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Evaluating Command and Control for Marine Littoral Regiments Operating with the Landing Ship Medium

September 2024

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Prepared for the Naval Postgraduate School, Monterey, CA 93943.

ACQUISITION RESEARCH PROGRAM
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ABSTRACT

The Navy's Landing Ship Medium (LSM) program, previously called the Light Amphibious Warship (LAW) program, is intended to field an amphibious support ship designed to support the Marine Littoral Regiment (MLR) conducting Stand-In-Forces and Expeditionary Advanced Base Operations (EABO). This thesis presents three distinct models of command and control for the integration of Landing Ship Mediums into the Navy and Marine Corps team using joint venture theory: a Marine-centric organization, a Navy-centric organization, and a shared organization. The three command and control structures were then evaluated through a PACOM-focused analytic wargame set in the South China Sea using players from the Naval Postgraduate School. From the wargame, we analyzed each command and control structure based on message traffic generated, information centralization and capacity, decision making ability, complexity, and flexibility. Ultimately, we determined the Commander Amphibious Task Force/ Commander Landing Force (CATF/CLF) structure was the best option for future LSM and MLR integration.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACE	Air Combat Element
ARG	Amphibious Ready Group
BLT	Battalion Landing Team
C2	Command and Control
CATF	Commander Amphibious Task Force
CLB	Combat Logistics Battalion
CLF	Commander Landing Force
CWC	Composite Warfare Construct
DDG	Guided Missile Destroyer
DMO	Distributed Maritime Operations
DOD	Department of Defense
DON	Department of the Navy
EABO	Expeditionary Advanced Base Operations
GCE	Ground Combat Element
JADC2	Joint All Domain Command and Control
JEF(M)	Joint Expeditionary Force (Maritime)
JFMCC	Joint Force Maritime Component Commander
JOA	Joint Operations area
JV	Joint Venture
LAAB	Littoral Anti-air Battalion
LAW	Light Amphibious Warship
LCE	Logistics Combat Element
LCT	Littoral Combat Team
LHA	Landing Helicopter Assault
LHD	Landing Helicopter Dock
LOCE	Littoral Operations in a Contested Environment
LPD	Landing Platform Dock

LSD	Landing Ship Dock
LSM	Landing Ship Medium
MAGTF	Marine Air Ground Task Force
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MLR	Marine Littoral Regiment
NPS	Naval Postgraduate School
OODA	Observe, Orient, Decide, Act
PLA	People's Liberation Army
PLA-N	People's Liberation Army-Navy
PLA-MC	People's Liberation Army-Marine Corps
SAG	Surface Action Group
SIF	Stand-In Forces
SME	Subject Matter Expert
TG	Task Group
TU	Task Unit
USMC	United States Marine Corps
USN	United States Navy

I. INTRODUCTION

The Marine Corps is redesigning its force to better prepare for future conflict and integrate more closely with the Navy (Berger, 2020; Feickert, 2022). The effort, dubbed *Force Design 2030 (FD2030)*, centers on the Marine Corps' belief that it is not currently organized, trained, or equipped to fight an extended naval campaign, particularly in the Pacific Ocean theater (Berger, 2019, 2020; Feickert, 2022). A key aspect of *FD2030* is the Marine Littoral Regiment (MLR), a new formation of Marines created to provide a stand-in force in the Pacific that will reinvigorate Marine Corps contributions to any potential naval campaigns in the region (Berger, 2020; Feickert, 2023; Story, 2023). An MLR will be capable of many tasks and operations but is critically capable of shore-to-sea over-the-horizon fires, operating modern sensors integrated into the Joint Force, and operating inside an enemy's Weapons Engagement Zone (WEZ) (Story, 2023). The MLR is self-contained and self-mobile ashore, but it does not contain aircraft or other transportation capabilities that could enable littoral or inter-archipelago maneuver (Story, 2023). To bridge this gap and enable amphibious operations in and around the First Island Chain in the Pacific, the Marine Corps and the Navy are working together to procure a new type of amphibious ship: the Landing Ship Medium (LSM) (Combat Development & Integration [CD&I], 2023; Feickert, 2023).

