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America's competitors dominate maritime key terrain through calculated use of robust operations below the level of armed conflict. Adversarial forces recognize and monitor key terrestrial and maritime terrain denying friendly forces the typical operational flexibility traditionally possessed by an actor in the offensive and jeopardizing the resiliency of friendly forces. In order to maintain a high state of vigilance and control, adversarial forces must constantly and accurately discriminate vessel intentions in the world's most congested maritime and aviation environments providing friendly forces with opportunities to exploit gaps in time, space, knowledge, and access provided by allies and partners.

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TITLE:
Enabling Contact Layer Resiliency Through Complexity & Ambiguity

SUBMITTED IN PARTIAL FULFILLMENT
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Executive Summary

Title: *Enabling Contact Layer Resiliency Through Complexity & Ambiguity*

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Thesis: Creating an asymmetric cost imposition strategy by operating from civilian craft modified for military use in a complex environment will increase resiliency of Marine forces. By overwhelming an adversary's ability to sift information from noise will prove successful enough to provide friendly forces a window to create a lodgment and/or activate/deactivate existing expeditionary advanced bases during the contact phase.

Discussion: America's competitors maintain Anti-Access/Area Denial (A2/AD) environments in differing regions by dominating maritime key terrain through calculated use of robust civil maritime militia or other operations below the level of armed conflict. Adversarial forces recognize and monitor key terrestrial and maritime terrain denying friendly forces the typical operational flexibility traditionally possessed by an actor in the offensive. In order to maintain a high state of vigilance and control, adversarial forces must constantly and accurately discriminate between friendly, enemy, and benign vessels in the world's most congested maritime and aviation environments providing friendly forces with opportunities to exploit gaps in time, space, knowledge, and access provided by allies and partners as outlined in the 2018 National Defense Strategy.

Conclusion: The concept of utilizing commercial maritime vessels coupled with advanced optimization techniques and artificial intelligence to increase domain complexity to the point of adversarial paralysis should be adopted and war gamed as a means to increase force resiliency. Regions like the eastern Indian Ocean, where opportunities exist to create asymmetric advantages, should be included as likely future competitive operating environments.

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INTRODUCTION

America's competitors maintain Anti-Access/Area Denial (A2/AD) environments in differing regions by dominating maritime key terrain including the first island chain, the Gulf of Finland, and the Strait of Hormuz through calculated use of robust civil maritime militia or other operations below the level of armed conflict. As outlined by both Andrew Krepinevich and Michael O'Hanlon in their separate but similarly striking descriptions of near-peer conflict with China and Russia: enemy forces recognize and monitor key terrestrial and maritime terrain denying friendly forces the typical operational flexibility traditionally possessed by an actor in the offensive.[1] In order to maintain a high state of vigilance and control, adversarial forces must constantly and accurately discriminate between friendly, enemy, and benign vessels in the world's most congested maritime and aviation environments. This target prosecution provides friendly forces with opportunities to exploit gaps in time, space, knowledge, and access as outlined in the 2018 National Defense Strategy.[2] Creating an asymmetric cost imposition strategy by operating from civilian craft modified for military use in a complex environment will increase force survivability. By overwhelming an adversary's ability to sift information from noise will prove successful enough to provide friendly forces a window to create a lodgment and/or activate/deactivate existing expeditionary advanced bases during the contact phase. The current state can be distilled into three imbalances acting in the adversary's favor: cost, access, and cognition/tempo.

In order to thrive in this congested tripartite environment, one must master the art of survivability. Foremost, the concept presented here posits a shift in the taxonomy of what the Marine Corps is defining in the MOC when it refers to "survivability" in the face of renewed peer conflict. Broadly defined survivability includes four elements:

- Detectability: the ability to *avoid* being aurally and visually detected as well as detected by radar (by an observer)
- Susceptibility: the ability to *avoid* being hit (by a weapon)
- Vulnerability: the ability to *withstand* the hit.
- Recoverability: longer-term post-hit effects, *capability restoration*

MILITARY PROBLEM

The Marine Operating Concept (MOC) and Future Operating Environment (FOE) specifically call attention to the task of survivability in a "Battle of Signatures" as a key driver of change in how we organize, train, and equip the Marine Corps to execute its assigned functions, roles, and responsibilities. Simply put "tomorrow's fights will involve conditions in which *to be detected is to be targeted is to be killed*… our units will need to adapt how they fight, emphasizing emissions control and other means of signature management to increase their survivability."[3]

While the Marine Corps is dedicating much thought, discussion, and funding to the electromagnetic implications of survivability; the hardening of networks, redundancy, shielding, disaggregation of communication nodes, much less emphasis has been placed on the physical survivability of the force through the use of movement/maneuver, concealment, camouflage, or deception.[4] Highlighting the need for a renaissance in the nuanced aspects of survivability for today's fight let alone tomorrow's; as Col. George Schreffler III, former Commander of Special Purpose Marine Air-Ground Task Force-Crisis Response deployed to Iraq and Syria from April to December 2018 stated, "We have to continue to train to minimize our signatures, both from an electromagnetic perspective, and from the physical, visual and audible observation perspective.

