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The Amphibious Endeavour: Tactical Risk, Strategic Influence

Guillaume Garnier

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Ifri
27 rue de la Procession
75740 Paris Cedex 15 – FRANCE
Tel : +33 (0)1 40 61 60 00
Fax : +33 (0)1 40 61 60 60
Email : ifri@ifri.org

Ifri-Bruxelles
Rue Marie-Thérèse, 21
1000 – Bruxelles – BELGIQUE
Tel : +32 (0)2 238 51 10
Fax : +32 (0)2 238 51 15
Email : info.bruxelles@ifri.org

Website : www.ifri.org

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The author

An officer in the French Army, Lieutenant-Colonel Guillaume Garnier is on a research assignment at the Defence Research Laboratory (LRD). He is a graduate of the French military academy Ecole Spéciale Militaire de Saint-Cyr and of the Collège Interarmées de Défense (CID) (Joint Service Defence College).

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Abstract

Despite a centuries-long history, amphibious operations were rarely in the spotlight before the Second World War. Meteorological constraints and joint planning challenges both emphasize their risky and complex character. Lessons learned highlight indispensable operational requirements such as superior naval power, favourable strength ratio for disembarked forces and the advantage of surprise. Nowadays, amphibious operations have adapted to new conditions by strengthening joint forces integration, and by taking advantage of the most modern naval and military technologies. Although amphibious operations remain a high-end perspective in a total war concept, they still represent a key capability for “forcible entry” in a world where 50% of the population lives by the sea. Stretching over the entire operational spectrum, amphibious operations will prove more and more their importance in low-to-medium intensity crisis scenarios, rather than in the hypothetical use of all-out force and wide-scale operations.

* * *

Malgré une histoire séculaire, les opérations amphibies sont restées relativement occasionnelles avant la Seconde Guerre mondiale. De par les fortes contraintes météorologiques et les difficultés d’une planification interarmées, il s’agit de missions complexes et très risquées. Les retours d’expérience mettent en lumière des données incontournables telles que le besoin d’un appui-feu naval écrasant, d’un rapport de forces favorable sur le lieu de débarquement et surtout de l’effet de surprise. Ces vérités persistent aujourd’hui, mais l’amphibie a changé de visage, exigeant une intégration interarmées de plus en plus poussée, tout en bénéficiant des technologies militaires et navales les plus modernes. S’il continue d’offrir une perspective de haute intensité, l’amphibie constitue surtout une capacité clé pour « l’entrée en premier » dans un monde où 50 % de la population vit sur les littoraux. Couvrant l’ensemble du spectre de la conflictualité, l’amphibie démontre aujourd’hui davantage son utilité stratégique dans des scénarios de crise de basse à moyenne intensité que dans d’hypothétiques opérations de guerre majeure.

Abbreviations

A2/AD	Anti-Access/Area-Denial
BPC	Bâtiment de Projection et de Commandement (Landing Helicopter Dock)
C4ISR	Command, Control, Communications, Computer, Intelligence, Surveillance, Reconnaissance
CJEF	Combined Joint Expeditionary Force
CTM	Chaland de Transbordement Maritime (Maritime Transhipment Craft)
EDAR	Engin de Débarquement Amphibie Rapide (Rapid Amphibious Landing Craft)
EAI	European Amphibious Initiative
EFV	Expeditionary Fighting Vehicle
ERM	Extended Range Munition
FREMM	Frégate Multi-Mission (Multi-Mission Frigate)
GRAMM	Guided Rockets, Artillery, Mortars, Missiles
LCAC	Landing Craft Air Cushion
LCS	Littoral Combat Ship
LHA	Landing Helicopter Assault
LHD	Landing Helicopter Dock
LPD	Landing Platform Dock
LPH	Landing Platform Helicopter
LRLAP	Long Range Land Attack Projectile
LSD	Landing Ship Dock
LST	Landing Ship Tank
MCM	Mine Counter Measures
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MLP	Mobile Landing Platform

MPF	Maritime Prepositioning Force
OTH	Over-The-Horizon
RMA	Revolution in Military Affairs
SEAD	Suppression of Enemy Air Defence
SPOE/D	Sea Port of Embarkation/Debarkation
STOM	Ship-To-Objective Manoeuvre
STOVL	Short Take-Off Vertical Landing
TCD	Transport de Chalands de Débarquement (Landing Platform Dock)
USMC	United States Marine Corps
VHM	Véhicules à Haute Mobilité (High Mobility Vehicles)

Introduction

The word amphibious invariably conjures up images of the blood-stained sand of Omaha Beach. Those who are more familiar with the subject would add the Dardanelles, as well as Tarawa, Iwo Jima and Okinawa. Amphibious operations are thus primarily associated with the idea of a massacre, which is all the more impressive as it is concentrated in a confined space with no possibility of withdrawal. It is also generally believed to be a *modus operandi* which appeared in the 20th century and which is more or less obsolete today, though it has existed since antiquity, as demonstrated by the Peloponnesian War or the Punic Wars, and its current strategic value remains wholly intact.

However, these platitudes mask the essential fact that the amphibious operation is an *offensive operation* involving a *change of environment*, which doubles the risk. Consequently, planners of this type of operation expect to obtain strategic or operational added value commensurate with the exposure to danger. Thus an amphibious operation is defined as any operation designed to place on land, on a potentially hostile shoreline, a maritime force in a situation where the local port infrastructure is non-existent or clearly inadequate. In a wider sense of the definition, re-embarkation manoeuvres, often under pressure, are also included, along with amphibious demonstrations, provided they are sufficiently credible to produce the desired effect on the land-based protagonist. Amphibious operations are among the most difficult imaginable since they revolve around the delicate change of environment between sea and land. Yet the situation of the shore-based defender is likewise less simple than one might imagine.

Historically, several types of amphibious operations have existed covering the full spectrum from low to high intensity. A large-scale amphibious operation originates in the freedom of action obtained by the force that has secured sea control. Able to act without warning from the sea towards the land, the latter potentially gains the strategic gift of being everywhere at once. Today, this major advantage is amplified by a geostrategic environment which reinforces the importance of the littoral. Three-quarters of the world's population lives less than 300 km from the coast,[1] and this trend has grown steadily more pronounced over the past three decades. The fact is that the littoral contains the majority of power centres and many economic centres of prime importance. Increasing

[1] Geoffrey Till, *Seapower, A Guide for the 21st Century*, 2nd edition, Abingdon, Routledge, 2009, p. 226.

volumes of natural resources – particularly gas and oil – are extracted close to the coast, including deep-water sites. In addition, the littoral is the most likely to be affected by major climatic events. Finally, insidious threats in these areas have multiplied, with the resurgence of piracy on a significant scale and the presence of criminal groups taking advantage of the coastline to organize illegal activities[2]. These factors create the conditions for potential geopolitical disruption and thus promote the hypothetical use of amphibious capabilities.

This brief review of the environment is intended to elucidate the advantages of amphibious operations as part of a low- or medium-intensity operation. The debate, therefore, goes far beyond the question of an amphibious assault in the context of a major war. This latter case is overshadowed by the prospect of excessive sacrifice or needless risk, particularly as access denial strategies are being developed by several countries, whose number – admittedly limited today – is destined to rise. Who can still claim to have the resources needed to perform an assault landing operation against an organized adversary and what is the probability of occurrence of such a scenario?

However, amphibious operations in the 21st century *do not promise only blood and tears*. Their strategic utility resides today in the fact that they offer a *forcible entry*[3] *capability* in a permissive or semi-permissive environment. Once the principles governing amphibious action have been established, the attacker-defender dialectic must be analysed first of all in the light of contemporary access-denial strategies – strategies that can still be bypassed at least partially – but at the cost of a potentially debilitating technology race. With the operational approach thus defined, we need to look at the strategic role of amphibious operations, in order to determine the extent to which this capability represents an asset and the most probable or limitative assumptions for its employment. Ultimately, the primary advantage of amphibious operations lies in their flexibility. They offer the political decision-maker a tool with which to both exert controlling influence within a coalition and apply a scalable response to crises of varying intensity and modality.

[2] Hugues Eudeline, “Contenir la piraterie: des réponses complexes face à une menace persistante”, *Focus stratégique*, No. 40, November 2012, pp. 19-29.
[3] This term does not presume the level of the threat, which will be considered here as ranging from low to medium.

The Ineluctable Principles of Amphibious Warfare

As with airlift operations, the extreme complexity of amphibious operations stems from crossing the environmental boundary, with an even greater number of parameters than the air-to-land boundary crossing. Haphazard planning in this case is a recipe for disaster. The vagaries of the weather add to the constraints of physical geography, obstacles which even the latest technology cannot overcome with absolute certainty. Whether these obstacles are man-made or natural, their effects are magnified, considering the more or less irreversible nature of a landing once the operation has begun. This is why – as experience has built up and technology has progressed – efforts have focused on reducing the margin of uncertainty and, therefore, risk by taking advantage of both massive superiority of fire support (at first naval, then airborne and naval) and the element of surprise, since the best landing is the one that occurs where nobody is expecting it. Finally, as in every military dialectic, the defender seeks to adapt to operational breakthroughs imposed by the attacker, thereby generating a further, increasing complexity, that of joint force integration.

Crossing the Environmental Boundary Generates Friction

One can readily comprehend how an abrupt change of physical environment can generate intense tactical and logistical difficulties. It is less easy to see the consequences on a command and organisational level. Yet these effects (physical impact, operational control, cohesion within units) cumulate to amplify the friction. Solutions are constantly being tested and applied in order to reduce this pernicious source of risk.

Complex Natural Contingencies

The first difficulty in an amphibious operation is to simultaneously cope with constraints imposed by the physical geography of the shoreline and those due to maritime weather. It is necessary to keep in check the numerous physical parameters imposed by winds, currents, tides, the presence of shoals and the key area of the foreshore or intertidal zone (see appendix 1). The gradient of the foreshore is of critical importance as it determines the type of landing craft[4] able to run up onto the beach as a function of the draught. Extremely precise timing is, therefore, necessary at

[4] Landing craft refers to any type of boat, barge or other craft used to perform the actual landing, *i.e.* the ultimate offload.

the planning stage to avoid the numerous pitfalls resulting from these contingencies.[5] Nonetheless, even with the most rigorous foresight, an amphibious operation remains a manoeuvre subject to a large degree of uncertainty.

The Alger landing led by Charles Quint in October 1541 serves as a timely reminder of this cast iron rule. Though the operation had been prepared in every detail and brought together an impressive combined force to seize a Barbarossa base of strategic importance for the Ottoman Empire, it failed essentially because of the weather. Troops had been placed ashore with no major difficulty, but three days of fierce storms (frequent at that time of year) overwhelmed their logistics. The camp set up close to Algiers was destroyed and numerous ships were disabled or ran aground, including those carrying munitions and siege artillery. Charles Quint was forced to raise the siege, running into headwinds on the return voyage, which left him dangerously exposed to Barbarossa's pursuing Ottoman fleet.[6]

What Balance in the Command Structure?

While natural elements work together to cause friction, the human factor also plays a major role. Combining both maritime and land-based logic, the amphibious operation poses the delicate question of the definition of an *ad hoc* command structure. Should the operation be directed by a navy or army commander? Who makes the crucial choice of the landing point, knowing that the "naval" commander will necessarily have different preoccupations (global vision of the operation, with a focus on secure maritime communications and long-term logistics support) from those of the "army" commander (a more tactical vision focused on the most vulnerable phase, which implies a need for powerful naval fire support and the choice of a beach enabling rapid spread inland)? Numerous historical examples show that operations are in most cases led by a naval commander who transfers authority to the land-based commander once a significant volume of the land force has disembarked. In practice, however, personality problems have often disrupted this common-sense solution, if only because it is difficult to judge in concrete terms the exact moment when this command transfer can be carried out without generating additional friction. The doctrinal solution adopted today within NATO defines a pragmatic sharing of tasks between a "commander at sea" and a "commander on land".[7] Their headquarters are co-located on the same platform and, as the centre of gravity of the operation gradually moves from ship to shore, the transfer of functional responsibilities proceeds accordingly, knowing that it

[5] Till, *Sea power,* pp. 193-194.
[6] Barnaby Rogerson, *The Last Crusaders*, New York, Peter Mayer Publisher, 2010.
[7] These are the CATF (Commander, Amphibious Task Force) and the CLF (Commander, Landing Force), respectively.

remains reversible according to the operational situation – *e.g.* for as long as re-embarkation remains a possibility.[8]

The epic siege of Malta in 1565, during the protracted conflict between Charles Quint and the Ottoman Empire, illustrates these interactions and their harmful effects. When Suleiman the Magnificent decided to lay siege to this powerful fortress held by the Knights Hospitaller, he did not designate a supreme commander for the combined operation – Mustafa Pasha led the land forces and Piyale Pasha, the fleet. An initial dispute rapidly arose as to where to anchor the fleet. Piyale Pasha wanted to shelter the fleet as soon as possible in Marsamxett bay, but Mustafa Pasha argued that they would need to first capture Fort Saint Elmo and that other choices were possible. Finally, he reluctantly agreed with Piyale's position and the initial siege of Saint Elmo dragged on, resulting in significant losses in a campaign where attrition played a decisive role.[9]

Tactical Dissociation of Land Units

A land unit, to be tactically effective, is structured according to an optimal organisation that depends on the historical period. This tactical organisation is necessarily disrupted not only due to embarkation on large ships providing strategic transportation, but even more so when units are broken up on the landing craft taking them to the beach. Troops are grouped according to the loading plans permitted by the landing craft and not according to their tactical structure. As a result, they must reorganise on the beach, possibly under fire, making them extremely vulnerable to counter-attack. The difficulty consists in reducing the negative effects of the ship-to-shore transfer through meticulous planning. The first significant progress in this respect came during the Seven Years' War (1756-1763). The British made a particular effort to improve cooperation between the fleet and land forces. Boat loading plans reflected as closely as possible the structure of the units. Simple, common-sense measures were adopted to mark the boats – systems of numbers or pennants – to make it easy to identify and gather units together. If a commanding officer was on board, a distinctive sign was used to enable orders to be rapidly transmitted during the action. Finally, General James Wolfe[10] made a habit of sending scouts on land in advance – like modern-day commandos – to gather intelligence and thus accelerate the establishment of a beachhead once the majority of troops had disembarked. From this time forward, we can talk of genuine combined operations.[11]

This permanent desire to improve coordination, whether methodologically, by designing new equipment or by creating new types of

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[8] CICDE, *Doctrine interarmées DIA-3.1.1a, Opérations Amphibies, Livret 1/2,* 7 November 2011, pp. 29-32. This command structure is itself derived from US amphibious doctrine (JP 3-02 *Amphibious operations*, August 2009).

[9] Rogerson, *The Last Crusaders;* Thomas F. Arnold, *Atlas des Guerres de la Renaissance*, Paris, Editions Autrement, 2002, pp. 129-132.

[10] English general who captured Louisbourg (1758) and Quebec (1759).

[11] Merrill L. Bartlett, *Assault from the Sea*, Annapolis, Naval Institute Press, 1983, pp. 51-57.

increasingly specialised units, would characterise the subsequent evolution of amphibious warfare.

Specific Troops and Equipment

It gradually became apparent that dedicated troops and equipment were indispensable for landings against powerful opposing forces. Concerning the equipment, it should be recalled that men landed from simple long boats during the Dardanelles campaign (April 1915 – January 1916 for the land campaign)[12]. The Second World War, with its multiple amphibious operations, brought rapid technology advances in this sector, mainly driven by the U.S. Landing craft made considerable progress with the development of specialised craft (troop transport, tank transport, rocket-launching craft for fire support), amphibious vehicles (tanks, engineering vehicles, *alligators*[13], *ducks*[14]…), to name only the key ones, since around 80 different types of barge or vehicle were developed by the Americans and the British.[15] Since then, the amphibious domain has been marked by continuous technical innovation.

What is true of equipment is also true of men. Professional "*marine troops*" first appeared in 1537 – Spain but particularly in the 17th century Portugal, France, Great Britain, Netherlands. Their missions were not confined to landing, but included boarding and the security of ships, ports and fortresses overseas. The common denominator was that they were "navalised" forces with an expeditionary culture. Logically, they provided all or part of the manpower needs of the future amphibious assault units.

