Down to the Sea in Ships (Again)

50 Ships (and pieces of legislation) that will radically transform the way America projects influence through its economic, maritime, and naval instruments of national power

A number of evolving macro trends are creating an incredible window of opportunity for America to re-enter a surrendered domain and re-establish itself as a world economic and maritime leader as well as elevate its naval prowess to a new level

1. Why is there a window of opportunity for a return to this maritime domain?

1.1 Historical Overview – the immediate Post World War II era and the departure of America from the maritime scene.

1.2 Other macro-economic and societal trends that led us away from shipbuilding and maritime activities.

1.3 So what has changed to create this window of opportunity to re-enter the maritime field and why should we care?

1.3.1 First – let's ask this simple question. What is modern shipbuilding? Answer – it's an algorithm. And who's best at algorithms? Google!

1.3.2 Second – The current wave of builders are now facing the familiar and predictable trajectory of shipbuilding – South Korea and China are losing interest – a graying population and a youthful workforce disenchanted with industrial employment – and an assumption that Chinese economic growth would continue in an unrelenting and unrealistic manner. The collapse of shipbuilding is becoming a national scandal in South Korea and China.

1.3.3 Third – Just like the aerospace industry has done so successfully - harness and leverage an internationally connected vertical supply chain for shipbuilding.

1.3.4 Fourth – Harness and leverage the agglomeration of information technology and venture capital in the San Francisco Bay – The Bay Area can also be a great hub of shipbuilding innovation (again).

1.3.5 Fifth – Getting out in front of disruptive economic trends. The rise of unmanned ships and merchant fleets – essentially an un-crewed "Uber for the Ocean" - with a requisite demand in absolutely reliable, secure, and safe networks and information technology are just some of the emerging phenoms to be harnessed.

2. What needs to happen to seize upon this window of opportunity? How to take this from the abstract to the actionable.

2.1 Inverting the current environment - a quick review of existing shipbuilding and merchant operational models and intellectual constructs - massive and poorly planned over-construction capacity on the low end – but under-capacity on the high end.

2.1.1 Shipbuilding cost estimating

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2.2 Aggressive implementation of passionate Public-Private leadership and Partnership (Just what in the world does the oft used term Public-Private really mean?). Also, a cost sharing model for implementation of this effort – the National Shipbuilding and Infrastructure Operation and Construction Company (NSIOCC). How can we get the Federal Government, State Government, the Venture Capital Firms, and major corporations such as Google, Apple, Oracle, Facebook, and others to come together and create a modern Panama Canal Commission like entity to share risk and reward in this venture?

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2.2.2 What would cost (and profit) sharing for NSIOCC look like?

2.3 Transforming the Jones Act, Capital Gains, and Corporate Taxation – let's free ourselves of 19th century concepts such as cabotage and other self-sabotaging government intervention. Let's rapidly pass legislation to incentivize the return of profits and capital to America.

2.3.1 What is the Jones Act?

2.3.2 Cease Big Government's War on Profits

2.4 Harnessing a Revolution in Economic Affairs- How Uber took a new look at a stagnant, regulated, non-innovative market segment and turned it upside down. Apply these and similar trends to revolutionize shipbuilding and merchant vessel operations.

2.5 Establishing a Private Public National Shipyard – first in the San Francisco Bay Area, but with potential satellite activities at Roosevelt Roads, Puerto Rico, and other strategic partner locations.

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3.1 Diversifying the carrier fleet – re-introducing a new era of smaller carriers as a complement to the big sticks.

3.2 More mobile bases and additional operational uses for the Expeditionary Mobile Bases and Transfer Docks. A quick way to project air, sea, and littoral influence.

3.3 Getting the Littoral Combat Ship (LCS) program right.

3.4 A return to an (advanced) Diesel or Air Independent Submarine capability as a complement to the SSN fleet. The greatest opponent of this is not the PLAN – it's the US Navy nuclear submarine fleet community (which is incredibly successful) – but a return of diesel boats will be very complementary to the nuclear submarines and allow US to provide diesel submarines to strategic partners such as Singapore, Taiwan, the Philippines, Vietnam, and others.

3.5 Additional revolutionary ship types for incorporation into the transformed fleet.

3.6 A return of a more visible DoD Presence in San Francisco and New York to provide direct availability of resources for the Defense Support of Civil Authorities mission set.

4. Way ahead and summary

Supplemental Tables

1. **Rough Orders of Magnitude for Ship Production Prices**
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A number of evolving macro trends are creating an incredible window of opportunity for America to re-enter a surrendered domain and re-establish itself as a world economic and maritime leader as well as elevate its naval prowess to a new level

1. Why is there a window of opportunity for a return to this maritime domain?

1.1 Historical Overview – the immediate Post World War II era and the departure of America from the maritime scene.

Ending World War II with an unmatched Navy and industrial capacity, America walked away from maritime dominance by the 1960s (at least in regards to merchant vessel production and ownership or control of a merchant fleet). Macro economists would argue that lower end industrial activity would and should naturally and for the better seek the lowest cost of production and activity in less industrialized nations seeking to establish themselves economically. Also, for many years there was a surplus of World War II Liberty vessels that provided inexpensive ships to be given away to foreign countries as aid in kind which also disincentivized further domestic maritime ship production and requisite innovation.

As the modern Post World War II era proceeded, the internal facing national economy began to transform in the 1960s and the international inter-connected economy began to take off in an unprecedented manner. As innovations such as bulk oil shipments on a vast scale and the nascent advent of containerization and the concept of highly efficient inter-modal transport began to emerge, a new era of shipbuilding and commerce began to develop. But the existing American shipbuilding and maritime industry was addicted to naval production and uninterested in maritime innovation.

Japan seized upon shipbuilding as one of the critical paths to rapid post-war re-development and economic superstardom in the 1960s. They took the Kaiser World War II shipbuilding model and super-sized it along with some Keizen and Lean Six Sigma and brought it to the next level. Furthermore, existing American legacy yards were dirty, messy, and now relatively inefficient World War II leftovers and laden with what would become a great litigation wealth transfer industry – asbestos. Since the peak of the Japanese era of dominance, South Korea and China have also seized upon shipbuilding – displacing Japan as the leading manufacturer of merchant vessels.

Only second to the opportunity in the tobacco industry, the asbestos lawsuits ensured the demise of post-World War II American shipbuilding. Although many American maritime workers had been genuinely harmed by asbestos exposure and were exceedingly worthy of restitution, just like with

the tobacco settlements of the 1990s, the greatest recipient of the wealth that was transferred was the legal industry itself. Now that this locust plague of lawyers has moved on from this maritime cadaver to other sources of wealth, an opportunity for a re-start is upon us.

Originally this article was going to focus solely on revolutionary naval transformation, but as analysis occurred, the realization became apparent that it was more than just about naval transformation it became clear that a window of opportunity exists for America to re-emerge in the entire maritime domain. Although by title this article would appear to simply be about ships – this article is more about macro-economic trends, geo-political trends, the international economy, innovation, and disruptive revolutions in military and economic affairs.

1.2 Other macro-economic and societal trends that led us away from shipbuilding and maritime activities.

The scourge of self-serving Asbestos litigation was the coup de gras – but other factors were in play.

Let us be honest - the reality was shipbuilding was dirty, messy, and unappealing to younger generations (long before the danger of asbestos was known). American shipbuilding had done little to innovate in the post-World War II era. Although Kaiser and others had pioneered modular construction and efficient construction, little was done to consolidate these innovations and evolve to higher levels of efficiency.

Every single large shipyard that currently remains in America traces its roots to World War II (or earlier) – and has changed relatively little since then. Great innovations in shipbuilding have occurred since World War II, but these were introduced by other countries. Oversize, modern, floodable dry docks; traveling overhead giant, straddling cranes; un-encroached space to properly stage and fabricate large modular assemblies; and environmentally controlled large structures to allow year round assembly and fabrication without degradation from inclement and extreme weather were established as standards by other countries in the post-World War II era. Meanwhile American shipyards evaporated or maintained dire and bleak subsistence conditions while addicted to Navy work or well-intended, but lethargic, poorly executed attempts to re-establish commercial maritime ventures occurred such as "Project America" (kind of sounds like "Team America"). However, these whimsical efforts depended on massive government subsidies for unrealistic and unviable rates of return[1].

The focus of technology innovation and the main landing point for Science, Technology, Engineering, and Math graduates during the immediate World War II era until the climax of the raging Cold War was aerospace. This was the golden age of aerospace – which now itself is facing a similar conundrum as fewer STEM graduates seek employment in this field. The appetite for these American STEM graduates in the golden age of aerospace was voracious and as the British aerospace system collapsed, many of their best and brightest came to the US to feed this demand[2]. For all up and coming STEM graduates – the choice was clear and simple - why walk around a sloppy, decrepit shipyard in the heat or the cold and rain, when you could do your engineering work in an Atomic-age, air conditioned drafting table or the indoor production line in nice, neat, clean, and comfortable conditions?

The rise of efficient air transportation also fed this dichotomy. Why focus on production or operation of ships (or even trains for that matter) when the perfect world of the future atomic age was gleaming jet transports moving the masses at speed? With the rise of air travel – a de-connection of the general society to maritime activity began to accelerate – the linkage of American society to its nautical roots frayed and maritime activity became invisible, forgotten, and a part of abandoned America.

The final element that assured the demise of shipbuilding and shipping lines was aging federal statute that ensured these once proud maritime economic sectors became emaciated versions of their former selves.

The Jones Act is the absolute manifestation of what happens with government intervention: unintended consequences, dramatic worsening of the bad things that were supposed to be resolved, high prices, and poor selection.

And with this dependency on government protectionism saw the rise of niche but vocal maritime constituents that reacted ferociously if alternative viewpoints were dared proffered. So instead of innovating, an irreversible pathway to a long, agonizing, death spiral was introduced. The once mighty drydocks of American World War II shipbuilding are now used to test bridges made of duct tape on Mythbusters[3] with most viewers not having the historical literacy to understand the context of the stage being used.

Thus saw the demise of these once viable sectors. But there's hope - the planets are beginning to come into alignment for a new awakening.

1.3 So what has changed to create this window of opportunity to re-enter the maritime field and why should we care?

There are several converging and parallel trends occurring, that if properly connected, leveraged, and harnessed can provide the momentum for a re-launch of the United States into the economically competitive assembly of merchant vessels and a powerful, viable, and competitive merchant fleet.

Originally this article was solely about naval affairs and creating radical new naval force structures and ship types – these are important – but in true Mahanian fashion – the topic is bigger than just naval forces – this is about the world economic and political environment. Because of these evolving trends, America is in a position to aggressively and passionately re-enter the ship construction and maritime commerce sectors.

1.3.1 First – let's ask this simple question. What is modern shipbuilding? Answer – it's an algorithm. And who's best at algorithms? Google!

One can say the classic predictable response when asked about shipbuilding – it's blood, it's sweat, it's steel, etc. etc. That's quaint and evocative of many historical mages, but misses the seminal point. Here is a posit of a different definition.

Shipbuilding and merchant vessel operations are essentially complex algorithms.

Who dominates the world in algorithms?

Google, Facebook, and Apple

Let's encourage the algorithm dominance, technical prowess, and oh by the way, bountiful cash reserves on the books[4] of these information technology giants to deploy in the direction of this moribund, yet opportunity filled economic sector.

The algorithm allegory is very important – if you can get the exact scheduling, ordering, and operations, to a much more exact science in the fabrication and assembly stages through the magic of algorithms, the inherent waste and inefficiency, compounded by the much higher American labor rates can be addressed and resolved.

1.3.2 Second – The current wave of builders are now facing the familiar and predictable trajectory of shipbuilding – South Korea and China are losing interest – a graying population and a youthful workforce disenchanted with industrial employment – and an assumption that Chinese economic growth would continue in an unrelenting unrealistic manner. The collapse of shipbuilding is becoming a national scandal in South Korea and China.

Impressive 10 years ago and following the model of the Japanese seizure of shipbuilding in the 1960s, South Korea's magnificent shipyards are now in economic freefall and approaching total collapse[5]. The rush to advance this sector fell victim to similar forces that caused massive rationalization in Japan in the 1990s – too much capacity, rise in labor costs, greying of the population, and an evaporating youthful generation more interested in the malls, computer games, and cubicles than the steel, sparks, and noise of a shipyard.

Although the South Koreans seized upon the Japanese "Mega" concept of massive drydocks, multiple straddling goliath cranes, and relatively spacious layout yards for very large ship construction – they still didn't develop or apply the complex algorithm level of analysis and planning to the early phases of shipbuilding during the cost estimation phase. Older methods of cost estimating were still being applied which led to massive under bidding and in the end their foray into establishing market dominance has instead led to massive financial losses approaching disaster levels[6] and Watergate levels of national scandals. And in the end – it was inevitable - Korea graduated from a low cost producer to a high cost producer – congratulations![7] China is right behind and its number of active yards has shrunk 63 percent since the boom of last decade.

China's situation is clouded in lack of transparency but appears to reflect a very similar situation[8]. Both situations provide evidence that massive Goliath cranes are impressive, but without the power of algorithms as applied to planning and cost estimating, they are only part of the story[9]. Both South Korea and China fell into the trap of rapid industrialization through heavy industry, but not concurrently planning spirals of innovation to keep their costs under control. They created massive over capacity on the low end, without focusing on the value-added aspect of the high end such as production improvements, engines, specialized ships, cruise ships, electronics, specialized ocean structures, and the rise of automated shipping.

Ship building and merchant vessel operations out of Korea and China were depending and gambling upon a continued healthy growth of the Chinese economy – hence a need for a large amount of low end, bulk commodity ships and container ships. With the stagnation and even potential collapse of the Chinese economy[10] – the need for ships and shipping has essentially evaporated – leaving the world with a massive oversupply of too many ships chasing too little cargo[11]. Daily average costs of ships run approximately $16,000/day, of which $4,000 are crewing costs – with earnings running at $2,000/day, this is a bleak situation. This has also led to weird situations like South Korea's Hanjin line becoming insolvent and suddenly, approximately 100 large ships are essentially either disallowed from entering ports or fearful of entering ports due to complex litigation by creditors[12].

1.3.3 Third – Just like the aerospace industry has done so successfully - harness and leverage an internationally connected vertical supply chain for shipbuilding.

In the early days of airliner manufacturing in the 1950s to the 1960s, the major players of Boeing, Lockheed, and McDonnell Douglas essentially produced many of the parts and major assemblies in house and did the integration themselves. Boeing though rapidly evolved to a worldwide integrated chain of suppliers. Originally this was done to gain the favor of potential buying countries – but it has become quite economically efficient. The Aerospace Industry has become internationally vertically connected – if properly planned and executed, so can the maritime industry. Boeing has become the model for this vertical integration. Originally it was just oversize trains running from the LA basin to Seattle carrying fuselage and wing sections. In addition to the rail mode of transport, Boeing now also utilizes a fleet of outsize 747 Dreamlifters flying from Europe and Asia to support the production of the Dreamliner 787 aircraft[13],[14].