Camouflage and cover and concealment matter, and when any adversary is looking at you with their own small unmanned aerial systems, or their aircraft ... your Marines have to be good at skills Marines always have to be good at."[5]

Furthermore, there is little to no consensus on what element of the Marine Air-Ground Task Force (MAGTF) should command and control this function only that "it" must occur: at all echelons, continuously in all phases, throughout the entirety of an area of operations, and in all spectrums/domains to be effective. Survivability outside of the electromagnetic spectrum has not been addressed in a holistic manner in either the Academic Year 2019 (AY19) "Fight Club" or "Gray Scholars" wargames despite opponent forces specific targeting of known gaps (massing of logistics, command & control sites, lodgments, vulnerable lines of communication).[6]

The task to maintain survivability is threat, theater, and domain agnostic and cross-cuts the Maneuver, Fires, Sustainment, and Force Protection Warfighting Functions.[7] Per Joint Publication 3-34 *Joint Engineer Operations* the Engineer (both combat and general engineering) community is responsible for friendly force survivability as one of its three primary missions, the other two being friendly force mobility and enemy counter-mobility.[8] JP 3-34 further defines *survivability* as "all aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy."[9] The Army and Marine Corps expand on the joint definition of *survivability* as a quality or capability of military forces which permits them (friendly units) to avoid or withstand hostile actions or environmental conditions while retaining the ability to fulfill their primary mission.[10] Although units conduct survivability operations within capability limits, engineers have a broad range of diverse capabilities that can enhance survivability. Engineer tasks in support of survivability operations include tasks to build, repair, or maintain fighting and protective positions and harden, conceal, or camouflage roads, bridges, airfields,

and other structures and facilities. These tasks tend to be equipment intensive and may require the use of equipment timelines to optimize the use of low-density, critical equipment. Historically, the notion of survivability has been focused on the previously mentioned hardening of structures to provide resiliency in the face of kinetic attack. However, as the MOC states the idea of survivability must be expanded to include all signature management.

Uncovered by the MOC/FOE and further illuminated through wargaming are four primary questions related to survivability:

1. What element and/or Major Subordinate Command (MSC) within the MAGTF is responsible for holistic (physical and electromagnetic) survivability?

2. How does the MAGTF create and maintain a survivable force and what are the tenets that underlie what the MAGTF understands survivability in the FOE to be?

3. How does the MAGTF gain resiliency through the interweaving of maneuver/mobility with concealment/camouflage (physical and electromagnetic) and deception to not just survive but thrive in the future operating environment with enough to mass to decisively strike the enemy where he is most vulnerable?

4. Quantitatively, where do the capabilities/force structure outlined in the MOC fall along a survivorship curve plotted in conjunction with operational phases in the FOE? What changes (technologically, doctrinally, structurally, etc) are required to increase survivability in certain phases when viewed through the

> lens of the FOE and what venues exist for the MAGTF to demonstrate any changes made are having the desired outcome/effect?[11]

These questions are too far afield to be addressed here but would ideally be factored into Phase 4 "Solutions Analysis" (specifically the Doctrine, Organization, Training, Materiel, Leadership/Education, Personnel, Facilities, Cost - DOTMLPF-C portion) within the Marine Corps Capabilities Based Assessment produced by Marine Corps Combat Development Command (MCCDC).

Foremost, this concept posits a shift in the taxonomy of what the Marine Corps is defining in the MOC when it refers to "survivability". Broadly defined survivability includes four elements:

- Detectability: the ability to *avoid* being aurally and visually detected as well as detected by radar (by an observer)
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Wherein the MOC uses "survivability" to describe the ability of discrete future forces to remain viable in a contested environment what should be described is the ability of the mission to endure the loss of multiple force elements while remaining accomplishable regardless of what degraded assets remain; resiliency. Table 1 illustrates a systems perspective of survivability and resiliency.[12]

Systems Perspective of Survivability & Resiliency

Survivability drives	Resiliency drives
• hardening (lifetime & prompt dose) • maneuverability • active defense • passive defense • cyber hardening/resistance • tolerance to disruption and destructive attacks	• disaggregated systems • affordability to allow sparing and system redundancy (proliferation) • interoperability with other missions/systems (diversity) • responsive/rapid turn-around times • density of the constellation of systems (capacity) • rapid technology insertion • reconstitution

Table 1

This is the ability of augmented systems with possibly degraded capacities to accomplish the original mission-set while absorbing and adapting to force losses in order to generate novel capabilities from systems not originally tasked as the main effort. Survivability, therefore, is a subset of resiliency. An example of this are the World War II airborne assaults conducted in support of Operations HUSKY in Sicily, MARKET GARDEN in the Netherlands, and OVERLORD in France. The assault force was disaggregated and degraded but still able to flexibly mass novel capability, in most cases comprised of elements not initially slated as the main effort, where needed based on the assigned mission.[13] The essence of expeditionary forces is their resiliency, the ability to situationally adapt the forces and material at hand and create a self-contained element able to accomplish a given mission set.

In order to ensure true multi-domain survivability/resiliency the issue must be addressed holistically. In the context of the FOE survivability cannot be shouldered by the engineer alone. Either a shift in engineer mission set, enhanced engineer training in the subject, and/or augmentation of the field by experts in intelligence/deception and the electromagnetic spectrum must be incorporated. In a "battle of signatures" deception should be at the heart of any

survivable/resilient strategy. Deception, in all forms must be factored into the campaign from the onset and planned for as vigorously as authentic operations. Similar to the way in which fires/effects are orchestrated in a coherent manner regardless of domain or phase, so too the management of deception, signatures, and targetability of the friendly force should not be relegated to the afterthought of planners but to a dedicated entity that synchronizes all efforts to that end. Currently, the capabilities required for survivability/resiliency are distributed across different elements of the MAGTF. Comprised of experts from the engineering, communications, intelligence, and information disciplines, this element should be a coherent enterprise responsible to the commander for ensuring gaps in survivability do not exist and efforts at the tactical, operational, and strategic levels are complementary and reinforcing. The remainder of this work details the idea of leveraging ambiguity in a contested environment, such as the Indian Ocean, to create an asymmetric cost imposition by exploiting "noise" in complex settings thereby increasing survivability and resiliency.