This specialisation, however, needs to be placed in perspective. During the Norwegian campaign in April-June 1940, regular infantrymen carried out the surprise German landing. Similarly, in Narvik, *chasseurs alpins* – *i.e.* mountain infantry – and troops from the Foreign Legion carried out the landings on the French side. The Germans planned to conquer England using regular divisions supported by parachute units.[16] Thus at this stage in the war, there were no troops dedicated to amphibious operations. That changed with the war in the Pacific and the landings on heavily defended beaches – landing under those conditions with units untrained for the task would have ended in disaster. The units designated for the landings had to be accustomed to the maritime environment and trained for amphibious assault – complex measures for combined-arms and joint coordination had to be fully understood, down to the lowest tactical echelons.[17] Though Japan began the war with a doctrinal head start,[18] the

[12] Michael Evans, *Amphibious Operations*, volume 4, London, Brassey's, 1990, p. 19.
[13] Official name: Landing Vehicle Tracked (LVT): amphibious troop transport vehicle.
[14] Official name: DUKW, hence the nickname "duck": amphibious vehicle for troop or equipment transportation.
[15] Evans, *Amphibious Operations* p. 23 and 26.
[16] Bartlett, *Assault from the Sea,* pp. 228-235.
[17] Ibid., pp. 220-224.
[18] Ibid., pp. 195-199.

US Marine Corps (USMC) continuously perfected its strictly amphibious know-how, building on the lessons learned from each landing, while the Japanese culture of collective sacrifice did not encourage operational feedback. US Army units also performed amphibious operations[19] but, like their USMC counterparts, they first underwent extensive training and adopted the existing doctrine. Finally, specific units were created, particularly combat divers with a variety of missions[20] – destruction of waterborne obstacles, mine clearing, reconnaissance – or commando units – destruction of strong points or seizure of key locations. Nowadays, this role would be filled by Special Forces whose action is decisive, particularly before an operation is launched.

What Subordination for Amphibious Forces?

Today there are multiple organisational and institutional responses (see appendix 2), often linked to the military history of each country. In the United States, the USMC is considered to be an independent service, practically on the same level as the other services. The USMC is the keeper of the amphibious specialty, its traditions and its doctrine. It also possesses a large portion of its aerial support resources.[21] Though intrinsically amphibious, USMC units are also used for traditional land operations, as was the case in Iraq and Afghanistan. In fact, they have become partially removed from their core activity over the last 10 years, which have been particularly demanding.

In other countries, amphibious land units are most frequently attached to the Navy, for historical reasons of affiliation. This is the case for the *Royal Marines* in the UK, the Dutch *Korps Mariniers*, Russian naval infantry or Spain's *Infanteria de Marina*. The Italian and French cases are special. Italian amphibious units are attached in some cases to the Army (*Reggimento Lagunari "Serenissima"*) and in some cases to the Navy (*Brigata Marina San Marco*).[22] In France, the 6th BLB and the 9th BIMa[23] are attached to the Army. These two brigades have an "amphibious specialty": for them, this competence is know-how to be maintained alongside all the other traditional missions of a "multi-role" brigade. They have priority for training sessions with the French Navy and for qualification courses. This offers the advantage of having a large reservoir of forces essentially formed from regiments belonging to *the Troupes de Marine* or the *Foreign Legion*.

[19] Like the 1st DIV US (*Big Red One*) or the 4th DIV US on 6th June 1944.
[20] Thus underwater demolition teams made their first appearance in 1944 during the invasion of the Mariana Islands, in Bartlett, *Assault from the Sea,* pp. 224-225.
[21] The tactical unit is the MAGTF: *Marine Air-Ground Task Force*; Congressional Budget Office, *An Analysis of the Navy's Amphibious Warfare Ships for Deploying Marines Overseas*, November 2011, p. 3.
[22] James Hasik, "Ambitions amphibies, les conséquences industrielles", *DSI hors-série*, No. 16, February-March 2011, pp. 22-23. Since March 2013, the San Marco has become Brigata Marina San Marco, even though it was previously a "Reggimento".
[23] Brigade Légère Blindée and Brigade d'Infanterie de Marine (both light armoured brigades) - CICDE, Doctrine interarmées *DIA-3.1.1a Opérations Amphibies,* p. 30.

The disadvantage is that all the elementary units of these two brigades cannot undergo regular amphibious training.[24]

From this brief review, we can see that there are several amphibious models, varying between two extreme rationales. The first (U.S.) prefers a system with specifically amphibious units, ready to deploy immediately, including under the most demanding tactical conditions, even if this means limiting the volume of forces available for this speciality (Italy, UK). The second (France) prefers to rely on a larger number of units "available for amphibious missions" but whose specific training for the toughest missions is necessarily less regular, since amphibious operations for them are just one skill among others. In any case, the minimum core requirement to be able to deploy an operational amphibious force is to have previously developed a doctrine that can be assimilated at short notice by dedicated units (tactical know-how) and *ad hoc* headquarters – planning and conduct know-how. It is also necessary to maintain a minimum threshold of competence through regular exercises. If these conditions are not met, friction cannot be reduced to a tolerable level.

However, having dedicated units and resources is not enough to ensure a successful amphibious operation. A certain number of operational conditions must first be established, introducing further complexity through the close coordination required between the increasingly numerous parties involved.

The Attacker's Prerequisites

Interactions between the two protagonists – the attacker and the shore-based defender – clearly illustrate the complex dialectic generated by amphibious warfare. Certain principles can be brought to light by studying this form of warfare throughout the 20th century. This historical perspective helps to understand current issues, which are developed in the second section.

Naval and Air Superiority

On the strategic, operational and tactical levels, an amphibious operation is inconceivable without naval superiority in the area where the landing is planned. This is necessary not only to ensure strategic transportation without risk of major damage in the event of an interception, but also to guarantee security during the landing operation, at a time when part of the fleet is static, in order to provide fire support and long-term logistics support. In most cases, it is also necessary to have a covering force to deal with any threats, in addition to the fleet supporting the landing itself.[25] To reduce vulnerability created by the landing, a deception operation

[24] Based on the force specialisation logic set forth in the 2013 White Paper on National Security and Defence, there is already a degree of specialisation due to the exclusive training of these two brigades. However, this logic has yet to manifest itself at the equipment level, even though one might expect them to be equipped with specific vehicles (*Hagglunds,* for example).
[25] Till, *Sea power*, p. 191.

(measures taken to create the impression that a landing will occur at another location) generally proves indispensable. Technical stratagems and know-how are required to render the deception credible. The latter will in any case require additional naval resources that are not available for the main action. Accordingly, only the protagonist enjoying naval superiority can afford this dispersal of resources. Finally, on the tactical level, the first essential factor in the success of the landing resides in the power of naval fire support, the only support initially available, since land-based artillery is too bulky to be put on shore in the first waves of the assault. This fire superiority at the decisive location is directly dependent on naval superiority.

The First World War, with the example of the Dardanelles, marked a turning point in this respect. This large-scale amphibious operation, the *Dardanelles campaign*, as it is called, took place at a time when the art of war was itself undergoing a fundamental evolution – in the direction of massive firepower so as to render almost any manoeuvre impossible. So this campaign was marked by a double surprise: underestimating the destructive effects of firepower – common on all fronts in 1915 –, and the inherent difficulties of an amphibious operation on a scale that was unprecedented at the time. For the attacker, naval fire support proved essential, but it was not on its own decisive – direct fires from the powerful ship guns[26] could not destroy the deep defensive entrenchments.[27] Progress was made during the course of the campaign. Aviation was gradually introduced for reconnaissance, firing corrections and sometimes even ground attack, a precursor for the major role that airpower was about to assume in amphibious operations. The British even tried out their first, modest aircraft carrier, HMS *Ark Royal*.[28] Nonetheless, the campaign ended in bitter failure and the resulting traumatism would generate in-depth analysis during the inter-war years – particularly on the U.S. side – to understand the errors committed and lay the foundations for a renovated doctrine.[29]

The Second World War saw another key change in amphibious operations. Henceforth, naval superiority has had to be accompanied by air superiority, since the former was almost impossible to establish without possessing the latter. The aircraft carrier became the emblematic instrument of control in the naval air domain and proved itself decisive in the Pacific theatre. Still on the tactical level, the need for naval fire support was accompanied by a critical need for close air support. From then on, amphibious operations were associated with increasingly gigantic naval air battles (Philippine Sea, June 1944;[30] Leyte Gulf, October 1944)[31] until the

[26] The largest calibre at the time was 305 mm.
[27] Theodore L. Gatchel, *At the Water's Edge*, Annapolis, Naval Institute Press, 1996, p. 22, pp. 149-150 and p. 179.
[28] Actually a merchant ship converted to carry amphibious aircraft, *cf*. Gatchel, *At the Water's Edge*, p. 21.
[29] Williamson Murray and Allan R. Millett, *Military innovation in the interwar period*, Cambridge, Cambridge University Press, 1996, pp. 50-78.
[30] Evans, *Amphibious Operations,* pp. 3-8.

Japanese forces had practically disappeared. Also, air cover and air support were frequently provided by land-based aircraft: amphibious operations were thus marked by urgent and complex joint force coordination, from the strategic level – planning, coordinating force concentrations – to the tactical level – more prominent role for liaison officers, upgrading controllers for naval fire and for air-to-ground fire support, for example).[32]

Overcoming Logistical Difficulties

While the tactical difficulty of a landing operation can be easily imagined, the logistical aspect – which is no less complex – is more readily forgotten. Initially an amphibious operation has no deep-water harbour infrastructure to rely on that could ensure the sustainability of supply and the arrival of second-echelon reinforcements. Where such a structure exists,[33] the defender clearly focuses most of his efforts there or, at the very least, sabotages the installations. Historically, then, the attacker only has the beachhead to get organised: no piers, no warehouses, no access roads to leave the beach. The latter rapidly becomes chaotic, as supplies brought ashore pile up and can even lead to congestion. This logistical disruption risks having an adverse effect on the force build-up on shore and on penetration further inland which is supposed to proceed rapidly. Thus, one generally observes a drastic reduction in operational tempo following an initial successful phase. Witness the Normandy landings in June 1944, with the difficult capture of Cherbourg (a port of relatively modest capacity) which was only completed three weeks after D-Day, and the technical solution of the artificial *Mulberry* harbour of Arromanches. This brilliant technical feat demonstrated the inventive genius of the Americans to bypass logistical difficulties, but it was no panacea, as the harbour was heavily damaged by three days of storms (19-21 June 1944).

The Element of Surprise

Knowing that the amphibious manoeuvre is vulnerable and random, it is important to catch the defender off guard by using surprise. The best landing is the one that is performed where it is least expected in order to destabilise the defender and gain decisive initial momentum. The reinforcement of the first assault wave by successive echelons is thereby facilitated.

Subsequently, the desire to bypass the logistical congestion problem on the beachhead and the need to catch the enemy by surprise encouraged the emergence of a doctrine based on “vertical envelopment”. The main idea consists of reducing reliance on the umbilical cord that constitutes the physical link between the beachhead and the line of advance of units that have landed, by landing all or part of the troops from

[31] Samuel Eliot Morison, *Leyte*, Annapolis, Naval Press Institute, 1986.
[32] Elie Tenenbaum, “Entre ciel et terre, le débat air-sol et les défis de l’appui-feu”, *Focus stratégique*, No. 21, May 2010, p. 8, 16, 18, pp. 37-38; Bartlett, *Assault from the Sea,* p. 179; Evans, *Amphibious Operations,* pp. 29-30.
[33] For example Cherbourg, Normandy in June 1944.

the air. This logistical consideration does not, on its own, explain the benefit of vertical envelopment: by multiplying the tactical choices for seizing bridgeheads, and by increasing the potential directions from which attacks can originate, the attacker substantially increases the element of surprise as well as the tactical dilemmas of the defender, who is faced with the challenge of defining a plan that takes account of a large number of hypotheses. In doing so, the defender has a greater incentive to disperse his forces and he has more difficulty in committing his reserves appropriately. Accordingly, vertical envelopment is the latest major doctrinal evolution to facilitate achieving that key factor: surprise.

This doctrine made its mark progressively. One of the first examples of vertical envelopment combined with an assault landing came in February 1942 during the Japanese conquest of Timor,[34] which was defended by Australian and Dutch forces. In addition to their amphibious assault, the Japanese decided to drop a naval parachute battalion. The objective of the airborne assault was to seize Penfui airport intact and surround the defenders more rapidly. The combined attack was a success, though losses were heavy, and the island was captured. In the U.S., vertical envelopment began to be translated into doctrine in December 1955 with the publication of *Landing Force Bulletin-17*[35] by the USMC. This publication sought to define the ideal compromise between critical mass (favourable balance of forces for the assault) and necessary dispersion (reduced vulnerability of forces) by combining an assault from the sea with a heliborne assault. This presupposed developing a new class of large amphibious ship, whose function as a helicopter platform became essential. The first Tarawa class *Landing Helicopter Assault* (LHA)[36] ship entered service in 1976. Meanwhile, combined operations in Suez (1956) and Cyprus (1974)[37] showed that the concept was functional, amplifying the element of surprise through the flexibility offered by using a variety of platforms.

Thus, the attacker, across the ages, has had to show a series of qualities. Precision in studying the physical parameters of his landing was required. Courage in executing the operation was necessary. Skill in coordinating the different joint force supports was crucial, not to forget perspicacity to invent new operational modes that significantly increase the chances of success. Amphibious operations are gruelling for him, but it would be erroneous to conclude, therefore, that the defender does not have his share of difficulties to manage.

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[34] Bartlett, *Assault from the Sea,* pp. 202-209.

[35] Ibid., p. 354. A draft doctrine had even been prepared in 1948 at Quantico Academy, in Etienne de Durand, Benoît Michel, Elie Tenenbaum, “La guerre des hélicoptères. L’avenir de l’aéromobilité et de l’aérocombat”, *Focus stratégique*, No. 32, June 2011, p. 11.

[36] Joseph H. Alexander & Merrill L. Bartlett, *Sea soldiers in the Cold War*, Annapolis, Naval Press Institute, 1995, pp. 72-73.

[37] These operations combined traditional landings with airborne and heliborne assaults, Evans, *Amphibious Operations,* pp. 37-39.

The Defender's Dilemmas

Several postures can be imagined to meet the challenge of a landing. Should the defender build an *Atlantic Wall* along the coast or should he adopt a more flexible plan, with a light coastal screen and substantial reserves inland to counter-attack rapidly? This recurrent dilemma between rigid frontline defence and flexible defence-in-depth raises the question of a possible optimum compromise in this area, knowing that the exact nature of this compromise depends on contextual elements (balance of forces, terrain, technologies available at a given point in time …).

Priority to Defence on the Beach or Mobile Reserves?

Knowing that the moment of greatest vulnerability for the attacker occurs during the ship-to-shore transfer, it is tempting to consider that the decision must be created at this precise moment, by halting his progress on the beach and seeking to destroy the maximum number of landing craft while preventing him from organising himself tactically. Firmly entrenched, the defender has all his time to repel the enemy into the sea. And yet, in practice, this is rarely how things have worked. Even in the Dardanelles, the amphibious assault was certainly contained, but it was never forced back into the sea. The Americans came within inches of disaster at Tarawa (November 1943) and Omaha Beach (June 1944), and yet, with heavy losses, they eventually secured the beachhead. One of the reasons for these multiple defensive failures is that the attack culminates with massive naval and airborne fire support at the precise time of landing or immediately before. The static defensive positions around the beach then become targets, and the defender's plans will most likely be thrown into disarray, particularly if the physical configuration of the coast facilitates target acquisition.

The other mode of defensive action consists of setting up a reserve to organise, as soon as conditions permit, a counter-attack to destroy the beachhead. In practice, this is almost always complementary to the first mode, the core of the dilemma being to determine the correct proportion between resources devoted to static defence and resources reserved for the counter-attack.[38]

There is also a third possibility: echelons of defence in depth, so as to gradually weaken the attacker once the landing has culminated. Opportunities can appear, such as weaknesses in the attacking force under the effect of attrition, and these must be exploited by judicious employment of reserves, which are not exposed to naval firepower, being stationed too far inland. The attacker, brought to a halt, is unable to capitalise on the success of his landing and to achieve his operational objective.