With the introduction of sophisticated and ingenious heavy lift ships firms such as Dockwise (now owned by Boskalis)[15] have introduced a robust fleet of ships capable of impressive feats of unbelievable movements of outsize structures.

Yes, that's an entire oil rig being transported.
Dockwise Vanguard from Boskalis website[16]

By using advanced heavy lift float on/float off (FLO/FLO), this could allow the international vertical integration of major ship components. One area could focus on hull sections, one on engine and crew sections, one on installation of major fitting out of modular cargo and passenger sections, and other variations. This could allow great efficiencies of cost and specialization.

However, to allow this to happen, Government rulesets such as the Jones Act would have to be re-visited and amended. This review is long overdue – and will be further addressed later in the paper.

1.3.4 Fourth – Harness and leverage the agglomeration of information technology and venture capital in the San Francisco Bay – The Bay Area can also be a great hub of shipbuilding innovation (again).

A logical geographical aggregation of several of the essential ingredients for such an economic re-launch of shipbuilding already exist – it's the San Francisco Bay Area.

The Bay Area has several potential sites for development or re-development into a world class, public-private consortium national shipyard. The Bay Area also already has immense gravitational pull for much of the nations' current younger age profile of science, technology, engineering, and math graduates (STEM). Shipyard work would be a natural landing spot for STEM graduates looking to practically apply their training in real time and real life – an appeal and interest displayed and immortalized in such television shows such as *Dirty Jobs*[17] or *How it's Made*[18].

In addition, the Bay Area is the location for the Information Technology (IT) Titans and their massive and historically unprecedented amounts of cash on the books looking for investment opportunities[19], [20], [21]. Amazon, Google, Facebook, Tesla, and others are spending massive and virtually unconstrained amounts of cash on research, development, and monetization of space and unmanned systems. They are behaving like the American defense research initiatives of the 1950s – 1970s – bold and unconstrained.

Exhibit 2: Global Cash Reserves – Top U.S. Companies vs. Nations.

(Cash and international reserves levels)*

*International reserves exclude gold holdings.

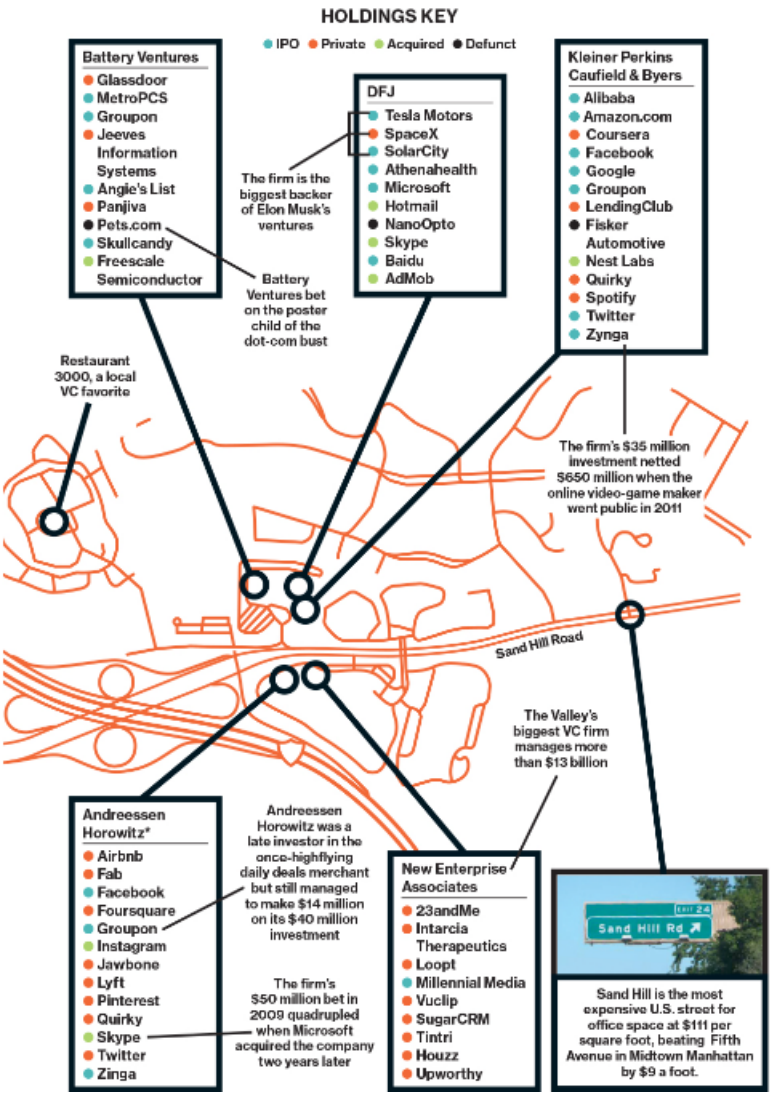
Sources: Company filings and Moody's Financial Metrics; IMF.

Data as of 2013.

Rank	Company/country	Cash/reserves ($billion)	Rank	Company/country	Cash/reserves ($billion)
1	Apple	159	26	South Africa	42
2	Malaysia	130	27	Colombia	41
3	Turkey	109	28	Qatar	41
4	Poland	99	29	Chile	39
5	Indonesia	93	30	Germany	39
6	Microsoft	84	31	Oracle Corporation	37
7	Denmark	82	32	Lebanon	36
8	Israel	80	33	Italy	36
9	Iraq	74	34	Angola	32
10	Philippines	74	35	Qualcomm	32
11	UK	70	36	Johnson & Johnson	29
12	UAE	67	37	Kuwait	29
13	Peru	63	38	Spain	29
14	Google	59	39	General Motors	28
15	Canada	58	40	France	27
16	Sweden	55	41	Merck	27
17	Norway	55	42	Intel	26
18	Verizon Communications	54	43	Ford Motor	25
19	Czech Republic	54	44	Argentina	25
20	Pfizer	49	45	Amgen	23
21	U.S.	48	46	Coca-Cola Company	20
22	Cisco Systems	47	47	Ukraine	19
23	Hungary	46	48	Kazakhstan	19
24	Romania	45	49	Morocco	18
25	Australia	43	50	EMC	18

Table 1: Listing of Cash reserves (note the IT firms co-mingled with Nation State funds)[22]

Solving the algorithm issue of planning for shipbuilding and merchant vessel operations would be a logical outlet for this pent-up energy of phenomenal cash on the books. World leaders in Computer Aided Design and Manufacturing and related IT innovations such as Autodesk and Salesforce are conveniently right on the San Francisco waterfront. A related, but different part of the equation are the incredibly powerful venture capital firms housed on Sand Hill Road in Menlo Park. In discrete and ordinary looking buildings, Andreessen Horowitz, Greylock, Sequoia, Kleiner Perkins, Trident, and many other firms exert immense international influence with their breathtaking ability to deploy capital towards promising ideas.



Several of the Venture Capital Firms in Menlo Park[23]

Conducting a cursory survey – there are several possible locations for a totally new, state of the art, built fresh from bottom to top with new super-size drydocks, enclosed by environmentally sealed and covered work spaces and internal goliath cranes, unconstrained by the vestiges of legacy structures or encroachment by urban development.

This could include the fallow and abandoned Alameda Naval Air Station – itself built upon reclaimed land, additional reclaimed land around the old Treasure Island Naval Station, the derelict Hunter's Point Naval Shipyard, or totally new reclaimed land somewhere in the greater San Francisco Bay region.

The magic tendon would be additional high speed rail/transit infrastructure to connect this facility with other parts of the Bay Area – especially south to the heartland of Silicon Valley – and to lower cost of living areas further in-land. Future endeavors could also include a partner facility at the decaying and dormant Roosevelt Roads Naval Facility in Puerto Rico which could benefit from a highly educated population in dire need of economic opportunity. The newly expanded Panama Canal would allow swift transport of major assemblies between these two facilities.

These former Department of Defense and Federal Government properties can provide the acreage and starting infrastructure for these new start efforts. Like what is going on at Kennedy Space Center – the Federal Government has allowed Blue Origin[24] and Space-X[25] to use Federal space and facilities under a lease arrangement. Although title to these afore-named Bay Area locations may have in some ways fully or partially transitioned, the Federal Government could make cautioned and careful re-assertion of title to these facilities for the purposes of a private-public partnership to wholly re-develop these areas into a world class, environmentally sound, shipyard complex.

With a properly designed facility, shipbreaking can also be undertaken. No longer can shipbreaking be relegated to the uneducated/disposable world population masses, it is neither economically nor morally viable, plus with the rise in commodity prices, it should be considered a valuable part of the lifecycle process that can harnessed and be brought home. Done in a controlled environment, this de-construction process can be done in an environmentally sound, safe, and efficient manner. The spectacle of large ships being dragged onto the shore in Bangladesh is a pathetic scene[26]. Apple receives $40M/Year for reprocessing[27]. With the rise in commodity prices, recycling of materials on scale, it is becoming somewhat valuable and lucrative. State of the art, enclosed facilities would allow safe, efficient salvaging and re-processing. If nothing else – most of the National Defense Reserve Fleet needs retirement and replacement (close to 100 ships) - this fleet will provide years of supply for advanced re-processing (please see Chart below those numbers).

NATIONAL DEFENSE RESERVE FLEET INVENTORY
MAR-612: RESERVE FLEET MANAGEMENT SYSTEM
MONTHLY REPORT AS OF August 31, 2016

Type Summary

	NDRF			NDRF Total	Custody	Grand Total
Ship Type	Non-retention	Retention	RRF		Custody	
Barge					1	1
Barge Ship		5	2	7		7
Break Bulk	8	10	2	20		20
Crane Ship	1	2	6	9		9
Military	4	3		7	1	8
Other		6		6	3	9
Passenger Ship		4		4		4
Roll-On/Roll-Off	1		35	36		36
Tanker		4	1	5		5
Grand Total	14	34	46	94	5	99

Table 2: August 2016 Inventory of the National Defense Reserve (NDRF) Fleet[28]
RRF = the Ready Reserve Fleet of Ships maintained in a "warm" status for mobilization

As this matrix shows – there are approximately 100 ships in the NDRF construct – this includes the final tip of the tail of what where vast ghost fleets at Suisun Bay, The James River, and other locations – artifacts of the vast industrial output from the Arsenal of Democracy in the Second World War II. At a rough approximation of an average of 20,000 Dead Weight Tons (empty) – this means two million tons of material for re-processing – that's $332 million at a low scrap steel price of $166/Ton[29]. This doesn't account for other higher price retrievable metals and content. Now we're starting to talk about some potential down payment revenue for a public private partnership.

1.3.5 Fifth – Getting out in front of disruptive economic trends. The rise of unmanned ships and merchant fleets – essentially an un-crewed "Uber for the Ocean" - with a requisite demand in absolutely reliable, secure, and safe networks and information technology are just some of the emerging phenoms to be harnessed.

Automated merchant vessels are a real, revolutionary, and disruptive economic event and it's right in front of us[30] – since ship crewing costs are the major factor in ship operations, this allows an American re-entry in terms of crewing costs. Even a foreign crewed ship needs a highly paid ship Captain, First Mate, and Chief Engineer who are qualified and trained. In future automated ships, this leadership team will be virtualized and can perform their on-shift duties from command centers or even their homes. With the rest of the crew superfluous, the playing field is now level in terms of crewing costs. The future is rapidly approaching on this revolutionary trend[31] – let's get in front of it or get on the bridge and start providing rudder so this trend doesn't pass us by like Tom Hanks in "Stranded" who watched as mighty merchant vessels sped by him.

With automated, uncrewed, merchant vessels, the crew is made redundant for most of the ships life and can be transformed into high value emergency response teams that can rapidly deploy and take over a situation where an automated ship is in distress. For these response actions, industry will demand the best of the best are available and deployable on call to handle rogue ships. The market will likely demand these response crews are well trained and certified – i.e. they will pay a premium to ensure these highly trained crews are available – thus advantage back to American Crews – both a virtual American leadership team of Captain and First Mate, and a complete American maritime intervention package on standby to deal with any rogue unmanned vessels.

The next wave of shipping is automated ships – most of the industry realizes it and sees this as the future[32]. This is a disruptive economic trend that will capsize the existing operating norms and conditions of the relatively secretive and exclusive world of shipbuilding, merchant fleet operation, and ownership of these ventures. But wait – some would say that because of its secrecy and exclusiveness, nothing could alter the landscape in shipbuilding, merchant vessel operations, and the business thereof.

Resistance against new trends is what many cities have tried to do in protecting their legacy taxi industries – often a secretive and exclusive monopoly in urban areas. These jurisdictions have created figurative walls, moats, and trebuchets to keep out the transformative effects of Uber. But Uber lays siege through a variety of legal and insurgent measures and within months, the city falls and Uber moves onto the next city[33]. The fleets of Yellow Cabs are sent to the scrapyard in these surrenders[34]. Uber has figured out how to take a captive economic model and successfully lay siege and take it over. And on the production side, Google, Tesla, and Apple are beginning to panic the classic production

model run out of Detroit[35]. The whole American concept of their relationship to their personal cars is on the verge of being totally turned upside down.

On another evolving phenomenon, let's not forget the transformative effect of the expansion of the Panama Canal. This revolutionary transformation of one of the original wonders of the modern world and a billboard for American turn of the century exceptionalism and ascendancy to being a superpower is an enormous event for world shipping[36] as is the rise of Panama as a Hong Kong of the Americas[37]. The United States should seek a mutually beneficial special relationship with Panama. At the same time, we should keep a watchful eye on the adventurism of China and Iran in Nicaragua as they continue to chatter about a rival to the Panama Canal. This may be more of a ruse to allow Chinese economic exploitation of land and populations like they have done in Africa[38].

So 10 years ago, most would have scoffed at Uber's and Google's thoughts – they are rapidly coming to fruition and blowing through the abbatis and caltrops set up by the current owners of the environments they are challenging. So entrenched, seemingly monopolistic and unassailable markets can be disrupted and taken over. Anything is possible.