Operating Environment

Adversary economies are heavily dependent on the continued and uninterrupted flow of global maritime trade, case in point 33% of global trade transits the South China Sea (SCS)[14] and 7% transits the Baltic Sea as underlined in "red" in *fig. 1*.[15] The majority of this trade is handled by ships suitable for militarization (*fig. 2*) and flagged (*fig. 3*), built (*fig. 4*) and operated (*fig. 5*) by American allies and partners. Furthermore, the United States Coast Guard (USCG) maintains a worldwide presence (*fig. 6*) and can be leveraged further in regards to platforms from which to operate and access to friendly ports, vessels, and institutions.[16] Manipulation of maritime and aviation transponder frequencies and data can inject uncertainty into adversary detection

systems, leading systems are controlled by American, allied, or partner firms.[17] While these deceptive techniques skirt the border of acceptable practices they do not run afoul of the Law of War if executed in Phase 0 or I as detailed later. As such, friendly national assets should exploit the abundance of actors in these areas.

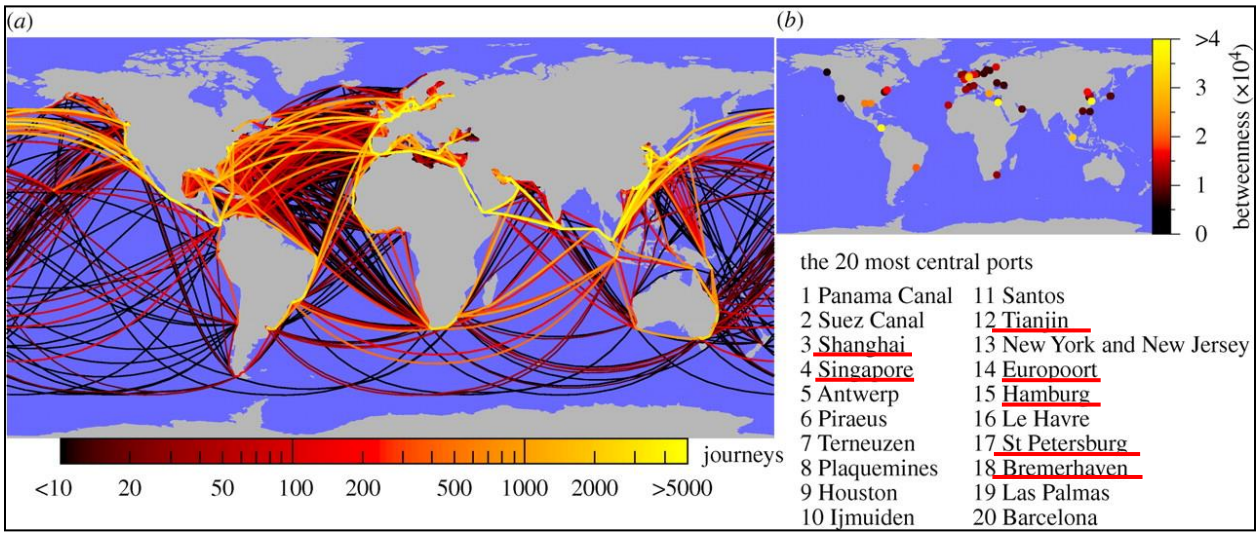

Figure 1

Routes, ports and betweenness centralities in the Global Cargo Ship Network (GCSN). (a) The trajectories of all cargo ships bigger than 10 000 GT. The color scale indicates the number of journeys along each route. Ships are assumed to travel along the shortest (geodesic) paths on water. (b) A map of the 50 ports of highest betweenness centrality and a ranked list of the 20 most central ports. Source: http://rsif.royalsocietypublishing.org/content/7/48/1093