The LSM is intended to be smaller than the current fleet of amphibious ships but larger, more capable, and more independent than existing ship-to-shore connectors (CD&I, 2023). This new vessel is specifically designed to enable MLR movement and maneuver (Feickert, 2023). It will have a displacement of around 4,000 tons and carry approximately 75 Marines and their equipment from beach to beach without needing a port (HQMC, 2022; Feickert, 2023). Critically, it is designed to support the MLR(s) and give them freedom of movement in the littoral. Current amphibious ships are multi-roled and designed to enable a Marine Expeditionary Unit (MEU) to conduct power projection, amphibious operations, and forcible entry operations (DON, 2023b). The LSM differentiates itself through its smaller size, self-contained loading capability, and extended ability to operate in shallower

littoral waters and open seas. It is a unique vessel designed to complement new and unique Marine formations associated with modern Marine Corps doctrine.

Once the LSM is fielded, the Navy and Marine Corps will require a command and control structure that is purpose-built for the unique roles of the LSM and MLRs for use in distributed maritime operations (DMO), amphibious operations (AO), Expeditionary Advanced Basing Operations (EABO), and littoral maneuver. Current Navy ship inventory does not contain a similarly capable and sized ship; the Navy will need to organize LSMs appropriately to use them operationally. The purpose of our research is to evaluate potential models of command and control for the integration of Medium Landing Ships into Navy and Marine Corps operations. Our primary goal is to identify and evaluate potentially viable command and control structures the Navy and Marine Corps could use for a squadron of LSMs assigned to work with an MLR. Our secondary goal is to evaluate the applicability of the identified command and control structures in a wargame centered on potential future conflict in the South China Sea.

We approach these goals in three ways. First, we examine the reasoning behind the need for an LSM and illustrate why it is critical to Marine Corps efforts in the evolving operational environment, viewing Navy and Marine Corps actions as a joint venture between the two Services. Next, we assess dominant parent and shared management joint ventures theory to evaluate options for integrating a squadron of LSMs into operational Navy and Marine Corps command and control structures. This examination provides critical insights into possible benefits for the Navy and Marine Corps from the private sector approach to joint ventures. The outcome of these insights are three possible command and control structures for operationally organizing the MLR and LSM. Finally, in conjunction with the Marine Corps Warfighting Lab and Naval Postgraduate School, we created, designed, and executed a wargame to evaluate the identified command structures in a relevant future Indo-Pacific Command operational context. Footnotes will be used to provide details of specific organizational structures or equipment that would detract from the narration for those familiar with these topics.

II. BACKGROUND

A. FORCE DESIGN

FD2030 became the Marine Corps' top priority in 2019 (Berger, 2019). The Marine Corps is undergoing fundamental changes as part of the *FD2030* effort, one of which is the establishment of the MLR as a part of the larger Marine Corps strategy to modernize itself and provide focused support to the United States Indo-Pacific Command (INDOPACOM) (Berger, 2019). As the 38th Commandant declared in *FD2030*, the Marine Corps is not currently organized, trained, or equipped to properly support the naval force executing distributed maritime operations[1] (Berger, 2019). First announced in the *FD2030* Phase I and II update, the MLR is the new focal point of Marine Corps capabilities[2] in the U.S. 7th Fleet[3] (Berger, 2020; Feickert, 2022). Significant divestments in other capabilities – including tanks, infantry, artillery, law enforcement, and aircraft[4] – were undertaken to create reorganization space in the Marine Corps force structure for the MLRs and other newly integrated capabilities (Berger, 2020; Feickert, 2022). As the newest Marine Air Ground Task Force (MAGTF) formation and the primary investment of *FD2030*, the MLR is the product of the Marine Corps' venture into the future, offering a unique forward-deployed Marine presence that is organized, trained, and equipped to accomplish sea denial

[1] Distributed Maritime Operations (DMO) is defined in the 2020 Department of the Navy Tri-Service Strategy as "an operations concept that leverages the principles of distribution, integration, and maneuver to mass overwhelming combat power and effects at the time and place of our choosing. This integration of distributed platforms, weapons, systems, and sensors via low probability of intercept and detection networks, improves our battlespace awareness while complicating the enemy's own scouting efforts. Applying combat power through maneuver within and across all domains allows our forces to exploit uncertainty and achieve surprise" (DON, 2020).

[2] MLRs differ from traditional amphibious forces in that they are designed to contribute to sea control missions from the shore, rather than provide power projection from ship to shore like a Marine Expeditionary Unit (MEU). The Marine Corps will continue to maintain its seven standing MEUs and deploy them on L-class amphibious shipping as naval readiness allows (Berger, 2021b).