2. What needs to happen to seize upon this window of opportunity? How to take this from the abstract to the actionable.

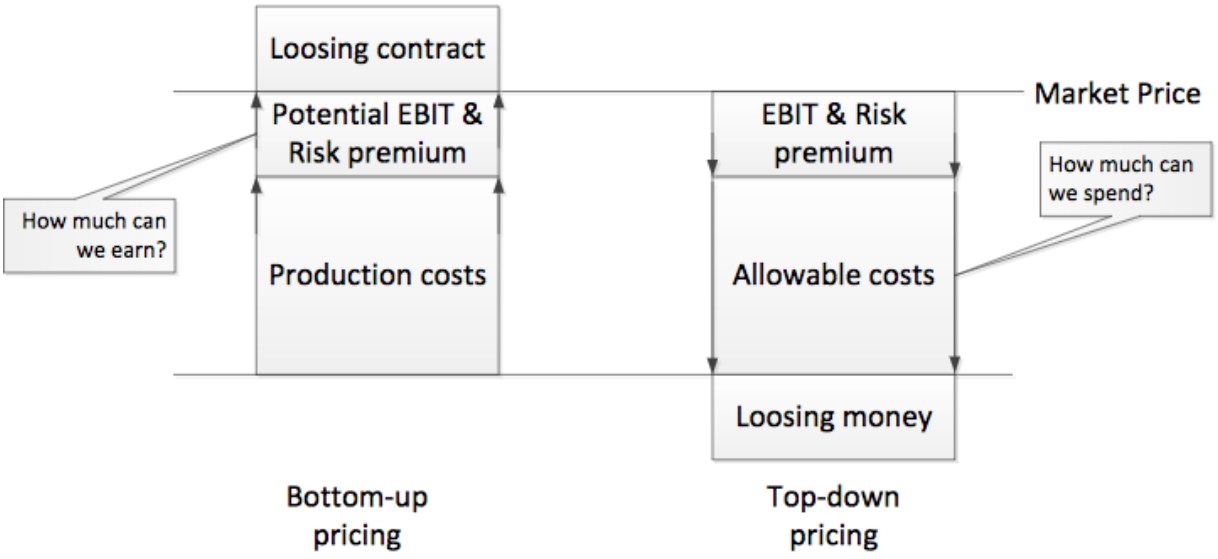
2.1 Inverting the current environment - a quick review of existing shipbuilding and merchant operational models and intellectual constructs - massive and poorly planned over-construction capacity on the low end – but under-capacity on the high end.

2.1.1 Shipbuilding cost estimating

The key word in estimating shipbuilding costs is the term "stochastic" – a sophisticated way of saying, shipbuilding cost estimation is filled with a lot of unpredictable and random variables. The groundwork for these shipbuilding algorithms exist and are represented in a number of very detailed, but with all due respect very boring academic articles focusing on academic mathematical models[39,40,41] - with the noteworthy exception of Shetelig's 2013 work which focuses on Offshore Support Vessels – but is well written and scalable to other situations[42]. These presentations of algorithm analysis are sophisticated, but in many ways, very tactical and focused on the individual steps of the building process (i.e. welding, painting, etc.) – but not the full integrated end to end process which also take into account the macro-economic trends of politics, conflict, commodity prices, technology, and other matters. And the question is for these very well thought out tactical algorithms - in the end, have they been applied?

I point to the current dilemma of the South Korean and Chinese yards as irrefutable end state evidence to bypass academic quibbling over the piece parts of the evidence chain. Exuberant contracts were signed before true costs, prices, and trends were calculated[43,44] in a sophisticated algorithmic manner.

The basic dilemma for estimating ship construction cost is whether to price the number or cost the number[45]. This leads down two paths – if the end state of the ship, vessel, or structure is relatively non-differentiated, non-specialized, commodity bulk carrier, the answer would trend toward pricing. This would apply to bulk carriers of raw materials such as coal, wheat, iron ore, or crude oil. If the final product is more sophisticated or customized (even if produced in quantity) – then costing is likely more applicable. Cruise ships, offshore platforms, and heavy lift vessels would likely fall into this category. Also retrofit and conversion of already built vessels would also fit into this category. Container vessels likely straddle the two categories.



The Shipbuilder's Dilemma – Costing (left column) or Pricing (right column)?[46]

Another interesting aspect – where do the accumulated costs occur during the concept to contract to production to delivery cycle? Most costs occur in the actual production yard – but the phases that have the greatest impact are earlier – the design phase. This is where we need to introduce the power of sophisticated holistic algorithms. If properly applied, this will minimize the costs during the production phase.

Building stage	Cost of the stage	Impact on total building costs
Preliminary design	3 %	60 %
Other design stages	7 %	25 %
Ship production	90	15 %

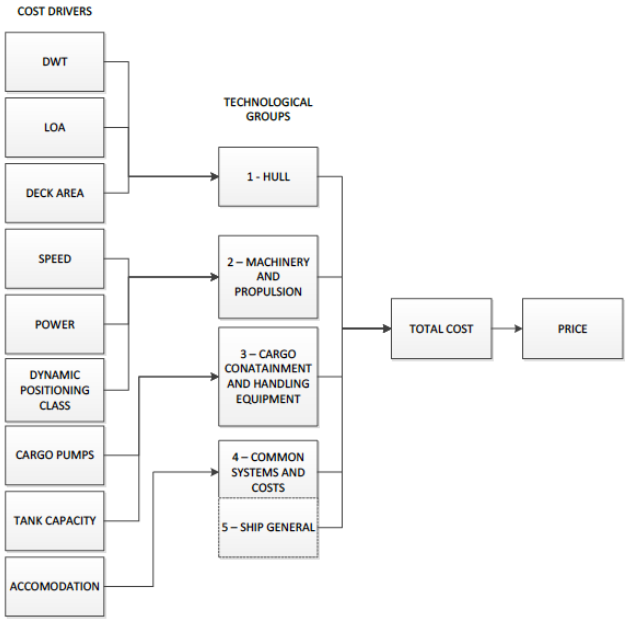
Building stage's impact on total cost[47]

So once in the yard – the vast majority of costs are incurred whether anticipated or not – but these costs were substantially pre-determined in the earlier phase. So once in the yard what are the major cost components? It is labor and material. Labor is all about minimizing the time and motion of activity and minimizing wasted effort. Material can be essentially broken down into the technological groups – hull, machinery and propulsion, cargo containment and handling, common systems, and general costs such as crew and passenger accommodations, painting, and final fitting out. There must be a ruthless focus on advanced planning to ensure absolute efficiency once activities in the yard begin. Time is money and any mistakes or miscalculations immediately endanger the economic viability of the project.

2.1.2 Major cost elements of shipbuilding activities in the production phase

As previously described – the planning steps up front have the greatest impact on the total cost of the assembly. The major focus on algorithmic analysis should be on absolute minimization of non-value added activity to minimize waste and inefficiency. Once in the yard, any errors or waste in the assembly process contribute to cost overruns which threaten the original cost estimates and can immediately turn the endeavor onto an irreversible negative ROI pathway – exactly what the South Korean and Chinese shipyards are currently experiencing.

Algorithmic focus should be on advanced planning to account for maximum efficiency of the costing and sourcing of the different major components of the process. This way an internationally integrated process can culminate in seamless assembly in an advanced yard with minimal disruption and deviation from the original plan. There is also a difference in design and construction standards for naval versus maritime vessels – the basic guidance is that naval vessels are more expensive for their tonnage than maritime vessels due to survivability and offensive and defensive systems. In addition, there significant savings when ships are made en masse versus one-offs due to the obvious application of scales of efficiencies and applied production efficiencies from lessons learned. The basic work breakdown structure of yard cost drivers are shown below.



Generic Work Breakdown Structure for fabrication and assembly in the yard[48]

Advanced analysis is needed on each of these elements to maintain absolute efficiency. Labor effort standing around the yard waiting for their step of the operation is incredibly expensive. The secret to minimizing waste is planning planning planning – all based on algorithms. With a focus on the higher value types of ships – such as advanced post-PANAMAX container ships, cruise ships, specialty and custom designed ships, and offshore structures, there is more room for unanticipated deviations or updated requirements from plans (and higher profit margins).

Technological group	Portion of total cost
Hull	20 – 30 %
Machinery and Propulsion	25 %
Cargo containment and handling	20 – 25 %
Ship common systems / Ship assembly and systems integration (for outfitting yard)	20 %
Hotel and accommodation	5 %
+ Financial costs	+ Financial costs

Table 3: Basic approximation of costs for fabrication and assembly in the yard[49]

2.1.3 So what are the take aways?

- Current estimating focuses on the yard stage – the stage with the least impact on total costs
- Better planning up front during the design phases decreases costs during the yard stage
- The chaos of the competitive contracting process undermines better planning during the design phase
- Algorithms must be holistic – not tactical. They must include the stochastic elements of world economic trends such as demand for vessel type, demand trends for service being delivered, crewing costs (or lack thereof), and price trends in materials and componentry of the vessel or structure
- By more sophisticated focus on the design phase, costs can be driven down during the in-yard phase.
- Relatively low end/commodity vessels need to be priced, more sophisticated maritime deliverables need to be costed.
- Another important issue is whether the vessel in question is designed to maritime standards or naval standards which immediately sends us one of two directions:
- Naval and Maritime construction standards are very different. The simple takeaway is that lower production quantities, unique specifications, and many special components not necessary for maritime vessels mean naval vessels and unique vessels are usually more expensive propositions.[50]

The Chinese and Koreans produced massive and impressive yards – but in the end they took massive swags at cost estimates. The labor advantage was the assumed driver that would make them successful. But what does it really cost to produce a ship in a foreign yard? Without the magic of advanced algorithms, it's a massive roll of the dice – which is why the Chinese and Korean yards have collapsed.

So we need advanced planning and cost estimating procedures – simple academic models focusing on tactical steps currently exist but macro-variables are wildly unpredictable – which leads even "low cost" producers to wildly fail to estimate with relative assurance – we need to introduce Google level algorithms to better estimate – and this is best done where total planning and final integration is conducted in totally new, built from scratch, American shipyards.

2.2 Aggressive implementation of passionate Public-Private leadership and Partnership (Just what in the world does the oft used term Public-Private really mean?). Also a cost sharing model for implementation of this effort – the National Shipbuilding and Infrastructure Operation and Construction Company (NSIOCC). How can we get the Federal Government, State Government, the Venture Capital Firms, and major corporations such as Google, Apple, Oracle, Facebook, and others to come together and create a modern Panama Canal Commission like entity to share risk and reward in this venture?

2.2.1 The model of Public Private Partnership – the Presidio Foundation

The Presidio of San Francisco has never looked better than it does today. What was once a large US Army Installation, Nike Missile Base, and Coast Defense Fort always looked a little in need of maintenance and attention when it was under DoD control. The Presidio Foundation[51] has transformed the entire installation into a model of what can be done with excess US Government property and facilities. Historical significance has been maintained while housing areas, offices, and warehouses are being re-purposed into high end housing, museums, movie studios, offices, sports complexes, and other viable activities under the rubric of the Foundation legal construct. The facility has never looked better. The Presidio Foundation is a model of Public Private Partnership.

Essentially not utilized on scale since the Panama Canal Commission or the Tennessee Valley Authority, a new semi-government, semi-private legal construct should be established in statute – perhaps as a permanent adjunct to the Presidio Foundation, a temporary adjunct to the Presidio Foundation, or a new stand-alone entity to oversee the development of the new National Shipyard and Infrastructure Operation and Construction Company (NSIOCC). This entity would have the following status, charter, and expectations:

Be created through an act of Congress.

Be exempt from Federal, State, and local taxes (including property taxes) for a period of seven years from passage of statute. After that, a transition period would occur that would allow taxation but capped at a 15% on profits and capital gains at the Federal level and capped at payback of State and local long term capital contributions over a 20 year period.

Be expected to be revenue positive in terms of operational costs and reasonable long term capital paydown expectations within seven years from passage of statute.

The endeavor must receive expedited environmental oversight – the whole operation must be environmentally friendly from the beginning, but at the same time, environmental permitting and review must, by statute, be expedited to ensure the timely nature of delivery of the San Francisco/Alameda site.

Establish an investment, cost sharing, and profit sharing structure between Federal, State, local, Venture Capital community, major firms (existing IT firms, infrastructure, large system integrators), and other investors.

Establish a totally new shipyard, ship conversion, ship recycling, and mega-structure construction facility.

In addition to establishing a source of construction the venture would also create a pool of operators to operate some of the high value output. I.e. an adjunct to the core NSIOCC entity would be an operational arm to oversee the operation of some of the output, for example, the float on-float off fleet that would be scheduled in a way to allow some percentage of availability for US Navy purposes, while some dominant percentage is available for commercial movements.

For maritime new production of ships - focus on high end ships (especially cruise ships), float on-float off, total recapitalization of the National Defense Reserve Fleet (approximately 100 vessels), ship conversion, ocean structures, infrastructure projects, special purpose vessels, and unmanned ships.

2.2.2 What would cost (and profit) sharing for NSIOCC look like?

There would be a need for significant cost sharing of the initial investment for the establishment of NSIOCC. As opposed to previous efforts, it can't be an entity established as a being dominated by Federal appropriated funds. That is a recipe for absolute nothingness and a bridge to nowhere on a scale never seen before. There must be an expectation from the beginning of delivery ahead of schedule and under budget and graduation into a self-supporting economic entity. Although perhaps dismissed as colonialist – the Panama Canal Commission became a viable, self-supporting thing. And now under Panamanian control, has magnificently transformed all of Panama. So there is a time and a place for government to become involved in endeavors even in our private sector centric, capitalist system.

The following elements would be the foundation for cost sharing for the establishment and operation of the NSIOCC:

The Rough order of Magnitude (ROM) for the Capital costs of establishing the NSIOCC would be on the order of $2B across a three year design and construction phase, which would cover the San Francisco/Alameda Hub, but also seed money for the Puerto Rico satellite, and with bi-lateral international agreements, perhaps overseas satellites to start the process of the international, vertically integrated supply chain.

Cost share for the start-up fund would be spread across Federal, State, local, Venture Capital community, major firms, and other investors. For the Federal portion of perhaps 30% (i.e. $300M) some of that would be annual appropriated funds in the ROM of $100M, but could also come from very light touch tariffs on energy development in the 200 mile exclusive economic zone, passenger fees on existing cruise activity, and other sources of non-appropriated Federal revenue.

To incentivize the participation of the venture capital community, existing overseas profits, and mobilization of existing cash on the books by US Corporations, statute based incentives must be used to minimize capital gains and profit based taxation. This must be established to direct and reward the flow of capital to the establishment of NSIOCC.

2.3 Transforming the Jones Act, Capital Gains, and Corporate Taxation – let's free ourselves of 19th century concepts such as cabotage and other self-sabotaging government intervention. Let's rapidly pass legislation to incentivize the return of profits and capital to America.