Global Shipbuilding by Type/Gross Ton

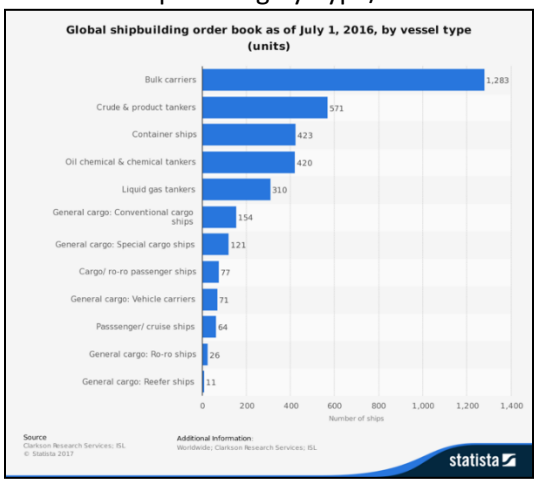

Figure 2

Source: statista.com/global shipping

Global Ship Flagging by Country/gt

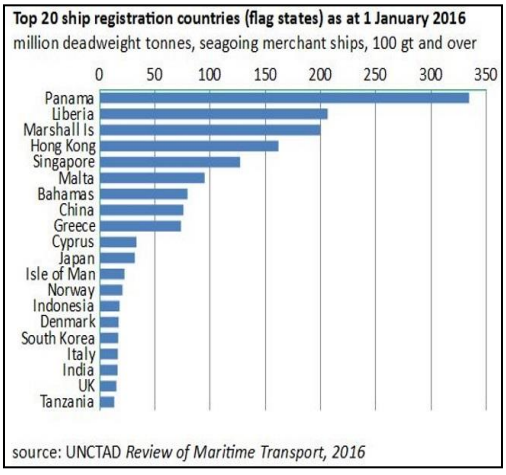

Figure 3

Source: https://unctad.org/en/Pages/Home.asp

Global Shipbuilding by Country/gt

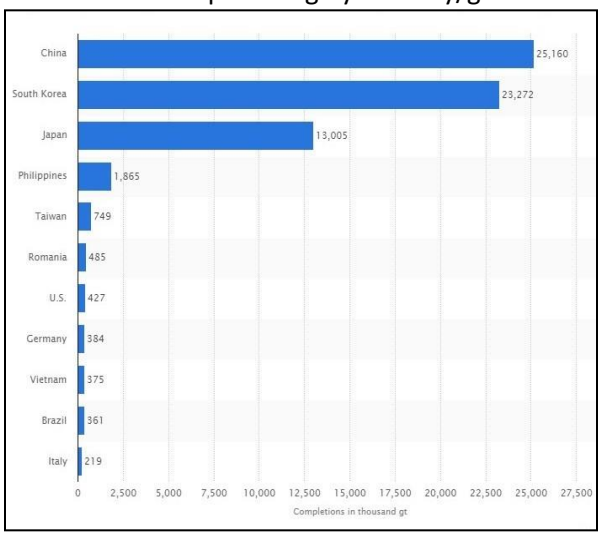

Figure 4

Source: statista.com/globalshipping

Container Fleets by Country/gt

Figure 5

Source: statista.com/globalshipping

U.S. Coast Guard Global Laydown

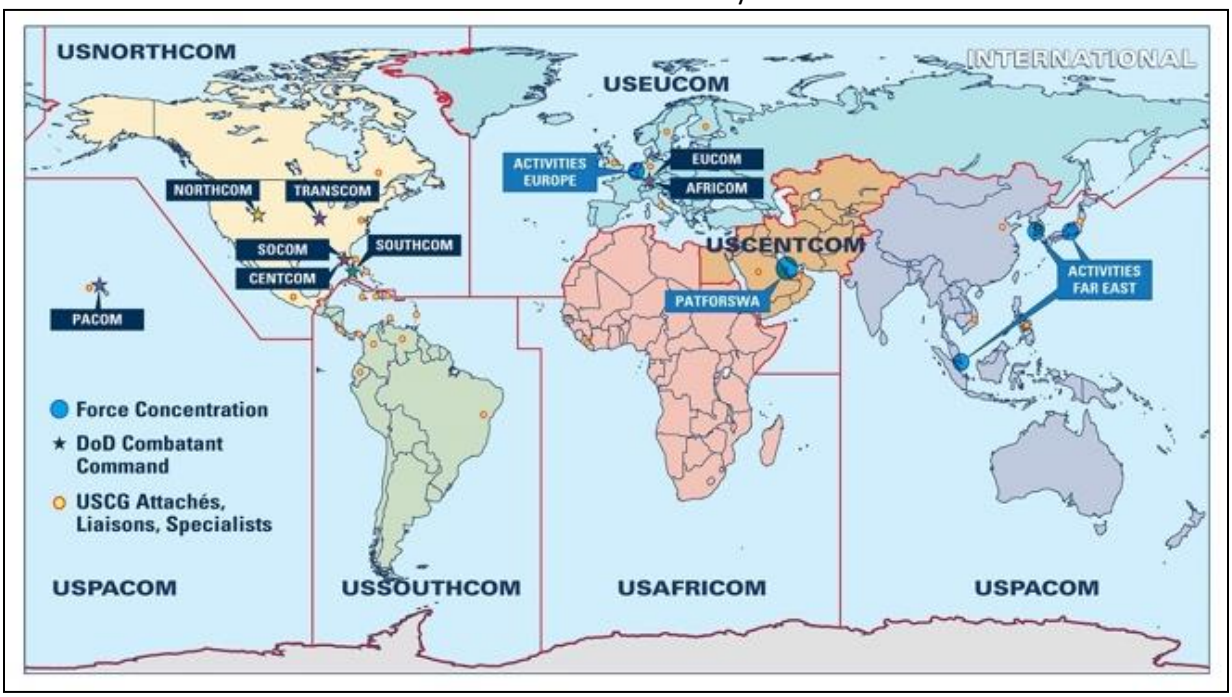

Figure 6

Source: https://www.uscg.mil/Portals/0/Brading/Laydown-INTL.jpg?ver=2018-06-14-115020-440

Specifically, use of deception in the eastern Indian Ocean Theater (eIOT), which serves as the gateway to the South China Sea, should be considered a strategic imperative. Within the eIOT Marine forces can provide employment options shy of armed conflict and outside threat weapon employment zones to hold adversary critical vulnerabilities at risk while maintaining the ability to contribute to a kinetic fight should events escalate. The concept overview is centered along the idea of strategic micro actions in which tactical assets hold strategically vital lines of communication at risk while remaining survivable through the use of optimization techniques; instituting cost imposition through creating and hiding in complex environments. A similar strategy can be employed in the western IOT (wIOT) to threaten adversary assets on the African continent. While the wIOT concept was explored as a minority report it requires further development.

The current state can be distilled into three imbalances acting in the adversary's favor: Cost, Access, and Cognition/Tempo.

Cost is defined as low barrier of entry for the adversary in terms of operating in the IOT. Adversarial parties have nascent footholds in the region but only on the periphery. With the relatively advanced presence of the Indian Tri-Service Command at Port Blair in the Andaman & Nicobar (A & N) Islands an opportunity exists to leverage existing capability and capacity, any form of engagement would be seen as contesting the adversarial, in this case Chinese, steady state and injects a new level of complexity outside of the existing SCS weapons engagement zone.

Access to key terrain is vital to the idea of asymmetric cost imposition. Contested hegemony is the current state of play, adversarial actions seek to delegitimize the economic and sovereignty claims of local states. Local actors beholden to the rule of law can address and adjudicate outstanding boundary disputes thus reducing the available contentious space in which

the adversaries find purchase. Emboldening local responsible parties to act in accordance with, and enforce, binding diplomatic resolutions frees American elements to selectively engage with intransigent states requiring a more robust presence.