The debate between Rommel and von Rundstedt over the best course of action to defend the *Festung Europa* in 1944 provides a good

[38] It should be noted that in some cases, when defending a small island (Tarawa Atoll), all resources should be devoted to static defence due to the lack of space to manoeuvre for a large-scale counter-attack.

illustration of this dilemma. Contrary to the distorted claims that have frequently been put forward, Rommel did not plan for an exclusively coastal defence. To be sure, there was a focus on land-based defence of the coast, but local armoured reserves were positioned to counter-attack as quickly as possible. These reserves had to be split up, in the immediate vicinity of the defensive zones, in order to prevent any immediate advance inland. Von Rundstedt, on the other hand, wanted to gather the reserves in a single large armoured unit with the power to sweep aside any bridgeheads. Centrally located, this unit would be able to intervene massively at different points under threat, unlike the more rigid plan proposed by Rommel. The latter argued that it was not possible to move such a large armoured reserve fast enough with the skies under enemy control. It turned out that he was right: allied aviation closed-off the terrain and severely hampered movement of the *Panzer Divisionen* held in reserve.[39]

In the final analysis, none of these different modes of action can systematically ensure a greater degree of effectiveness than the others, though on an operational level, the dynamic defence model seems to have shown the greatest capability to bring the attacker close to breaking point by halting the initial assault (Salerno, September 1943; Anzio, January 1944).[40] The choice depends, of course, on the terrain, the available resources and – perhaps to an even greater extent – the real capacity of the defender to conduct (more complex) agile defence if he chooses this option. Japanese doctrinal hesitations, swaying between coastal defence and inland defence between 1943 and 1945, bear witness to the difficulty of this question.[41]

Multi-Layered Forward Defence

"Multi-layered" forward defence is the "rich man's" defence, since it requires significant joint force resources. If the attacker enjoys naval and air superiority, the defender can contest this within a limited space-time window. The objective is to provoke attrition in advance, far from the coast, sufficiently detrimental to the amphibious operation as to deter the attacker.

Urgent British planning to prevent a hypothetical German invasion in the summer of 1940[42] provides a good illustration of what this type of defence could look like when fully developed. Curiously, there was no integrated defensive doctrine in the UK to respond to an amphibious invasion.[43] Consequently, the general staff urgently planned to implement a global defence – from the broad scope to the smallest details – whose phases were largely inspired by earlier Royal Navy thinking. In an initial phase, it was planned to bomb the amphibious force concentration zones,

[39] Further disruption was generated by the brilliant deception manoeuvre, Fortitude, leading the Germans to believe that a landing was planned in the north of France well after D-Day, *cf.* Bartlett, *Assault from the Sea*, pp. 320-321.
[40] Gatchel, *At the Water's Edge,* pp. 51-58.
[41] Ibid, p. 151.
[42] Operation *Seelöwe*, Bartlett, *Assault from the Sea,* pp. 228-235.
[43] Gatchel, *At the Water's Edge,* p. 31.

i.e. the ports from which the force would be organised. In a second phase, if the attacker had not been substantially disrupted, the British fleet was to intercept the transportation fleet during transit, by engaging the protection fleet and thus deterring the former from proceeding further. This required as a minimum the capacity to contest German air superiority. Finally, if naval combat proved ineffective and large numbers of transportation craft remained intact, the coast itself was to be defended from protected positions (obstacles, mines). This fixed defensive organisation was designed to gain time before launching counter-attacks by mobile reserves.[44]

Thus we see that, whether from an offensive or defensive viewpoint, an amphibious operation is characterised by great complexity, for reasons that are both physical and human – command and coordination of a joint force down to the lowest echelons. This complexity undoubtedly has a greater impact on the attacker, who must manage the friction created by crossing the environmental boundary and related risks. Nonetheless, in cases where they were decided and properly planned, amphibious operations have often been successful. The attacker has – by necessity – benefited almost systematically from a better unified command system, while the defender has generally retained a vertical organisation, with each service retaining its independence[45]. Naval mobility has proven superior to mobility on land. Finally – and this became clear during the Second World War – an attacker has never risked undertaking a large-scale amphibious operation without having a clear advantage, giving him naval and air superiority in the landing theatre and a favourable balance of ground forces on the beach – generally estimated at three to one, at least. This last point puts into perspective the lessons that might be learned by analysing the history of amphibious operations. At best, one can note that advances in firepower initially favoured the attacker but today seem to give an advantage to the defender. In fact, taking a long-term view, one can distinguish three periods. Until the 18th century, a naval battle close to the shore was the decisive factor in a landing: victory paved the way for forces to be put ashore with no opposition on the beach. The force placed ashore generally organised a siege not far from the landing area. Around the 18th century, naval firepower increased substantially, allowing more precise and destructive fire support. Then we gradually see the emergence of veritable combined operations, sometimes with direct opposition in the landing area. Finally, the First World War saw further substantial gains in naval firepower, while the Second added airborne fire support as a key element. Each of these increased the margin of superiority required in the

[44] This coherent plan, which was never implemented due to the Luftwaffe's inability to ensure air dominance, nonetheless had a flaw: there was no provision for a joint command to integrate the manoeuvre of the three services. As a result, the latter appropriated the overall plan separately, sometimes applying different interpretations and defining their own efforts within different space-time domains. This would have been detrimental to the general effectiveness of the defensive measures. This shortcoming in the command structure seems to be particularly recurrent on the defender's side. Ibid., pp. 29-30 and p. 37.
[45] Ibid., p. 9.

same proportion and rendered the element of surprise even more indispensable to avoid defensive fire that had also gained in destructive power.

The recent acceleration of advances in precision weapon systems, capable of striking at long range, seems to signal the start of a new phase. It remains to be seen whether these innovations can create a new amphibious paradigm for the 21st century or whether, on the contrary, these modern systems will not concur to coherent strategies of littoral access denial. In other words, does amphibious assault remain relevant in the current context, where the advantage seems to lie with the defender?

Amphibious Operations in the Face of Modern Anti-Access Strategies

Over the past 20 years at least, a growing number of States have developed strategies to deny access to the littoral, strategies designated in the U.S. by the expression Anti-Access/Area Denial (A2/AD)[46]. These seek to coordinate different elements – mines, submarines, surface ships, aircraft, shore-based missiles, etc. – to prevent the approach of a hostile force. In the face of this development, a certain number of capacity gaps of the Western powers – counter-mine, naval fire support – have become all the more glaring, calling into question the traditional vision of the amphibious operation which consists of an assault to secure a beachhead by concentrating all available firepower on a limited area.

In response, a new focus was brought to bear on doctrinal concepts in the U.S., with an update of the (heliborne) vertical envelopment concept, associated with an *Over-The-Horizon* (OTH) intervention, *i.e.* beyond visual range from the coast. These efforts gave rise to the *Ship-To-Objective-Manoeuvre* (STOM) idea. This updated doctrine gave rise to a new line of specific equipment centred on the assault helicopter carrier, which became the emblematic amphibious platform.

These doctrinal and capacity innovations, however, may not be sufficient, in the light of the deadly nature of modern defensive weapons, which have fully benefited from continuous increases in range and precision. Ultimately, C4ISR[47] predominance seems to determine the feasibility of coercive amphibious operations in the 21st century.

Aggiornamento and Limits of the Amphibious Manoeuvre

Over the past two decades, a certain number of capacity gaps have tended to grow wider, even in the U.S., for cases where a large-scale assault is being considered. Naval fire support and mine warfare are at the top of the

[46] Corentin Brustlein, "Vers la fin de la projection de forces ? – tome I. La menace du déni d'accès", *Focus stratégique*, No. 20, April 2010.

[47] Command, Control, Communications, Computer, Intelligence, Surveillance, Reconnaissance: i.e. the full range of systems required to detect, acquire and destroy targets while maintaining a rapid, integrated command loop capable of evaluating strike damage to decide on further action (re-tasking, exploitation...).

list of these shortcomings from the traditional viewpoint of amphibious combat. The emergence of the STOM concept responds to this by attempting to define ways in which the ship-to-shore manoeuvre could be given a fresh dynamic.

Crippling Shortcomings

Naval Fire Support in Question

In the first section, naval fire support was presented as a major asset. Previously it offered a mass and saturation effect that translated into both quantity (number of guns) and quality (gun calibre). Since the withdrawal from active *US Navy* service of the four *Iowa* class battleships[48] (1992), this mass effect no longer exists in any navy in the world. Today the most ambitious project in terms of naval fire support is the American *Zumwalt* destroyer,[49] which should be armed with two 155 mm guns. Notwithstanding, this programme has already been substantially cut back due to huge cost overruns, since only three of the 32 ships initially planned will actually be delivered. Its technically bold *Advanced Gun System* is designed to strike targets at ranges of over 100 km thanks to a precision munition.[50]

Apart from this project, currently in development, the largest calibre currently in service is the Italian or American 127 mm gun that equips the Italian *FREMM* frigates and the American *Ticonderoga* or *Arleigh Burke*. The conventional Italian munition has a range of only 15 km. However, the *Vulcano* version currently at the design stage should have a range of 70 km, or over 100 km for the *Vulcano II*,[51] if the developments under way lead to series production. The American *Extended Range Munition* (ERM) should also have a range of 70 km. France has settled for limited firepower for its programmes in progress – 76 mm guns on its *FREMM* frigates.

It can be argued that aerial firepower (fixed or rotary wing) makes up for naval fire support. Yet, in practice, these two types of support are complementary, each with its different advantages and disadvantages.[52] As with land-based fire support, naval fire support offers good permanence of fire, or even a saturation capacity if the calibre is sufficient, unlike airborne fire support which, in addition, is more dependent on the weather. The latter, nevertheless, has proven more accurate and operates over an incomparably larger area thanks to the mobility of the airborne platform.

To summarise, modern naval fire support can gain substantially in precision and range – provided that development of the latest munitions is

[48] Their weapons consisted of nine 406 mm guns, twelve 127 mm guns and 32 *Tomahawk* cruise missiles, in Milan Vego, "Land Attack. Are expeditionary navies ready?", *Naval Forces*, No. 6, 2008, p. 9.
[49] Or "DDG 1000".
[50] Long Range Land Attack Projectile (LRLAP).
[51] Bernard Prézelin, *Annuaire des flottes de combat, 2012 edition*, Rennes, Edilarge, p. 812.
[52] Tenenbaum, *"Entre ciel et terre, le débat air-sol et les défis de l'appui-feu"*, pp. 37-38.

completed –, but its saturation capacity is markedly less than it used to be. This can be explained by the downward trend in calibre and in the number of platforms available simultaneously. Consequently, naval fire support offers precision strike from standoff range rather than the traditional mass effect applying fearsome psychological pressure to those on the receiving end.

Cruise missiles cannot entirely make up for this relative capacity deficiency, since they do not participate in fire support for the manoeuvre. Firstly, their high cost[53] means they are reserved for targets with very high strategic or operational potential, normally in the context of a first strike. It would be inappropriate to use them for tactical reasons, to destroy a retrenchment or an artillery position, for example. Finally, they are not designed to produce tactical effects on the terrain, such as closing off or denying access to a zone. The utility of this type of strike is, therefore, essentially evident during the preliminary phase of the operation,[54] particularly to disorganise the enemy's command systems, at the highest possible level.

The Threat Posed by Mines

The other apparent weakness concerns anti-mine operations. The mine may be considered as the poor man's weapon as it is inexpensive and relatively easy to utilise in large quantities. Even rudimentary mines have significant destructive power, enough to disable a capital ship[55] and, as a minimum, considerably reduce the tempo of operations. It is estimated that there are 275,000 naval mines worldwide and that 50 countries are able to lay them.[56] Yet good tactical use of mines can have important consequences: the North Koreans laid 3,000 Soviet mines at Wonsan in October 1950, causing heavy losses for mine hunters and delaying the American landing to the point where it lost its operational relevance.[57] This disproportionate ratio between damage caused and weapon cost creates an undeniable psychological impact: danger is potentially omnipresent. In addition, mines can be used to close a zone (mines laid at the entrance to a bay), to deny access to a key passage, such as a strait, or to channel an invasion force towards a zone where the defender is lying in wait. The wide range of platforms with mine-laying capability (fixed and rotary wing aircraft, submarines and all types of surface vessels) offers genuine flexibility of employment[58]. Finally, if rudimentary mines already represent a threat in themselves, there are much more sophisticated designs featuring stealth (very weak sonar echo) and available in a variety of forms (magnetic or

[53] Around one million euros for the MDCN.
[54] Till, *Seapower*, p. 245.
[55] A ship of key importance, at one time the benchmark for naval power.
[56] Andrew M. Turner, Naval War College report: "Amphibious operations in the 21st century: are the costs and risks too high?", 4th May 2011, p. 9.
[57] Milan Vego, "Defensive and Offensive mining: still a viable option in littoral warfare?", *Naval Forces*, No 3, 2008, p. 12.
[58] Ibid., p. 10.

acoustic mines, "smart" mines)[59] which, when skilfully combined, further increase the complexity of mine-clearing operations. For all of these reasons, anti-mine operations need to be given very serious consideration.

Yet resources in this domain are limited, even for the US Navy, which has never made a decisive effort in this respect[60]. This situation results in clear vulnerability for a traditional amphibious operation requiring a highly sustained operational tempo. Faced with the – very probable[61] – presence of large-scale minefields, long periods of time must be allocated for clearing mines in access channels, knowing that it will be difficult to ensure any absolute guarantee, even though the use of divers – particularly in shallow waters – considerably improves the quality of the mine-clearing operation. At the very least, this could jeopardise the element of surprise. Is there any sign of a global solution to the anti-mine problem? The *US Navy* has pinned its hopes on the *Littoral Combat Ship* (LCS), a stealthy, modular catamaran – surface warfare module, anti-submarine module, or *mine countermeasures* (MCM) module). Here again the results have been disappointing. The unmanned undersea vehicle and its associated sonar, which plays a key role in the MCM module, is not yet reliable[62] and the LCS programme in general is a subject of wrangling.[63] At the leading edge of technology in this domain, along with other European countries, France is experimenting with new *modus operandi*.[64] However, these developments will not reach full maturity before 2020 at the earliest.[65]

In a scenario against strong opposition, anti-mine operations and the lack of a saturation effect from naval fire support – two traditional domains of amphibious combat – continue to pose a challenge. The STOM concept seeks to get around the negative effects of these shortcomings, while taking care to respond to Anti-Access/Area Denial strategies, using a variety of platforms, particularly airborne.

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[59] Captain Benon, "Plongée dans le monde de la guerre des mines", *Mer & Marine*, 14th December 2012, available at: http://www.meretmarine.com/fr/content/plongee-dans-le-monde-de-la-guerre-des-mines.

[60] Particularly in shallow-water (3-12 m) anti-mine operations. The *US Navy* has generally tended to rely on its allies, as it did in *Desert Storm* in 1990 (UK, but also Belgium, France, Germany, Japan and the Netherlands), *cf.* Turner, "Amphibious operations in the 21st century: are the costs and risks too high?" p. 12.

[61] Turner, "Amphibious operations in the 21st century" pp. 8-10.

[62] Malcom Philips, "The US Navy's Littoral Combat Ships Compared", *Naval Forces*, No. 5, 2012, p. 100.

[63] As demonstrated by the 2011 report from the DoD's *Direction of Operational Test & Evaluation*, in Malcolm Philips, "The US Navy's Littoral Combat Ships Compared", *Naval Forces*, No. 5, 2012, pp. 99-100.

[64] "La guerre des mines à l'heure des drones", *Mer et Marine*, 14th December 2012, available at: http://www.meretmarine.com/fr/content/la-guerre-des-mines-lheure-des-drones.

[65] SLMAF programme: future anti-mine system (using "UAV-carrying UAVs"), "Les drones marins, avenir de la lutte contre les mines navales", *Ministère de la Défense,* 22nd October 2012, available at: http://www.defense.gouv.fr/salle-de-presse/communiques/ministere/les-drones-marins-avenir-de-la-lutte-contre-les-mines-navales.

The STOM Concept

Trading Mass for Rapidity

The STOM (*Ship-To-Objective-Manoeuvre*) concept, approved by the USMC in 1997,[66] did not appear *ex nihilo*. It is the culmination of a gradual process that originated in the Second World War. The key principle of this concept is to break free of the constraints of seizing a beachhead, the tactical and logistical disadvantages of which have been explained. The idea here is to proceed directly to the objective using a manoeuvre based on velocity and the use of a large variety of platforms. Ideally, these are divided into three categories for the American version of the STOM: aircraft (helicopters or V-22 tiltrotors), LCACs (*Landing Craft Air Cushion*) and AAV-7-type amphibious vehicles. The wider the variety of platforms employed, the greater the degree of uncertainty for the defender who must disperse his resources to cover all possible entry points,[67] and the greater the potential for surprise. The other major characteristic of the STOM is that it is implemented from naval platforms located over the horizon (OTH), *i.e.* at a distance of 25 nautical miles from the coastline, in other words outside the visual or radar range of the adversary, in order to protect the *capital ships*, which are large amphibious ships. At worst, if the deployed force comes under attack, the distance between it and the coast increases the reaction time available to escort ships to destroy incoming missiles.

The STOM is also designed to offer great flexibility in the use of force, since the final destination of the platforms can be modified en route if circumstances require – new opportunities or threats. Also, once they are ashore, units can be more readily recovered thanks to their agility, possibly from an area other than the entry point. The action of the STOM is reversible – a tactical and political advantage if the land force has to be withdrawn prematurely. These advantages, of course, depend on the capacity of the attacker to finely coordinate, within a limited time period, the employment of his resources: this calls for tactical virtuosity and a high degree of training. Logically, this American concept has irrigated NATO and, by capillary action, all of the amphibious nations that are members of the Alliance, including France.