2.3.1 What is the Jones Act?

The Jones Act from 1920 delivers what government legislation normally does – it creates high prices, poor selection, unintended consequences, and more of the same bad stuff it was supposed to address. The Jones Act has crippled and destroyed the once vast American shipbuilding and merchant fleet and created a small, protected micro-economic sector which is void of competitiveness, innovation, and far more expensive than the foreign competition[52, 53]. So, one may ask – this paper is proposing semi-governmental intervention – what's the difference between this paper and establishing a new Jones Act? The key element is the provision of a clear sunset clause to ensure the statute sunsets, transitions, or must be fully reviewed before it is re-authorized.

The basic elements of the Jones Act require that any cargo or passengers transiting between US ocean ports must be on American built, American crewed vessels. Sounds appropriate and neat, but this ensures cargos are moved extremely inefficiently and significantly punishes non-contiguous areas of the US such as Alaska, Hawaii, Guam, and Puerto Rico[54]. It also disallows the cruise ship movement of passengers between US ports.

In essence, a foreign vessel from the Far East or South America can't land or move cargos on their way to or from foreign ports to the mainland. Oh they can stop – but they are not allowed to make cargo or passenger movements from these non-contiguous areas to the mainland and visa versa. Hence it only makes sense for them to discharge en masse at a mainland port and then the same cargo has to be re-handled and re-shipped back to these non-contiguous ports. This cost is not insignificant.

Please – take some time to study the Jones Act Statute references[55, 56]. This is what happens when lawfare takes over an environment. It's like the Arms Export Control Act – a statute started with the best of intentions to keep the good stuff of stealth, precisions strike, night vision and other things out of bad hands, but now has become a wall separating American exports from customers – and other countries are rapidly filling the void[57]. Crushing regulatory oversight just makes things too difficult and capital and talent naturally flee to less regulatized environments which kills off the industry it was designed to protect.

Senator John McCain has championed the reform or repeal of the Jones Act, but has run into stiff opposition. " "But I have to tell you … the power of this maritime lobby is as powerful as anybody or any organization I have run up against in my political career," he said. "All I can do is appeal to the patron saint of lost causes and keep pressing and pressing and sooner or later you have to succeed." "[58]. But Export Control Reform is beginning to get significant bi-partisan support for action[59] and so can Jones Act Reform.

What is this lobby that Senator McCain is referring to? It's the Jones Act dependent Philly Shipyard in Philadelphia[60] and National Steel and Shipbuilding Company (NASSCO) in San Diego and their respective Congressional Delegations. To a lesser extent it's the owner/operators of the roughly 200, Jones Act and subsidy Merchant Vessels that comprise essentially the entire US Merchant Fleet. There are passionate arguments for protectionism of this sector usually along the lines that this ensures the existence of American shipbuilding and American merchant vessels – but any modicum of reality shows this fleet and market sector is in a zombie like condition[61]. Let's get past this fruitless discourse.

So it's the year 2016, how do we get past the 19th century concept of cabotage and put to rest this archaic concept that keeps an industry and arguably an entire national economy on its knees?

The basic elements of Jones Act Reform must focus on incentives for much larger investment in the ship construction and US Flag merchant vessel operations while allowing a long term grace period to wean Philly and NASSCO and merchant fleet operators off of government Jones Act addiction. Both of these shipyards have actually shown great progress in cost efficiencies and innovation and can become even larger, world competitive shipbuilding venues. Philly and NASSCO should be looked at as partners and not competitors to the NSIOCC concept. In addition, large naval focused shipyards at Newport News, Bath, or Pascagoula could also be enfranchised within the broader NSIOCC construct to lead them long term to a diversified business base.

The basic nature of Jones Act Reform must follow the ideals and/or address the following issues:

De-regulation of the airline industry in the 1970s is a model for Jones Act reform. Although it took some time, the US airline industry has never been stronger or more profitable.

There is an enormous, undeniable, economic drag co-efficient on the cost of living in Hawaii, Alaska, and Puerto Rico due to the monopoly nature of the Jones Act. Recently a cost model was shared where the price of a significant re-roofing job in Hawaii was double due to the high cost of transport of the roofing materials to Hawaii[62]. Because of tourism in Hawaii and natural resource development in Alaska, these negative costs are somewhat camouflaged. But the economic blight of Puerto Rico is obvious and the Jones Act is a direct contributor to this chaos and clear evidence of the unintended consequences of unbridled Government statute.

A total or partial Jones Act exemption for foreign flag unmanned ships, built overseas, modified in the US, and operated virtually by US based crews.

Like the airline industry, the Jones Act overhaul should facilitate the rise of leasing companies that actually buy and sell the vessels while operators lease them long term. An adjunct or core part of the NSIOCC could act as this leasing partner. This arrangement would help smooth out spikes and valleys in supply and demand for shipping capacity.

Legacy manned, foreign flag container, heavy lift, and cruise ships could go between US Ports for a nominal tariff which would pay into the NSIOCC.

Unlock and allow unfettered, but environmentally respectful, economic development in the 200 mile economic zone – foreign ventures would be allowed through a tariff paid to the NSIOCC foundation.

For security and environmental reasons, keep oil and gas shipments to and from Alaska under the existing concept of the Jones Act, but wean Roll on Roll Off, Container, cruise traffic, and other maritime activities from the Jones Act.

Codify and incentivize the legal and economic construct of the concept of effective US Controlled Ships (EUSCS) [63]. Create a tiered incentive model for profit taxation and tariffs that would encourage US virtually operated ships, EUSCS, and foreign flagged ships in that order. Also address US operated tug and barge operations to ensure they also receive proper incentives – they are a very efficient and effective US Flag activity.

Create an open period for NDRF purchase of foreign ships if reconfigured in US yards. Also expand the NDRF model in the NSIOCC to allow long term charter of NDRF assets by private ventures.

2.3.2 Cease Big Government's War on Profits

A central element in the equation to resurrect US shipbuilding and maritime vessel operation is addressing the collusion of governments around the world to conduct a secret shadow war on profits by major corporations. This is not just a maritime issue – this is a macro-economic issue and is an exemplar of why American Gross Domestic Production growth has stayed under 3 percent for eight years straight. Now, I say the "shadow war" somewhat tongue in cheek, but this is essentially what's going on. The high profit IT industry has been stalked by government taxation agents which has led to this somewhat serious, somewhat comical movement of profits to avoid taxation[64].

Like the law of gravity, profits and capital will always flow naturally to the most liberal, least constraining, highest growth, least siphoning environment. Whether it be the collapsing European Union or US Presidential candidates, short term political interests are constantly referring to the boogeyman of hidden corporate profits. Let's create a bi-partisan way forward to incentivize the return of profits to the US environment.

There are several key elements to address these matters, some could be part of the statute based NSIOCC charter, some could appear in other legislation:

There is one thing big government can do correctly – incentivize by cutting capital gains and shrinking American corporate taxation – the highest in the world.

Government should pivot toward incentives not punishment – stop this aggressive Captain Ahab pursuit of offshore profits.

The NSIOCC statute should address specific economic issues. For example, there should be a capital gains and two-dollar corporate tax reduction to 25pct for every overseas profit dollar spent when a ship is drydocked in US for 21 days or more and value of drydocking is more than

$2M. An increasing scale of three-dollar corporate tax reduction for every dollar spent more than $5M, and five dollars for every dollar spent more than $20M.

For maritime and non-maritime infrastructure projects worked on at the NSIOCC facilities (offshore structures, bridges, tunnels, etc) and moved into place by NSIOCC Flo-Flo vessels, similar capital gains and corporate tax incentives should be enacted. Although substantially complete now, the new Bay Bridge between San Francisco and Oakland could have been substantively fabricated in the NSIOCC.

2.4 Harnessing a Revolution in Economic Affairs - Uber took a new look at a stagnant, regulated, non-innovative market segment and turned it upside down. Apply these and similar trends to revolutionize shipbuilding and merchant vessel operations.

Aligning the NSIOCC concept with the emerging Uber for the Ocean era is critical. The confluence of Silicon Valley, Venture Capital, mobilizing corporate cash on the books, incentivizing the return of overseas held profits, Government light touch, and the world integrated supply chain is intuitively simple. The NSIOCC is an actionable model for public-private partnership to create sustainable growth in an economy.

Applying the Uber model for turning taxi service upside down and how to overcome entrenched interests and the rapidly evolving driverless car industry, NSIOCC can transform the rudderless and stagnant maritime and infrastructure industry at a large and viable scale. The initial operating location for the NSIOCC will place it conveniently close to the center of IT and social media innovation and venture capital. As the world evolves to crew-less shipping, the NSIOCC will be firmly in the pilot house leading this innovation.

The NSIOCC construct can also act as a feeder landing point for STEM graduates. There is great talk about STEM Education and shortages in STEM graduates, but at the same time, many of the national STEM efforts are soundbites at worst and very challenging obstacle courses at best. The NSIOCC can be a landing point for STEM graduates, especially those who receive government scholarships, to spend two to four years applying their skills in an intern status. After this period of service, they can stay on with the NSIOCC or pivot to the world of Silicon Valley or other related IT focused geographic hubs. The NSIOCC is also an opportunity to harness the energy of the Myth Busters and How it's made syndrome in America – a renewed interest in making things.

Following in the steps of Boeing who successfully harnessed the dynamic energy of a vertically integrated, international supply chain, updating the Jones Act and implementing the NSIOCC will leverage, not fight international supply chain. Geographic and market segment focused specialties will naturally evolve to produce the most efficient supply chain.

US – Final assembly, networks, and network security, passenger accommodations, final fitting out, de-construction and re-processing.

Europe – Engines, nautical machinery.

Asia – Major structural assemblies, painting

This NSCIOCC effort should focus on the higher end, higher value products, following the successful focus of European yards versus Asian yards[65,66]. The legacy activities of simple, manned, bulk commodity maritime vessels can be focused on by overseas shipyards.

2.5 Establishing a Private Public National Shipyard – first in the San Francisco Bay Area, but with potential satellite activities at Roosevelt Roads, Puerto Rico and other strategic partner locations.

There are potentially many areas around the nation, but for the thesis of the article, a proximity to the magic of Silicon Valley is desired. Several existing and potential places exist in the Bay Area. It's historically interesting that the Bay Area which revolutionized shipbuilding through the epic effort to modularly build Liberty Ships in many ways was created and established in the Bay Area – at Kaiser's Richmond, California facility. Below is a listing of several possible locations and potential opportunities and issues with their use.

Re-opening Mare Island: Would require massive reconstruction and in the end, is very constrained from establishing the broad acreage necessary for large shipyard modular construction processes. There are also silt issues that would require regular dredging.

Treasure Island: Would require significant new reclamation and has limited transportation access from other than the water.

Hunter's Point Naval Shipyard: Still several long term clean up issues from the Atomic Age. Would require significant de-construction, alteration, and reconstruction. Useable areas are already being re-developed through a maturing re-development entity.

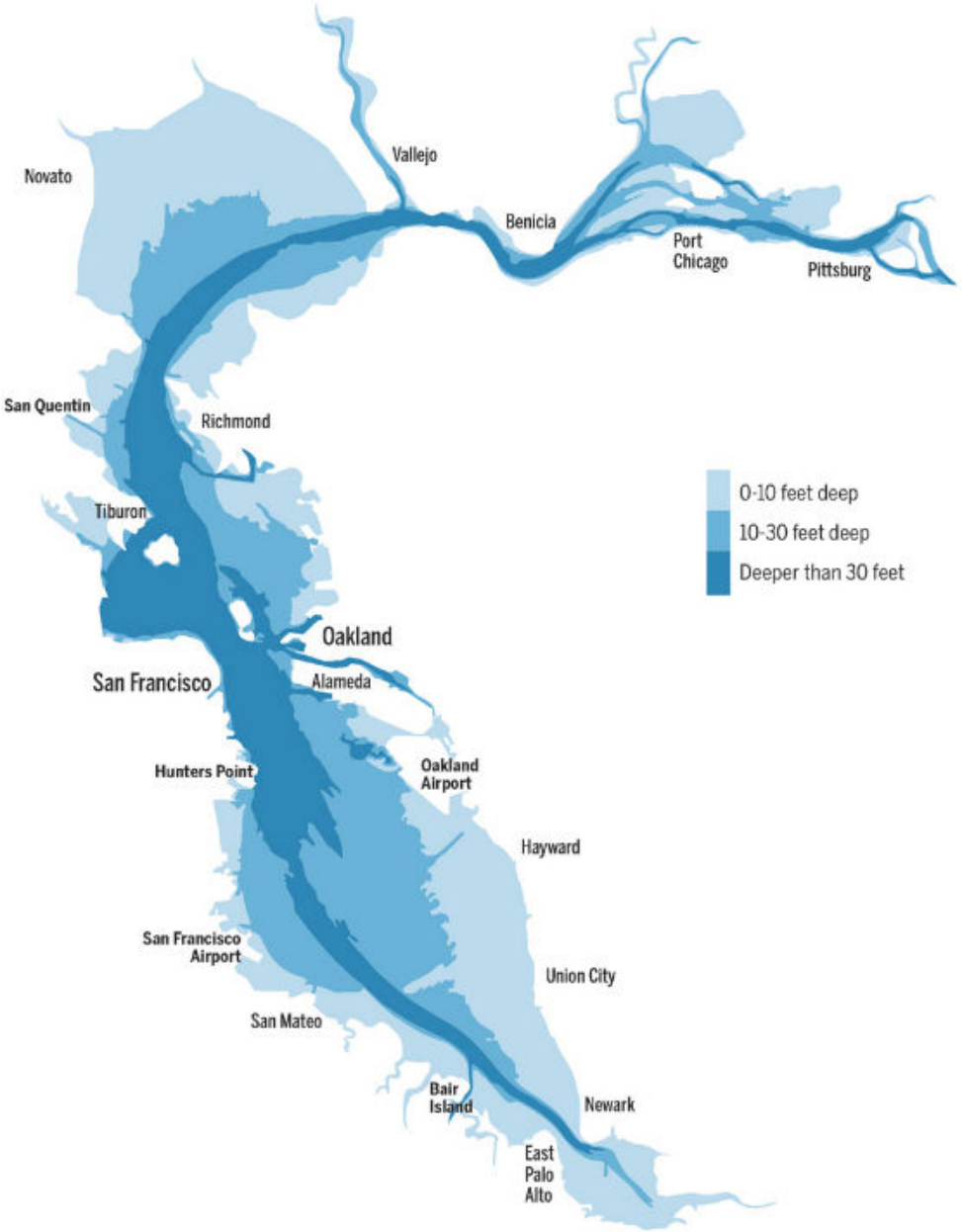
Totally new area in South Bay: Possibilities exist, but zoning and reclamation would take decades. Deep water access is rapidly lost and would require significant dredging and environmental impact.

