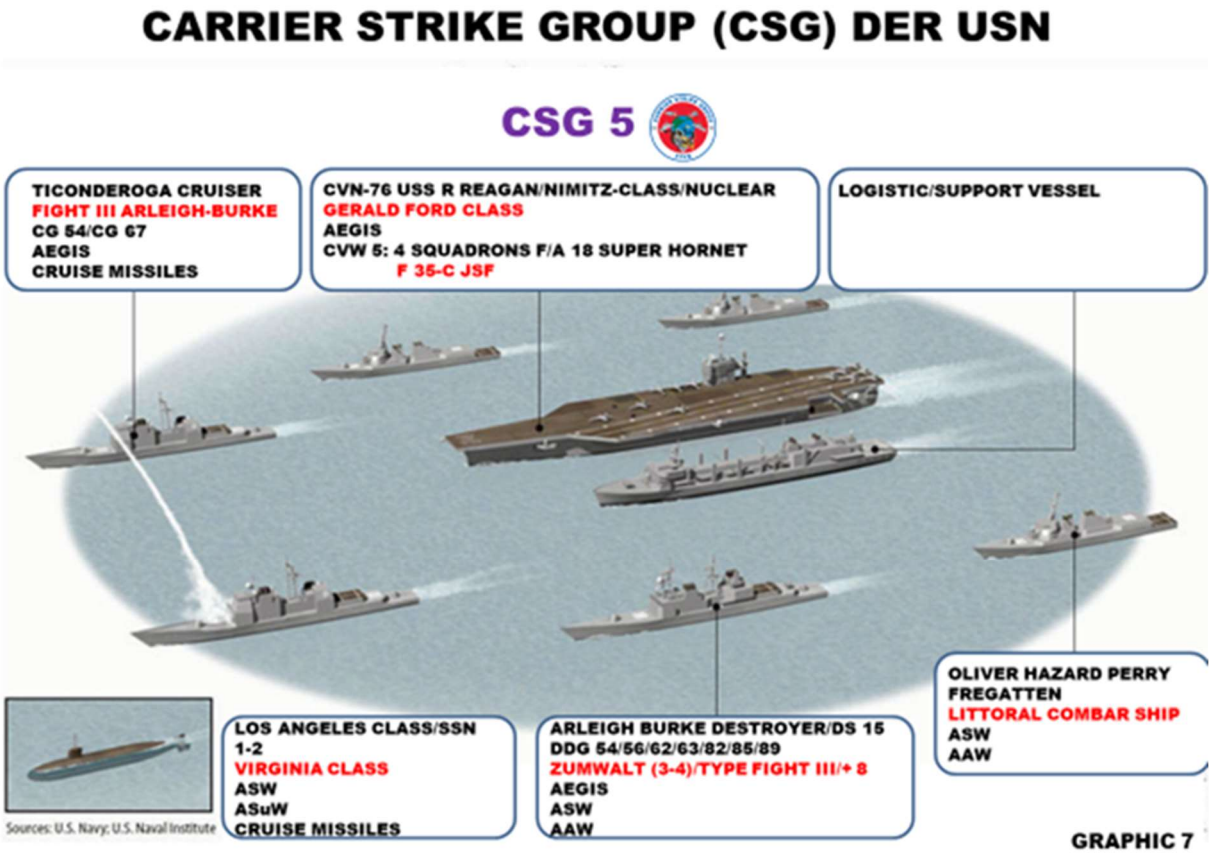
1. Global power projection requires at least four CVN and threeCSG, a corresponding number of CAW, a global network ofsupport bases with corresponding logistics.

2. In a permanent process, national-functional modernization, new technology, and the interplay of the main componentsCVW-CVN-CSG must be existent and renewed.

3. Education, training and combat experience cannot besubstituted by any other measure.

4. The superstruction from the *Grand Strategy* to the security and maritimestrategy must be existent, and capacities in research, industry, economy, technology as well as human education and training must be kept ready.

5. The political power structure has to muster the means necessary for thisoverall plan and provide them sustainably over long periods of time (see also chapter “Perspectives”, example USA, p. 32 – 35).



Only if these conditions are given or are accomplished, one will be able to think of operational implementation. The “operational truth” of today is a simple and at the same time complex one. Simple, because according to the criteria mentioned above – considering the classification of maritime forces by Grove and Till – only the United States with their USN can dispose of the possibility of global power projection, and because no challenger will be able to earnestly claim the same in the near and middle future. Complex, because the Peoples‘ Republic of China has clearly expressed with the PLAN notwithstanding to be willing and being able to invest in CV/CVN, CVW, CSG. France and the United Kingdom alone are not capable of such efforts because of economic reasons, and they do not have any correspondent ambitions. There only remains Russia, the great unknown on the maritime level. Strong fighter and strategic submarine forces, an immemorial CV which is not without reason always

accompanied by a technical auxiliary ship, can hardly belie symbolical actions with low fighting value. No announcements of the last decades – remember Admiral Gortschkow who wanted to provide the Soviet Union with an "excellent *blue water navy*" – have spawned any single modern element of a CSG, apart from some types of aeroplanes as well as a relatively modern destroyer force, the Sovremenny-class. Russia follows its *Grand Strategy* as a Eurasian land power and goes on investing massively in modern armoured land forces … and in nuclear deterrence. With this, however, one does not gain any advantages on the stage of global power projection.

And so the formula

X10/(11) = 1-(4/6)-[5/3]

simply expresses the CSG mission situation of the USN from **29.01.2019**: one of the (Nimitz-) carriers is deployed - CVN-74/Stennis/CVW 9 in the CENTCOM-area/5. Fleet/Persian Gulf; 4 carriers (CVN 75/Truman, CVN 76/Reagan, CVN 77/Bush and CVN 70/Vinson) ride at anchor in their home ports and are *de facto* standby, with the home port of CVN 76 at Yoko-hama/Japan. This carrier is permanently *forward deployed*, according to the relevance of this region. CVN 68/Nimitz, CVN 69/Eisenhower, CVN 71/Roosevelt, CVN 72/Lincoln and CVN 73/Washington are lying at anchor in dockyards due to different maintenance, training and modernization programs, and are at best partially, but not in the short term deployable – CV 73 because of the quadrennial *refuelling* [nuclear] *plus complex overhaul* (RCOH) not earlier than August 2021. That means that the USN can deploy a maximum of 4-5, maybe 6 carriers rapidly (up to several weeks) in a serious case of threat. Just to remember: the chief mission rule for carriers reads: one is none, two/three are one, and four are two at best. Thus it becomes clear why the PLAN talks about four carriers until 2050, and at best one of them can be CVN; this, too, will have to be addressed.

There is another aspect to be mentioned: Graphic 7 (p. 21) shows exactly which follow-up models/elements of the decisive parts of a CSG are and have been planned, developed and partially built already, in order to keep a permanent (technological) process of renewal up-to-date during the life cycle of the Nimitz-class and its 1:1 replacement. Thus, already here it is delineated comprehensively and even more exactly, that e.g. with a lifecycle of a CVN lasting approximately 50 years a further development according to a predetermined alignment, in order to be ready for action any time. One has also to consider which effects a fundamental change of the *Grand Strategy* would have on these entangled processes; this issue will be discussed as well later on.