Sea-Basing, the Essential Complement to the STOM

The STOM has another advantage of a political nature: its small footprint on land. It is planned with sea-based logistics, hence the American term "sea-basing". *Sea-basing* has the advantage of avoiding the need for any agreement or convention with any host nation concerning use of its territorial space, whether on land or at sea. Freedom of action is thereby increased. Specialised ships are required to ensure long-term logistics support at a safe distance. There is no longer any need to build specialised

[66] "Amphibious operations in the 21st century", *Marine Corps Combat Development Command*, March 2012, p. 9.
[67] "Naval amphibious capabilities in the 21st century", *Report of the Amphibious Capabilities Working Group*, 27th April 2012, pp. 43-45.

infrastructure on land, or to dedicate units to their protection or maintenance. Costs and threats are thus minimised.[68]

The *sea-basing* concept poses a technical challenge, since it requires highly specific equipment, which only the Americans possess. The US Navy has defined a set of impressive, modern resources to create the equivalent of an artificial anchorage in the middle of the sea in order to dispense with a pier. Hence, the development of the *Mobile Landing Platform* (MLP) which, in conjunction with other maritime transportation vessels (such as the LCAC) allows logistical cargo (food, fuel, munitions, spares) or vehicles to be transferred at sea. The MLP design has been optimised to facilitate side-by-side mooring with other ships, including those of the *Maritime Prepositioning Force* (MPF).[69]

The Limits of the Concept

The STOM presents numerous difficulties in its execution. Though it eliminates the need to secure a beachhead, the concept is very demanding in terms of air support and, therefore, replaces one dependence with another. It seems difficult to envisage if the air defence threat is strong, well dispersed and dissimulated to avoid preventive strikes. Solid air cover is indispensable to ensure hermetic protection of the insertion movement from enemy air threats. To be sure, the STOM provides for other penetration modes, particularly using LCACs. Nonetheless its velocity depends above all on the advantage of the air-mobile manoeuvre. The latter, incidentally, gives rise to another obvious limitation: helicopters, however heavy, cannot land a massive volume of forces. “Beasts of burden” of the STOM, utility helicopters and Osprey tiltrotors have to transport the assault units – without their vehicles – but also their support equipment (sling-loaded engineering equipment, light artillery, etc.) and logistics if the operation lasts more than three days – the duration that constitutes the “initial autonomy” which troops can theoretically carry with them. That represents a large number of rotations with an inevitably limited number of air vehicles. The final difficulty of the STOM is that the level of coordination required makes the operation delicate to plan and conduct (the dispersion, or even isolation, of committed units creates real vulnerability). This can be managed, but only through the relentless precision that comes from regular training.

The STOM equation can thus be expressed as follows: exchange mass for agility. The concept seems relevant in the context of limited

[68] This needs to be placed in perspective, however: if the operation continues in the long term, the cost of reconditioning/repairing/regenerating logistics ships that have endured several months at sea would be high. Also, the threat can increase over time since the “logistics base at sea” constitutes a target with little mobility, giving the adversary time to organise a counterattack. In CICDE, *Concept des actions littorales interarmées*, *CIA-3.1.1 (A)*, 11th July 2012, p. 43.

[69] Naval platforms used to concentrate the amphibious force from prepositioned stocks. They then provide logistical support for the operation over time, *cf.* Congressional Budget Office, “An Analysis of the Navy’s Amphibious Warfare Ships for Deploying Marines Overseas”, p. 4.

operations involving highly trained troops to perform a high added-value mission. However, the STOM shows its limits in large-scale operations, unless it is combined with the traditional mode of action to secure a beachhead in order to accelerate the arrival of a second echelon and reinforce the on-land logistic support. Note that French amphibious doctrine covers – on a necessarily much more modest scale – the three possible combinations: traditional beachhead capture mode, STOM-type mode, or a mode of action combining the two previous modes.[70]

Once the overarching concept has been defined, it remains to associate the corresponding equipment, bearing in mind that several types of compromise are possible and that, as in any other operational domain, inflation of development costs weighs on programme feasibility.

The Quest for Ideal Equipment: What to Choose for the 21st Century?

For two centuries the Vikings posed a major strategic problem for Christianity, by maintaining an almost permanent state of insecurity in the littorals. Among other factors, this was rendered possible by a technological feat: they had managed to define an ideal platform to overcome the offload problem. The drakkar (*langskip* in Norwegian) provided strategic transport, served as a base for tactical assaults and contained the minimum logistics required for the operation. Its ability to navigate waterways made the threat ubiquitous in nature, even inland, rather like the STOM. What could be the drakkar of the 21st century, in the light of the budget potential available to the expeditionary powers?

The Helicopter Carrier, a Capital Ship for Amphibious Operations

Since the development of the Tarawa class helicopter-carrier amphibious assault ships in the 1970s, this type of ship featuring a full-length flight deck has become the modern emblematic instrument for amphibious operations. A ship of high political visibility, it is an indicator of naval power, ranked immediately after the aircraft carrier, and should therefore be considered as a *capital ship*.[71] Howbeit, there are different types, depending on whether or not they are equipped with a well deck,[72] on their transportation capacity and on their aviation infrastructure (see appendix 3). Specialisation generally involves two of these three domains, resulting in different types of ship: *Landing Helicopter Assault* (LHA), *Landing Helicopter Dock* (LHD), *Landing Platform Helicopter* (LPH), to use NATO terminology[73] – they can

[70] CICDE, *Doctrine interarmées DIA-3.1.1a*, pp. 62-69.
[71] Joseph Henrotin, *Les Fondements de la stratégie navale au 21ème siècle*, Paris, Economica, 2011, p. 160.
[72] Dock inside the ship, which can be used to launch boats and landing craft thanks to a ballast system.
[73] LHD and LHA (older): substantial aviation platform with hangars and large well deck. This category includes the French BPC (Bâtiment de Projection et de Commandement) helicopter-carrier amphibious assault ship. LPH: optimized above all as a helicopter carrier, with no well deck, but can launch landing craft using cranes.

be compared using appendix 4. *Landing Platform Docks* (LPD) and *Landing Ship Docks* (LSD) are also large ships; they complement the amphibious helicopter carriers, being more specialised in putting units ashore using landing craft.[74] An amphibious navy equipped with a balanced combination of these different categories, therefore, can take advantage of their complementarity, bearing in mind that the LHD is the ship with the best capabilities.

The U.S. has essentially invested in this latter category. The former *Tarawa* class ships are currently being withdrawn in piecemeal fashion from active service and are gradually being replaced by the *America* class (45,000 tfl),[75] which is optimised for vertical envelopment and air-to-ground fire support with a modular fleet of around 30 aircraft – a combination of Osprey tiltrotors, helicopters or vertical landing fixed-wing aircraft.[76] The USMC, however, is unhappy about the general downward trend in the number of large amphibious platforms. It is calling for an incompressible volume of 38 large ships, compared with the 60 ships available in 1990.[77] Yet the CBO, in its 30-year plan, foresees a balanced fleet comprising on average over this period around 30 ships split into three approximately equivalent parts: LHD, LPD and LSD.[78]

Five European countries have respectable capacities, though substantially less than those of the U.S. (appendix 2)[79] and with different fleet compositions. France has opted for a model based on its three *Mistral* BPC ships (21,500 tfl)[80] and only has one *Siroco* TCD as a complement. The homogeneity of the French fleet can also be explained by the reduced costs generated through economies of scale and by the 2008-2009 stimulus plan. France, therefore, is well placed within Europe, since it is the only country to possess three platforms with full-length flight decks. The British fleet only includes one amphibious ship with a full-length flight deck, HMS Ocean (LPH), but also two LPDs and three LSDs. One can see the relative complementarity between the French and British equipment, which could be an asset in the context of cooperation as agreed under the *Lancaster House Treaty*.[81] A combined amphibious force is perfectly

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[74] LPD: equivalent to the French TCD (Transport de Chalands de Débarquement) landing platform dock. They have a large well deck and aviation installations allowing them to carry a small number of helicopters. LSDs are smaller, with a well deck but no helicopter hangar.

[75] Displacements will be systematically indicated in tonnes full load (tfl).

[76] Sam LaGrone, "Shifting horizons: Marines refocus their future at sea", *Jane's Navy International*, April 2011.

[77] USMC, *Marine Corps Operating Concepts*, 3rd edition, June 2010, p. 79.

[78] Congressional Budget Office, "An Analysis of the Navy's Amphibious Warfare Ships for Deploying Marines Overseas", pp. 6-7.

[79] The UK, France, Italy, Spain and the Netherlands.

[80] Multi-role ship offering, in addition to amphibious and aeronautical capability, high-level hospital infrastructure and elevated command and control capacities. Russia has ordered two BPCs.

[81] All the more so if one takes account of other naval capacities: France has an aircraft carrier, while the British fleet has a greater number of modern top-class escort ships and a larger logistic fleet. *Cf.* "Corsican Lion, retour sur les grandes

possible in the frame of a *Combined Joint Expeditionary Force* (CJEF)[82] and the idea has been tested several times, including exercise *Corsican Lion* in October 2012. In parallel to this Franco-British cooperation, a close and proven cooperation has existed since the Cold War (1973) between the UK and the Netherlands,[83] which has two LPDs. The other amphibious navies that count in Europe are those of Italy and Spain, again with different combinations (appendix 2).[84]

If the amphibious helicopter carrier can be thought of as a 21st century amphibious *capital ship*, we can observe that there are significant differences between the powerful American ships, capable of absorbing damage, and the European ships, half the size, less costly and less well equipped with self-defence weapons and sensors.[85] It should be noted, however, that a major amphibious ship is never used on its own, but is systematically accompanied by an escort providing a protective shield in line with the evaluation of the threat (air, surface ship and/or submarine, coastal).

Landing Craft and Aircraft, Cornerstone of the Ship-to-Shore Transfer

It would be incomplete to only discuss large ships when analysing amphibious capabilities. The added value of these ships lies in their ability to deploy the different craft ensuring the offload, particularly landing craft (see appendix 5). Here again, there are technical and operational challenges when one seeks to define the equipment that complies perfectly with the operational concept, within the planned budget envelope.

At the intersection of large ships and landing craft is the LST (*Landing Ship Tank*), an autonomous vessel but with limited range,[86] able to land heavy vehicles, including tanks, generally around 10, where the beach slope angle allows. This type of ship is no longer favoured by Western fleets, to the regret of some observers,[87] who think that it is the only equipment which could tip the balance of land forces in the event of

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manœuvres franco-britanniques", *Mer & Marine*, 30th October 2012, available at: http://www.meretmarine.com/fr/content/corsican-lion-retour-sur-les-grandes-manœuvres-franco-britanniques.

[82] Bilateral emergency action force.

[83] The UKNLAF (*United Kingdom-Netherlands Amphibious Force*).

[84] In particular, with the Conte di Cavour, Italy has an aircraft carrier (not exclusively amphibious) which is also designed to act as an LPH. In all, Italy has an LPH (the Cavour) and three LPDs, while Spain has one LHD (the BPE - *Buque de Proyección Estratégica* **-** Juan Carlos, of which it has sold two to Australia) and two LPDs. The Cavour and the Juan Carlos both have a ski jump to allow operation of the AV8-B and, tomorrow, the F-35B if that project is completed. See appendix 2 and 3.

[85] In addition, the BPC and BPE are built according to civil standards for reasons of cost and ease of maintenance.

[86] 4,500 nautical miles, for example, for a BATRAL at 13 knots, compared with 11,000 nautical miles at 15 knots for the *Siroco*.

[87] Carlton Meyer, "Opérations amphibies", *DSI hors-série*, No. 16, February-March 2011. Reprinted from: *The Spectrum of Future Warfare*, available at: www.g2mil.com/war.htm.

strong opposition. Be that as it may, expeditionary fleets have ignored this unsophisticated category of ships which do not offer sufficient flexibility of employment.

On the contrary, development of modern landing craft has focused on speed and the ability to overcome to the maximum extent the physical constraints of landing. While traditional landing craft can only be used on 20% of coasts, LCACs can be used on 70%, and they are faster, which makes all the difference. Logically enough, we see again the idea of agility associated with the STOM.[88]

This concept, as we have seen, is ideally based on the triad: helicopters-LCACs-amphibious vehicles. The U.S. plans to replace the current range of equipment with a new generation offering greater speed and payload capacity. In reality, the majority of these programmes are suffering from delays and disappointments. The slow-moving AAV-7 amphibious vehicle was to be replaced by the *Expeditionary Fighting Vehicle* (EFV) but this development has been cancelled due to the impossibility of meeting the requirements within the defined budget envelope. The CH-53K *Super Stallion*, the replacement for the heavy CH-53E, has also been hit by a series of delays. Still more worrying, the F-35B[89] has been affected by recurring development problems, to the point where the resulting cost overruns could jeopardise some countries' plans to buy the aircraft, resulting in a *de facto* increase in unit cost. And yet this aircraft is essential for the air-to-ground fire support required for the STOM. All of this must be set alongside previous disappointments due to the development delays on the MV-22 *Osprey*, which finally entered service much later than initially planned. Adding layers of technical specifications causes costs to spiral upwards, in a context of strong budget constraints. Therefore, it is probable that the *US Navy* and USMC will have to ease the technical requirements for their equipment or accept a reduction in the volume of equipment orders. The STOM concept can certainly be implemented on a material level, but its full impact cannot be achieved, due in particular to the absence of a true amphibious combat vehicle that is autonomous at sea,[90] and tomorrow the crucial problem of air-to-ground fire support could come to the fore.

France has invested in an innovative concept, the *Engin de Débarquement Amphibie Rapide* (EDAR). There are currently four of those.[91] This is a catamaran that transforms into a flat-bottomed landing craft on approaching the beach. Compared with a conventional landing craft (CTM, see note [87]), the change in capacity is considerable, since speed increases from 8 to 18 knots, and logistic capacity is multiplied by

[88] Like the French CTM (*Chalands de Transbordement Maritime*), which are rather old.
[89] The STOVL (*Short Take-Off Vertical Landing*) version of the F-35.
[90] The AAV-7 has numerous drawbacks: very slow, heavy and therefore easy to destroy.
[91] With options for four more (*i.e.* two EDARs per BPC, but this is now unlikely, since the 4th BPC has been cancelled by the 2013 White Paper).

five.[92] The very shallow draft of the EDAR allows it to land on most beaches, unlike the CTM. Compared with the LCAC, it is much simpler to use and maintain, but its range and speed are more limited.[93] If one adds to the EDAR the ongoing entry into service of the Tiger and NH90 helicopters, plus the possibility in the near term of using VHMs (*Véhicules à Haute Mobilité*, *Hagglunds*-type),[94] one can see that in the short term France should be technically well prepared to perform STOM-type operations,[95] though clearly on a much less ambitious scale than the U.S., but with a coherent set of equipment and at reasonable cost.

In the end, the more amphibious operations are oriented towards high-intensity action, the greater the cost, since they then require quality and quantity. Thus, budget pressure naturally orients capacities towards low/medium-intensity scenarios, particularly as the latter appear to be the most probable.

The 21st Century Amphibious Invasion: a Pipe Dream?

In parallel, the modern weapons available for coastal defence represent a challenge for any wide-scale amphibious operation, resulting in an increasingly costly counter-innovation race.[96] While the degree of propagation of these weapons is relatively limited for now, the tendency for this propagation to accelerate is a concern. Consequently, it is important to evaluate the extent to which these new defensive threats can, or not, render obsolete the most demanding type of amphibious operations: the large-scale amphibious invasion in a non-permissive environment.

Vulnerability Induced by A2/AD Strategies

The last two decades have seen weapons become increasingly sophisticated and an enhancement of characteristics, whether precision, speed or range.[97] The *Revolution in Military Affairs* (RMA) has spread beyond Western countries, admittedly to different degrees, but resulting in the ability in certain cases to establish a network linking sensors and effectors in an operational network-centric system, with a view to fine-tuning the targeting process. The best-equipped countries can then adopt A2/AD strategies which can jeopardise an amphibious invasion by

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[92] "Les EDA-R accostent au cœur du BPC Mistral", *Ministère de la Défense*, available at: http://www.defense.gouv.fr/marine/a-la-une/les-eda-r-accostent-au-caeur-du-bpc-mistral.

[93] 60 nautical miles vs. 200, 18 knots vs. 40.