Alameda Naval Air Station: Already built on significantly reclaimed land. Additional reclamation would be necessary but not significant. Large uncluttered acreage exists, only occupied by legacy, closed runways and taxiways. Immediate access to deep water. Immediate access to existing port and rail hubs, potential to connect as a node on an east bay high speed rail network. Potential to re-open one of the runways to provide additional inter-modal transportation access. Re-development activities are still nascent and un-resolved. Close to workforce, innovation, and venture capital of Silicon Valley.

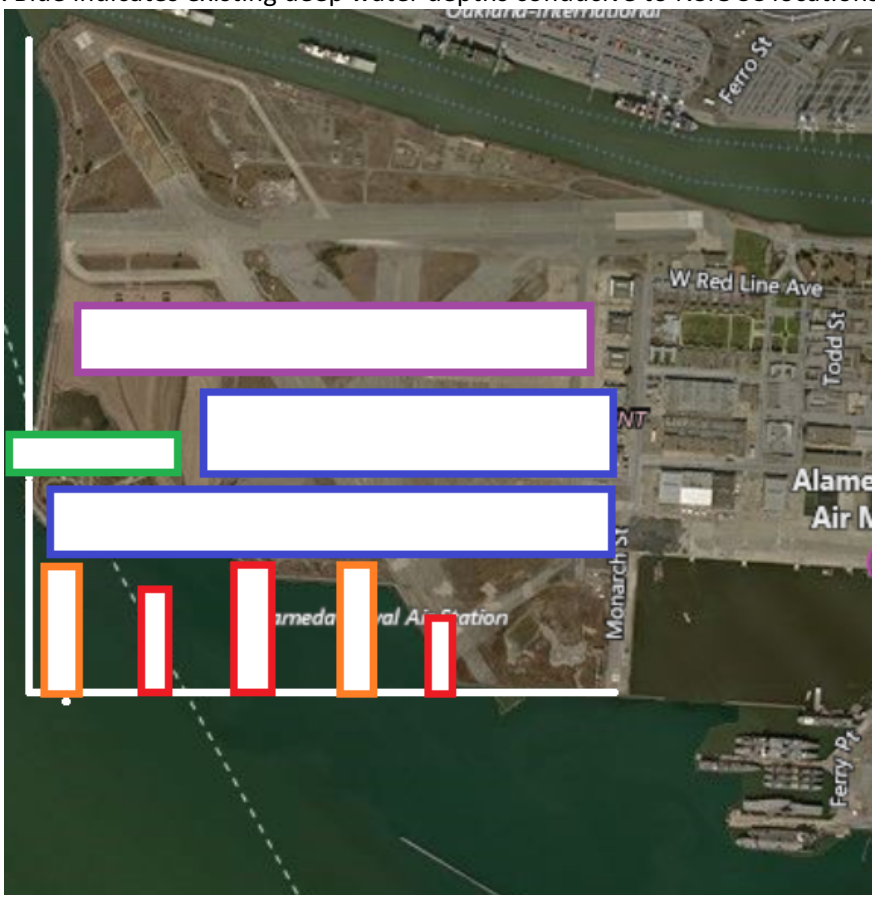
Beyond the San Francisco Bay area, other opportunities exist in the Puget Sound region of Washington State and the Los Angeles Port facility of the West Coast. Because of routine inclement weather in the Puget Sound region and the encroachment of development on the legacy port areas of Los Angeles and Long Beach, these regions are more problematic in establishment of a new, large acreage facility.

With this cursory analysis, the intuitive location is the legacy Alameda Naval Air Station. This location would be ideal with minimal reclamation required as opposed to other candidate sites.

Below are two graphics – one which shows the depth mapping of the San Francisco Bay and the other one shows a simple rendering of the NSIOCC facility proposal at Alameda.



Depth of San Francisco Bay[67]
Dark Blue indicates existing deep water depths conducive to NSIOCC locations



Simple overlay of the legacy Alameda Naval Air Station as re-developed for the initial NSIOCC facility. White Line on bottom and left side would represent new reclamation.

Red – Covered and sealed Dry Docks (2,000 x 400), (1,500 x 200), and (1,000 x 200): New construction, conversion, and re-processing. Each supported by two straddling giant cranes with 2,000 ton lift capability.

Orange – Covered and sealed vertical sealifts (1,500 x 400): New Construction and conversion. Each supported by two straddling giant cranes with 2,000 ton lift capability.

Green – Open air vertical sealift (2,000 x 400): Oversize construction of ocean structures and infrastructure projects. Supported by straddling cranes with 4,000 ton lift capability.

Blue – Modular layout areas with moveable overhead cover and modular assembly movement plates to transport the assemblies around the yard.

Purple – Fabrication, metal working, IT and automation innovation work areas.

Legacy existing runway at top can be re-opened for automated air-freight, general, and business aviation.

A partner facility for the initial NSIOCC facility at Alameda would be a re-establishment of the Roosevelt Roads facility in Puerto Rico. This once bustling DoD facility is essentially laying fallow – right in the middle of a region challenged by weak economic opportunities and growth. Re-opening of this facility would offer many tangible benefits for the NSIOCC construct and broader national and regional interests. An overhaul of the Jones Act provisions would also add significant stimulus to the Puerto Rican economy. Benefits of a Roosevelt Roads presence would include the following:

Ample, well-educated workforce.

Significant former DoD acreage available for re-development.

Space and security for NSIOCC or private sector data centers.

The re-vitalized facility could also be host to a return of Southern Command to Puerto Rico – allowing a closer connection to the region serviced by Southern Command. It would also facilitate a renewed bilateral and multilateral relationships with other key regional partners such as Panama, Columbia, Brazil, Argentina, Peru, and Chile. A light touch return to these areas would re-establish strong relationships in the Americas and also counter Chinese adventurism and their interests in establishing forward basing areas.

A re-establishment of locally based national security resources would allow more locally based capabilities to support Humanitarian Assistance and Disaster Relief operations.

In addition, appropriate military capabilities such as Littoral Combat Ships, Naval Helicopter Support and Logistic Squadrons, special warfare unit forward basing, In-Extremis capabilities, light aviation support, counter-insurgency training, and partner capacity and training could be re-established in a reconstituted Roosevelt Roads complex.

Similar to Alaskan air operations, DoD flight activity from Puerto Rico would allow access to less crowded flight zones in the mid-Atlantic and Caribbean.

To more fully develop the NSIOCC integrated supply chain construct, thought and consideration should also be given to bi-lateral agreements with key strategic partners such as Singapore, the Philippines and South Korea to partner in ship construction, repair, and modification to allow specialization and efficiencies of scale similar to the Boeing airliner supply chain.

2.6 What Maritime Vessels could be built or modified by this new maritime construction capacity?

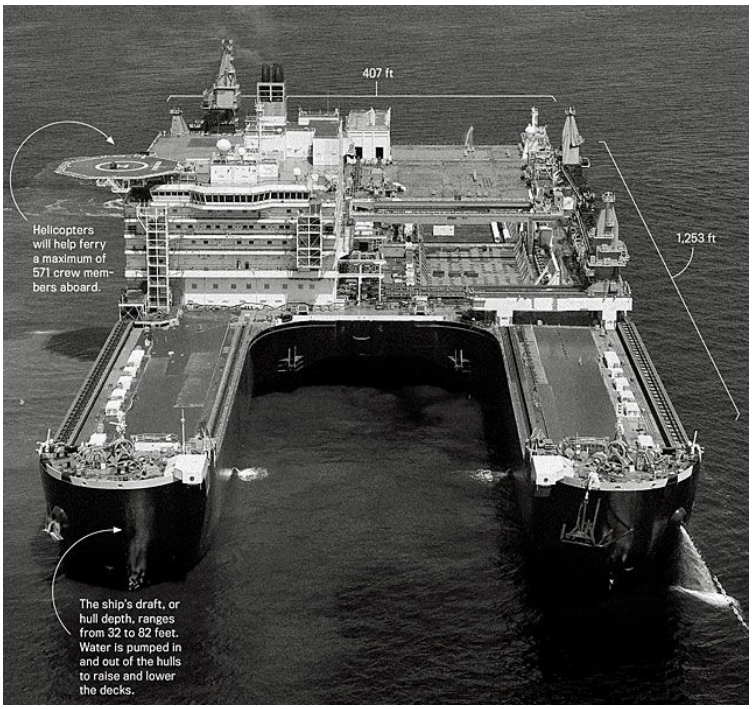
The NSIOCC construct would create capacity and capability beyond what exists in current naval focused shipyards or the two Jones Act shipyards. Instituted with Jones act reform and creation of a statute based public/private entity, a viable foundation will be established to allow for a bold re-entry into a market segment once dominated by America. This is not an attempt to re-live the past, but an

acknowledgment that the dynamic situation has evolved to a point that this is a real and tangible opportunity for the American economy. Because of the heavy, capital intensive up front nature of this endeavor, this is an ideal opportunity for a public/private partnership that shares in both risks and returns of this large-scale activity. Many new and existing market opportunities exist for the output from the NSIOCC construct:

> With the expansion of the Panama Canal, new post-Panamax opportunities for 10,000 Twenty foot Equivalent Unit (TEU) plus size, unmanned container ships with the most advanced network and physical security features[68].

The return of the Danish Armada – the 18,000 TEU "Triple E"[69]

> The large ocean structure commissioning/de-commissioning business has a need for several more, extra-large vessels.[70] These vessels not only needed for large, new facilities for their assembly and installation, but also requisite shore capabilities are needed to trans-load the new and de-commissioned structures.
>
> The Pioneering Spirit is currently one of a kind, but with many legacy structures in need of de-commissioning and or replacement, there is plenty of work for the next several decades[71]. The group that contracted for and operates the Pioneering Spirit, Allseas[72] is now looking at an even bigger vessel.



The Pioneering Spirit – the largest vessel in the world.[73]

Cruise vessels are enjoying a renaissance and are a high value, high end deliverable in which the high cost European yards have excelled. These high value ships are tailored to the American, European, and even the Chinese[74] markets. Meyer Werft of Germany has pioneered the construction of oversize vessels in totally enclosed environments. The following pictures shows the enclosed Meyer Werft facility in Papenburg, Germany. As Table 2 shows, large cruise ships are approaching $1B in total value for each vessel.

The Meyer Werft enclosed facility in Papenburg, Germany[75]. Bottom picture shows the Norwegian Joy (167,000 Gross Tons) in final fit out in the inside bay. Mega construction indoors is a proven process.

With the responsible development of our economic zone and open ocean areas, the assembly and use of very large ocean structures are a viable economic activity at scale. These structures can include wind farms, data centers, and space launch and recover platforms.

Another initiative is to bring Salmon and other fish farming to a new era by doing it in ultra large ocean vessels that would solve environmental challenges with static fish farming in coastal areas and on land[76]. A slow moving, unmanned vessel would dissipate sea lice in a more environmental responsible manner while providing 16 million cubic feet of fish farming based on the volume of a mid-size very large crude carrier as a basis for such a vessel[77].

There is ample over-construction in the very large crude carrier market, so perhaps an intermediate step is to use the new American yards to do modification of vessels purchased overseas. Existing fish farms should be encouraged through tax credits, capital gains cuts, and guaranteed loans to transition to this new methodology.

Previously mentioned as a mechanism to support an international supply chain, even larger versions of the specialty, FLO-FLO vessels need to be assembled. Boskalis has revolutionized international oversize transport and what was once an oddity is becoming routine.

Dockwise Giant in a notional lift of a full size cruise ship.

Now that these lifts are routine, even larger FLO/FLO ships are needed – more of these will be needed to support international shipbuilding supply chain and rapid recovery of rogue or distressed unmanned merchant vessels.

The combination of the NSIOCC and the FLO/FLO movement system will also allow the creation of infrastructure in a box – essentially bridges, tunnels, and other mega structures can be built in a controlled, facility without having to deal with the vagaries and chaos of on-site fabrication. They can be moved by FLO/FLO and mega-barges to their installation site.

With the availability of a new mega-shipyard, initial concepts such as the lighter aboard ship (LASH) can be revisited. Although tried previously and dropped in favor of containerization – with a new large ship – perhaps three to four 4 x 1s (400 x 100 foot) ocean going barges[78] can be carried (bow to stern in a linear fashion) – achieving the pre-packaging vision of the original LASH ship concept and making them more efficient and at a scale that makes them economically viable. Smaller ports can be serviced by new, unmanned LASH ships that don't need the servicing of the new generation of extra-large, post-Panamax container ships. New mega-LASH ships can move three to four barges of product at two to three times the speed of conventional ocean going tug and barge operations.

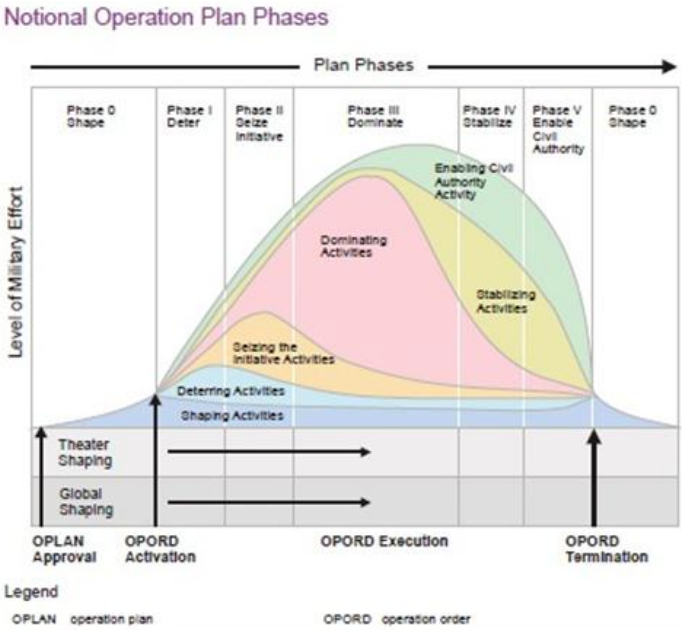
The legacy National Defense Reserve Fleet is largely in need of re-capitalization as previously identified. This is 100 large vessels that can immediately be processed through the Ship Reclamation Process in an environmentally safe (and when planned properly) and economically viable model. And at a low estimate of $300 million for the scrap value of the existing fleet, this is potential seed money for the NSIOCC operation.

3. Applying similar innovations to the Navy – revolutionizing Naval Affairs.

Originally this article was focused on naval force structure and creating a revolution in naval affairs. But as the topic was studied, it was realized that world trade patterns, economics, national industrial policy, politics, the application of algorithmic planning to shipbuilding and merchant vessel operations, and the revolution of unmanned ships that the topic was bigger than just naval affairs. Therefore this paper and thesis was re-done – but the topic of naval affairs was still to be an element of this posit.