Operational Basics

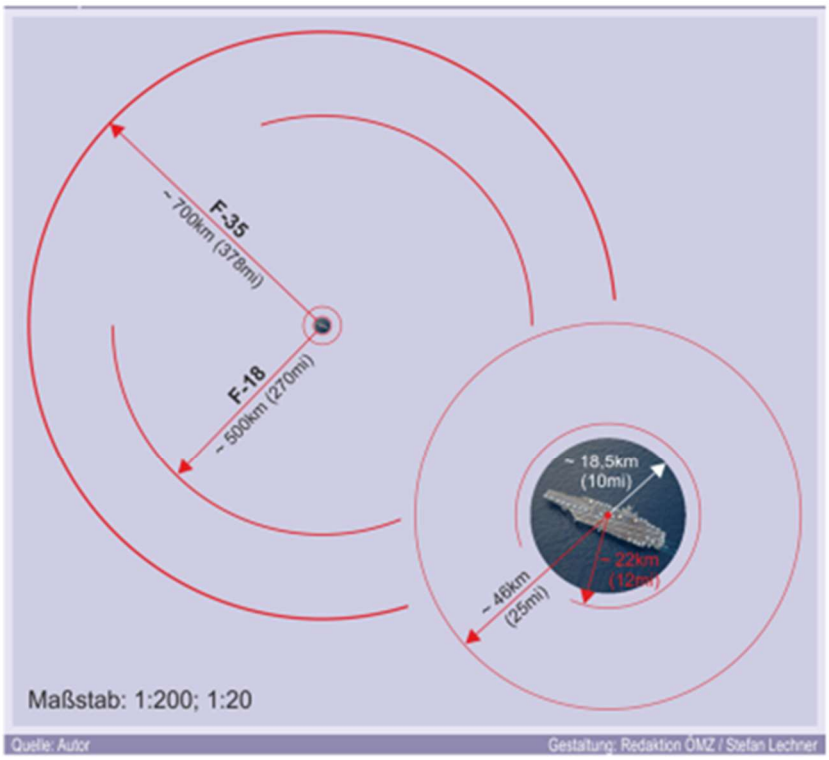
On the operational level, and in the sophistication of our inspection, one can assume very similar parameters with both CV/CVN and the according national approaches. Naturally, there are essential differences in the more subtle granularities, but this would require a library of its own. Starting with the big operational picture, the carrier – as has been mentioned already – must first permanently protect itself against potential ASW/AAW/ASuW-threats, and has to consider this its primary task even on mission. If the carrier (in the language of operations the *main body* of the CSG) is lost, the central weapon system, the CVW, and with it the striking power lost as well.

Here, too, on the operational level, one will have to start with the American "model", as an approved (!) Chinese one is still missing, and even if there were one, information about it would be rather sparse. The United States, on the other hand, apart from military secrets, have an open policy of discussion and information. For instance, the operational mission conception USN *Concept of Operations* (CONOPS) naturally is subject to secrecy. American conceptions (at least with the USN) go so far as to investigate adverse reactions to operational facts with priority and to publish them, and even to predetermine them as a basis for their own operational development. This somewhat cumbersome phrased and hardly understandable approach is to be elucidated by means of a practical example.

The main task of the CSG, establishing operational-tactical sovereignty of the airspace at sea, is thus primarily bound to the range (combat radius) of the manned and unmanned means of air-to-air combat. **Graphic 8** shows the combat radius of the two manned warplanes used by the USN-CVW at present; consequently it is compulsive that the CSG must be positioned at a distance of approximately 500 km (F/A-18) and/or +700 km (F-35-C) from the theatre in order to be effective.

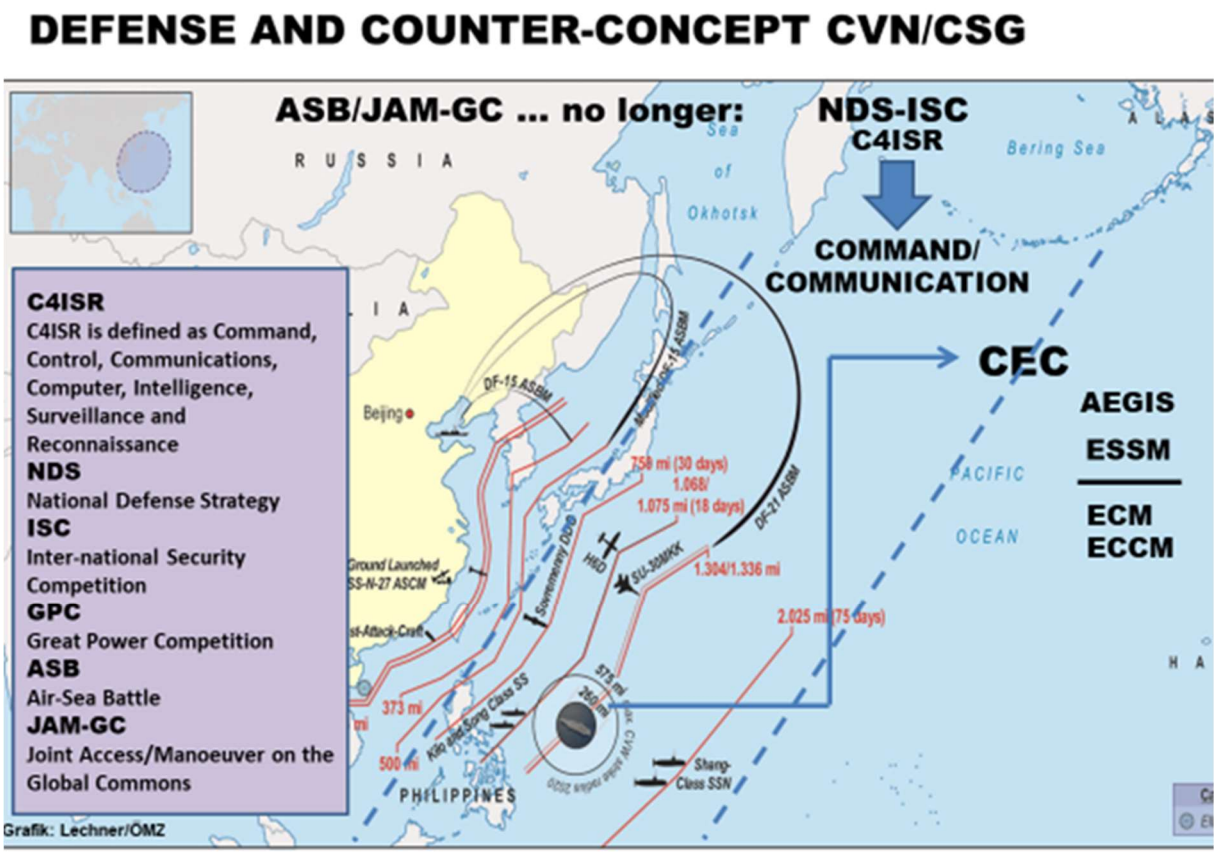
In the other relevant *navies*, this calculus with the combat radius, correlated with the own equipment, naturally is similar. The radius can be enlarged by in-flight refuelling, likewise reconnaissance and combat by *Airborne early Warning and Combat Systems* (AWACS) [20], but with this a key parameter is determined both for the CSG and the forces fighting against it. Moreover, one has to take into account the CSG which can be effective over larger distances, short- and intermediate-range ballistic missiles (ASCM) as well as strategic bombers and all land-based systems which can become effective approaching the adverse coast. The threat caused by hunter-killers is existent permanently and everywhere. **Graphic 9** illustrates these facts with a notional positioning of a (USN) GSG in front of the Coast in the South China Sea. This conception of defence of a coastal country against a CSG, described, published, widely discussed and analysed as *anti-access/area denial* (A2/AD) by the USN, has been gratefully accepted by the PLAN and correspondingly and made an issue of with regard to the own A2/AD-equipment.