[3] 7th Fleet is the operational Naval fleet of USINDOPACOM. Much of the *FD2030* effort has focused on the Marine Corps' ability to support naval activities, efforts, and operations in the USINDOPACOM area of responsibility (Berger, 2020; Feickert, 2022).

[4] In total, *FD2030* divestments included: all Tank Battalions, all Law Enforcement battalions, all Bridging Companies, reducing the number of infantry battalions from 24 to 21, reducing cannon artillery batteries from 16 to 5, reducing amphibious vehicle companies from 6 to 4, and eliminating four helicopter squadrons (Feickert, 2023).

and control missions within contested maritime space (Feickert, 2023; Story, 2023). The Navy is procuring the LSM[5] to pair alongside the MLR and create a new Navy and Marine Corps team in USINDOPACOM. Through case study and wargaming, we seek to evaluate the command and control implications of the to-be MLR and LSM operational pairing.

B. THE MARINE LITTORAL REGIMENT

The MLR consists of approximately 1,800 to 2,000 Marines and sailors organized into three main elements: a Littoral Combat Team (LCT), a Littoral Anti-Air Battalion (LAAB), and a Combat Logistics Battalion (CLB) (Feickert, 2023; Story, 2023). The LCT is comprised of an infantry battalion and a long-range anti-ship missile battery supported by additional enablers (Story, 2023). The LAAB provides air defense, air surveillance and early warning, air control, and forward rearming and refueling capabilities (Story, 2023). The Littoral Logistics Battalion provides all tactical logistics support to the MLR (Story, 2023). MLRs were purposely designed to create dilemmas for adversaries (Feickert, 2023). The MLR synchronizes four critical warfighting capacities in the contested littorals: maneuver, long-range fires, anti-air defense, and logistics. Together, these allow an MLR to be capable of conducting Expeditionary Advanced Base Operations,[6] serving as Stand-In Forces[7] (SIF), conducting strike operations, coordinating air and missile defense, supporting maritime domain awareness and surface warfare options,[8] and integrating the

[5] The Landing Ship Medium (LSM) program was previously known as the Light Amphibious Warship (LAW). The LSM is designed to support the MLR as it conducts Expeditionary Advanced Base Operations (CD&I, 2023; Feickert, 2022).

[6] Expeditionary Advanced Base Operations (EABO) are a type of expeditionary warfare that employs low-signature, mobile, persistent, and relatively easy to sustain naval expeditionary forces from a series of austere, temporary locations ashore or inshore within a potentially contested maritime area in order to conduct sea control, support sea denial, or enable fleet sustainment (USMC, 2023).

[7] Stand-In Forces (SIF) are defined as "small but lethal, low signature, mobile, relatively simple to maintain and sustain forces designed to operate across the competition continuum within a contested area as the leading edge of a maritime defense-in-depth in order to intentionally disrupt the plans of a potential or actual adversary. Depending on the situation, stand-in forces are composed of elements from the Marine Corps, Navy, Coast Guard, special operations forces, interagency, and allies and partners" (USMC, 2020).

[8] Air and missile defense, support to maritime domain awareness, and support to surface warfare are three mission-essential, expeditionary tasks that differentiate MLRs from other O-6 level MAGTFs previously fielded.

information warfighting function[9] (Feickert, 2023; Story, 2023) Before the MLR's creation, the MEF and Marine Expeditionary Units (MEU) were the only organized Marine Corps forces capable of integrating these varying mission sets. Now, 3d MLR (and soon to be 4th and 12th MLRs[10]) provides a purpose-built stand-in force with "fight tonight" capability to III MEF[11] and 7th Fleet (Feickert, 2023; Story, 2023). III MEF prioritizes MLR requirements and supports the MLR(s) with capabilities from the 1st Marine Aircraft Wing (MAW) and 3d Marine Logistics Group (MLG) to support MLR movement and maneuver. However, III MEF support has some limitations, particularly in the environment for which the MLR was designed – the littorals.[12]

C. LANDING SHIP MEDIUM

To address this gap of movement and maneuver in the littorals, the Navy and Marine Corps are developing the LSM (CRS, 2023). The LSM (see Figure 1) is a relatively small amphibious warship purpose-built to provide tactical maneuver to Marine forces conducting EABO (CD&I, 2023; Feickert, 2023). Importantly, this ship is additive in capability to the Navy-Marine Corps team; it does not replace the current L-Class ships[13]

[9] Marine Corps Warfighting Publication 8-10, *Information in Marine Corps Operations*, was released in February 2024 and contains more detailed doctrine concerning the information warfighting domain.