Engagement in the eIOT is set-piece, spasmodic, and telegraphed. The emerging concept of Dynamic Force Employment coupled with deliberate use of deception ensures tempo control remains with friendly forces. The end state is to force adversarial Great Power elements (military and pseudo-military) to prosecute every perceived contact thus expending resources, conditioning them to American presence, and remaining at an unsustainable level of alert while allowing friendly forces to apply assets in a fluid, unforeseeable manner. Tempo control creates the opportunity to force malign actors to improvise; a friction inducing state in which they do not excel but in which practitioners of maneuver warfare are innately comfortable.

While ultimately a mission for the Joint Force, in concert with other instruments of U.S. power, the Marine Corps can provide added depth to "Contact Layer" forces capable of achieving multi-domain situational awareness and the ability to selectively engage to shape Chinese behavior, while setting conditions for follow-on actions.

Due to the distances involved and the scarcity of terrestrial features, persistent maritime multi-domain awareness is critical to maintaining friendly control of the eIOT. Capabilities including long-endurance unmanned aerial and submersible systems with sensor packages proficient at sorting and analyzing targets in the most congested maritime ecosystem will be key to understanding the operating environment. These sensor packages should be dual-use, contributing to a maritime/aviation common operating safety picture while maintaining the ability to pass engagement quality cueing tracks during times of conflict.

Key terrain in the eIOT includes the Indian Andaman & Nicobar Islands and the Australian Keeling & Christmas (K & C) Islands. The A & N control access to the Strait of Malacca while K & C overlook the Lombok and Sunda Straits. These terrestrial features, corresponding maritime chokepoints, and associated distances are illustrated below in *figure 7.*

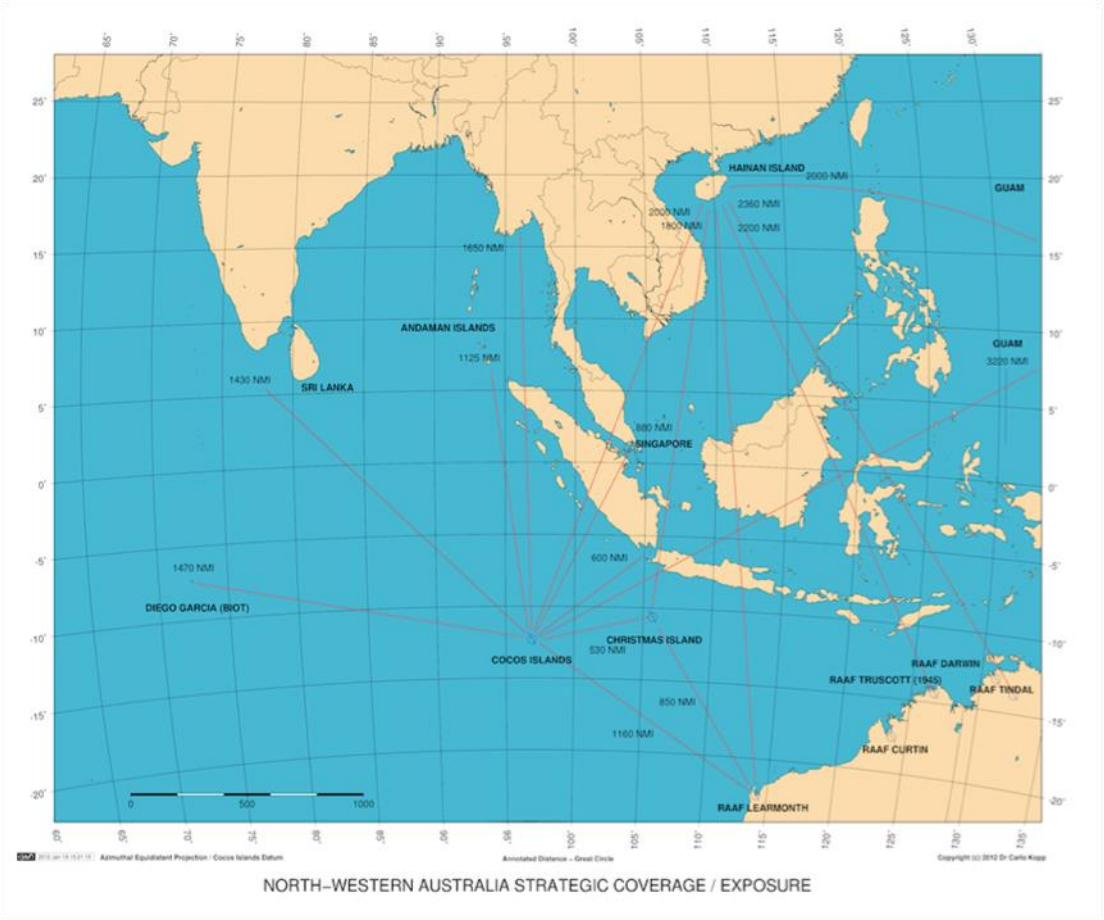

Figure 7

Source: https://www.ausairpower.net/PDF-A/DT-Cocos-Christmas-Mar-2012.pdf

These three straits, Malacca, Sunda, and Lombok, account for the bulk of maritime trade entering the South China Sea (SCS) and the primary transit points for exiting People's Liberation Army-Navy craft. Linking this key terrain with the existing facilities aboard Diego Garcia provides a "hub and spoke" overlay for pulsing aforementioned employment options to complement and amplify the inside force strategy in the South China Sea. This presents a

horizontal escalation akin to resting a finger on the carotid artery of Chinese sea lines of communication.

Under this construct of a reimagined survivability concept, Marine forces would provide flexible response and employment options through persistent access to, and presence in, complex regions like the eastern Indian Ocean Theater. Survivability in the blunt layer can be viewed in the non-standard context of gaining and maintaining U.S. initiative; increasing competition costs for China while decreasing costs for the U.S. and regional allies and partners; creating and strengthening regional partnerships; enforcing freedom of navigation and the international Law of the Sea; and maintaining competition with China below the level of armed conflict while creating cost, positional access, and temporal/cognitive advantage in the event of escalation.