COMBAT RADIUS CSG



GRAPHIC 8

This view of the expected counter-repulsion guaranteed the desired effect of a "threat" against the own power projection, and led to the development of an operational defence conception against the A2/AD-threats, including the necessary means (budget/Congress/public) – and the *Air-Sea Battle* (ASB) as "conceptual answer" in the framework of *joint*-consideration was borne. Even the term *battle* was controversial and was therefore partially considered "too aggressive", and for this reason one changed the – until then in the technical literature (and naturally in the Chinese as well…) introduced term into *Joint Concept for Access and Manoeuver in the Global Commons*, with its official abbreviation JAM-GC … and was not happy with it even after some reasoning. Today this term has disappeared, and latterly one talks in a considerably more sketchy and neutral way about *International Security Competition* (ISC) or *Great Power Competition* (GPC) in the framework of *National Defence Strategy* (NDS), with the focus on the old and well-known prerequisites *Command, Control, Communications, Computer, Intelligence, Surveillance and Reconnaissance* (C4ISR). Notwithstanding, ASB has survived well in the circles of experts …



GRAPHIC 9

Already long before this objectively irrelevant, but for public relations work in all directions (adversaries, politicians. Congress, partners, etc.) important "designating battle", the USN had had to deal with and solve two key problems concerning CSG-operations: an electronic defence command and control system necessary for such a sophisticated formation, and naturally an electronically based integrated combat guidance system (with blurring boundaries) as well. As only *navy* the USN has both systems, and these have been permanently adapted, modernized and above all electronically more and more upgraded in the last decades: the *Cooperative Engagement Capability* (CEC) and the *Aegis Combat System* (ACS). As a matter of course, the other CV/CVN-operators have/try something like that and naturally have basic systems. Notwithstanding, the assumption seems to be warrantable that the USN-capacities on these do important sectors are established on a considerably higher level.

There are rumours that the captain of a US-carrier answered the question what he was afraid of with "of submarines". As a matter of fact, the area on and above water is "so easy to reconnoitre" by the CSG itself and with the equipment of the USN in the course of remote reconnaissance and aerial reconnaissance, that this statement might really apply. One must, however, relativize here and state that in the field of ASW the greatest efforts have been made by all nations having or planning CV/CVN at their disposal. The position of the CSG is totally decisive for the ASW-problem. The ASW-threat is easier to parry on open sea, but near the coast (up to approx. 750 nm/ approx. 1400 km) the danger is

more imminent because of extremely quiet hunter-killers with conventional drive (*ship submersible*, SS) and extremely low noise development. The USN and the FN deploy nuclear hunter-killers with their CSG, and other states as well (availability provided). For defence, as A2/AD-operators, however, the conventional submarines mentioned above are very convenient, but their deficiencies are combat radius and residence time under water. Nuclear submarines are much better concerning these parameters, but on the other hand they are louder and thus easier to be detected.

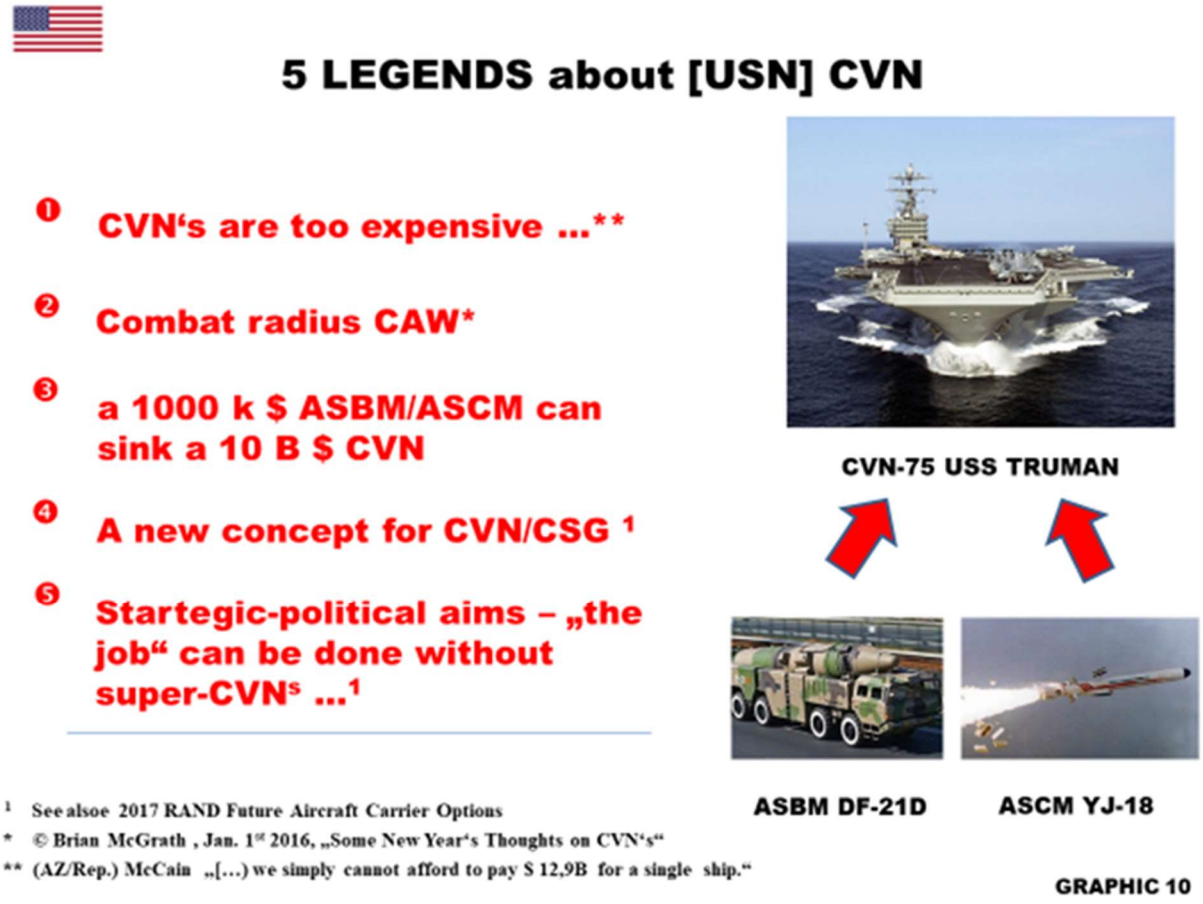
Legends and Truths

After having portrayed the facts about the CVN, one now has to deal with the opinions, assumptions, and even legends prevailing in the public discussions about the carrier. Even declared experts, once convinced of the idea of *offshore balancing*, of technologically new approaches (UAV, AI, modern missile systems), or of lower military presence/armament/expenses, tend to refer in this discussion to "weak points" of the carrier and thus to query it as an instrument of power projection. This is legitimate but ought to be carried by a discussion which is based on facts. The eminently cherished colleague, Cap. (ret.) USN Brian McGrath, former commander of an *Arleigh-Burke* destroyer (DDG), at present head of a maritime oriented *think-tank* (Ferry-Bridge Group, Easton, MD, USA), gave his view on the extremely sceptical statements of Senator McCain († 2018; Republican, erstwhile fighter bomber pilot) in a spectacular comment/reaction (01.01.2016, Some New Year's Thoughts On Aircraft Carriers). Put in a nutshell, there he confronts some legends/opinions directed against the USN CVN-conception. One can use **Graphic 10** for dealing with these problems (items 1, 2 and 5, based loosely on McGrath).

1. **CVNs – and especially the Ford-class carriers – are too expensive: USN-estimate (at that time) 12,9 Mia $ for CVN-78Sen. McCain: „*We simply cannot afford to pay 12,9 B* [Mia $] *for a single ship.*"**

   How much may a swimming, nuclear-driven airport, gaining speeds of 30+ kn, cost when calculated with a life cycle of 40-50 years? The costs of the first carrier always include *basic* development costs for the relevant class (EMALS/A1B/DBR/ AAG). If one requests global power projection, one has to put up with the relevant means (government: *Grand Strategy* plus $/USN for strategic and operational implementation). Naturally, a discussion within the conception with different implementation variations is legitimate, but according to almost all experts, there is no other solution which can replace the CVN equivalently concerning functionality and less expensive in the operational sense, neither at present nor in predictable future. The Ford-carrier, which is renewed every five years, replacing a former different model, requires approx. 0,33% of the defence budget in these five years. Labelling a unique military

asset such as the CVN as too expensive, „*unaffordable*“, does not comply with a clear view of the present and predictable future tasks in the framework of power projection.