In regards to naval force structure and revolutions in naval affairs, the thesis is that with current world events and the transition of world affairs from the War on Terror (WOT) to the World in Chaos (WIC), naval forces and the maritime domain provide the best way for America to generate and project the Military and related instruments of national power.

Land forces (other than Special Operations Joint Task Forces) have proven to be cumbersome and non-agile in their ability to nimbly generate and project force and national influence. The logistics tail for setting up these land operations is incredibly resource consuming and glacial in their ability to pivot to the evolving threat. It also ensnares us in endless land wars because of the need to generate massive ground life support footprints that are very expensive, hard to re-deploy, move, or re-direct. Naval operations provide inherent mobility and much greater relative ability to re-purpose to different mission sets in the phases of conflict – especially Phases 0 and 1.



DoD Doctrinal Phases of conflict[79]

After years of a strategy of supporting two major conflicts simultaneously, which morphed into just supporting legacy Overseas Contingency Operations in the Middle East and Afghanistan, it is clear the Naval Force structure of under 300 combatants is insufficient from a force generation and deployment aspect and also that force structure is grossly under-funded from an annual operations and

maintenance (O&M) perspective (there is very visible evidence - there is simply too much rust on the existing US Navy ships which are is a very noticeable indicator of maintenance shortfalls).

DDG 62 USS Fitzgerald and CG 62 Chancellorville with many signs of rust on hull – a not insignificant symptom of an underfunded Navy.[80]

Both capital investment and O&M elements need to start increasing to achieve a re-invigorated force structure of the following size and capabilities:

The US Navy Force Structure must increase to 350 combatants.

Re-capitalization of the Military Sea Lift Command (MSC) structure – the unsung hero of the ability of the US to generate and project naval influence needs to recapitalize many hulls and expand from approximately 120 ships[81] and vessels to 150.

The Maritime Administration administered Ready Reserve Fleet (RRF) of about 50 vessels needs to totally recapitalize and move to approximately 80 – 90 vessels.

The Navy needs to establish 11 large carriers and 14 large deck amphibs (including new, larger amphibs of an enlarged America Class to serve as light carriers) as the minimum force structure. Twenty Five decks are the minimum to properly generate and project American influence.

Diesel submarine production and operation should be re-established for several strategic reasons – these boats will serve several unserved mission sets – this is a complement to and not to compete with the existing nuclear submarine fleet.

More mobile base platforms should be developed and deployed to support special operations, regional support and presence missions, and mobile anti-submarine warfare (ASW) efforts.

The Navy must rapidly embrace and put into service long endurance unmanned air, surface and sub-surface capabilities. They must be integrated as a routine part of maritime air, sea, and littoral operations.

An ASW version of the V-22 should be rapidly fielded to create a more robust anti-submarine and littoral warfare capability for the large and small carrier force.

To support this expanded force structure and to execute the Defense Support to Civil Authorities Missions, the Navy should seek to re-establish a presence in major urban areas such as San Francisco, New York, the Caribbean, and the Pacific.

Overall DoD Force structure must lean toward increasing naval and air capabilities and rationalizing ground force capabilities outside of the Special Operations force structure. Ground domain forces must maintain a world class heavy and light force capability but also must embrace a sea-based basing and projection joint operational concept. There is room for both the Army and Marine Corps in this operational concept without pitting them against each other for budget and mission sets. The Army at one time had a strong maritime capability and heritage in the World War Two and immediate World War Two era, but has essentially departed this operational domain – they must re-establish a confidence in this operating space.

3.1 Diversifying the carrier fleet – re-introducing a new era of smaller carriers as a complement to the big sticks.

At one time America had a suite of carriers from CVEs to CVBs to CVANs. Now there's only the CVN. Although capable of generating incredible air sortie capability, the CVNs are few in number and will be highly targeted. The vision of the Lexington being abandoned during the battle of the Coral Sea is ominous and haunting. Resurrecting the small carrier concept will be an ideal way to increase and increase and disperse lethality among the fleet. A new era is at hand where the American fleet should have at a minimum 11 large decks and 14 smaller decks. There has been much study and review of this hi-lo mix of flattops[82] back to the 1970s – the time is now to return to a diversity of carriers.

Where will these smaller decks come from? We already have them – the America Class LHA. The America Class could be accelerated to deliver 14 hulls with LHA 10 and beyond being jumboized versions to approximately 55,000 tons with angled decks and perhaps even cats and traps. A third turbine should be added for redundancy and a little more speed of air over the flight deck. These enlarged America Class ships would be able to generate significant air sortie capability and influence over large swaths of ocean and littoral environment while also adding ASW capability and also Marine and Army landing teams for rapid and short term influence operations.

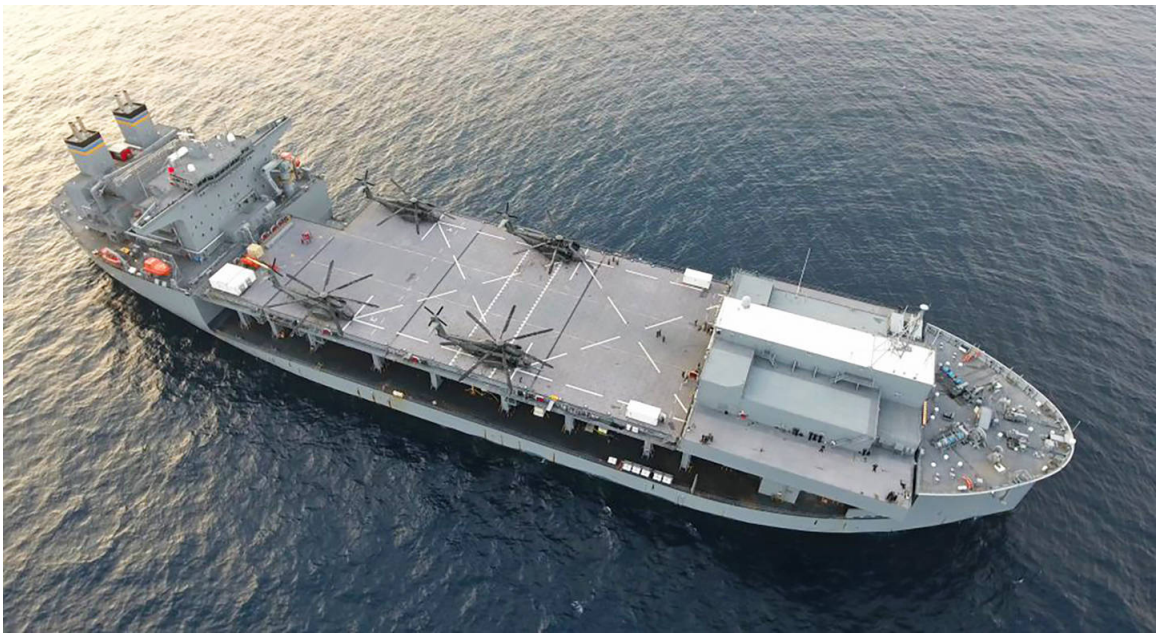
The Panamax width and mindset should be dispensed with and ample sponsons should be added like previous carrier conversions such as the Midway class. The extra tonnage can be devoted to expanded air capability like the original LHA 6 design was intended to deliver – but this time also keeping the well deck. The existing eight Wasp LHDs can become ideal foreign aid transfer ships to immediately bolster the capability of partner nations such as Canada, India, England, Japan, South Korea, Taiwan, and other strategic partners. They should be transferred now while they still have a significant amount of tread life left on them.

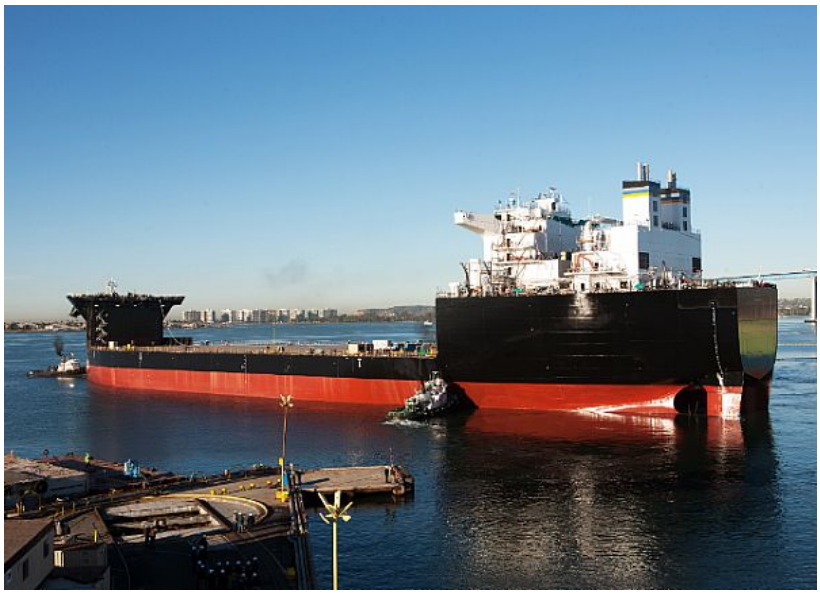
The basis for a new light/medium carrier – the America LHA[83]

3.2 More mobile bases and additional operational uses for the Expeditionary Mobile Bases and Transfer Docks. A quick way to project air, sea, and littoral influence.

These vessels show great potential for various mission sets. The current program is at five with two to be Transfer Docks and three to be Mobile Bases[84]. The program should be increased to 10 with six as Mobile Bases and four as docks. The vessels could be held as Ready Reserve Force vessels when not deployed to support declared mission sets. The Mobile Bases could be used in Flexible Deterrent Option efforts, such as acting as mobile ASW or special operation bases close by to contested littoral waters or in a close stand-off distance such as the Sulu Sea or off the north end of Luzon.

These mobile bases would provide dramatic increases in the presence of multiple capabilities and would help monitor the transit of PLAN SSBNs to deep water when acting as mobile ASW bases. They would need to be provided with basic passive sonar sensors equivalent to the Maritime Security Cutter of the Coast Guard[85], triple torpedo tubes with Mk54 Torpedoes, Sea Ram[86], and light cannon when conducting this role. Furthermore, built-in, angled, ramp/mini-well decks amid ship should be provided for rigid hull inflatable boat (RHIB) and small patrol boat operations. Cut outs for transport and deployment of causeways would allow the mobile base to deploy floating pier structures for support of combatants such as the LCS, submarines, or special operations craft.





Top: USNS Lewis B. Puller (T-ESB-3)
Bottom: USNS Montford Point (T-ESD-1)

The Mobile Bases would also make ideal patrol bases for the Littoral Combat Ships and the new Diesel Submarines described in this article. Additional uses would be as mobile Humanitarian Assistance and Disaster Relief facilities and focal points. Both vessel types, especially the Transfer Docks could be leased out for private sector activity including acting as feeder vessels in the expanding float on/float off heavy lift industry or supporting expanded civilian space launch capabilities. New Naval Reserve units could be created to operate these vessels in rotating shifts when they are generated and projected for use in forward areas. The extra transfer docks could also be placed in the RRF or shared in lease

arrangements with industry acting as FLO-FLO ships when not actively needed by the Navy Force Structure.

3.3 Getting the Littoral Combat Ship (LCS) program right.

After many successful frigate level programs, the tortured progress of the Navy's LCS program has been a real disappointment – a well-intended and novel ship design that in the end has limited capabilities and survivability and has been delivered well behind schedule[87,88]. The LCS is the modern naval equivalent of the M-10 Wolverine Tank Destroyer of World War II. The M-10 looked like a tank and was often pressed into service because it looked like a tank, but it was thinly armored and had weak armament, and was ferociously outclassed by the German tanks it faced[89]. Many American tankers died because of the ideology behind the tank destroyer concept. Let's hope the LCS doesn't become a modern equivalent.

It has been extremely painful to watch the slow-motion train wreck of the LCS effort. There are so many changes in this program it is hard to keep up, but it appears the current program of record has now been split at 32 basic ships of two designs and an additional 20 ships of a more robust design[90], but even the "robust design" is feeble. Although many ideas of the LCS employment concept are sound – the LCS is a far more appropriate partnership when dealing with many allied navies than a 10,000 ton Arleigh Burke Destroyer - but the LCS equivalent ships of most allied and potential threat navies are much more heavily armed.

It is unclear if some type of political correctness or lead in the water at the Navy Yard in Washington DC is driving the delivery of underperforming ships, but anyone with any nominal understanding of naval operations marvels at the lack of capability on these ships. The basic program of record should be rapidly modified to include 24 upgraded ships of the Flight "0" capability and then a new Flight "2", skipping the meagerly upgraded Flight "1" concept, to deliver 32 or more new ships beyond the Flight "0" ships. These Flight "2" ships need at a minimum a 16 cell Vertical Launch Capability for Evolved Sea Sparrow Missile[91] level air defense and stand-alone launchers for Harpoon missile level Anti-Surface Warfare capability. In addition, organic ASW sensoring, defensive, and offensive capability need to be added.

The ample flight decks on both versions of the LCS should be rewarded with three complete hangers to allow continuous operations of three complete airframes of the H-60/MQ-8C Firescout category if the mission requires the full air complement or if unencumbered with airframes this will provide additional enclosed space for other mission sets. An organic indirect fire capability with 120mm auto mortars would also provide devastating fire in support of Special Operation activities. The extra weight may cause reduced speed, but a drop from 40 knots to 32 knots is going to make marginal difference when faced with hostile high performance anti-ship capabilities. The extra capabilities will more than make up for this speed trade-off.

Once the Flight "2" level ships are established – the true vision and capability of the original LCS program can be finally realized. The Flight "0" ships can be re-purposed as Coast Guard vessels, Special Operation Support vessels, Naval Reserve Ships focusing on the Defense Support to Civil Authorities mission set, or Foreign Aid transfer opportunities.

3.4 A return to an (advanced) Diesel or Air Independent Submarine capability as a complement to the SSN fleet. The greatest opponent of this is not the PLAN – it's the US Navy nuclear submarine fleet community (which is incredibly successful) – but a return of diesel boats will be very complementary to the nuclear submarines and allow US to provide diesel submarines to strategic partners such as Taiwan, the Philippines, Vietnam, and others.

This is perhaps one of the more controversial proposals of this paper, and yes, I did actually say Diesel Submarines. A small number (perhaps 12 - 16) would provide incredible complementary capability to the existing nuclear attack submarine fleet. Although at first glance, this may seem to be counter-intuitive and aggressively opposed by advocates of the excellent and powerful nuclear attack submarine fleet of the American Navy, there are a number of existing and emerging mission sets that would be far more appropriate for a lower cost, lower capability advanced non-nuclear submarine class[92].