[94] "Le VHM (véhicule de haute mobilité)", *Ministère de la Défense,* available at: http://www.defense.gouv.fr/dga/equipement/terrestre/le-vhm-vehicule-haute-mobilite. This vehicle is very appealing because of its high degree of mobility on an unprepared beach, but it cannot move under its own power over long distances at sea. Nonetheless, it allows a landing without prior preparation of the beach (no need for engineering resources to install a special mat).

[95] CICDE, *Concept des actions littorales interarmées,* p. 36.

[96] Corentin Brustlein, "La nouvelle posture militaire américaine en Asie", *Politique Etrangère*, Summer 2013, p. 60.

[97] The Ellis Group, "US Amphibious Forces: Indispensible Elements of American Seapower", *Small Wars Journal*, August 2012, p. 5.

drastically complicating the prerequisites that the attacker must fulfil, among the most important of which is the element of surprise. To start with, strategic surprise becomes impossible to achieve, as does, in all probability, operational surprise, faced with modern detection capacities (satellites, UAVs, submarines, "spy trawlers", electromagnetic eavesdropping, etc.) that are so varied, high-performance and easily accessible – *Google Earth* should soon be available in *full motion video.* Tactical surprise will remain difficult, but not impossible, to achieve, with the need for consummate skills in the art of deception. The STOM concept could help, but it does not solve the problem of mass.

The second constraint concerns the safety of the transport fleet, including the amphibious helicopter carriers. Their large size makes them an ideal target, particularly for anti-ship cruise missiles. Being positioned "over the horizon" does not in any way resolve this problem, since there are several modern systems that can detect and strike at distances greater than 25 nautical miles. In these conditions, whatever the concept adopted – STOM or methodical capture of beachheads –, the invasion fleet remains vulnerable, even in the presence of a powerful, multi-environment protective shield (cf. appendix 6, action mode 3).

Consequently, to meet this new A2/AD challenge, a number of advance operations are essential, as part of an attrition campaign which can be lengthy when faced with modern, redundant, multi-layer defensive systems. In other words, the goal is to blind the coastal defender (the primary factor in creating conditions allowing for surprise), then prevent him from effectively coordinating his forces (command centres, radars).[98] Consequently, the attacker must obtain uncontested dominance in the C4ISR domain by putting the adversary's systems out of operation as attrition progresses. This modern paradigm for achieving fire superiority in a four-dimensional environment (land-air-sea-electromagnetic) is built on the complementarity of effectors (initial salvo of cruise missiles, precision guided weapons, air and naval fire support),[99] each supplying added value at a different level (strategic, operational, tactical). Once the process is complete, the defender can only offer sporadic and dispersed resistance to the coastal assault. Operationally, he has been isolated.

If it is necessary to reduce coastal resistance to this extent before considering any kind of landing operation, does this really constitute amphibious combat rather than a traditional form of combat with a conventional manoeuvre into a land zone following initial strategic transportation by sea? The answer is affirmative for two reasons. First, until infrastructure has been secured to provide theatre entry, many of the specific features of amphibious operations discussed in the first section

[98] Ibid., p. 11: "Enemy employment of guided rockets, artillery, missiles & mortars (G-RAMM), whether at sea or ashore, relies on a battle network of observation, tracking and targeting. This network contains vulnerabilities potentially exploited in the fight for localized dominance".

[99] For a typical scenario, see the Report of the Amphibious Capabilities Working Group, "A Vision of the Future", 27th April 2012, pp. 25-31.

apply, starting with the difficulty of maintaining high operational tempo. In these conditions, even residual threats can generate significant resistance to a large invasion force. They will be all the more difficult to eliminate as they will benefit from the law of diminishing returns, which calls for an increasingly disproportionate effort to destroy small units. In addition, these residual units will be intermixed with the attacker's land forces or the local population, rendering targeting complex.

Furthermore, if a strategy of defence in depth is adopted (cf. appendix 6, action mode 2), the key problem will not be coastal occupation but penetration inland without becoming bogged down at the beachhead. Here again, the sea-to-shore umbilical cord remains a specificity, due to the resulting technical and logistic constraint. Moreover, peripheral beach landing operations could provide possible tactical solutions to release the stranglehold (landing to the rear or on the flanks, amphibious deception operation, partial re-embarkation).

However delicate it may appear, the amphibious invasion, therefore, is still possible, provided that certain conditions are met. The attacker must achieve clear dominance in the C4ISR sector, patiently neutralising the defender's systems. Consequently, he needs a prolonged period of time to achieve this attrition, which presupposes broad freedom of action. Finally he must secure an infrastructure to provide theatre entry fairly rapidly – within a few days of coming ashore –, in spite of undoubtedly fierce opposition. This is because the *sea-basing* concept would not be able to provide long-term support for a modern force of several tens of thousands of men with heavy equipment.

Clearly, no European country today could reasonably consider such an invasion on its own. In all probability, no European coalition could manage it either without the U.S., even if the five amphibious countries joined forces.[100] That leaves the U.S., backed by its 10 large aircraft carriers[101] and its all-round naval and air power. Nonetheless, even the U.S. could have difficulties and require the assistance of its allies in certain operational functions, mine warfare in particular. In the offensive-defensive dialectic of modern amphibious operations, quality on its own is not enough to gain the upper hand. Quantity also plays an important role in a war of attrition where the defender is trying to saturate the attacker using weapon systems that, although perhaps technologically inferior, are numerous and redundant.

[100] The capacity gaps common to these five countries have been multiplied: lack of SEAD (*Suppression of Enemy Air Defence*) capabilities, low number of ISR platforms (particularly UAVs) or EW (electronic warfare) platforms, no massive capabilities for naval air strikes (one single aircraft carrier with an arrest or cable, the Charles de Gaulle, carrying around half the number of aircraft of an equivalent U.S. carrier, and a maximum of 3-4 carriers for STOVL aircraft – to be compared with 10, soon 11, large U.S. aircraft carriers); and, finally, limited in-flight refueling capacity to maximize strikes.

[101] 11 when the *USS Ford* enters service around 2015.

Technological Breakthrough on the Horizon?

Recent advances in weapons technology seem to give an advantage to the littoral defender – submarine stealth, increased speed, precision and range of anti-surface missiles, sophistication of mines or air defence systems – creating a Herculean task for anyone wanting to attempt an amphibious invasion. However, technological progress is a dynamic phenomenon, necessitating a regular re-evaluation of the offensive-defensive balance, since breakthroughs are always possible in the short or medium term. A quantum leap forward in technology, giving the attacker total dominance of the electromagnetic space (jamming, electronic countermeasures) or allowing him to obtain cyber-attack capabilities against the defender's C4ISR systems, would largely neutralise the latter's plan of action. At that point, the amphibious assault could be considered in a much more favourable light.

Nonetheless, the quest for technological superiority must be obtained at reasonable cost, which has not been the case until now for several American equipment programmes – EFV, F-35, long-range 155 mm naval munition for the *Zumwalt*, among the examples we have seen previously. Stealth technology (aircraft) also has the potential for a breakthrough in the attacker's favour, but for now the research & development and maintenance costs are exorbitant. On the other hand, a real breakthrough triggered by advances in unmanned vehicles seems more promising, since the tactical applications are so numerous – detection, acquisition, precision targeting, underwater counter-mine systems… – and operating in all physical dimensions.

For now, absent such a decisive breakthrough, the current difficulty of undertaking an amphibious assault remains undiminished on the operational and tactical levels. Howbeit, it is important to broaden the scope of reflection and analyse the probability of occurrence of the different types of amphibious operation and, more generally, pose the question of the truly strategic utility of amphibious operations.

Strategic Utility of Amphibious Operations: Forcible Entry and Scalability of Force

It is one thing to pose theoretical questions concerning the respective merits of attack and defence in the current technological environment. It is another matter to identify credible circumstances for large-scale use of amphibious operations. It is not easy to imagine what scenario, on a strategic scale, could justify the employment of an amphibious force and what leverage would be exerted by such a force. This question raises the issue of the level of intensity at which such a force could reasonably be used. In view of the probable losses and ensuing political costs, not to mention the risk of mission creep, the question of amphibious operations in a high-intensity context is open to debate – where "high intensity" refers to any operation combining highly important or vital, interests, cutting-edge technology and the employment of forces in significant quantities.

On the other hand, the role of amphibious operations in the management of low/medium-intensity crises is more or less self-evident. Thus, the probability of occurrence is inversely proportional to the level of intensity of the crisis: the most probable are low-intensity operations, while the least probable concern large-scale symmetric conflicts and as a result require the greatest efforts in terms of equipment. This dichotomy is key to the question of the strategic relevance of amphibious operations, given furthermore that the relevance of amphibious operations can also be measured in terms of capacity proliferation. The latter shows that an increasing number of States, particularly in the Asia-Pacific region, consider it necessary to possess this capability.

Do Amphibious Operations Still Make Sense in a High-Intensity Situation?

Considering the tactical risks and equipment deficiencies discussed previously, the employment of an amphibious force in the context of a large-scale coercive operation may seem hard to imagine, particularly considering that Western public opinion does not tolerate losses. This encourages political authorities to exercise extreme caution or to seek a palliative strategic option. This consideration, however, needs to be qualified.

The Acceptability of Losses

A coercive amphibious operation is very often accompanied by heavy losses.[102] It is very likely that area denial strategies based on a variety of systems can only be overcome with losses. The number of countries capable of applying this strategy in a sufficiently coherent manner is expected to increase in the medium term, as they learn the lessons of Western operations and profit from the proliferation of certain technologies.[103]

Howbeit, the acceptability of losses depends on the strategic stakes. It is broadly acknowledged that Western nations have not had to defend their vital interests since the end of the Cold War. In the event of a major threat, perceived as such, there would probably be a significant shift in public opinion. Consequently, in view of the risks involved, a high-intensity amphibious operation is only conceivable if vital interests are at stake, and even then it would be necessary to form a coalition for both military and political reasons.[104]

A Decline that Has Often Been Announced Prematurely

The decline of amphibious operations has often been predicted in recent times, only for them to immediately make a comeback, dictated by necessity. The traumatism of the Dardanelles campaign had seemed to ring the death knell for amphibious operations. The Second World War yet saw a multiplication of landings – often decisive – on all fronts. In 1946, General Bradley decided that, with the advent of nuclear weapons, the amphibious assault was inappropriate[105] and most of the amphibious fleet was scrapped. However, in September 1950, the operational dead end created by the Korean War (Pusan Perimeter on the point of being breached by North Korean forces) forced MacArthur to risk a landing behind enemy lines at Incheon. Finally, the example of the Falkland Islands sheds some interesting light on the manner of responding to a strategic surprise through improvisation under conditions of urgency. The UK only regained control of its territory through a costly recapture operation[106] with a high degree of risk (the British did not possess blatant air superiority, though the Argentine forces were only able to overfly the zone of operations for limited periods), even though it had been decided only

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[102] Some examples of losses (dead, wounded, missing) on the attacking side: 250,000 men in the Dardanelles campaign, 3,400 to capture the tiny atoll of Tarawa, 50,000 for Okinawa, Gatchel, *At the Water's Edge,* p. 23, 129, 164. The figures for 6th June 1944 are controversial, but vary between 9,000 and 10,000 men.

[103] Brustlein, "Vers la fin de la projection de forces ? – Volume I. La menace du déni d'accès".

[104] NB: this study does not consider employment of an amphibious force in coercive mode between nuclear-armed protagonists: the risk is so disproportionate that such an eventuality seems highly improbable.

[105] Alexander & Bartlett, *Sea soldiers in the Cold War,* p. 1.

[106] 256 dead, 5 ships sunk, 12 damaged, 4 aircraft shot down, Bartlett, *Assault from the Sea,* p. 436.

shortly beforehand to break up the fleet's amphibious equipment.[107] One could add examples of medium intensity (Suez in 1956, Cyprus in 1974) to show that, since the end of the Second World War, high-intensity amphibious operations have generally been launched reactively and even in urgent response to an initial surprise of significant proportions and in the absence of convincing alternative military options. It is generally accepted that the nature, character and intensity of future threats are uncertain and, therefore, very difficult to anticipate. In addition, potentially destabilising crises like the Arab Spring have been on the rise since 2008.[108] Therefore, it seems presumptuous to assume that there will be no more surprises or crises that could, *nolens volens*, require a major amphibious response.

Amphibious Deception

The other manner in which amphibious operations may be used in a high-intensity context is, paradoxically, through their "non-use", *i.e.* their employment in a diversion or deception operation. This trick, designed to deceive the adversary as to the exact location of an imminent offensive, is an old stratagem, but one that has proved its value. It was successfully used again during Operation Desert Storm against Iraq in 1991, when a naval force of Marines immobilised six divisions on the coast, that is to say 25% of the Iraqi land forces rendered useless.[109] For the deception to work, however, the attacker must have a credible amphibious force, *i.e.* equipped and trained and recognised as such. A powerful and experienced amphibious force, posing a permanent potential threat, thus proves itself a strategic instrument that increases the range of operational options available to decision-makers.

What Crisis and Where?

It would be attempting the impossible to draw up an exhaustive worldwide list of inter-state tensions that could degenerate to the point of triggering a coercive amphibious response, since there are so many uncertainties involved. Nonetheless, one can try to identify some trends. First of all, it is clear that an arms race has been under way in Asia for the past one or two decades.[110] There are more maritime territorial conflicts than in other regions, particularly in the South China Sea – Spratly and Paracel Islands, disputed among China and different States in the region – and in the East China Sea – Senkaku Islands between China and Japan. To this one can of course add the awkward problem of Taiwan and, to a lesser extent, that of the Kuril Islands – between Japan and Russia. Militarily, these territorial conflicts have remained limited, though not without sometimes degenerating into violent action[111]. There were numerous diplomatic

[107] Plan to sell the LPDs Fearless and Intrepid, cf. Alexander & Bartlett, *Sea soldiers in the Cold War,* p. 108.
[108] *Livre Blanc sur la Défense et la Sécurité Nationale*, Paris, 2013.
[109] Alexander & Bartlett, Sea soldiers in the Cold War, p. 164.
[110] Geoffrey Till, *Asia's Naval Expansion*, Abingdon, Routledge, 2012.
[111] In 1974 and 1988: between Vietnam and China, see Thomas M. Kane, *Chinese Grand Strategy and Maritime Power*, London, Frank Cass, 2002.

incidents again in 2012, with demonstrations of force between China and Japan over the Senkaku Islands. These tensions are further exacerbated by the presence of energy, and even mineral, resources in the sea bed around these islands. The hypothesis of military escalation cannot, therefore, be excluded. In a worst-case scenario, such an escalation could get out of control and bring two protagonists into conflict, followed by other States in the region and the U.S. indirectly. In this respect, the archipelagic configuration of Southeast Asia and the Pacific in general favours *de facto* amphibious operations, by geographical necessity, as was abundantly illustrated by the Second World War.

Another zone of potential tension, the Persian Gulf, has vital importance as a passage for oil to the large industrial centres of the world. Closure of that passage – due, for example, to inter-State tensions with Iran – could translate into the employment of amphibious capacities as a coercion force or at least as an intimidation force.

Among the less probable scenarios, regional instability could restrict freedom of circulation in the Red Sea, and the Suez Canal in particular. Finally, melting of the Arctic icecap, by modifying the geostrategic situation in the Arctic zone, could create strong tension between countries in the region in the medium or longer term[112] (rights of transit, control of energy and mineral resources). Here too, amphibious operations would be an operational option, among others.

To sum up, the hypothesis of a high-intensity amphibious operation proves to have strict conditions. In all probability, it would come in response to a strategic surprise of major importance and an absence of any alternative mode of entry into the theatre.

A More Probable Employment: Forcible Entry in a Low-Intensity Crisis

Here we look at the most probable scenarios, which are of special interest to political authorities. The intrinsic qualities of amphibious operations lend themselves well to this type of scenario. In the first place, amphibious operations provide a very interesting combination of good strategic mobility (projection of significant volumes by sea) and good tactical mobility once on zone, thanks to air mobility. The capacity for action in all three dimensions gives the deployed force agility and reversibility, the latter quality being particularly appreciated on the political level, since it gives greater flexibility in managing the critical phase of a risky operation (initial phase or re-embarkation). It offers relative permanence through its dwell time at sea. It is a force that is “ready for use” since it embarks with its organic resources, equipment and initial logistic support. Political authorities can, therefore, use it in an emergency. Finally, it is a capacity of variable geometry,

[112] On the subject of Russian sentiments in this respect, *cf*. Pavel Baev, “La Politique russe dans l’Arctique et la modernisation de la Flotte du Nord”, *Russie.NEI.visions*, No. 63, August 2012.

allowing for scalability of the force which one wishes to employ – Special Forces for shock impact, light troops to gain a rapid foothold, medium forces for a more coercive mission.