Friendly engagement and posturing in the eIOT presents Chinese leadership with horizontal escalation based on the principle of an asymmetric cost imposition. Establishing even the smallest presence in the eIOT will provoke an unsustainable PRC response in the region drawing resources and attention from Contact Layer inside forces arrayed within the South China Sea furthering their ability to survive as conflict escalates. Future investments should be directed toward establishing a multi-tiered contact layer for the Joint Force in the eastern Indian Ocean, focused on imposing costs on the Chinese while reducing the cost for U.S. competition.

Historic Exemplars

Within regions like the eIOT, opportunities exist to create asymmetric advantage through the manipulation of the commercial environment and force a cost imposing strategy on adversary actions. While this is only short paraphrasing of the cases it provides examples from the

historical record, shy of large-scale conventional war, to illustrate elements of the survivability/resiliency concept discussed thus far and applicability in the contact layer.

Operations PRIME CHANCE (Tanker War, 1987-1989) & SEAFLOAT/SEALORDS (Vietnam War, 1968-1971) illustrate historical examples in which the United States has weaponized civilian craft.[18] During Operation PRIME CHANCE the use of modified, leased, commercial barges for littoral operations including helicopter basing, fire support, and sea control provided the Combatant Commander with operational flexibility and ambiguity not available from traditional naval shipping and was the early validation of the sea-basing concept.[19] The Vietnam era SEAFLOAT program utilized Mobile Advanced Tactical Support Bases (MATSB) as hub-and-spoke platforms for maritime interdiction using special operations, coast guard, and riverine units.[20] These MATSBs were constructed out of barges and riverine craft and acted as a floating mobile guard posts able to project combat power, logistics, command & control, and aviation sorties into some of the most restricted terrain in Vietnam.

The penultimate example of civilian craft used for military ends is that of the U.K. Falklands Campaign of 1982. The British use of Ships Taken up from Trade (STUFT), modified civilian vessels to provide power projection capabilities including use of short take-off/vertical landing (STOVL) aircraft while still adhering to international maritime law and the law of armed conflict at sea. A specific example is that of the container ship *SS Atlantic Causeway* which was a modified roll-on/roll-off container ship operated by Cunard which was modified to be a helicopter landing ship, executing 4,000 helicopter landings, 500 helicopter refuels, and costing less than $2M to refit for military use.[21] A further in-depth analysis of this conflict provides a recent case study of nascent A2/AD capabilities employed by a second-rate military against a declining world power.

An oft overlooked example is that of South/Central American narcotics smugglers (NARCOs) in their battle against the U.S. Drug Enforcement Agency, Coast Guard, and local governments. In essence, NARCO entities are surviving and thriving in an active A2/AD environment as they co-opt regional powers, navigate transnational logistics challenges, and innovate operational models in order to remain competitive.[22] As such, NARCO entities are able to iterate quicker than adversary defensive measures by activating/deactivating supply lines, communication systems, and alliance networks. In addition, elements and lessons learned from the following operations and concepts can be applied to this problem set.

Another underutilized but highly ubiquitous structure for military use is that of Offshore Platforms, specifically petroleum rigs.[23] Use of petroleum platforms and rigs to conduct anti-submarine warfare, maritime surveillance, and interdiction/sensing operations in sea lines of communication as was accomplished by the USCG during Operation Iraqi Freedom-I when Port Security Units seized the oil platforms of Khor al-Amaya Oil Terminal and Mina al Bakr Oil Terminal creating garrisoned platforms used to monitor area shipping and insurgent activity.[24] Similarly, adversaries have co-opted civilian structures for pseudo-military applications. China's continued creation of artificial islands through the use of dredging and reinforcement of offshore shoals and reefs in international waters as "aids maritime navigation and safety" is an exemplar of this strategy.[25]

These historic vignettes illustrate analog use of the survivability/resiliency concept detailed in this work. To fully apply these lessons learned to the modern operating environment practitioners should lean upon the temporal advantage provided by artificial intelligence and advanced quantitative complexity optimization techniques for sensing the environment and alerting friendly forces when and where to exploit adversary gaps and seams.

Complexity Optimization

Operating in an environment like the eIOT, with such an array of complexity and multitude of actors provides friendly forces with an opportunity to employ a novel means of survivability; increasing the level of complexity and requiring ever greater adversary resources to understand the true nature of the environment. A way to undertake this is through the use of advanced optimization techniques which cycle at superhuman speeds and provide friendly decision makers with optimal windows for injecting capabilities into the environment. Existing artificial intelligence (AI) and machine learning (ML) coupled with open source social and private network data streams such as Facebook, Instagram, judicial, business and maritime data can dynamically recommend operationally relevant locations, times, formations, and risk of use when employing ambiguity in an environment as described. This is akin to network mapping operations seen in various contingencies worldwide.[26] Swarming communication relay drones provide an additional layer of deception and allow for further amplification of cost imposition when routed via AI enabled "multiple Traveling Salesman Problem (mTSP) solutions.