[10] The Marine Corps has committed to establishing "at least" three MLRs (Feickert, 2023). 3d MLR was activated in 2022 and is based in Hawaii. 12th MLR is scheduled to activate in 2025 and will be based in Okinawa, Japan. 4th MLR is scheduled to activate in 2027 and is currently planned to be based in Guam.

[11] The direct command relationship between the MLR(s) and III MEF is critical to support a gap in the MLR's capability – movement and maneuver. While the force is properly allocated for ground movement once in place, the MLR does not possess air or surface assets capable of moving the force in great numbers or over great distances. This is especially important given the MLR's operational context – island chains in the Pacific.

[12] The DOD dictionary does not contain a definition for the littorals. Joint Publication 3-02, *Amphibious Operations*, states that the littorals "include those land areas (and their adjacent sea and associated air space) that are predominantly susceptible to engagement and influence from the sea and may reach far inland." (JCS, 2021) The Tentative Manual (TM) for EABO defines littoral as "comprising two segments of the operational environment: 1. Seaward: the area from the open ocean to the shore, which must be controlled to support operations ashore. 2. Landward: the area inland from the shore that can be supported and defended directly from the sea." (USMC, 2021) Other Marine Corps publications also use this seaward and landward-focused definition. For our purposes, we will use the TM EABO definition.

[13] L-Class ships are landing ships in the U.S. Navy inventory, specifically built to embark Marines for amphibious operations. The current L-Class ships in service are the *Wasp* class LHD, *America* class LHA, *San Antonio* class LPD, *Whidbey Island* class LSD, and *Harpers Ferry* class LSD (USMC, 2001).

or ship-to-shore connectors[14] (Feickert, 2023). The LSM is a critical enabler for the Marine Corps *FD2030* designs, providing the MLRs with a method of moving about the battlespace without the need for ports and increasing the Navy-Marine Corps team's capabilities in a littoral fight.

Figure 1. Artist Rendering of the Austal Landing Ship Medium Proposal (O'Rourke, 2023)

As initially conceived in 2020, the Navy envisioned LSMs to be relatively simple and inexpensive ships (see Figure 2) with the following features.

- a length of 200 feet to 400 feet;
- a maximum draft of 12 feet;
- a displacement of up to 4,000 tons;
- a ship's crew of no more than 40 Navy sailors;
- an ability to embark at least 75 Marines;

[14] Ship-to-shore connectors include the Landing Craft Air Cushion (LCAC) and Landing Craft Utility (LCU) operated by the Navy, as well as the newly fielded Amphibious Combat Vehicle (ACV) operated by the Marine Corps.

- 4,000 to 8,000 square feet of cargo area for the Marines' weapons, equipment, and supplies;
- a stern or bow landing ramp for moving the Marines and their weapons, equipment, and supplies the ship to shore (and vice versa) across a beach;
- a modest suite of C4I equipment;
- a 25mm or 30mm gun system and .50 caliber machine guns for self-defense;
- a transit speed of at least 14 knots, and preferably 15 knots;
- a minimum unrefueled transit range of 3,500 nautical miles;
- a "Tier 2+" plus level of survivability (i.e., ruggedness for withstanding battle damage)—a level, broadly comparable to that of a smaller U.S. Navy surface combatant (i.e., a corvette or frigate), that would permit the ship to absorb a hit from an enemy weapon and keep the crew safe until they and their equipment and supplies can be transferred to another LSM;
- an ability to operate within fleet groups or deploy independently; and
- a 20-year expected service life. (O'Rourke, 2023)