The logical starting point for such a submarine class already exists. It is the German 216 class [93]or the Japanese Soryu[94] Class. These designs could be purchased and then manufactured in the new public/private sector yard on the West Coast or East Coast. These new submarines would be ideal for the following purposes:

Protecting the approaches to the continental US from the elevated level of patrols by aggressive SSNs/SSGNs/SSBNs of the Russian and PLAN. This would free up American SSNs to project power deep into forward deep ocean areas. These new American SS's will provide a powerful ambush deterrent to such threat submarine forays into our immediate approaches.

Provide a domestic non-nuclear submarine production capacity to sell submarines to partners, parties, and countries friendly to the US. The US has made previous commitments to do such, but has no current capability and other US allies have been deterred from making such sales.

Provide surveillance and interdiction of suspicious vessels, covert Sea Launched Cruise Missile threats, and counter-narco sub efforts in the Homeland Defense mission set and support of the Homeland Security mission set. These submarines could also have full or partial Reserve crews to keep competency levels high in the Naval Reserve.

Projection of anti-submarine, surveillance, and special operations capabilities in forward littoral areas where a big SSN is not needed or not worth the risk.

New and advanced capabilities such as incorporation of anti-air, direct fire anti-surface, and special operations and surveillance features should be incorporated to make these new, relatively low cost, submarines a powerful and game changing addition to the American Fleet.

3.5 Additional ship types and transformative capabilities for incorporation into the fleet.

There are several additional capabilities to add to both the active fleet and the National Defense Reserve Fleet to ensure a re-capitalized naval force. This is not just a larger ship count, these are new

capabilities to provide strategic influence and strategic deterrence. The revitalized US Navy is the best way to provide this without establishing static, large forward operating bases.

San Antonio Class LPD – These large (25,000 DWT) amphibious transport docks are ideal platforms to be jumboized to 30 – 35,000 DWT to act as new command and control ships to replace the aging Mount Whitney and Blue Ridge. They could simultaneously serve as arsenal ships to support long range strike and anti-air/anti-ballistic missile defense missions. The two existing hospital ships in Navy service also are suffering from age and limited ability to conduct roll on-roll off or small vessel operations or even aviation operations in support of Humanitarian Assistance and Disaster Recovery operations. The new San Antonio hulls would also make ideal forward area support vessels for submarines or special operations in higher threat areas than the expeditionary base vessels. Five to eight additional jumboized San Antonio class hulls would re-capitalize and expand Navy capabilities for these mission sets.

DDG-1000 – The first ship, the USS Zumwalt is now at sea, but thought should be given to expanding the acquisition of this class beyond the original three to six to nine to provide additional long range fire capabilities in a stealth hull in forward operating areas. The specter of their presence would send ample strategic messaging of US capabilities and intent.

Cruiser based on the Arleigh Burke Destroyer – The very successful Arleigh Burke Cruiser could be expanded from 10,000 tons to 15,000 tons to re-constitute the capability of independent surface action groups for naval influence operations separate from the large or light carrier task forces. The Arleigh Burke Cruiser could have an expanded flight deck and hanger facilities to provide a more robust aviation capability of five to eight airframes to include perhaps F-35 and V-22 operations.

Advanced autonomous surface and sub-surface vessels for ASW dominance/deterrence – Although in development already, these vessels such as the surface Sea Hunter[95] and the sub-surface Echo Voyager[96] need to be rapidly accelerated. Each of these and related programs provide long range, long dwell capability to deal with surface and sub-surface threats without endangering ship and submarine crews. These are radical, game-changing capabilities that must receive hardened, reliable network connectivity to integrate them into complex naval operations in high threat areas.

Ocean Monitor – a forgotten party of Army and Navy history were the monitor programs of the late 1800s and early 1900s to provide immediate defense of high value harbors. A modern version of the monitor program would be large, stealth vessels based on very large barges (400 ft by 100 ft)[97]. These would be powered for station keeping and limited mobility, but for long range deployments and transits could be towed by LCS vessels of the active and reserve fleet. They could be autonomous and securely networked into the homeland defense and homeland security environments with anti-air, anti-ballistic missile defense, anti-surface, and anti-submarine capabilities to prevent strategic surprise and project strategic deterrence in the maritime approaches to the United States including the continental region as well as Alaska and Hawaii. Two to four of these loitering off the east and west coasts of the United States would provide a cost effective, long dwell loiter capability to provide surveillance and defensive capabilities forward of what can be projected now.

Barge mounted power plant systems on each coast for power in support of domestic recovery operations – Hurricane Sandy and previous experiences with Katrina and Rita demonstrated a need to have a mobile power generating capability on each coast. Using a system of barges for the holding of the Liquid Natural Gas, Propane, Diesel, or even nuclear (harkening back to the Army Nuclear Power Program[98]), power generating capabilities, transformers, cabling, fuel, and even limited fleets of rolling stock for recovery and humanitarian assistance, a complete set could be maintained in a warm status on each coast (perhaps the James River in Virginia and the San Francisco Bay Area in California). Fully assembled, each system could produce in the range of 200 megawatts of power or could be broken down to two to four individually deployable packages. It may be more appropriate to have these under Army management. These barge mounted systems would be maintained by Department of Defense but would be available for immediate deployment in Defense Support to Civil Authorities mission sets.

Two Large Recovery/Super Heavy Lift vessels/platforms – With the retirement of several key vessels, the Navy has lost the dedicated capability for submarine recovery. Two new vessels that could each conduct a complete lift of a Virginia class submarine and complex undersea recovery operations should be developed and maintained in a warm status or deployed in a public private partnership for large infrastructure construction, with a national security asterisk if they were needed on short notice. The lack of this national capability is startling and provides strategic re-assurance that capability does exist for full recovery of a distressed submarine. They could also provide startling new capabilities for national infrastructure projects such as tunnel and bridge construction.

Reconstitution of a robust forward area floating drydock capability – pioneered in extended naval operations during World War II operations in the Pacific, this capability has essentially disappeared from the Navy inventory. To provide a forward repair and alteration capability, a number of new floating drydocks should be built in the NSIOCC to ensure a healthy and robust capability exists in forward areas such as Guam. Additional sections and elements could be maintained in a warm status in the United States.

Re-capitalization of the RRF and Military Sealift Command Fleets – referenced several places in this paper (including Table 3 for the RRF) – these incredible national assets of approximately 150 – 200 support, logistics, and other vessels (combining the RRF and the Military Sealift Command (MSC) fleets) are in need of almost total re-capitalization. Although the RRF and much of the MSC fleet is relatively "low mileage", their age has degraded their capabilities, systems, and usefulness. A number of steam powered vessels are still in these inventories. It's time to conduct a twenty year plan to totally upgrade these magnificent fleets.

Rapid Development of an Anti-Submarine Warfare (ASW) Version of the MV-22 Osprey, the SV-22 – This aircraft introduces long range, high speed, and loiter capability beyond the very robust MH-60 helicopter fleet and in-between the P-8 Poseidon. The resurgence of the diesel submarine threat from peer and near-peer competitors, calls for a revitalized ASW force and the SV-22 would provide the ideal platform to prosecute these threats before they provide an immediate danger to friendly naval and maritime activity. The current program of record appears to be 48 for the Navy[99], and these may be dedicated to the carrier on board delivery role, but an SV-22 should be rushed to production to add ASW and Search and Rescue capabilities. Approximately 150 more

would provide robust mid-range ASW to the diverse carrier fleet, surface action groups, and other naval task forces. Additional procurement could also deliver air-to-air tanker variants to provide a re-constituted tanker capability not seen since the days of the KA-6D.

3.6 A return of a more visible DoD Presence in San Francisco and New York or other large urban areas to provide direct availability of resources for the Defense Support of Civil Authorities mission set.

DoD presence evaporated in these and other areas with the peace dividend of the 1990s. A naval based return of DoD to these two strategic areas would be a tangible commitment of DoD to the Homeland Defense mission. Moffett Field and Treasure Island California and a partially re-opened Floyd Bennett Field in New York City would provide basing for Active and Naval Reserve Helicopter Squadrons and Navy Reserve LCS and High Speed Vessels.

A reconstituted DoD presence in these areas would provide powerful naval presence and very robust Defense Support to Civilian Authorities capabilities in these large urban regions. Such a reconstitution would be tangible and specific additions to the resource pool for counter-terrorism or humanitarian assistance/disaster relief on each coast.

The Reagan Administration saw this foresight by expanding dispersion of naval basing for several strategic reasons during the 1980s. This was partially implemented before the collapse of the Soviet Union and the resulting Peace Dividend. Similar prescient thinking should be re-instituted to address these matters in the modern World in Chaos era.

The large and expanding Navy MH-60 helicopter force structure is very consolidated for economy reasons on each coast and these newly partially-reconstituted bases would provide additional dispersion of the force structure for security and forward deployment reasons. Their force structure would still be available for annual fleet deployment requirements planned by the Navy and Joint Staff.

4. Way ahead and summary

This article started out as a thought piece to discuss the radical transformation of the American naval instrument of national power. But quickly it became apparent that there were larger forces in play. The inter-connected world economy and environment is rapidly evolving. By identifying and connecting these economic, technology, and societal trends and forces, there is opportunity for new and re-launched American endeavors that can be viable and self-supporting without the initially helpful, but deadly long term scenario of massive and inefficient and innovation-killing government subsidies, regulation, and bureaucracy. The expanded posit to return America to its maritime heritage is not an attempt to reprise a mythical past, but a realistic opportunity to shape the future using a forgotten economic sector that offers great opportunity.

The formula for this endeavor will need the integration of several moving parts:

Legislation to address corporate taxation, incentivize innovation, and properly scope the role of the Federal Government in these and related matters to unleash American Corporations into the world market place.

Assemblage of public and private investment partners for a Public Private maritime construction and operation Corporation

Work with international classification societies, standards bodies, maritime insurers, and other groups to address the rise of innovations such as crew-less ships, complex and secure information technology networks, and international integration of supply chains similar to other markets

Statute based creation of a Public Private Corporation with maximum tax incentives and minimal government regulation

Site selection and strategic planning

Re-orientation of American diplomatic efforts

Re-capitalization of American naval structure and capabilities

Passionate implementation of this broad and grand vision by the Public Private Corporation

So let's free the capital, unleash the innovation, use government legislation to create the environment for economic transformation and not for punishment or corrosive protectionism, and return to an abandoned market segment with an Uber and Google algorithm swagger. Let's turn it upside down, then turn it right side up and revolutionize it. And let's put America back in the driver's seat (or back on the bridge) for ship construction, merchant vessel operation, and naval security.

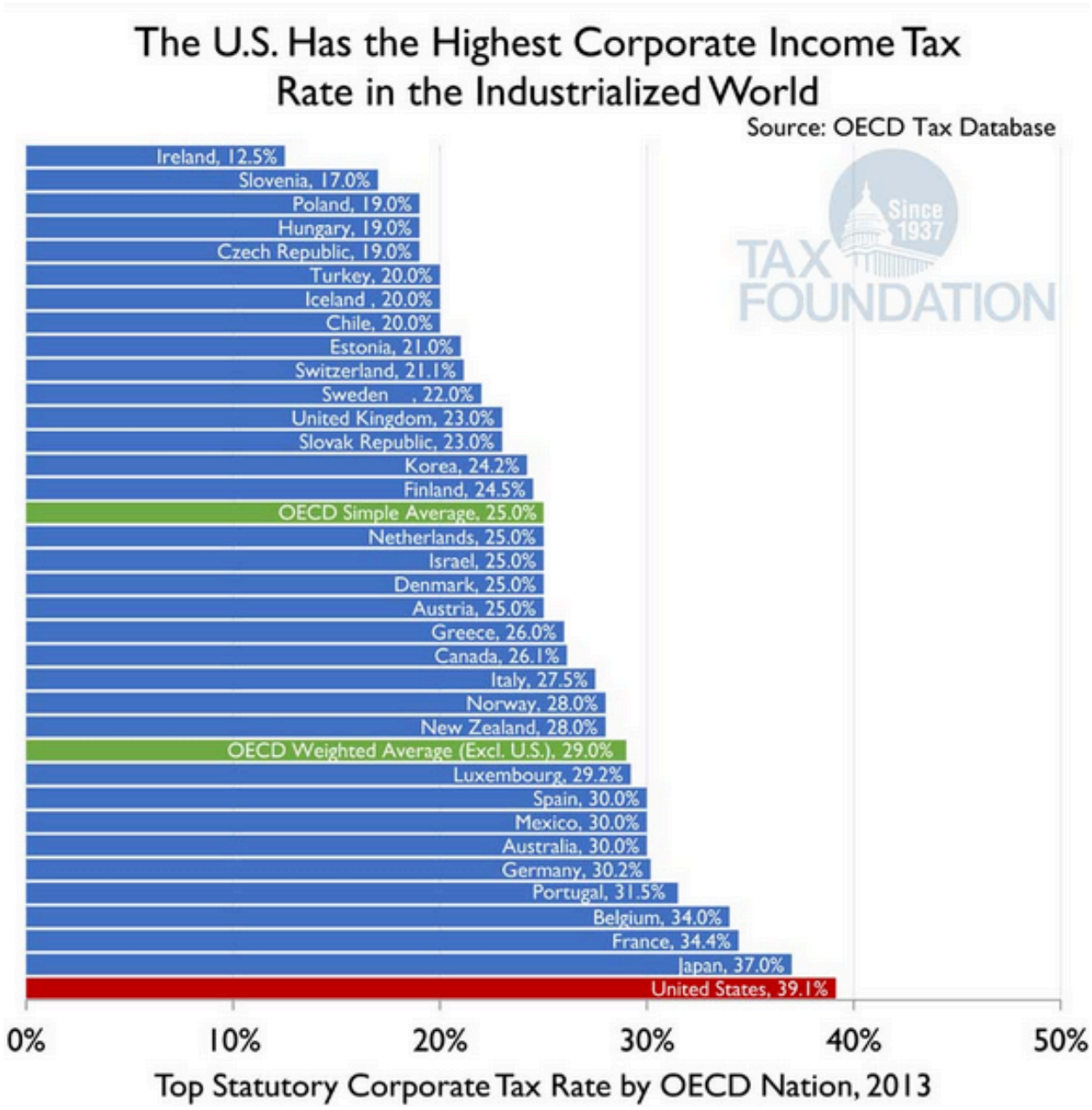
Supplemental Tables

1. **Rough Orders of Magnitude for Ship Production Prices**
2. **World Corporate Taxation**
3. **U.S.-flag Oceangoing privately-owned fleet**
4. **Ownership of world merchant fleet**
5. **RRF Fleet (Numbers and location)**
6. **Military Sealift Command Fleet**
7. **Model for cost sharing of new shipyards – establishing a Presidio like foundation**