> The Multiple Traveling Salesman Problem (mTSP) is a generalization of the Traveling Salesman Problem (TSP) in which more than one salesman is allowed. Given a set of cities, one depot (where mm salesmen are located), and a cost metric, the objective of the mTSP is to determine a set of routes for mm salesmen so as to minimize the total cost of the mm routes. The cost metric can represent cost, distance, or time. The requirements on the set of routes are:
>
> - All of the routes must start and end at the (same) depot.
> - Each city must be visited exactly once by only one salesman.
>
> The mTSP is a *relaxation* of the vehicle routing problem (VRP); if the vehicle capacity in the VRP is a sufficiently large value so as not to restrict the vehicle capacity, then the problem is the same as the mTSP. Therefore, all of the formulations and solution approaches for the VRP are valid for the mTSP. The mTSP is a *generalization* of the TSP; if the value of mm is 1, then the mTSP

problem is the same as the TSP. Therefore, all of the formulations and solution approaches for the mmTSP are valid for the TSP.[27]

Analogous to simultaneously solving mTSP using dynamic variables while manipulating explicit sets of those variables to confound an adversary.[28] This holds true for self-healing mesh networks able to discern intrusion and route through uncompromised fixed communication nodes should one hub fail as well as routing for logistics convoys and attack profiles for strike aircraft or submarines. This concept is similar to the way in which an ant colony, when presented with a physical obstacle seeks out and optimizes the most efficient route from nest to food as illustrated in *fig. 7*.[29]

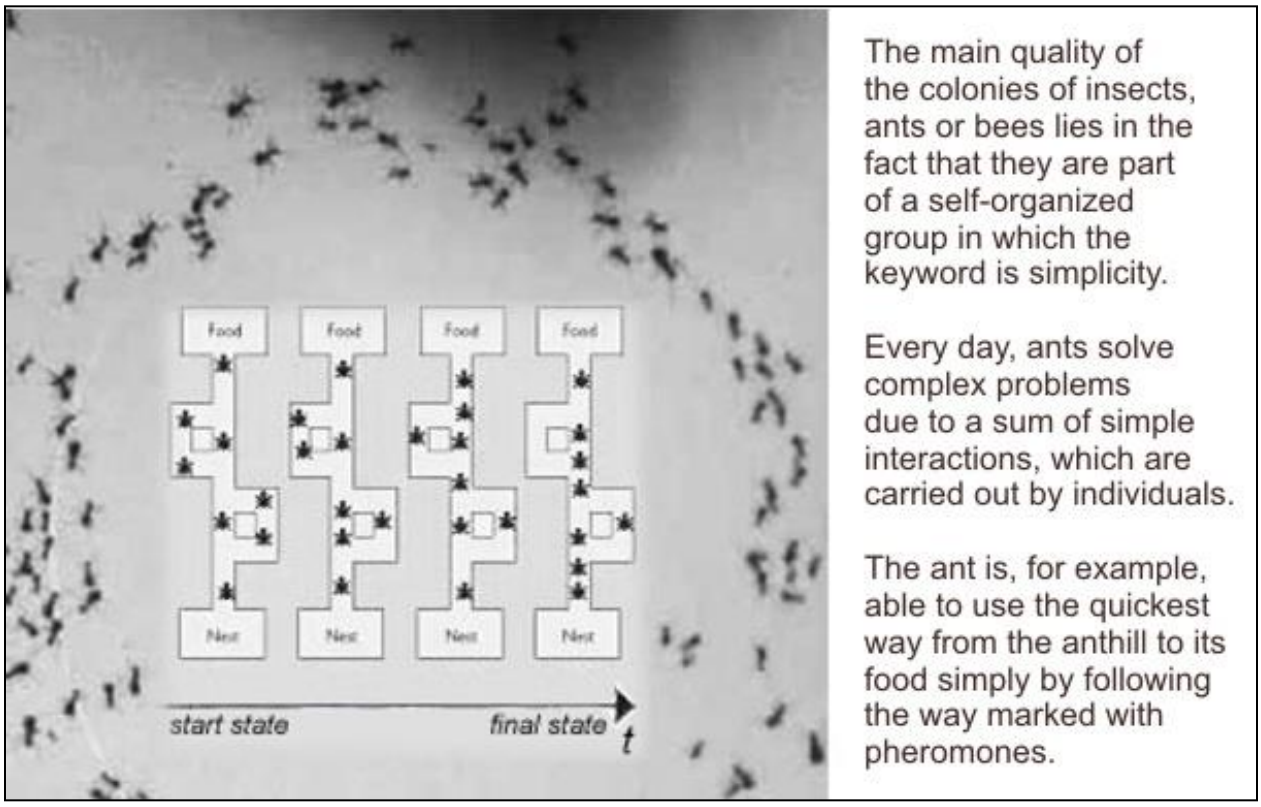

Figure 8

Source: "Nanocomputers and Swarm Intelligence", Jean-Baptiste Waldner, John Wiley & Sons, 2008

Swarming highly-emitting unmanned systems and civilian craft modified for military use can be used to confuse adversary detection mechanisms when attempting to designate friend from foe. Complicating this identification is the use of AI to dynamically recommend ideal friendly "cold" and "engagement" locations using real-time data from swarming entities (maritime/aviation) to sense environmental characteristics (civilian craft disposition, atmospherics/hydrographics, enemy asset locations, etc). Again, this is analogous to ant colony optimization as described above in *fig.7* as well as swarm/colony resilience in "leader-leader" and "leader-follower" interactions in *fig. 8* below and cheaply impose a cost imposition strategy on adversarial kill-chains and command & control networks. When employed in densely populated, complex environments with varied topography and a variety of actors, optimization techniques like mTSP or leader-lead should be used to simultaneously inject massive amounts of friction into adversarial decision processes while providing friendly forces with opportune windows (in time and space) to activate/deactivate capabilities or surge/reduce capacity.