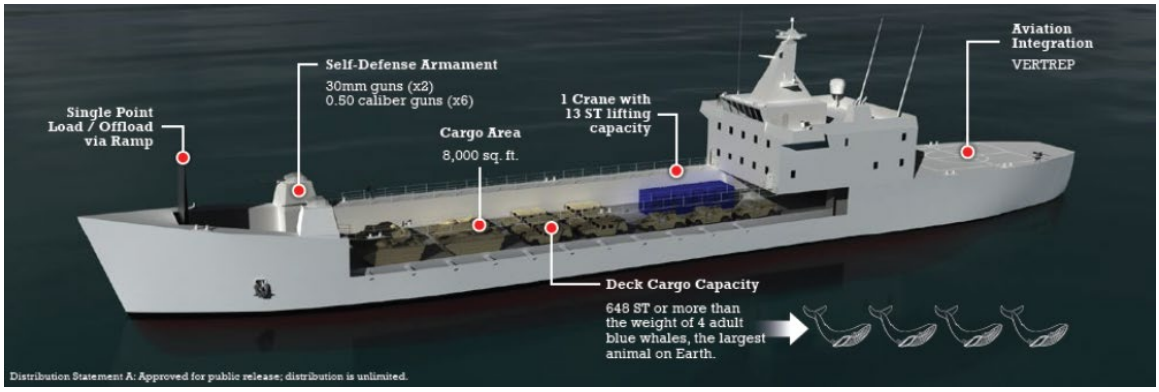

Figure 2. NAVSEA Rendering of Landing Ship Medium Requirements[15] (Lagrone, 2023)

The above characteristics illustrate the LSM as lighter and smaller than traditional L-class ships but more capable and independent than any current ship-to-shore

[15] NAVSEA, Naval Sea Systems Command, is the Navy organization charged with conducting the procurement of the LSM (Lagrone, 2023).

connectors.[16] When fielded, the LSM would become the principal maneuver vessel of the littoral force, supporting the day-to-day maneuver of stand-in forces operating in the littoral operations area (USMC, 2021). Nine LSMs are expected to be procured for each MLR (Berger, 2023; O'Rourke, 2023). The range, endurance, and austere access of LSMs provide options to Marine Corps and Joint forces while enabling the littoral force to deliver personnel, equipment, and sustainment throughout a widely distributed area (Berger, 2022; O'Rourke, 2023). The ship's shallow draft and beaching capability are critical for maneuvering the MLRs while supporting DMO, Littoral Operations in a Contested Environment[17] (LOCE), and EABO (USMC, 2021). These capabilities are particularly applicable in the Pacific theater, where the three MLRs will be based and expected to be employed (Berger, 2022; Berger, 2023).

D. PROCUREMENT STRATEGY AND TIMELINE

The Navy plans to begin procurement of the LSM in FY2025 with the lead ship in the class, followed by an additional five ships from FY2026 to FY2028 (O'Rourke, 2023). Initial operating capacity (IOC) is expected in FY32 once nine vessels are complete (Berger, 2023; O'Rourke, 2023). The operational requirement is 35 LSMs: nine ships aligned to each of three MLRs and eight additional hulls[18] (Berger, 2023; CD&I, 2023). The Marine Corps' request for 35 ships would cost approximately $150 million each with lower survivability requirements (O'Rourke, 2023). Much of the procurement cost and design elements are still subject to change as the Navy evaluates potential options, but the program continues to move forward (Lagrone, 2023). Specific characteristics of the vessel are expected to be ironed out through the ongoing initial phases of the design and

[16] The requirements for the LSM indicate the LSM will be roughly 1/4 the size of a *Whidbey Island* class LSD, 1/6 the size of a *San Antonio* class SPD, and 1/10 the size of an LHD/LHA. It will also be double the displacement, three times the length, and three times the capacity of a Navy LCU, the largest amphibious ship-to-shore connector (USMC, 2001).

[17] Littoral Operations in a Contested Environment (LOCE) is a Marine Corps and Navy operational concept that seeks to overcome threats in the littoral areas and provide a framework for naval integration. It places emphasis on sea control within the littoral operations area (DON, 2017a).

[18] Some Navy documents call for an 18-ship class of LSM rather than the 35-ship class. The Marine Corps has remained committed to a 35-ship class since the LSM requirements were integrated into the Navy's shipbuilding plans in 2019 (O'Rourke, 2023).

procurement process. Additionally, the Department of the Navy is reviewing its current amphibious capabilities to inform future shipbuilding plans and the LSM procurement timeline (O'Rourke, 2023).