1. Rough Orders of magnitude for Ship Production Prices

	Example	Source	Number of Ships or structures	Published Price (in Millions)	Buyer	Builder	Type	TEU	Dead Weight Ton (DWT)	Length (M)	Width (M)	Area (M2)	Passengers	Simple Price per Ship (in Millions	Simple Price for TEU	Simple Price per DWT	Simple Price, Passenger	Simple Price/Area (M2)
1	Matson orders two ships for Hawaii Trade	1	2	$511,000,000	Matson (US)	NASSCO (US)	Con-Ro	3,500	Unknown	265	35	9,275		$255,500,000	$73,000	N/A	N/A	$27,547
2	Wisdom Orders a Tanker	2	1	$100,000,000	Wisdom (TW)	JMU (JP)	Tanker	N/A	115,000	Unk	Unk	Unk		$100,000,000	N/A	$870	N/A	Unk
3	World's largest semi-submersible crane vessel	3	1	$1,000,000,000	Heerema (NL)	SCM (SG)	Semi-Submersible Crane Vessel	N/A	273,700	220	102	22,440		$1,000,000,000	N/A	$3,654	N/A	$44,563
4	Three Very Large Crude Carriers	4	3	$243,300,000	JX Ocean and Kyoei (JP)	JMU (JP)	VLCC	N/A	300,000	330	60	19,800		$81,100,000	N/A	$270	N/A	$4,096
5	Five large Container Vessels	5	5	$372,000,000	Hapag-Lloyd (GE)	Korean	Large Container Ships	10,500	Unknown	Unk	Unk	Unk		$74,400,000	$7,086	Unk	N/A	Unk
6	Cruise Vessel	6	1	$1,300,000,000	Royal Caribbean Harmony	STX (FR)	Large Cruise	N/A	227,625				5,400	$1,300,000,000	N/A	$5,711	$240,741	
7	Cruise Vessel	6	1	$950,000,000	Royal Caribbean Ovation	Meyer (GE)	Large Cruise	N/A	167,000				4,100	$950,000,000	N/A	$5,689	$231,707	
8	Cruise Vessel	6	1	$960,000,000	Dream Cruises Genting Dream	Meyer (GE)	Large Cruise	N/A	150,000				3,360	$960,000,000	N/A	$6,400	$285,714	
9	Cruise Vessel	6	1	$780,000,000	Carnival Vista	Fincantieri	Large Cruise	N/A	135,000				4,000	$780,000,000	N/A	$5,778	$195,000	
10	Cruise Vessel	6	1	$645,000,000	AIDA Cruises	Mitsubishi	Large Cruise	N/A	125,000				3,250	$645,000,000	N/A	$5,160	$198,462	
11	Very Large Container Ships	7	30	$15,000,000,000	Maersk	Varied	Very Large Container	14,000						$500,000,000	$35,714			
12	Very Large Container Ships	8	4	$620,000,000	Mitsui OSK	Samsung (SK)	Very Large Container	20,150	Unknown	400	58.5	23,400		$155,000,000	$7,692			$6,624
13	Three Very Large Crude Carriers	4	3	$243,300,000	JX Ocean and Kyoei (JP)	JMU (JP)	VLCC	N/A	300,000	330	60	19,800		$81,100,000	N/A	$270	N/A	$4,096

2. World Corporate Taxation



Source: http://taxfoundation.org/blog/us-has-highest-corporate-income-tax-rate-oecd

3. U.S.-flag Oceangoing Privately-Owned Fleet, Year-End 2010

Vessel Type	Ships	DWT
Jones Act	**97**	**5,136,250**
Dry Bulk	4	142,490
Containership	26	784,438
General Cargo	1	13,864
Roll-on/Roll-off	10	186,945
Tanker	56	4,008,513
Foreign Trade	**95**	**3,986,707**
Dry Bulk	9	438,337
Containership	51	2,661,281
General Cargo	4	78,951
Roll-on/Roll-off	27	633,041
Tanker	4	175,097
U.S. Flag	**192**	**9,122,957**
Dry Bulk	13	580,827
Containership	77	3,445,719
General Cargo	5	92,815
Roll-on/Roll-off	37	819,986
Tanker	60	4,183,610

https://view.officeapps.live.com/op/view.aspx?src=http%3A%2F%2Fwww.marad.dot.gov%2Fwp-content%2Fuploads%2Fxls%2Fus-flag_fleet_10000_dwt_and_above.xls

Vessels of 10,000 Dead Weight Ton and above (DWT = total long ton weight of the ship (including freight, fuel, and all stores) minus the dry weight of the vessel itself).

4. Ownership of world merchant fleet

Table 2.3. Ownership of the world fleet, as of 1 January 2015 (dwt)

Rank (dwt)	Country/territory of ownership	Number of vessels			Dead-weight tonnage				
		National flag	Foreign flag	Total	National flag	Foreign flag	Total	Foreign flag as a % of total	Total as a % of world
1	Greece	796	3 221	4 017	70 425 265	209 004 526	279 429 790	74.80%	16.11%
2	Japan	769	3 217	3 986	19 497 605	211 177 574	230 675 179	91.55%	13.30%
3	China	2 970	1 996	4 966	73 810 769	83 746 441	157 557 210	53.15%	9.08%
4	Germany	283	3 249	3 532	12 543 258	109 492 374	122 035 632	89.72%	7.04%
5	Singapore	1 336	1 020	2 356	48 983 688	35 038 564	84 022 252	41.70%	4.84%
6	Republic of Korea	775	843	1 618	16 032 807	64 148 678	80 181 485	80.00%	4.62%
7	Hong Kong, China	727	531	1 258	56 122 972	19 198 299	75 321 271	25.49%	4.34%
8	United States	789	1 183	1 972	8 731 781	51 531 743	60 263 524	85.51%	3.47%
9	United Kingdom	477	750	1 227	12 477 513	35 904 386	48 381 899	74.21%	2.79%
10	Norway	848	1 009	1 857	17 066 669	29 303 873	46 370 542	63.20%	2.67%
11	Taiwan Province of China	117	752	869	4 681 240	40 833 077	45 514 317	89.71%	2.62%
12	Bermuda	5	317	322	289 818	41 932 611	42 222 429	99.31%	2.43%
13	Denmark	392	538	930	15 286 153	20 893 511	36 179 664	57.75%	2.09%
14	Turkey	576	954	1 530	8 321 506	19 366 264	27 687 770	69.95%	1.60%
15	Monaco		260	260		23 929 323	23 929 323	100.00%	1.38%
16	Italy	596	207	803	15 961 983	6 040 199	22 002 182	27.45%	1.27%
17	India	697	147	844	14 546 706	7 268 449	21 815 155	33.32%	1.26%
18	Brazil	228	163	391	3 150 493	17 308 798	20 459 291	84.60%	1.18%
19	Belgium	87	156	243	7 302 545	12 787 196	20 089 741	63.65%	1.16%
20	Russian Federation	1 291	448	1 739	5 920 435	12 403 644	18 324 079	67.69%	1.06%

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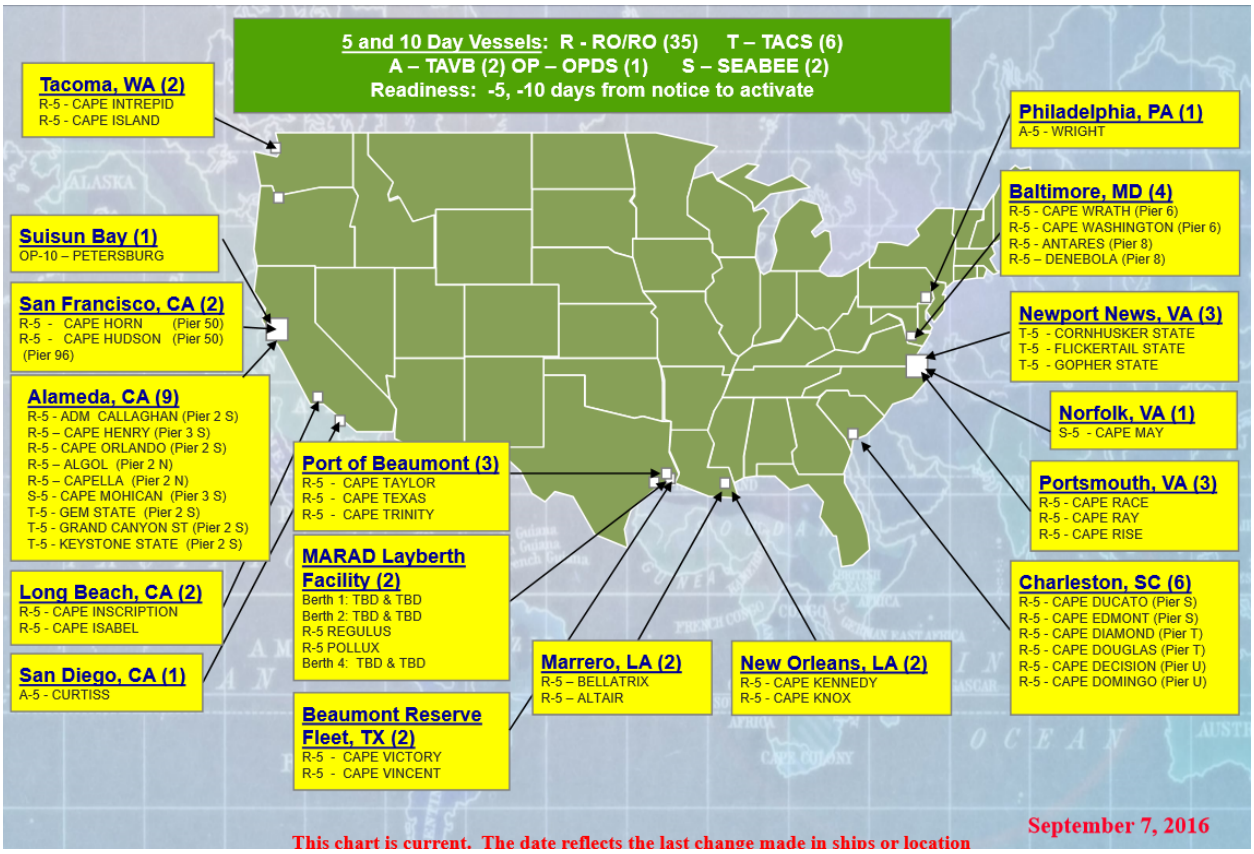
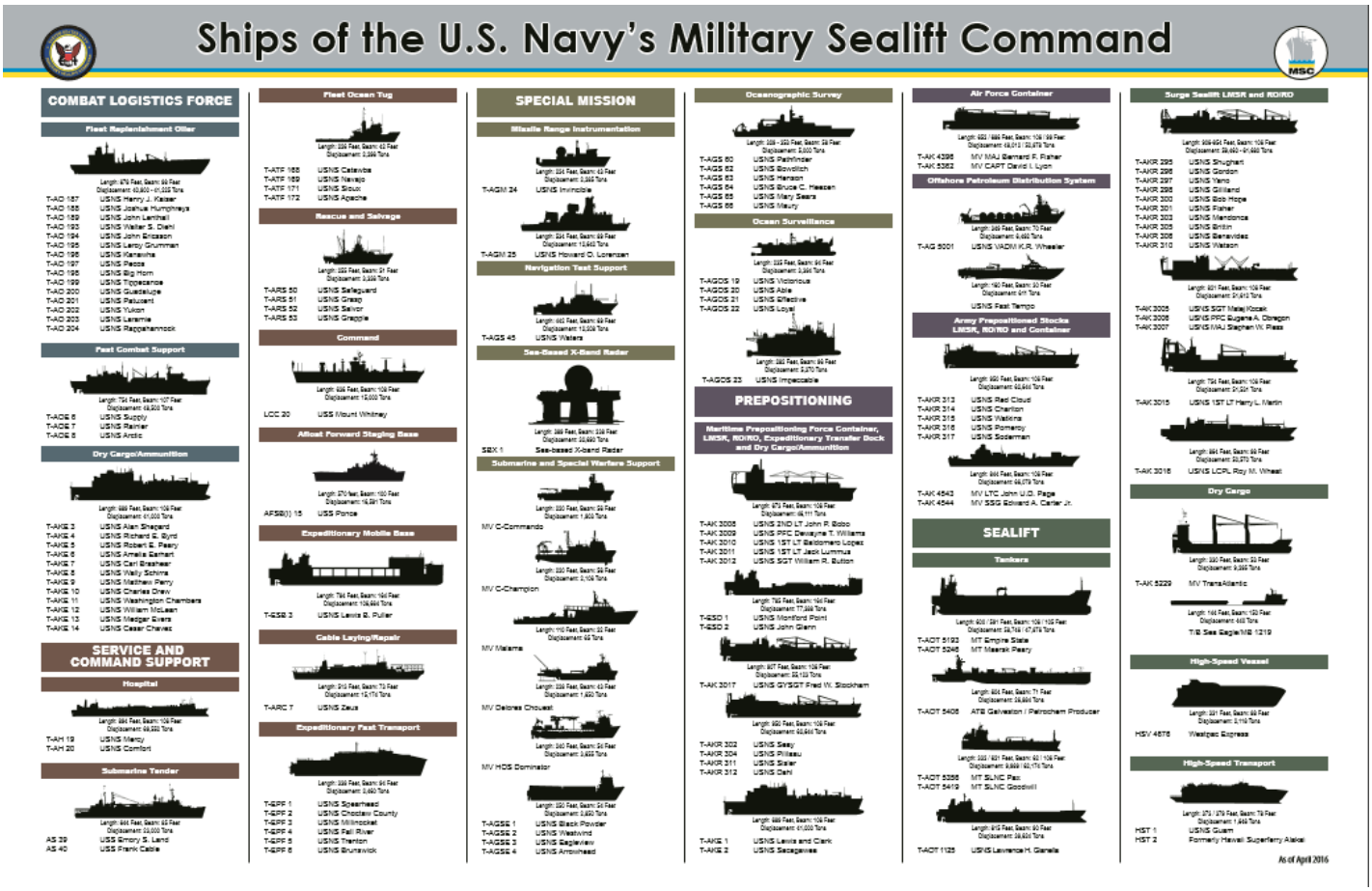
5. RRF Fleet (Numbers and location)



6. Military Sealift Command Fleet



7. Model for cost sharing of new shipyards – establishing a Presidio like foundation

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related to product type
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