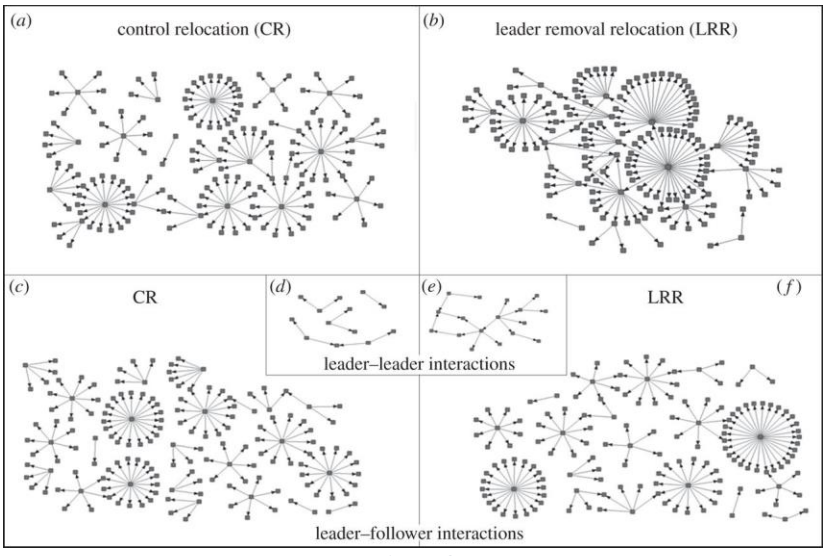

Figure 8

Source: http://rsos.royalsocietypublishing.org/content/2/9/150104

Legalities

Two limiting considerations regarding the theory of operational ambiguity and survivability are the second and third order effects on commercial shipping insurance as the "risk of war may increase insurance rates, cause charter parties to be cancelled, and change the ports of discharge or places of delivery designated in charter parties, bills of lading, and service contracts. It will probably increase freight rates."[30] Additionally, it is possible this concept could violate the Law of Naval Warfare if continued after a declaration of war.

While civilian casualties are at issue; adversaries have historically blurred the issue i.e. downing of flight MH17 by a Russian BUK missile,[31] the advocated concept is designed to be applied during Phase 0-1, prior to the outbreak of open hostilities and thus not susceptible to the same rigor placed on safe guarding civilians as proscribed in the Law of Armed Conflict. As set forth in the *Modern Law Review* article of April, 1947: "War Risks in Marine Insurance" the issue at hand is therefore in terms of insurance rates and claims in times of war and is twofold: first a state of war must exist and second it must be proved the causation of any damages "are the consequence of hostilities or warlike operations" and not some other *causa proxima.* An example is "the holding that the insurers against ordinary risks are liable for the loss of a vessel which went ashore because the Confederates had extinguished the light on Cape Hatteras…the immediate cause of the loss was the striking on the reef, not the act of war."[32] The environment described is this paper resides shy of the open hostilities and thus nullifies the initial issue of whether a state of war exists. As a state of war does not exist the *causa proxima* would therefore be "viewed as holding the risk an ordinary one, unless there is a direct act of hostility against the object (ship) insured."[33] Furthermore, "the ordinary Lloyd's of London policy of marine insurance contains a clause excluding war risks from the cover granted by the normal policy and

in cases where a vessel is on charter to the government the charter-party will usually contain a clause framed in like words that the chartering department shall take responsibility for war risks" thus in the event hostilities arise it is the government that will "eat" the cost of increased insurance not the carrier/operator.[34] While some may argue the impact to "freedom of navigation" this point is mute as both insurers and operators are loath to exploit new routes in times of war as the historical record proves; maritime trade routes shifted insignificantly during WWI and WWII, arguably the most encompassing and violent conflicts of the 20th century.[35]

Addressing the legality of naval ambiguity can be done through either the lens of the San Remo Manual on International Law Applicable to Armed Conflicts at Sea (San Remo), specifically Section III *Deception, Ruses of War and Perfidy* or via the U.S. Navy/Marine Corps/Coast Guard Commander's Handbook on the Law of Naval Operations. Both directives delineate the permission of ruses, false flags, deception, cunning, and guile as appropriate means to gain advantage over an enemy but bar any sort of offensive engagement until a vessel has displayed its true colors, and under no circumstance should one simulate the characteristics of a vessel under protected status i.e. hospital ship, humanitarian ship, etc.[36] As the environment and activities described here within lie prior to conflict and are not perfidious there is nothing in standing legal doctrine to preclude a nation from refraining from designating shipping as of military purpose prior to the outbreak of hostilities, only that they not feign exempt, civilian or neutral status the definitions of such can and should be argued by military legal practitioners.

Conclusion

Creating an asymmetric cost imposition strategy by operating from civilian craft modified for military use in an environment saturated by friendly transponder and

electromagnetic signals to overwhelm an adversary's ability to sift information from noise will prove successful enough to provide friendly forces a window to create a lodgment and/or activate/deactivate existing expeditionary advanced bases during the contact phase. The adversary will be placed in a cost imposing dilemma where the identity of a target cannot be fully known unless physically identified, this limits enemy freedom of movement/action and introduces confusion into a severely regimented system that is not optimized for decentralized command and control. Containerization of any friendly capability, specifically strike and anti-ship missiles, further enables this concept as there are currently over 20.5M containers handing cargo accounting for 60% of worldwide trade.[37] Allied forces are not tied to fixed geographic positions (artificial islands, refit/refuel ports, etc) as adversary forces are, thus the principles of maneuver warfare, regardless of domain, still remain applicable and in favor of friendly forces.

What is evident is the fallacy of old-world Marine Corps concept development, the seclusion of a group of combat-arms officers steeped in the nuances of their profession, informed by retirees and defense contractors, striving to create timeless strategy in a vacuum. Today's battles require a potent mix of qualitative and quantitative experts at the junior levels and from across a vast and diverse array of disciplines rather than the parochial functional-area food fights currently undertaken at Quantico and within the Pentagon. Gone are the days of "hey-diddle-diddle-strait-up-the-middle" amphibious landings or long lead-time combat power build-up and lodgment.[38] Cunning, guile, and deception enabled by unique application of public-private partnerships and access granting alliances must be the focal point not exquisite systems or stagnant force posturing if we are ever again going to effectively compete on the world stage.

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