Thus, it is in this context that amphibious operations show their utility with greater clarity, as underlined by the large number of amphibious operations that have been conducted over the past two decades, some of which one is not even aware of[113].

Non-Permissive and Semi-Permissive Scenarios

The activism of violent infra-State groups acting within weak States appears as an important factor of strategic instability. These actors, and the complex relations they have with each other and with their environment, create a volatile security situation. On the operational level, this increases the probability that an urgent intervention will be required, with a reduced volume of forces and in a low-intensity context, to warn, dissuade, intimidate or neutralise armed groups acting against our security interests. Several operational modes are possible.

Neutralisation Raid

In this case, the environment is characterised by local instability generated by non-conventional actors generally operating within failed or weak States and threatening the interests of the intervening power. They could be terrorist groups with operational infrastructure located close to the coast – they could also possess proven sea-going skills, like the Tamil Tigers, now defeated. One can also face well organised criminal groups (drug smugglers, pirates) posing a problem of regional stability, which can acquire an international dimension if they start to hinder maritime communications. If the security impact becomes intolerable, it may be deemed appropriate to destroy the organisation's base with a strategic amphibious raid characterised by its shock impact and its reversibility – withdrawal as soon as the key infrastructure has been destroyed or the leaders put out of action.

Extraction

An amphibious operation can also be considered as an operational mode for withdrawal (*e.g.* the evacuation from Dunkirk in June 1940). From a low-intensity viewpoint, a hostage extraction raid by heliborne infiltration is perfectly feasible (DGSE operation in Somalia, January 2013). This type of scenario – extraction of personalities or hostages, withdrawal of a force in a precarious position[114] – remains very likely in the short and medium term. It can be executed in the presence of significant opposition in the case of a hybrid threat.

[113] For the USMC, the CBO lists 107 amphibious operations since 1990, including four categorised as assaults, one raid, three demonstrations, one withdrawal, 78 in support of other operations and 20 uncategorised, *cf. CBO report* "An analysis of the Navy's Amphibious Warfare ships for deploying Marines overseas", p. 5.
[114] As was the case with UNOSOM in Somalia in 1995, ibid., p. 6.

Opening the Theatre

Unlike the raid, operations of this type can occur in a space-time context requiring the amphibious force to remain in-theatre. The first task is to ensure forcible entry, especially by seizing strategic infrastructure, then to fulfil the predetermined objectives, either in the context of a crisis management operation or as part of a more ambitious operation to open the theatre, in which case the amphibious force ensures the conditions for successive echelons to expand into the theatre, e.g. to perform a stabilisation mission. Operation *Palliser*, the British intervention in Sierra Leone in May 2000, is a good illustration of forcible entry as part of the management of a serious crisis, where the evacuation of civilians constituted only the first phase of the operation. The method used on 25th November 2001 to open the Afghan theatre for American land forces is interesting, as it represents an extrapolation of the STOM, well beyond the limits normally used to categorise an operation as a littoral one. Nonetheless, the *Marines* unit, transported almost 700 km by CH-53E helicopters, with in-flight refuelling, did depart from a sea base (*USS Pelelui*) to take control of a zone that would become US forward operating base *Rhino*.[115]

These two examples show the significant probability of relying on amphibious forces to open a theatre in order to act against unconventional forces, generally militia, in a variety of crisis management contexts. In addition, within a coalition, forcible entry gives greater political weight to the country assuming it, since that country's operational influence is automatically increased, to the point where it can claim to assume conduct of subsequent operations.

Scenarios Ranging from Semi-Permissive to Permissive.

These are scenarios where the threat is weak or inexistent. First of all, an amphibious force can be charged with evacuation of civilians from disorders in a third country, particularly when there are no functioning airports. LHDs (French BPCs) are particularly well suited for this task as they provide transportation, hospital support and logistic support (helicopters). They can also embark a force with more robust capacities in the event of a really severe situation. There are numerous recent examples, such as Operation *Baliste* – Lebanon, July 2006, after the bombardment of Beirut airport by Israel. These operations may appear permissive at first glance, but they should actually be categorised as semi-permissive, since a threat can emerge at any moment. Operation Baliste had to take account of the unpredictable behaviour of Hezbollah, which had damaged Israel's Hanit corvette with a C802 missile,[116] thus demonstrating that even a militia can be well equipped with sophisticated weapons.

[115] On this subject, read the article by Henrotin, "STOM, réalisme optimiste ou utopie*?"* p. 61.
[116] Chinese anti-ship missile.

Amphibious capabilities have also been used on several occasions in humanitarian operations. The tsunami that struck Aceh in Indonesia (2004) produced a surge of international aid, marked – among other things – by rescue operations requiring amphibious equipment. The French Navy dispatched the helicopter cruiser *Jeanne d'Arc* accompanied by the frigate *Georges Leygues*. More recently, the earthquake in Haiti in 2010 led to the deployment of a BATRAL-class landing ship and the TCD *Siroco*, carrying disaster relief equipment, while mine-clearing divers were sent to perform underwater work. Finally, the Fukushima disaster in 2011 saw the deployment of impressive amphibious resources by the Japanese Navy and US forces.[117] These resources are particularly well suited to this type of mission, involving the need to intervene in the absence of coastal infrastructure, due to the wide-scale destruction. Finally, this type of disaster can also lead to disorder that can degenerate from a security viewpoint – temporary absence of public security forces, opportunistic acts by various gangs. The presence of a light land force on board, or gendarmerie units, can have a dissuasive effect. Given the frequency of natural disasters, the use of amphibious resources in such configurations remains highly likely.

In general, these capabilities play a role in naval diplomacy, commensurate with the flexibility they allow. As in a high-intensity context, an embarked force produces an effect through its simple presence on-board, even – and especially – if it has not disembarked. It thus contributes to the strategic "prevention" function, like the *Corymbe* mission by which France maintains a regular presence in the Gulf of Guinea. In case of diplomatic tensions, such a force can intimidate the troublemaker and serve as a final warning signal prior to direct intervention. It can also constitute a theatre reserve when a land operation is already in progress, as was the case in Ivory Coast in 2011, in support of the *Licorne* force.[118] Finally, in the case of softer naval diplomacy, an amphibious force enjoys high visibility when it comes into port and also through the nature of the exercises and the assistance projects proposed to partner nations.

Accordingly, it is above all in this context of low-intensity crisis management that consideration should be given to the employment of an amphibious force. Despite its undeniable advantages, few countries possess a true expeditionary capability, so much so that the "amphibious club" can resemble a "rich men's club", particularly as almost all the countries that have this instrument of power are Western nations. Recently, however, there have been signs of a certain capacity proliferation in this sector.

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[117] Operation *Tomodachi*, *cf.* Andrew Feickert and Emma Chanlett-Avery, *Japan 2011 Earthquake: U.S. Department of Defense (DOD) Response*, Washington, Congressional Research Service, 2nd June 2011.

[118] Captain Pierre-François Gouret, "Groupe amphibie à un bâtiment : emploi tactique dans le cadre du prépositionnement stratégique", *DSI,* No. 82, June 2012, p. 44.

Proliferation of Amphibious Power?

Indeed, in view of the strategic benefits of a high-performance amphibious capability, new countries are acquiring capacities or increasing their potential in this area.

Western Powers Still Retain Substantial Capacity.

In terms of volume of forces potentially deployable (assault waves or conducting important raids), the amphibious powers mentioned in Section 2 (the U.S. and the five European nations) have substantial resources. The U.S. indicates in joint doctrine JP 3-02[119] that the largest unit that could be deployed is the *Marine Expeditionary Force* (MEF), a joint force of 45,000 men with 60 days' autonomy.[120] However, the capacity that might really be deployed simultaneously seems more likely to be around two *Marine Expeditionary Brigades* (MEB), *i.e.* 28,000 men.[121]

France could count on a force of 1,400 men[122] with vehicles and air-mobile support, assuming simultaneous availability of its four large amphibious ships. For the UK, the 3rd *Commando Brigade* (Royal Marines) should be able to provide an intervention force of 1,800 men[123] – other European capacities are listed in Appendix 2.

At a European level, the European Amphibious Initiative (EAI), created in December 2000, brings together the five European amphibious nations. Its aim is to increase interoperability through joint exercises and institutionalised coordination meetings. The ultimate goal is to have a brigade-level amphibious capacity, with associated command structure, able to act on behalf of NATO or the European Union. The same force volume is planned for the Franco-British Combined Joint Expeditionary Force (CJEF) which could be deployed as part of an amphibious operation. This confirms that this is the order of magnitude (3,000-5,000 men) that it is reasonable to consider in connection with an amphibious operation involving all or some of the European countries, not including the reinforcements that would follow the forcible entry.[124]

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[119] Joint Publication 3-02, Amphibious Operations.

[120] "*A MEF is the largest MAGTF and is the Marine Corps' principal warfighting organization* …", ibid, II-7.

[121] According to Robert Work, Under Secretary of the Navy: "[The total volume] will never be six divisions (…). But an amphibious assault capacity of two MEBs is a very useful and strategically pertinent capacity, and Gates has taken this essential decision". In LaGrone, "Shifting horizons: Marines refocus their future at sea", p. 12.

[122] CICDE, *Concept des actions littorales interarmées*, p. 24.

[123] Joint Doctrine Publication 0-10, *British Maritime Doctrine*, August 2011, pp. 3-18.

[124] For comparison, the British land expeditionary force for the Falklands totalled around 10,000 men. The Incheon landing involved more than 70,000 men (assault waves and second echelon), in Alexander & Bartlett, *Sea soldiers in the Cold War,* p. 115 and p. 21.

Growth Trend, Particularly in Asia

Apart from US capacities, which are unrivalled, European capacities, therefore, are still significant. Howbeit, the budget constraints common to all these countries are tending to put pressure on modernisation plans and even call into question the retention of these capacities in the long term. At the same time, we see the regular development of such capacities, particularly in the Asia-Pacific region. Might we then shortly be discussing the end of the Western monopoly on this type of expeditionary force? Three types of situation can be considered.

An Amphibious Potential for Expeditionary Purposes

One thinks first of Japan, which has the fourth largest fleet in the world, modern and well equipped. Japan has devoted no efforts to its amphibious capacities, for well-known constitutional reasons. Nonetheless it has three LSTs[125] (*Osumi* class) and helicopter carriers – two Hyuga-class ships of 18,000 tfl and two other larger ships on order – modestly referred to as "helicopter destroyers". The primary function of the latter ships is anti-submarine warfare on the high seas, but Japan could use them as amphibious ships for "humanitarian operations" – which is what they did after the tsunami in 2011. In reality, these are powerful combat platforms that could directly support high-intensity amphibious operations. This shows the Japanese capacity to be included at short notice in the top rank of amphibious powers, if the country should wish to do so.

South Korea and Australia are also in the process of building an amphibious expeditionary capability that should place them on the same level as the European countries within a decade. South Korea was able to design its own amphibious helicopter carrier (*Dokdo* class)[126] and has one of those – with two or three more planned.[127] Australia also has ambitions, with its "Force 2030" programme, which includes plans for two LHDs[128] purchased from Spain and a strategic support ship for a total embarkation capacity of 2,000 men.[129]

Russia had to abandon its seafaring amphibious capacity with the withdrawal of the last LPD, *Yvan Rogov*, in 2008. It has recently ordered two BPCs from France, with options for two more, an order accompanied by technology transfer to inject new life into its military shipyards. Once this project has been completed, Russia may be included once again among

[125] A false designation, since these are more powerful ships that could be categorised as large LSDs (14,700 tfl, with two LCACs); the term "LST" conveys a less expeditionary image.
[126] 18,800 tfl LHD capable of launching two LCACs and AAV-7s.
[127] Prézelin, *Annuaire des flottes de combat.*
[128] Two Spanish BPEs, already ordered.
[129] Julian Kerr, "Amphibious ambitions: expanding Australia's naval expectations", *Jane's Naval International*, January/February 2012, p. 12.

the major amphibious nations, particularly as its "naval infantry" is still a significant elite force.[130]

In this rapid review, only the two Asian countries mentioned have the industrial resources to be able to independently develop a quality amphibious capability.

Countries with Regional Ambitions

Several other countries in this zone have elected to develop their amphibious capacities, but without considering for now force projection over a longer distance, whether through lack of resources or lack of strategic interest.

The Chinese amphibious fleet, which is abundantly equipped – three *type 071* LPDs and 27 LSTs – is intended above all for regional interventions. It still lacks large ships with full-length decks. Its equipment is oriented mostly towards traditional amphibious assault relatively close to its bases (West and East China Sea), where it can count on air cover from land bases. This gives added weight to its maritime claims, by suggesting a threat. Today China could transport and support 12,000 men in Taiwan, a capacity that will be doubled to 24,000 men by 2020, including a mechanised division.[131]

This factor largely explains the naval arms race in the region, including amphibious equipment. Thus, countries like Singapore or Indonesia have significant resources and continuous developments, including large LPD-type ships.[132] They are thus reaching a projection level that is significant on a regional level.

Emerging Amphibious Countries

Curiously, India has made no effort in this area to date, devoting most of its energy to the development of its naval aviation and its submarine fleet. Its fleet comprises just one LPD[133]. It has expressed the intention of eventually buying four LPDs, but this project has yet to come to fruition.

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[130] The naval infantry numbers around 12,000 men, *cf.* "Russian Federation", *Jane's World Navies*, IHS Jane's.

[131] Sheldon-Duplaix, "Les capacités amphibies de la Marine chinoise", 16, p. 86. It should also be noted that Chinese forces are equipped with amphibious tanks (ZTD-05 or ZTZ 63A) and amphibious infantry combat vehicles (ZBD-05), *cf.* "China Builds Up Amphibious Forces", *Defense Studies,* available at: http://defense-studies.blogspot.fr/2010/05/china-builds-up-amphibious-forces.html.

[132] Indonesia: five LPDs (and several LSTs) – Singapore: four LPDs, in Prézelin, *Annuaire des flottes de combat.*

[133] Purchased second hand from the U.S. (*USS Trenton*, launched in 1968).

Finally, at the opposite extremity of the Asian continent, Turkey has recently hinted at amphibious ambitions and is studying the procurement of a Spanish BPE[134] to raise its profile.

Long-Range Projection or Regional Projection

This comparison between Western and Asian nations shows that amphibious power, in its true seafaring version, remains the prerogative of the U.S. and its allies, whether European or Asian. This logic is due to the fact that the essential condition for long-range force projection by sea is control of the high seas to guarantee security during the transit phase. The U.S. has this control and extends it to its allies[135], and this "control of the global commons" is unlikely to be contested in the short term. The other condition, complementary to the first one, involves the possession of a network of bases spread over several oceans (logistic prepositioning). Only the Western powers have these, particularly the U.S. but also, to a lesser extent, France and the UK. Finally, despite the drastic budget cuts that have occurred over recent years, amphibious forces have tended to be preserved (naval platforms or land units), whatever country is considered – even Spain, despite the fact that it has had to make the greatest sacrifices.[136]

Thus, there is no fundamental "turnaround" of amphibious power. Yet the development of essentially regional capacities is real. Thanks to them, countries like China have a real ability to carry out assault landings provided they have air cover from the coast, until such time as their naval aviation capacities reach maturity. Special mention also needs to be made of Japan and South Korea. The only countries that could independently raise their status and, therefore, that could acquire heavily armed equipment capable of assuming the full range of naval diplomatic tasks.

To summarise, one can distinguish three groups of amphibious countries on the strategic level. The first group consists exclusively of the U.S. since it alone can project its amphibious power on all the oceans and across the entire spectrum of intensity, within the limits imposed by its strategic naval transport capacity – *i.e.* the 28,000 men mentioned earlier.[137] The amphibious capability is first of all optimised for coercion,

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[134] "Navantia compte bien vendre un bâtiment de projection à la Turquie", *Mer et Marine,* 4th January 2012, available at: http://www.meretmarine.com/fr/content/navantia-compte-bien-vendre-un-batiment-de-projection-la-turquie.

[135] Barry R. Posen, "La maîtrise des espaces communs, fondement de l'hégémonie des Etats-Unis", *Politique étrangère*, Spring 2003, pp. 41-56.

[136] This is less true of the U.S., which has lost amphibious capacities in absolute and relative terms. See James W. Hammond: "A Fleet out of Balance", *Proceedings*, February 2013, pp. 38-43. Thus, the amphibious transport capacity has been reduced from 4 MEBs in 1989 to 1.8 MEB in 2012 (*i.e.* below the stated target of 2 MEBs). *Cf.*: "A Fleet Out of Balance", *US Naval Institute,* February 2013, available at: http://www.usni.org/magazines/proceedings/2013-02/fleet-out-balance.