2. **Too short combat radius of the CVW**

   Yeah – longer combat radii! *Stealth-strikes*, sea-control, *intelligence, reconnaissance, surveillance*-tasks (ISR), *aerial refuelling drones*, combat-, reconnaissance- and support-drones – this development with the CVW is the unalterable consequence when pursuing the CVN-system. McGrath expressed it rather bluntly: „*It’s the Air Wing, Stupid.*“ One can assume that this is the suitable answer to many CVN-objectors who suggested to return to the drawing boards and develop alternative (cheaper!?) carrier concepts. This would be a security-political absurd undertaking – to reconstruct the airport because the combat radius is too short – just think of the sense, the periods of time, and the subsequent system-relevant changes/costs. Furthermore, nobody ought to forget that a classic airport, because unmovable, will always and in all situations represent a considerably more vulnerable target …

3. ***Anti-ship ballistic missiles*** **(ASBM)[21] and** ***anti-ship cruise missiles*** **(ASCM)[22] are – apart from their price – the key argument against the CVN: too big/(as a target), too cumbersome/slow,**

concerning the price unacceptable in relation to the destroying weapon (see Graphic 10) Here, too, one has to consider the facts instead of emotions and assumptions. Firstly, every moving target is more difficult to hit than an unmoving one. Even the apparently low velocity of about 50 km/h itself, with the possibility to change direction any time, represents for a missile (ASBM) fired from longer distances a target tracking and controlling problem not easily to solve. This is even more sophisticated for cruise missiles (ASCM) flying at a lower speed (about 1000 km/h) and at lower levels (protection against radar plotting, which therefore also must have permanent target tracking, and thus become more vulnerable for counter-measures such as air-air-defence missiles (*advanced medium range air-to-air missile* AMRAAM, radar-guided, etc.). This means that the flying time must be shortened in order to hit. Consequently, the launching platform must get closer (unnoticed or entirely surprisingly) to the CSG. The assumption that a CSG fit for action tolerate such an approach is unvalid. On the contrary, the CSG/CVN/CVW will try everything to destroy ASCM launch facilities (the cruise missile can be land-, air-, ship- or submarine-based) before they get near to the target (e.g. a CV/CVN). Additionally, the AEGIS-system of the USN has been designed especially for fighting against a multitude of attacking targets (which have an electronic signature and can be detected). Of course a CVN can be hit by an ASBM/ASCM; but that this is a "simple" venture rather belongs to the field of psychological warfare than to reality. A hit can damage the CVN, especially if the flight deck is hit and severely damaged. All current announcements, especially by China, that one has a whole arsenal of weapons (ABM, ASCM, new torpedoes, *stealth*-bomber) and thus can "keep away" the USN with its CSG from the Pacific coast far to the west (*area denial*), rather serve propaganda than the present real Chinese capabilities. A weapon system represents a danger after it has been built, tested and successfully deployed. Warlike announcements are not enough. „*Shooting anything at an aircraft carrier is a costly, difficult operation. And beyond the money cost, launching an open attack against an American CSG, with its own cruisers, destroyers and submarines, is almost certainly a suicide mission. So there are two questions that remain for anyone who thinks they even have a shot at taking down one of these CVN: can you do it? And even if you can, is it worth it?*" There is nothing to be added to this outmost felicitous and short answer by Robert Farley[23].

4. A new approach to the („old") CVN-Conception is demanded

This demand as well, basically following the natural course of time and especially the

technological capabilities*, per se* is neither irrational nor to be rejected. As with some preceding items too, as a fundamental condition, politics ought to either confirm, alter or partially drop the string *grand-, security- and maritime strategy* – all demands which sound so popular, modern and progressive waive this important fact.

Unknowingly or even wittingly? Additionally, according to a politically correct change of guidelines concerning the objectives demanded in the strategies, new capabilities must be integrated into the available/planned means (CVN+/GSG+) or even into entirely new systems: the axes time/available, developable means/new means must be coordinated, assessed and – without any losses concerning security to be guaranteed – assessed, altered and likewise funded. Compare these points with the perspective of the (USN) CVN/GSG discussed in the following chapter.

5. **Strategic-political objectives *(„the job")* can also be achieved without super-CVN**

Directly aiming at the Ford-class, the question suggests swerving from a continuation of the program, without offering relevant alternatives which are necessary due to the consequences. And again one can only assent to McGrath's opinion that *„[…]the current fleet architecture is the ONLY one that could accomplish the required balance between conventional warfighting and deterrence. But in my view, any competing approach MUST demonstrate in some reasonable manner that it maintains such a balance, or that such a balance is no longer required or desired.*" Only the balance between deterrence and conventional warfare – so far the CVN/GSG of the USN have not carried along tactical nuclear weapons – constitutes the difference between an important power and a world power in the global *power play*. Fleet architecture has to regard the balance between deterrence and combat capacity. If one strengthens the one, the other is weakened – and vice versa. At present, and within the next +/- 2-3 decades, the objective "both of them strong" can only be maintained and perpetuated by pursuing the CVN/GSG-conception.

Prior to the development of future prospects of the CVN/GSG-conception, one last preparatory step is necessary, however, because this analysis of the perspective must just be focussed on the USN. The current program for replacing the Nimitz- by the Ford-class, which completely complies with all valid strategic resolutions of the three decisive levels, is part of an elaborate 50-years-replacement-plan, with a simultaneous maintenance of at least 10 CVN (required for 5-7 CSG) in mind.

This requires a complex technological-industrial infrastructure with several hundred thousand jobs, and very high-grade ones among them, which are linked with technological and material research and

development. In competitive economy, such projects are only implemented if there is relevant planning security guaranteed by the client. If, however, the state/politics makes fundamental changes, this will have pivotal direct effects on economically relevant structures. In this sense, **Graphic 11** shows the situation with the replacement planning as of CV 78 as *fact*.

THE CHANGE FROM NIMITZ- TO FORD-CLASS

NAME	LAID DOWN	COMMISS.	REPLACES	STATUS
CVN-78 FORD	11-2009	07-2017	CVN-65 ENTERPRISE	IN SERVICE
CVN-79 KENNEDY	08-2015	2024 (PLAN)	CVN-68 NIMITZ	BUILDING
CVN-80 ENTERPRISE	2020	2027 (PLAN)	CVN-69 EISENHOWER	BUILDING
CVN-81 ?	2023	2030 (PLAN)	CVN-70 VINSON	ORDERED
CVN-82 ?	2027	2034 (PLAN)	CVN-71 ROOSEVELT	ORDERED

GRAPHIC 11

Although the existing contracts could be amended by politics, but one ought to take account of the consequences of such amendment plans mentioned above. One can discern clearly that due to the already issued orders (including CVN 82) until 2040, one cannot consider a possible change of means before that time, and the course for that – on keeping up the basic conception CVN+/CSG+ - must be set today already, for otherwise the result would be a composite system. With 5-year-steps the remaining six Nimitz-carriers would not have to be replaced. From 2060 onwards, this will also be the case for the Ford-carriers from CVN 78 (5 units) onwards. Naturally, such a transition is basically possible – the necessary security-political, economic and operational adaptations/changes/means (!), however, are a different kettle of fish…