E. OPERATIONAL IMPACT

As the Marine Corps continues its *FD2030* efforts, integrating the LSM provides an opportunity to meet future requirements of four key concepts: DMO, LOCE, EABO, and SIF. The LSM is a critical enabler of *FD2030* and DMO (O'Rourke, 2022). DMO is an operational concept that leverages distribution, integration, and maneuver principles to mass combat power and effects at a chosen time and place (DON, 2020). Critically, DMO relies on maneuver capabilities and integrated sensors to exploit uncertainty and achieve surprise (DON, 2020). Sensor capabilities are integrated into the MLR by design, and the LSM requirements aim to provide the MLR with a maneuver advantage to match. The MLR uses its intelligence, sensor, and tactical capabilities LOCE, introduced in 2017, championed a combined Navy-Marine Corps emphasis on fighting for and gaining sea control, including employing land-based Marine Corps assets to support a more significant, Navy-centric sea control effort (DON, 2017a). Similarly, EABO are a form of expeditionary warfare involving the employment of mobile, low-signature, and persistent naval expeditionary forces who operate from austere or temporary locations in support of sea denial or sea control operations (USMC, 2023). LOCE and EABO are reinforced by a SIF concept highlighting the importance of presence – maintaining allies and partner relationships, providing forward-stationed forces inside the potential WEZ to protect partnerships, enable friendly maneuver, and disrupt adversary attempts to gain the initiative (Berger, 2021a). As DMO returned advanced base concepts to Navy and Marine Corps thinking and lexicon, LOCE and EABO are intended to provide further details to move the concept into reality (Heck & Friedman, 2020). DMO, EABO, LOCE, and SIF work together towards a common purpose: providing relevance and detailing the necessity of the ongoing Marine Corps force design and subsequent changes to the force. The MLR was designed to meet the land-based requirements of these concepts (Berger, 2021b; Berger, 2023). The LSM is designed to give the MLR complete maneuver capability in the littorals and fully realize a nearly decade-long vision of fully integrating the Navy-Marine Corps

team as it pursues land- and sea-based options to win future sea control fight (O'Rourke, 2023).

While the LSM and MLR provide a peek into the future of amphibious forces, matching the right naval capability and landing force together to find operational success is a challenging and well-traveled historical road. Amphibious operations are some of the more difficult military operations possible and feature in many of history's defining moments (Heck & Friedman, 2020), from Marathon in Greece up to more recent examples in the Falklands War. Overall, "an amphibious operation is a military operation launched from the sea by an amphibious force (AF) to conduct landing force (LF) operations within the littorals" (Joint Chiefs of Staff [JCS], 2021). So, all amphibious operations, successful or unsuccessful, must address the complexities of transitioning their combined force from operations at sea to operations on land. Conducting command and control of forces during these inherently complex operations comes with many challenges, such as fires coordination and intelligence sharing.

F. DOCTRINAL IMPACT

The predominant command and control framework for amphibious operations is the relationship between the Commander, Amphibious Task Force (CATF), and the Commander, Landing Force (CLF) (JCS, 2021; USMC, 2015). Each commander holds specific responsibilities throughout the amphibious operation, generally shifting from CATF (for naval-related actions) to CLF (for landing or ashore actions) as the amphibious operation progresses. The clearest example of this relationship is between an Amphibious Readiness Group (ARG), the amphibious task force, and a Marine Expeditionary Unit (MEU), the landing force (see Figure 3).