[137] To this we could add, if needed, transport capacity using civilian ships in the event of absolute necessity, as was the case in the Falklands.

given that the US Navy has 10 heavy aircraft carriers to back it up. A second group is formed by the European countries having an expeditionary capability, to which we will eventually be able to add Australia. These countries have a significant capability, mostly oriented towards the low/medium-intensity spectrum and with back-up on a national level, for most of them, from an aircraft carrier (catapult or VSTOL version). They also have a good level of interoperability allowing them to consider joint action.[138] Within this group, France and the UK can also count on a network of national support points on several oceans. Finally, the Asia-Pacific countries have essentially regional capabilities, either for political reasons or because of capacity constraints. They are mostly oriented towards coercion and are constantly increasing both in volume and in quality.

Ultimately, the development of amphibious capabilities has not been called into question anywhere. States are aware of the influence derived from such a force. Once deployed in a zone where a crisis is developing, it allows the political authorities to modulate the message they wish to convey, thanks to the flexibility of the resources employed.

[138] *Cf.* numerous cooperation arrangements already mentioned (NATO, of course, but also EAI, or binational cooperation such as the UKNL amphibious force, France-UK or Italy-Spain).

Conclusion

The prime advantage of amphibious projection derives from sea control. It keeps the continental adversary uncertain about the place and scale of the next coastal attack. It has therefore been an undeniable asset throughout the course of history. Thus, Napoleon complained about the large volume of forces held in place by the perspective of a landing by the modest British expeditionary force. Similarly, the allies immobilised considerable German garrisons along the Atlantic coast during the Second World War.

Today this control of the seas is exercised by the U.S., and this advantage is extended to its allies. Consequently, it is logical that the Western nations are today the best equipped. In addition, in the current context, where the threat of total war has receded for the long term and where a large-scale landing is deemed improbable, the added value of amphibious operations is manifested in other ways. Its flexibility of employment makes it an attractive option for crisis management, giving the political authorities the possibility of adapting the political-military course of action between persuasion, intimidation and intervention. From this point of view, it can be used to extinguish geopolitical “bush fires”, avoiding escalation into massive, long-term interventions. Nowadays, it is difficult to assume a footprint in a theatre of crisis. In any event, it is preceded by lengthy political deliberations in view of the resulting risks of mission creep. If the current trend in crisis management continues to favour containment rather than finding definitive solutions, the reversibility of amphibious operations should satisfy this logic, particularly through the possibility of carrying out *strategic raids* at short notice involving significant resources with a variety of effects.

What remains to be decided is the utility of amphibious operations in a high-intensity context. There is a great temptation to devote less effort – human, financial and technological – to what is ultimately a very low probability of occurrence. Notwithstanding, it should be borne in mind that total renunciation in this area among the Western countries would ultimately be like giving a “reward for audacity” or for “insular takeovers” like the Argentine invasion of the Falkland Islands, since the political calculations would include the fact that no counterattack would be possible. Such an operational stalemate could end up being a factor of strategic uncertainty and international instability.

From a purely French viewpoint, the probability of employment of amphibious forces remains high, given France’s physical presence on all

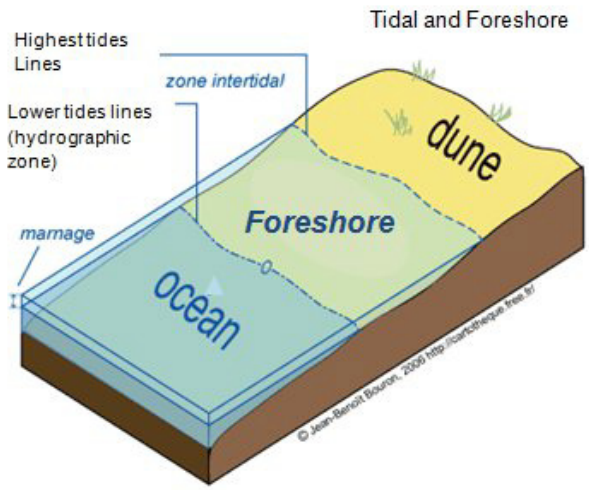
the world's oceans on a greater or lesser scale. In view of the numerous historical and political ties with third countries, the chances of seeing France involved in crises of variable intensity appear high, as the frequent interventions of the past two decades show. In this respect, the amphibious capability contributes as much to crisis prevention as to force projection. To some extent, it is the operational synthesis of these two strategic functions, applied to the littoral areas where it exerts its influence.

However, the most probable threats are low-intensity, requiring interventions in a semi-permissive environment. For a power of France's standing, under budgetary pressure, the amphibious capability should, therefore, be oriented towards a pragmatic choice creating the conditions for efficient intervention under the most probable scenarios, while maximising the strategic influence generated by these rare resources. The amphibious capability constitutes above all a capability for forcible entry. Thus, this gives the country that possesses it a particular standing, and the ability either to act alone in low/medium-scale crises or to "kick open the door" as part of a coalition, since amphibious capacities allow those who possess them to directly influence the course of military operations. As such, it seems essential for France to retain its amphibious forces, structured around the four large platforms, and maintain the panoply of industrial capacities needed to adapt resources to technological change and, more generally, to enable an escalation in strength.

Appendices

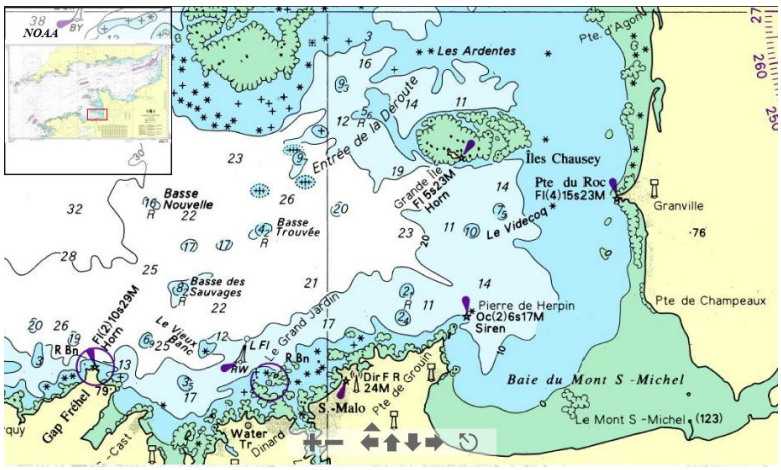
Appendix 1: Geographical Complexity of Coastal Zones

Natural Section of a Typical Coastline Portion



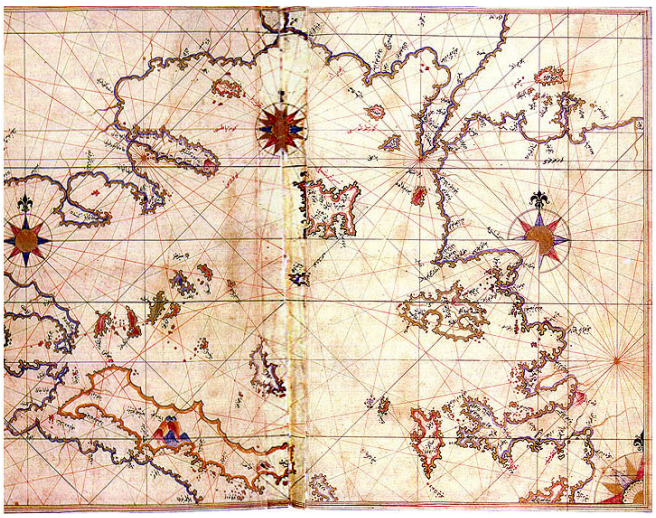
The gradient of the foreshore area will have an impact on the possibilities of beaching based on draught of amphibious vehicles.
Source: Jean-Benoît Bouron 2006 http://cartotheque.free.fr

Naval Map: Saint Michel Mount Bay



Example of a complex coastal zone (reefs, sandbars, tides, headlands, estuaries, strings of islands ...): the appearance of a shoreline is constantly changing according to the tides.
Source: « Carte marine », Aquaculture, available at: http://aquaculture-aquablog.blogspot.fr/p/carte-marine.html.

Naval Map of Piri Reis



As written by Yves Lacoste, "Geography is first used to make war." Illustration: naval map of Piri Reis, privateer then Ottoman Grand Admiral, sixteenth century (North Aegean Sea and Dardanelles). He endeavored to accurately map the entire Mediterranean basin for the military operations purpose.
Source: « Les turcs, maîtres de la carte. L'amiral Piri Reis, qui avait des amis bien informés et très reconnaissants, savait dès 1513 », Nanojv Blog, available at: http://nanojv.wordpress.com/2011/09/28/piri-reis-chypre/

Appendix 2: Global Capacity of Main Amphibious Power

Country	Ships	Amphibious forces' reservoir[139]	Maximum volume employable simultaneously
United States	10 LHD/LHA 11 LPD 12 LSD	USMC : 197 300	28 000 [140]
Great Britain	1 LPH 2 LPD 3 LSD	Royal Marines : 6 840	1 800
France	3 LHD (BPC) 1 LPD (TCD)	9th BIMA et 6th BLB : 12 000	1 400
Italy	1 LPH 3 LPD	Rgto San Marco (2 100) et Rgto Serenissima	1 Battlegroup (see 2) *i.e.* 1 000 men approximately
Spain	1 LHD (BPE) 2 LPD	Infanteria de Marina : 5 300	
Netherlands	2 LPD	Korps Mariniers : 3 000	1 MCG (Marine Combat Group) *i.e.* 720 men
South Korea	1 LHD	25 000 « marines» (conscripts)	
China	3 LPD	About 30 000 (Army & Navy combined)	12 000 (estimation on a short range)
Russia	0 (2 BPC commandés en France)	Infanterie navale : 12 000 (estimations)	(amphibious capabilities currently upsurging)
Japan[141]	3 « LST » (en fait 3 gros LSD)	No dedicated units (constitutional restrictions)	
Indonesia	5 LPD	About 20 000 « marines» (conscripts), locally employable force	

Sources: Military Balance 2013, International Institute for Strategic Studies, Annuaire des flottes de combat édition 2012, Jane's Fighting Ships, IHS Jane's; interview of naval officer and defense attaché.

[139] Special Forces are generally not included because their scope of definition is very variable depending on the country, and they are rarely only specialized in amphibious.

[140] *I.e.* 2 MEB. A 3rd MEB would be routed in the second level. The force then would total the size of a MEF (Marine Expeditionary Force) of 45,000 men.

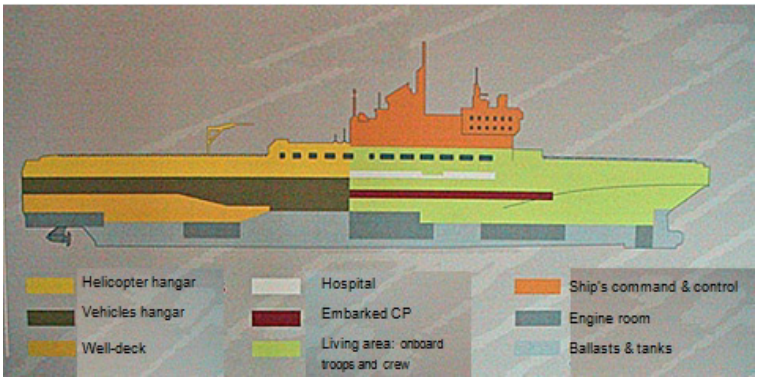
[141] Japan is not an amphibious power, because constitutionally it has only "self-defense" forces. However, it has significant resources and on short notice could become a real amphibious force.

Appendix 3: Architecture and Capacity of a Great Amphibious Ship

BPC Mistral Section

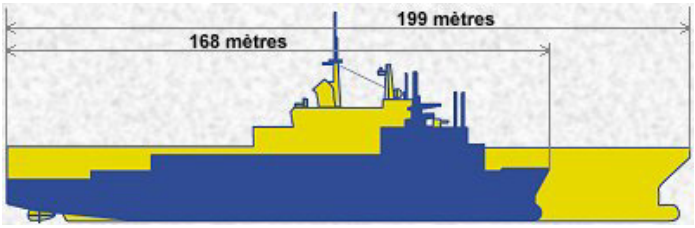
Source: Marine Buzz, BPC Mistral, available at: http://www.marinebuzz.com/marinebuzzuploads/e958047a71f1_77F2/BPC_Mistral_L90134.jpg.

Functional Section of BPC



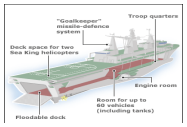
Source: BPC Tonnerre, available at: http://bpctonnerre.free.fr/detailbpc.jpg

Comparison BPC/TCD Siroco (in meters)



Source: netmarine.net

Appendix 4: Main Amphibious Ships (Identification, Capacity)

SHIP	SILHOUETTE	TONNAGE (TPC)	CRAFT TYPE	ONBORAD FORCE	AERONAUTICAL CAPACITY (Number of landing spot)
UNITED STATES					
LHD America		45 000	None	1870 *marines*	9
LHD Wasp		40 530	3 LCAC	1877	9
LPD San Antonio		25 300	2 LCAC	700	4
LSD Whidbey Island		15 745	4 LCAC	454	2
GREAT-BRITAIN					
LPH Ocean		21 750	4 LCVP	500	6
LPD Albion		18 500	4 LCU Mk10 + 4 LCVP	305	2
FRANCE					
LHD (BPC) Mistral		21 500	2 EDAR	450	6
LPD Siroco		12 000	8 CTM	470	4

ITALY					
LPH Cavour		27 900	4 LCVP	350	6
SPAIN					
LHD (BPE) Juan Carlos		27 560	4 LCM	900	6
SOUTH KOREA					
LHD Dokdo		18 860	2 LCAC	700	5
CHINA					
LPD type 071		17 600	4 LCM	500	2

Sources: Military Balance 2013, International Institute for Strategic Studies; Annuaire des flottes de combat édition 2012; Jane's Fighting Ships , IHS Jane's; « World Navies Today », available at: http://www.hazegray.org/worldnav/.

Appendix 5: LST, Craft and Amphibious Vehicles

CATEGORY	SILHOUETTE	TONNAGE (TPC)	SPEED (KNOTS)	CARRIAGE CAPACITY TYPE
LST (landing ship, tanks)				
LST (North Korea)		4300	15	12 tanks or 258 men and 14 AAV7 – 4 LCVP
LST (China) Type 072 Yuting		5000		10 tanks or 250 men + vehicles - 2 LCVP
LST (France) BATRAL :		1 385	16	12 vehicles + 138 men - 2 LCVP
FAST CRAFT (air cushion or catamaran)				
LCAC		184	54 (empty)	70 t or 1 tank
EDAR (France)		285	30 (empty)	80 t (*e.g.* 6 VAB or at least 1 tank) on 126 m2
LCAC Yuyi (type 726, China)		160	55	60 t or 1 tank
CLASSIC CRAFT (chaland)				
LCU (USA)		390	11	143 t or 2 tanks
LCU Mk10		240	12	120 men or 1 tank
CTM (France)		150	9	200 men or 90 t on 69 m2 (*e.g.* 2 VAB)
LCVP Mk5 (Great-Britain)		24	24	8 t or 35 men

Amphibious combat vehicles				
AAV-7 (USA)		29 t	7	
ZTD 05 (China)		26 t	Between 11 and 24 knots according to sources	

Sources: Military Balance 2013, International Institute for Strategic Studies; Annuaire des flottes de combat édition2012; Jane's Fighting Ships, IHS Jane's.

Appendix 6: What courses of action to face A2AD strategies?

Faced with the question of whether an amphibious assault against a heavily-defended coastline is feasible under existing technological conditions, one can try to develop scenarios illustrating the modes of action that could be chosen by the attacker and the defender. To make the following case studies realistic, it is assumed that while the defender possesses substantial quantitative and qualitative means, the attacker has the kind of global technological advantage generally enjoyed by expeditionary countries. The assailant also relies on a significant air and sea superiority (not necessarily complete), without which the amphibious operation would simply not be an option.

1. The Large-Scale Coastal Ambush Course of Action[142]

The defender's efforts are focused on the coastline and its immediate surroundings. His military system is static and strengthened by different types of mines. He does not seek to challenge control of the air-sea environment off-coast, leaving the initiative to the attacker in this area. However, he seeks to carve up certain coastal areas (mining) through a defensive posture focused on discretion and concealment, in order to channel the attacker into destruction areas where he will be expected. To do so, he possesses many GRAMM systems (Ground Rockets, Artillery, Mortars, Missiles), including anti-ship missile batteries. This course of action calls for discipline and coordination, so that activation of radars and opening of fire intervene at the right time to maximize the damage and ipso facto weaken the attacker. In addition to coastal defenses, swarm speedboats or coastal submarines intervene in vicinity of coastal line to create a full-scale threat in killing-box areas. Redundancy offsets the rudimentary nature of the means employed, resulting in increased resilience. Finally, aircraft braving the assailant air superiority might attempt opportunity strikes.