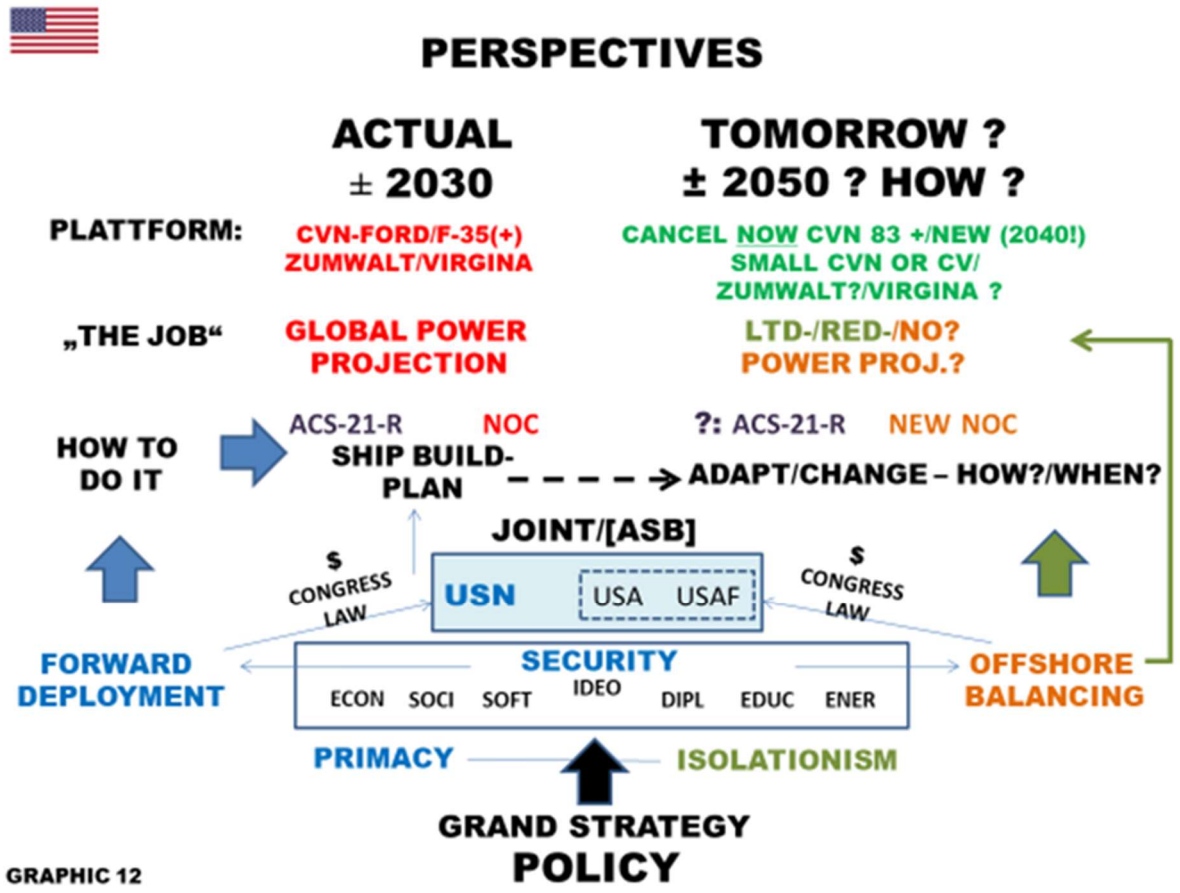
Perspectives

Now we have to join together the so far developed fundamentals from the *Grand Strategy* to the CVW or any other element of the CSG in order to get an overall picture, and to try to incorporate possible

measures, independent from own assessments, into the reality of existing resources, in order to guarantee achievement of objectives with the existing systems or with new resources. **Graphic 12**, which admittedly is complex and not easily to be designed, attempts at establishing the coherences. Politics, as the legislative power, on the basis of the valid *Grand Strategy*, including all necessary subareas such as economy/social matter/education/industrial capacity/energy potential, and naturally diplomacy as well as the ideological basis, determines a security-political strategy. In the framework of the military overall strategy (*National Defence Strategy*, NDS), this strategy is responsible for the area of security at sea and the resulting useable operational resources.

The maritime strategy *A Cooperative Strategy for National Sea Power in the 21st Century/R* (ACS-21/R) valid at present now requires an implementation conception: the *National Operational Concept* (NOC) contains all necessary steps and resources for being able to execute diplomacy, *disaster relief,* security, deterrence, and warfare at sea. Government and Congress have to provide the necessary financial resources – at present about 33-40% out of 650 billions $ per year.

The vertical ways to the time periods (from strategy to operational basics and resources, from today up to +/- 2030) in the left column show the way with the *Grand Strategy „Primacy"* with *Forward Deployment*, until +/- 2050. In the right column a possible development for *Offshore Balancing* is simulated. The overall picture, with its relevant steps and elements now understandable, is supposed to lead to a self-contained assessment of what extent of responsibility and scope the government, the USN and the Congress have in times of changes, and when and whether changes are desirable, possible or simply not feasible at all under these interlocked conditions. This will have to be dealt with in the chapter INFERENCES. On this occasion, one has to analyse a so far rather unexpected and innovative approach: an absolutely considerable shifting within the USN-budget in favour of more research and development concerning the investigation of the A2/AD-approach which is deeply emphasized by China. In addition to that, there are new assessments concerning the unpleasant question of the *Large Surface Combatant* (LSC), in general the cruiser (at present the *Triconderoga*-class) integrated into the CSG, which also has to be replaced/modernized, as well as the 66 Aegis-destroyers (*Arleigh-Burke*-class) in service.



The suggested arguments and substantiations of the American *Secretary of Defence* (SecDef) Patrick Shanahan are a political *statement* and did not surprise regarding the aspirated modern technological developments - *smaller robotic vessels (unmanned), minisubmarines* – but rather because of the model of counter-financing: instead of an increment of the defence budget, the premature quiescence of a CVN (CVN 75/Truman, about 25 years before the reasonable date of decommissioning of the carrier [approx. 2025 instead of 2050]) is supposed to provide new resources from the 2020-budget onwards.

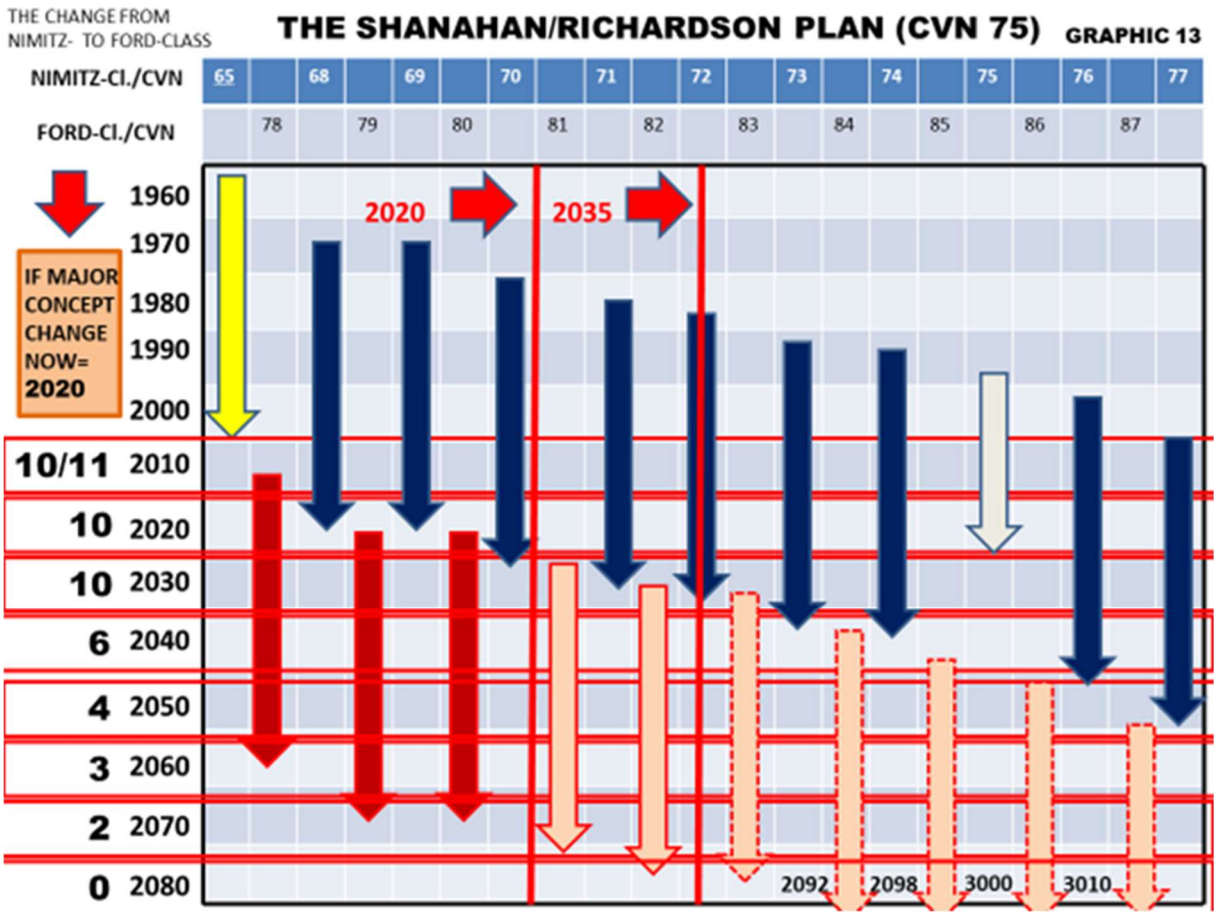
The (puny) percentage so far planned for this project in the 2020-budget can only concern fundamental elementary and planning studies. In a feature of USNI News[24] one can read: „*Not refueling the nuclear reactor core of CVN 75 would save the roughly 6,5 Mia $ it would have cost to overhaul, plus 1 Mia $ per year in operating costs thereafter, at the price of retiring the carrier about 25 years early.*" Apart from this political approach, which, according to the article, is vehemently discussed in the Pentagon and would have to be passed by the Congress – here, strong resistance concerning the reduction of dockyard jobs is to be expected – the position of the USN to these ideas will be decisive as well. Shortly afterwards, the CNO (*Chief Naval Officer*) Admiral John Richardson, again in USNI News[25], reacted to the question of the *Large Surface Combatant* and indirectly of the succession to the *Arleigh-Burke*-destroyer appealingly: *„John Richardson told USNI News that the requirement fort the ship is being revisited in light of the new focus on future operating concepts that emphasize distributed, lethal – and*