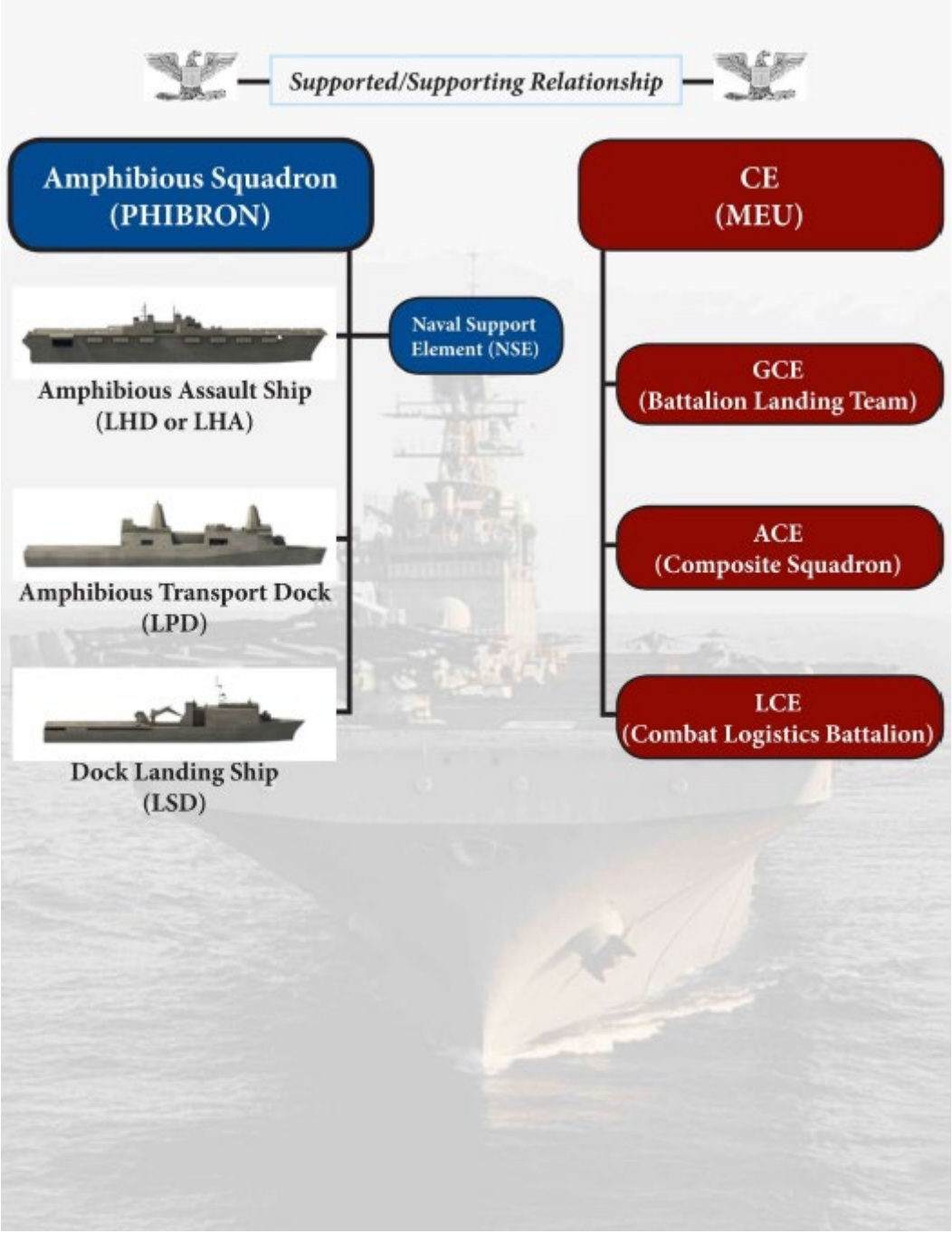

Figure 3. ARG/MEU Organization (USMC, 2014).

The ARG and MEU form the ARG/MEU team, the primary forward-deployed Navy-Marine Corps team (Berger, 2021b; USMC, 2015). The ARG is typically comprised of three L-class ships: one Landing Helicopter Dock (LHD) or Landing Helicopter Assault

(LHA), one Landing Platform Dock (LPD), and one Landing Ship Dock (LSD).[19] A MEU has four main elements: the Command Element, a Ground Combat Element (typically a Battalion Landing Team (BLT)), an Air Combat Element (ACE), and the Combat Logistics Battalion (CLB) (USMC, 2015). Through rigorous pre-deployment training and focused development by the Navy and Marine Corps, the seven ARG/MEU teams on the East Coast, West Coast, and in Japan are formed to conduct amphibious operations and conduct joint command and control of forces using CATF/CLF concepts. The ARG/MEU is expected to continue serving as the sea-based Navy and Marine Corps expeditionary force in readiness (Berger, 2021b; CD&I, 2023). While some changes may occur, the core concept of the MEU as the central Marine Corps embarked force will remain (Berger, 2023).

The MLR is established for a different purpose from that of a MEU. While the MEU focuses on a diverse set of embarked capabilities and power projection, the MLR is designed to provide capability as a stand-in force already engaged in potential conflict areas before the commencement of hostilities. The MLR and MEU are intended to operate in the littorals, but the MLR establishes itself before conflict. At the same time, the MEU is capable of forcible entry and amphibious landings. Both units are formed of a command element, ground element, air element, and logistics element. Both units are Colonel-level commands that fall directly beneath their respective MEF commanders. Nevertheless, while a MEU is aligned with an ARG, the MLR does not have a clear Navy counterpart. The emergence of the LSM will necessitate establishing a relationship between the MLR and the LSMs. We explore options between the Navy and Marine Corps to establish this command relationship through the lens of joint venture (JV) theory and use the case study method through a wargame based on a future scenario set on the first island chain[20] in the Pacific.

[19] As part of *FD2030*, the Marine Corps is investigating and experimenting with alternatives to the traditional 3-ship ARG (Berger, 2020; Berger, 2022).

[20] The first island chain generally refers to the first chain of islands off of the Asian continent in the Pacific Ocean. It is comprised of islands north of Borneo, west and north of the Philippines, the Japanese archipelago, and islands east of the Kamchatka Peninsula. We will focus on the islands in and around the South China Sea (such as Natuna Besar and the Spratly Islands).