Possible Reply

Perceiving that the defender emphasizes concealment, the attacker must intensify the initial intelligence gathering to improve his understanding of the defensive system through detection of most of its components. At the same time, the attacker searches for porous areas where he might bypass strong points. Given that this is likely to be insufficient, he must adopt a flexible and dynamic posture to test the defense system. Hence he must proceed delicately enough for the defender to reveal himself, without triggering irreversible action. After ascertaining that he has collected enough intelligence to adequately gauge the enemy's defensive layout, he can start causing gradual but unavoidable attrition. To do this, he uses his complementary means of strike (cruise missiles, air and naval fire - support). Once the defence system is significantly weakened, the attacker focuses his efforts on the irreversible grounding operation, tactically maximizing its support costs (including its attack helicopters).

[142] This mode of action is regarded as the most likely, *cf.* The Ellis Group, p. 4: "The relatively few states with modern, integrated systems will pose the most lethal long-range anti-access threat (see supra course of action No. 3). A larger number of threats will employ shorter-range, area-denial capabilities to impede access…".

2. Course of Action of Concealed Mobile Reserves

Here, the defender chooses a main defense layout inland, far behind the coast. He creates the conditions for reverse *over the horizon*: if the attacker is invisible from the coast, the defender will thus be imperceptible from the sea. On the coast, he only defends at all costs the airport/harbor infrastructure, even if it is isolated, benefitting from the urban screen. Detection and acquisition to trigger distance strikes becomes more difficult, especially if he knows how to hide and scatter (including enmeshed in local populations). The defender leaves full freedom of action to the attacker in the air-sea environment. In addition, he does not seek either to oppose him during the vulnerable phase of environmental rupture, which he regards as his tactical-operational climax. In return, the defender relies on land attrition, made easier by the slowing of the attacker's operational tempo due to increasingly heavy logistical constraints[143]. The opportunistic use of concealed mobile reserves in the hinterland is then paramount, requiring tactical skill to determine the appropriate timing to launch counterattacks of armored-mechanized units, Kesselring-style[144]. In addition, the attacking columns are backed by supportive air defense (for example, SA-22, oldest ZSU 23-4). This tactical virtuosity is not within the reach of all armies and requires regular training[145]. Finally, to challenge the airspace, the defender relies on a large number of multilayered anti-aircraft systems (anti-aircraft artillery, surface-to-air missiles of very short, short, medium or long range) spread across the country. The defender preserves its air assets in support of those counter-attacks, enjoying a proximity offsetting the global air inferiority. The global aim is a reembarkation under pressure of the assailant.

Possible Response

More than any other modes of action described, the attacker must rely on well-orchestrated deceptive and / or diversion maneuvers. He can reasonably be expected to devote resources to this maneuver since the air-sea environment is not disputed. He can afford a relative dispersion of his means, provided that he either brings the defender to scatter even more his means to deal with imaginary threats or causes him to wrongly engage his mobile reserves in combat, in premature fashion. The best operational performance will obviously be obtained through correlation of these two tactical effects. For example, a simulated attack by a swarm of cheap "decoy drones", combined with conspicuous preparations for naval mine-clearing operations in a nearby area can mislead the defender. In particular, it can push him to reveal himself prematurely. The attacker can also "shape" the battlefield, i.e. carve up the field in order to hinder the assembling and movement of counter-attacking units (destruction of intersections, bridges, stations yard...). Once he has created the preconditions of air-land superiority, the attacker seizes operational or

[143] Logistics located at sea or in infrastructure assets around the bridgehead of the conquered beach experience increasing difficulties to support the operation in long-term.

[144] General Kesselring: German commander in chief in Italy from 1943 to 1945, who conducted counter-attacks that were on the verge of pushing the Allies to the sea (Salerno, Anzio).

[145] Which is why this mode of action is likely the second one.

strategic objectives. He must take hold of at least one strategic entry point to support his long-term action (reinforcement by a 2nd echelon and densification of logistical support). If the attacker faces such a defensive action mode, he must have numerous in-depth strike means at his disposal (the recent American concept of "Air-Sea Battle" focuses, among other things, on this aspect).

3. Course of Action: Forward Defense by Successive Layers

The defender implements an A2 / AD strategy, in the full meaning of the term. Wide arrays of means are available to him (air-land-sea), though technologically-inferior to those of the assailant. His defense is organized in successive layers, from farther to closer, to delay, wear down and finally disrupt any culmination of the attacker during the invasion itself. The critical part occurs in a contested air-sea environment (long range aircraft and cruise missiles, then fast attack craft or missile patrol boats and submarines then coastal defense based on many obstacles – mines and obstructions). All kinds of means are used (*e.g.* Kilo submarines equipped with anti-ship missiles SS-N-27 Club, C801 or 802 coastal missiles, S-300 surface-to-air missiles). If he has ballistic missiles (DF21-D or Shahab-3 style), he may target the infrastructure from which the attacker concentrates. Finally, if qualified, he could try to disrupt his assailant through cyber-attacks (logistics management software, command and control systems...). This three-dimensional harassment (sea-air-cyber) is supposed to cause the kind of losses and friction that will force the attacker to give up. Implementing this requires a strong jointness: the command structure should be well-versed in the art of joint operations.

Possible Response

First, it is necessary to destroy all long range launchers, starting with ballistic missiles: they pose an unacceptable threat to the preliminary phase of the invasion and its subsequent conduct. The defender should strive to deny, layer after layer, the defender's ability to contest air-sea superiority, by gradually approaching the coastline. This implies sequencing and patience, for each phase requires the successful completion of the previous one ("steamroller approach"). The presence of land airfields in the field would facilitate and accelerate the naval forces' achievement of air superiority. The ongoing effort of these phases is to disarticulate the coordination of the opponent on which the consistency of his defensive strikes and his tactical effectiveness are based. Command systems (C2) and acquisition systems (articulated together in C4ISR) are therefore priority targets from the initial phase. It is noteworthy that massive cruise missiles strikes occur during this phase, along with DEAD/SEAD air missions. Blinded and unable to coordinate his actions in the theatre, the defender's system becomes progressively disabled. Finally, the attacker must cause in-depth attrition to the defensive layout. This requires a lot of time, hence a significant freedom of action – not only military, but chiefly political. The amphibious invasion itself can start, the immediate coastal threat being reduced to a residual level.

4. Asymmetric Harassment: for Illustrative Purpose

Aside from the conventional field, one can imagine a series of asymmetric actions that could be implemented by both state and non-state actors.

These actions could be usefully combined with the modes of action mentioned above, in order to obtain, at the very least, a cumulative friction effect, at best attrition. They would undermine the strategic projection infrastructure of expeditionary countries and/or their forward bases near the theater. The possibilities are endless:

- Subversion of dockworkers' unions (strikes, various disorders) or of the local populations of forward bases (rallies interfering with the freedom of movement...)
- Crane / gantry crane sabotage (terrorism)
- Mine-laying in the harbor exit by unmarked vessels
- Seizure of an oil tanker to cause a collision with a "fireball" effect on a SPOE/D (Sea Port of Embarkation/debarkation)
- Cyber-attack on management software / logistics coordination
- Etc.

Possible Response

- Multi-Sensor Intelligence (including significant human intelligence on logistical bases)
- A permanent and multidimensional monitoring system
- A force leading counter-terrorist operations
- General safety measures at every level
- Logistical Resilience (engineering infrastructure capacity, ability to operate a logistics switch to other allowances, ability to perform on degraded mode over a limited period)
- Cooperation with local authorities and populations

References

Official Documents :

AMPHIBIOUS CAPABILITIES WORKING GROUP, *Naval amphibious capabilities in the 21st century*, 27 April 2012.

AMPHIBIOUS CAPABILITIES WORKING GROUP, *A Vision of the Future*, 27 April 2012.

CENTRE INTERARMEES DE CONCEPTS, DE DOCTRINES ET D'EXPERIMENTATION, *Concept des actions littorales interarmées, CIA-3.1.1 (A)*, 11 July 2012.

CENTRE INTERARMEES DE CONCEPTS, DE DOCTRINES ET D'EXPERIMENTATION, *Doctrine interarmées DIA-3.1.1a, Opérations Amphibies*, *Livret 1/2*, 07 November 2011.

CONGRESSIONAL BUDGET OFFICE, *An Analysis Of The Navy's Amphibious Warfare Ships For Deploying Marines Overseas*, November 2011.

CONGRESSIONAL RESEARCH SERVICE, *Japan 2011 Earthquake: U.S. Department of Defense (DOD) Response*, Washington, 2 June 2011.

JOINT DOCTRINE PUBLICATION 0-10, *British Maritime Doctrine*, August 2011.

JOINT PUBLICATION 3-02, Amphibious Operations, 10 August 2009.

LIVRE BLANC SUR LA SECURITE ET LA DEFENSE NATIONALE, Paris, April 2013.

MARINE CORPS COMBAT DEVELOPMENT COMMAND, *Amphibious Operations In The 21st Century*, March 2012.

UNITED STATES MARINE CORPS*, Marine Corps Operating Concepts*, 3rd edition, June 2010.

Books and Monographs:

ALEXANDER Joseph H. and BARTLETT Merrill L., *Sea soldiers in the Cold War*, Annapolis, Naval Press Institute, 1995.

ARNOLD Thomas F., *Atlas des Guerres de la Renaissance*, Paris, Editions Autrement, 2002.

BARTLETT Merrill L., *Assault from the Sea*, Annapolis, Naval Institute Press, 1983.

EVANS Michael, *Amphibious Operations*, Vol. 4, London, Brassey's, 1990.

GATCHEL Theodore L., *At the Water's Edge*, Annapolis, Naval Institute Press, 1996.

HENROTIN Joseph, *Les Fondements de la stratégie navale au 21ème siècle*, Paris, Economica, 2011.

INTERNATIONAL INSTITUTE FOR STRATEGIC STUDIES, *Military Balance 2013*, Londres, Routledge, 2013.

KANE Thomas M., *Chinese Grand Strategy and Maritime Power*, Londres, Frank Cass, 2002.

MORISON Samuel Eliot, *Leyte*, Annapolis, Naval Press Institute, 1986.

MURRAY Williamson and MILLETT Allan R., *Military innovation in the interwar period*, Cambridge, Cambridge University Press, 1996.

PREZELIN Bernard, *Annuaire des flottes de combat*, Rennes, Edilarge, 2012.

ROGERSON Barnaby, *The Last Crusaders*, New York, Peter Mayer Publisher, 2010.

TILL Geoffrey, *Asia's Naval Expansion*, Abingdon, Routledge, 2012.

TILL Geoffrey, *Seapower, A Guide for the 21st Century*, Abingdon, Routledge, 2009, 2nd edition.

Periodical Articles:

BAEV Pavel, "La Politique russe dans l'Arctique et la modernisation de la Flotte du Nord", *Russie.NEI.visions*, No. 63, August 2012.

BRUSTLEIN Corentin, "La nouvelle posture militaire américaine en Asie", *Politique Etrangère*, Summer 2013, pp. 53-65.

BRUSTLEIN Corentin, "Vers la fin de la projection de forces ? – tome I. La menace du déni d'accès", *Focus stratégique*, No. 20, April 2010.

DURAND Etienne de, MICHEL Benoît, TENENBAUM Elie, "La guerre des hélicoptères. L'avenir de l'aéromobilité et de l'aérocombat", *Focus stratégique*, No. 32, June 2011.

EUDELINE Hugues, "Contenir la piraterie : des réponses complexes face à une menace persistante", *Focus stratégique*, No. 40, November 2012.

GOURET Pierre-François, "Groupe amphibie à un bâtiment : emploi tactique dans le cadre du prépositionnement stratégique", *DSI*, No. 82, June 2012.

HAMMOND James W.: "A Fleet out of Balance", *Proceedings*, February 2013, pp. 38-43.

HASIK James, "Ambitions amphibies, les conséquences industrielles", *DSI*, hors-série No. 16, February-March 2011, pp. 22-23.

HENROTIN Joseph, "STOM, réalisme optimiste ou utopia ?", *DSI hors-série*, No. 16, February-March 2011.

JANE'S INTELLIGENCE GROUP, "Jane's Fighting Ships", *IHS Jane's*, April 2013.

JANE'S INTELLIGENCE GROUP, "Russian Federation", *Jane's World Navies*, November 2012.

KERR Julian, “Amphibious ambitions: expanding Australia’s naval expectations”, *Jane’s Naval International*, January-February 2012.

LAGRONE Sam, “Shifting horizons: Marines refocus their future at sea”, *Jane’s Navy International*, April 2011.

MEYER Carlton, “Opérations amphibies”, *DSI hors-série*, No. 16, February-March 2011.

PHILIPS Malcom, “The US Navy’s littoral combat ships compared”, *Naval Forces*, No. 5, 2012.

POSEN Barry R., “La maîtrise des espaces, fondement de l'hégémonie des Etats-Unis”, *Politique étrangère*, Spring 2003, pp. 41-56.

SHELDON-DUPLAIX Alexandre, “Les capacités amphibies de la Marine chinoise”, *DSI hors-série*, No. 16, February-March 2011.

TENENBAUM Elie, “Entre ciel et terre, le débat air-sol et les défis de l’appui-feu”, *Focus stratégique*, No. 21, May 2010.

THE ELLIS GROUP, “US Amphibious Forces: Indispensible Elements of American Seapower”, *Small Wars Journal*, August 2012.

TURNER Andrew M., “Amphibious Operations In The 21st Century: Are The Costs And Risks Too High?”, *Naval War College*, 4 May 2011.

VEGO Milan, “Defensive and Offensive mining: still a viable option in littoral warfare?”, *Naval Forces*, No. 3, 2008.

VEGO Milan, “Land Attack. Are expeditionnary navies ready?”, *Naval Forces*, No. 6, 2008.

Press Articles and Internet Websites:

“A Fleet Out of Balance”, *US Naval Institute*, Februay 2013, available at: http://www.usni.org/magazines/proceedings/2013-02/fleet-out-balance.

“China Builds Up Amphibious Forces”, *Defense Studies*, available at: http://defense-studies.blogspot.fr/2010/05/china-builds-up-amphibious-forces.html.

“Corsican Lion, retour sur les grandes manœuvres franco-franco-britanniques”, *Mer & Marine*, 30 October 2012, available at: http://www.meretmarine.com/fr/content/corsican-lion-retour-sur-les-grandes-manoeuvres-franco-britanniques.

“La guerre des mines à l’heure des drones”, *Mer et Marine*, 14 December 2012, available at: http://www.meretmarine.com/fr/content/la-guerre-des-mines-lheure-des-drones.

“Les facteurs hydrodynamiques du littoral. Les caractéristiques hydro-météorologiques, les courants”, *Observatoire Estran Tranchais*, available at: http://www.observatoire-estran-tranchais.fr/observatoire/facteurs-hydrodynamiques-courants.htm.

“Les Turcs, maîtres de la carte. L’amiral Piri Reis”, *Nanojv Blog*, available at: http://nanojv.wordpress.com/2011/09/28/piri-reis-chypre/.

“World Navies Today”, *Haze Gray*, available at: http://www.hazegray.org/worldnav/.

"BPC Mistral", *Marine Buzz*, available at: http://www.marinebuzz.com/marinebuzzuploads/e958047a71f1_77F2/BPC_Mistral_L90134.jpg.

"Carte marine", available at: http://aquaculture-aquablog.blogspot.fr/p/carte-marine.html.

"Navantia compte bien vendre un bâtiment de projection à la Turquie", *Mer et Marine,* 4 January 2012, available at: http://www.meretmarine.com/fr/content/navantia-compte-bien-vendre-un-batiment-de-projection-la-turquie.

BENON Frédéric, "Plongée dans le monde de la guerre des mines", *Mer & Marine*, 14 December 2012, available at: http://www.meretmarine.com/fr/content/plongee-dans-le-monde-de-la-guerre-des-mines

Ministère de la Défense, "Les drones marins, avenir de la lutte contre les mines navales", 22 October 2012, available at: http://www.defense.gouv.fr/salle-de-presse/communiques/ministere/les-drones-marins-avenir-de-la-lutte-contre-les-mines-navales.

Ministère de la Défense, "Les EDA-R accostent au cœur du BPC Mistral", available at: http://www.defense.gouv.fr/marine/a-la-une/les-eda-r-accostent-au-caeur-du-bpc-mistral.

Ministère de la Défense, "Le VHM (véhicule de haute mobilité)", available at: www.defense.gouv.fr/dga/equipement/terrestre/le-vhm-vehicule-haute-mobilite.

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