in many cases unmanned – platforms equipped with weapons still in development." This question is very relevant for the operational deployment of the CSG insofar as the command team of the entire air defence is domiciled on the cruiser. Richardson went on by saying *„A recurring feature of the 2020 Budget request is an acceleration of emerging technologies – things that the Navy hasn't defined its requirements for and industry hasn't perfected, but that the Pentagon is sure it will need in this era of great power competition – at the expense of known technologies and programs.*" And some lines later one can read *„…of course it's going to have budgetary implications because we need to buy new stuff…". […]the high level message of the budget is that it is, one, focused on great power competition. Two, it is very focused on moving into the future with respect to some of these emerging technologies that are going to be decisive: so conventional prompt strike, hypersonics, directed energy, artificial intelligence, autonomy, machine learning.* He continued *„…that the Navy had to weigh another 25 years of life for a Nimitz-class carrier against requirements, which are studied.* […] *And what this budget also entails is the flexibility to respond to what those studies tell us. If we continue to see a need for more aircraft carriers, we have the flexibility to revisit that decision on the Truman* [CVN 75]."

At midyear 2020 it ought to be clear, therefore, which course both the SecDef (still some months in office) and the CNO will take. An assessment of these measures concerning the *Grand Strategy*/with the *„Primacy"/Power Projection* with regard to the operational conception of the USN for the time until 2050 will be given in the chapter INFERENCES. Clear is (was) that before these announcements every eliminated Nimitz-class CVN was replaced by a Ford-carrier concurrently, and thus the number of available CVN would have been at least 10, the number of deployable CSG always 4-6/max. 7 until far into the century (see also Graphic 11/p. 32).

The first two CVN of the Ford-class CVN 78 and 79 replace CVN 65 (2017) and 68 (2024). The 48-months' *Refuelling Complex Overhaul* (RCOH) of the CVN 75 is earmarked for 2024/25 and now becomes unnecessary; the ship was to be in service until 2050. **Graphic 13** shows the consequence of this measure which will be assessed in the inferences. The concern about the permanent consolidating of China in the A2/AD area, especially in regard to the *power projection capability* of the USN, supported by the CVN/CSG, now is in the centre of all considerations for the future of the USN which is to be planned now.

And the other four members of the acknowledged "nuclear club" [26]? All of them have variedly strong but nevertheless sufficient nuclear counterstrike power for seriously damaging or even extinguishing any other after a first strike – this conception, called *Mutually Agreed Destruction* (MAD), so far has protected the world from a nuclear inferno.



The stage of conventional showdown, however, looks completely different, as one can assume. Now if, in the struggle for global dominance, the nuclear level fails due to rational reasons, the importance of conventional global power projection obviously will increase. Let us now anticipate a slight inference: The PRC is still no global power in this sense just for that reason, because it first has to prove a credible deployable potential at sea, although it is working at it with a lot of energy, money and will. Russia as the third power with global claims is in the same position, but contrary to the PRC, all signs indicate land orientation, with a minimal, just feasible effort at sea: nuclear submarines and a dash of projection capacity which is by no means globally effective. If France and the United Kingdom were united with a powerful Germany in a European federal state, and on a similar way as the PRC… but like it is at the moment, these states remain small, two of them reclaiming their sovereignty and capable of protecting it, nationally operating medial powers in the global *Power Play*.

Inferences

As is not to be expected otherwise, these inferences consist of evaluating the options of the only rivals for global (military, etc.) dominance at the moment. The data and facts compiled in the previous chapters allow prognoses which are, as always, to be dealt with relatively: Too often in the history of mankind, particular incidents on all sorts of levels have enforced unexpected changes pregnant with consequences. In acceptance of the given facts, now we will try to assess assumable developments concerning maintaining or obtaining global military power.

Quo Vadis USN?

The basis for all future considerations is the valid claim of *Primacy* from the *Grand Strategy*, which within this consistency of *Forward Deployment* leads to the objective of global power projection, and considers CVN/CSG as a means necessary and even essential for it. Let us remember the graphic "perspectives" – its analysis leads to the conclusion that, in the short-term preview from topical until +/- 2030 no abandonment of further development/completion of the CVN 78 to the CVN 81 can be made. Leaving the above-mentioned strategic fundamentals and swerving from global power projection would have to result in discarding the valid order of the CVN 82 – but what next? How to replace the remaining Nimitz-carriers (CVN 71 to CVN 77)? A total reconception *de facto* would declare the Ford-carrier as being obsolete in terms of economy/industry and, above all, the military. A total reorientation, beginning with the *Grand Strategy* and further on NDS, ACS.21/R and its NOC would be the first, of the CSG-conception the second consequence. Additionally, the opponents of the CVN/CSG-conception would have to suggest convenient and financeable alternatives which they have not done so far. A *Grand Strategy* of total isolation, bundled with massive conventional disarmament and absolute waiver of global power projection seems to be fanciful at the moment. As a consequent, the assessment of the right column "alternatives" is to be graded as "too late" for the near/medial future. As a consequence thereof, the USN ought to take the following steps in the sense of the existing mission:

1. Persistent further development of the CSG/CVN-conception on the basis of the Ford-class, above all in the areas *Joint* (integration of USAF), capabilities (CVW), capacities.

2. Due to the new approach of intensified development of most modern Anti-A2/AD (PLAN) capacities, the CVN 75 is decommissioned earlier, in order to create a considerable economy potential (approx. 6,5 billion because of the cancellation of the RCOH with the CVN 75, and consequently due to only 9 CVN per year another one billion $) and to have it available for the development of new weapon systems. The objective of "*Primacy*" with *global power projection* can certainly be achieved permanently with 9 carriers.

3. On the technological level: combat radii, UAV-integration, AI, CG-DDG (cruiser/ destroyer), SSN,
   further development of the AEGIS-system.

4. Hustle industrial prerequisites/research/development:

5. Dockyards/docks, materials.

Beside it, one can/shall assay whether it would be sensible, in the area of deterrence, to reconsider the operational conditions in the sense of a more intense division of deterrence from warfare. A relief of the strain on the CSG in favour of (both new and existing) less substantial structures (CVX [new carrier type]/LCS [*Light Combat Ship*], these, however, in a new ++version), might make good sense.

Quo Vadis PLAN (PRC)?

The complex and intricate questions concerning strategy/conception/operational implementation/potential in the framework of an existing system do not apply to the PLAN/PRC to such an extent as to the USA. In the late 1980ies under Deng Xiaoping *de facto* starting at zero, the economic opening/achievement quickly led to an increasing demand of recognition on the global stage. The realization that, for an economic superpower on this upward way, it would be absolutely necessary to have the relevant military potential for safeguarding as well as a sign of claim available, inevitably led to an unparalleled armament program. Its advantage was uninfluenced reorientation, its disadvantage lacking experience of all concerned institutions, conceptual, industrial, research, etc. The lacking possibility of projection at sea was perceived by the government as being top priority from the start, and thus tackled accordingly. Willpower and money, however, are not sufficient for proceeding with such a complex question. Today, almost 30 years later, the situation with global power projection is still precarious – at present there is no possibility, because essential parts for a *strike*- or projection-capacity are /still) lacking. Compensational or partial conceptions such as *string of pearls*[27], conventions with land powers along relevant sea routes, OBOR[28] as land-oriented alternative, a amply announced ambitious building schedule for CV and later CVN, at best can slightly mitigate the Chinese foible concerning military power projection, but certainly not remedy it rapidly.

„*I think we must have five to six aircraft carriers. It will take 20 to 30 years for the PLAN to deploy all of them and be able to conduct strike group operations.*" This *statement* of the navy expert Li Jie[29], whether he was "appointed" by the government or not, demonstrates the information offensive used by the PRC/PLAN time and again, dealing with new weapons/systems of the PLA – no matter if it is a *stealth* bomber, a tactical fighter aircraft, a carrier or ASBM – announcement follows announcement. The near operational readiness of the system is suggested permanently, although without any details

nor information as to time and facts. We have stated at an earlier stage already that an announcement does not represent a functioning, field-tested, trained and battle tested system. There is nothing to be added to this statement, except to refer to the facts.

The first Chinese carrier, the Liaoning, a modified Kusnezow-class carrier of the 1980ies (1985 as RSS Riga laid down by the Soviet navy in Ukraine, renamed as RSS Warjag, 1991 the further construction was abandoned), was delivered to Ukraine in a semi-finished state after the failing of the Soviet Union, and there the further construction was abandoned as well. 1998 Ukraine succeeded in selling the body of the ship for several million $ to a businessman from Macao, who specified "construction of a swimming casino" as the buying incitement. A military use was forbidden in the purchase contract.

On quite adventurous/devious routes the ship arrived on the Chinese naval base Dalian in 2002, and was sighted at sea for the first time in 2011. Now as Liaoning a CV of the PLAN – there were rumours that the businessman from Macao had been a dummy figure of the Chinese Peoples' Army – she was first described as a "training ship", and afterwards, in November 2016, according to a press release, was presented to an amazed professional circle as *combat ready* and as the flagship of the first Chinese *strike-group* of the PLAN – let us put it to experts and the PLAN how to rate the Chinese CSG 001.

According to the actual state of knowledge, one can represent Li Jie's statement, aligned with other sources, in **Graphic 14.** If one ignores the Liaoning (CV 001) as a combat system due to justifiable doubts, at best and after solving all still existent and oncoming problems, the PLAN will have the first real deployable CSG/CV 001A at its disposal not earlier than about 2020, but its fighting strength would be far below of that of the FN-CSG Charles de Gaulle, and for both of them the rule "one is none" applies. CV 002 would be available about 2025, and the first nuclear carrier CVN-003 about 2030/35 at the earliest, and this does certainly not mean ready for action/ready for battle. Additionally, the transition from CV to CVN to full readiness for battle is certainly no simple or momentary undertaking. Even with the greatest benevolence with the assessment, the PLAN can at best have a deployable CSG not before or not until +/- 2020/2030. In this context one has to consider that the Chinese shipbuilding company *China Shipbuilding Industry Corporation* (CSIC), the biggest/only dockyard of the PRC for building big military ships, made the following interesting *statement* in March 2018 for the first time:

HOW CONTINUE PLAN?

	CV/KL 001A KUSNEZOW+	CV/KL 002 KUSNEZOW++	CVN 003 ?
TONS	+/- 60000 t	+/- 80000 t (EXPECTED)	MORE THAN 002 (PROJECT)
PROPULSION	STEAM/2T	STEAM/2T (EXPECTED)	NUCLEAR (EXPECTED)
LAUNCH SYSTEM	„JUMP“	CATOBAR (EXPECTED)	EMALS (EXPECTED)
ATTACK-MODEL / CVW	J-15	J-20/J-31 (STEALTH)	NEXT GENE-RATION (EXPECTED)
	2012/13 2020	2015/16 2023-25	2030?

GRAPHIC 14

„[CSIC plans to] *speed up the process of making technological break-throughs in nuclear-powered aircraft carriers, new type nuclear submarines, quiet sub-marines, maritime unmanned intelligent confrontation systems, maritime three-dimensional offensive and defensive systems and naval warfare comprehensive electronic information systems“*. And adding: „[that these breakthroughs] *are required for the People's Liberation Army* (PLA) *or PLAN to enhance its capabilities to globally operate in line with the service's aim to become a networked, blue-water navy by 2025."* [date: !!] It is also interesting that this CSIC-*statement*, in which an official Chinese national enterprise talked about nuclear carrier plans for the first time, was withdrawn the day after. Then a short time later again, the CSIC chairman Hu Wenming declared in his speech that China was capable of producing “any kind of aircraft carrier” with own design and construction. Nevertheless, so far the sole experience of CSIC with carriers is with the completion of the Liaoning and the constructing of the types 001 and 002, the design of both of them based upon the Liaoning, but step by step equipped with modern technology. Li Jie calls this „*incremental approach towards its carrier technology.*“ A carrier similar to Nimitz or Ford, however, poses entirely different challenges to the overall system, all elements of a CSG included.

Not totally unreasonable, one might think, as the CSIC was able to make its first experience with the construction of carriers in its history not earlier than 2002/2003 with the half done Liaoning. For remembrance and comparison only: Newport News Shipbuilding (NNS), one of the divisions of

Huntington Ingalls Industries (HII), with 38000 employees and thousands of subcontractors of HII, has since the 1960ies more than 60 years of experience with CVNs, and has built all 10 Nimitz-class CVN and CVN-78 of the Ford-class. The entire program for the USN comprises:

1. Gerald R. Ford-class carriersFrom 2015 onwards, NNS has to deliver one Ford-CVN everyfive years (in total 10 units, at present one has been delivered/commissioned, two are under construction, only another two have been ordered,

2. America-class attack ship(s), amphibious,

3. another amphibious support and transportation ships,

4. SSN of the Virginia-class (attack submarines).

In conclusion, once again Li Jie: „*In the future, China's natural interest will continue to expand overseas. Without a fleet of large nuclear-powered vessels, the Chinese navy cannot sail for long time to faraway waters*[30]." Here, there is no more to say, neither, except that (according to Prof. Allison/‚Thukydides' Trap), for years the *rising power* (PRC) has been preparing for curtailing the enormous backlog concerning global military power projection in the showdown with the *leading power* (USA).

Many military considerations of both rivals in Asia and on the world stage primarily involve the possibility,

- either to extend and secure (USA) dominance at, below and above sea level, and thus *command of the commons* (B. Posen),

- or to reduce the wide gap rapidly in order to be able to proceed offensively as well (PRC).

Therefore, the key concept for sea power up to the middle of the 21st century, and presumably beyond, will still be power projection, which is officially defined by the American side as

> *„The capability of a state to deploy all or some elements of its national power – political, economic, information-technological, or military – by means of rapid and effective forces on far-flung places of action, in order to react to crises, to deter, or to enforce regional stability."*
> *DoD/Dictionary of military and associated terms [1]*

thus being an indispensable strategic objective – tactical, fully manoeuvrable sovereignty over the global airspace - which at present and in foreseeable future cannot be achieved without CVN/CGS.

[1] Cartier, Raymond, 1982," Le Monde entre deux Guerres/Vom Ersten zum Zweiten Weltkrieg – 1918-1939", R. Piper&Co., München.

[2] In the Anglo-Saxon and French worlds, a big and above all military operational area is called *theatre* – an apposite choice of words

[3] Alfred Thayer Mahan (*1840, †1914); Columbia University, Naval Academy, as of 1861 naval officer, 1872 Commander. 1887 President of the Naval War College, Rear Admiral. 1890: The Influence of Sea Power upon History. 1897: The Interest of America in Sea Power. Publications on the tactics and strategy of naval actions.

[4] CVN, *carrier vessel nuclear*, is the worldwide acknowledged and used abbreviation for the nuclearly driven aircraft carrier.

[5] A *carrier vessel wing* (CVW) or *carrier air wing (*CAW) is the tactical-operational air component of a carrier strike group. The CVN as well as the CV (*carrier vessel*, not nuclearly driven) is the main weapon carrier system of the wing.

[6] *bandwagoning* „[…] is the possibility of smaller states to arrange with a hegemonial power, if in the sense of the *balance-of-power*-theory there are no other alternatives." (Gärtner, 2005).

[7] Interest according to Morgenthau: „The concept of interest, which is defined as power, is for the realist an objective category of universal validity." (Morgenthau, 1948).

[8] Anarchy: „[…] is, according to Waltz, in international politics the absence of a government. This does not necessarily mean chaos and confusion for Waltz, but the absence of a controlling supranational authority in a world dominated by states […]." (Gärtner, 2005).

[9] K. Waltz declared in his balance-of-power-theory, that only by equilibrating (mainly military) power the security in the international system can be guaranteed.

[10] Under the Thukydides-Syndrome one understands, according to Prof. G. Allison „[…] the rise of Athens [rising power] and the corresponding fears of Sparta [leading power], which made the war [Peloponnese War, 431-404 B.C.] inevitable." (Thuc. 1,23).

[11] Sir Halford Mackinder was a geographer, the first to talk about the importance of the geographical position of a state and its political-economic possibilities. Essay, The Geographical Pivot of History, 1904. His political core thesis is: „Who rules East Europe commands the Heartland. Who rules the Heartland commands the World-Island. Who rules the World-Island commands the world." He also differentiated the great powers between "Land-Wolves and Sea-Wolves".

[12] PLAN stands for people's liberation army navy, services of the people's liberation army, PLA.

[13] carrier strike group (CSG).

[14] The F-35-B/STOVL is a type of the multi-purpose warplane family Lockheed-Martin F-35 Lightning II of the 5th generation. The F-35 is a single-seat, single-engine, all-weather stealth-multirole warplane. Stealth means that the airplane has a special external hull protection („magic-hood-airplane") against hostile radar; it has been designed for two main tasks: ground combat support and fighting for sovereignty of the airspace. There are three models available:
F-35-A: conventional take-off and landing, CTOL, main customer USAF,
F-35-B: short take off and vertical landing, STOVL, main customer export, USMC, and the
F-35-C: carrier-based catapult-assisted take-off but arrested recovery, CATOBAR, main customer USN.
Altogether, along their total life cycle, about 3000 planes are to be used in the three U.S. services

[15] carrier vessel (CV), conventionally driven aircraft carrier.

[16] Under forward deployment one understands permanent or temporary military presence near or directly on the adversary/enemy, which allows more rapid relevant military deterrence and combat missions, than - should the occasion arise – to first have to cover great distances before engaging. It is one of the strategic conceptions of the USN in view of the dimensions/the time exposure, for being present or able to intervene on different global focal points in terms of deterrence or offensive.

[17] offshore balancing is a strategic conception of international relations of political realism, according to which a great power, supported on local partnerships, keeps upcoming powers in check.
In the interpretation used by John Mearshheimer „The Offshore Balancers" the United Kingdom and the United States with their respective foreign-political approaches were meant, who leveraged this model,

the UK in the 18th/19th century, and the United States in the interwar period 1918 – 1939. Christopher Layne reinterprets this expression a little, and indicates military dominance from a safeguarded own position, based on military strength superior to the adversary/adversaries. At the same time, one can do without military presence all over the globe, which is absolutely postulated by forward deployment, and can achieve dominance much more cost-efficiently. The crucial question, however, whether, when, and in which situation this would be efficient in military terms, still has not been disputed, decided, or solved.

18 Here one has to mention that, apart from the USN, only the FN and the RSN have all core elements of a CSG at their disposal – carriers, escort destroyers/frigates/carrier-based warplanes/nuclear attack-submarines (SSN), and on the level of strategic deterrence, nuclear submarines with nuclear intercontinental ballistic missiles (SSBN) of national production.

19 CSBA Center for Strategic and Budgetary Assessment,2018, "Regaining the high Ground at Sea - Transforming the U.S. Navy's Carrier Air Wing for Great Power Competition", Washington D.C., www.csbaonline.org

20 AWACS: Airborne Early Warning and Combat System; US all around radar in a high flying control system airplane; early recognition and early warning of air manoeuvres.

21 An Anti-Ship Ballistic Missile (ASBM) is a quasi-ballistic missile for combating targets above sea level. Quasi (or semi) ballistic means that the missile has a low trajectory and can manoeuvre in mid-flight or make unexpected swing or altitude manoeuvres. Thus it needs a precise and highly developed final approach system in order to be able to hit a moving target.

22 An Anti-Ship-Cruise-Missile /ASCM) belongs to the family of cruise missiles and combats targets above sea level. It is a cruise missile (winged missile), unmanned, and steers into the target on its own. Contrary to a ballistic missile it needs permanent drive. Navigation is provided by a combination of carrier navigation system, terrain-contour-alignment, and target-area-image-alignment and satellite navigation. It is propelled by turbofan or ramjet drive systems. Its low flight level (15-100 m) guarantees some protection against enemy radar. The CM can be launched from ships, submarines, airplanes, or from ground.

23 Robert Farley, Petterson School of Diplomacy and International Commerce at the University of Kentucky, April 2017, "What It Would Really Take To Sink A Modern Aircraft Carrier".

24 Freedberg, USNI News, 12.03.19., „Why DoD Cut A Carrier in 2020 Budget: Survivable Robots & Missiles V. China".

25 Eckstein, USNI News, 13.03.19., „Large Surface Combatant Program Delayed Amid Pivot Towards Unmanned, Other Emerging Tech".

26 Apart from the United States, the other four members of the standing United Nations Security Council, China, Russia, the United Kingdom, and France, are „authorized" holders of nuclear weapons.

27 US-term for strongholds of the PLAN in the Pacific and Indian Ocean on the way to the Persian Gulf and the African coasts.

28 Since 2013, the project One Belt, One Road (OBOR), and/or Belt and Road has pooled the interests and objectives of the Peoples' Republic of China under President Xi Jinping concerning the development and support of intercontinental trading and infrastructure networks between the Peoples' Republic of China and more than 60 further countries in Africa, Asia and Europe.

29 Li Jie, Peking, Naval-Expert, 12.05,2017, http://china-defense blogspot.co.at/2017/05experts-eigh-in-on-what-to-expect-from,html . See table as well.

30 Keck, 08202018, "China will soon have the ultimate naval weapon: Nuclear powered aircraft carriers." The National Interest, https://nationalinterest.org/blog/the-buzz/china-will-soon-have-the-ultimate-naval-weapon-nuclear-24807.

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