G. JOINT VENTURES APPLICATION

In addition to exploring naval doctrine, the uniqueness of the LSM and its unique characteristics merits exploring theories on joint ventures and how they apply to the Marine Corps and Navy efforts to pursue the LSM. JVs are undertaken for many reasons, but always to advance the interests of both or all parties involved (Beamish & Lupton, 2009; Killing, 2013). Joint ventures are shared-equity undertakings between two or more parties, each with at least five percent of the equity (Beamish & Banks, 1987; Beamish & Lupton, 2009). Additionally, JV owners create a new, separate entity for some defined purpose (Kogut, 1988; Harrigan, 1988). Corporations are attracted to JVs because they enable expansion into a target market or asset class without requiring significant additional resources (Reuer and Koza, 2000). Joint ventures also present opportunities to reduce risk, overcome barrier entries into new markets, and cooperate to take advantage of other organizations' intellectual property or institutional knowledge (Hennart, 1988). This paper defines a JV as a shared equity undertaking between two or more parties (Beamish & Banks, 1987). We intend to examine the Navy and Marine Corps' procurement of the LSM through a JV lens to illuminate potential command and control requirements once the LSM is fielded in support of MLRs.

Linking JV theory to the Navy and Marine Corps team, particularly in the context of command and control, is a previously untested approach. Very little of the literature on joint ventures focuses on government or not-for-profit entities. There is a benefit of executing joint ventures limited to two partners (Gong et al., 2007). We also explored potential implications within organizational theory, including organizational structure (Scott, 1961; Mutch, 2006). However, when applied to our problem, organizational theory addresses issues at the strategic level of design as it applies to the "big" Navy and Marine Corps. Additionally, there was a considerable focus on the intrapersonal and cultural aspects of organizations, which is beyond the scope of our inquiry.

Much of the literature on JVs focuses on a for-profit model to the benefit of larger businesses, with a focus on saving costs associated with expansion into new markets (Beamish, 1988; Harrigan, 1985; Hennart, 1988; Kogut, 1988; Reuer & Koza, 2000; Vivek & Richey, 2013). Traditionally, the rationale for JVs details that the skills of both partners

are required for a successful venture (Beamish & Lupton, 2009; Killing, 2013; Vivek & Richey, 2013). This rationale also holds for the LSM procurement process, as the Navy and Marine Corps contribute significantly to the requirements process (O'Rourke, 2022; O'Rourke, 2023; Feickert, 2023; CD&I, 2023).

Two aspects of JVs directly applicable to identifying optimal command and control solutions for LSM formations are dominant parent joint ventures and shared management ventures. Dominant parent ventures are JVs in which the overall venture is primarily dominated by one party (Killing, 2013; Harrigan, 1988). Shared management ventures encompass those in which both parties play an active role (Killing, 2013). These two approaches to an LSM JV provide us with three options: a shared management approach, a Navy-centric dominant parent, and a Marine Corps dominant parent. These possible options were arranged as they pertain to command and control of the LSM in an operational context, which we then explored in the wargame.

For all three approaches, we assumed that a Joint Force Maritime Component Commander[21] (JFMCC) would serve as the highest operational level Navy command. Additionally, we assumed the LSM would be organized as a squadron.[22] We arranged the expected nine LSMs in support of an MLR together as a single unit, and then changed the command and control relationships based on the approach selected.

1. Shared Management Approach

In a shared management approach, a JV splits responsibility and equity evenly (Killing, 2013; Beamish & Lupton, 2009). Suppose the LSM formation is to be considered equal to the MLR. In that case, they are designated to work together as a team, much like Amphibious Readiness Groups and Marine Expeditionary Units. This approach most closely aligns with the current amphibious operations doctrine centered on the CATF and

[21] The Joint Force Maritime Component Commander (JFMCC) is the designated Naval Service component of a Joint Task Force and the doctrinal headquarters element for Navy elements employed in a Joint Operations Area (DON, 2020; JCS, 2021). It is also the operational command for which the MLR was designed as part of *FD2030* (DON, 2020; USMC, 2023).

[22] Patrol boats, destroyers, and submarines are examples of other Navy ship types commonly grouped together in squadrons.

CLF. Similar to the CATF and CLF relationship (see Figure 4), a shared management approach will likely require significant attention to detail and defining roles and responsibilities.

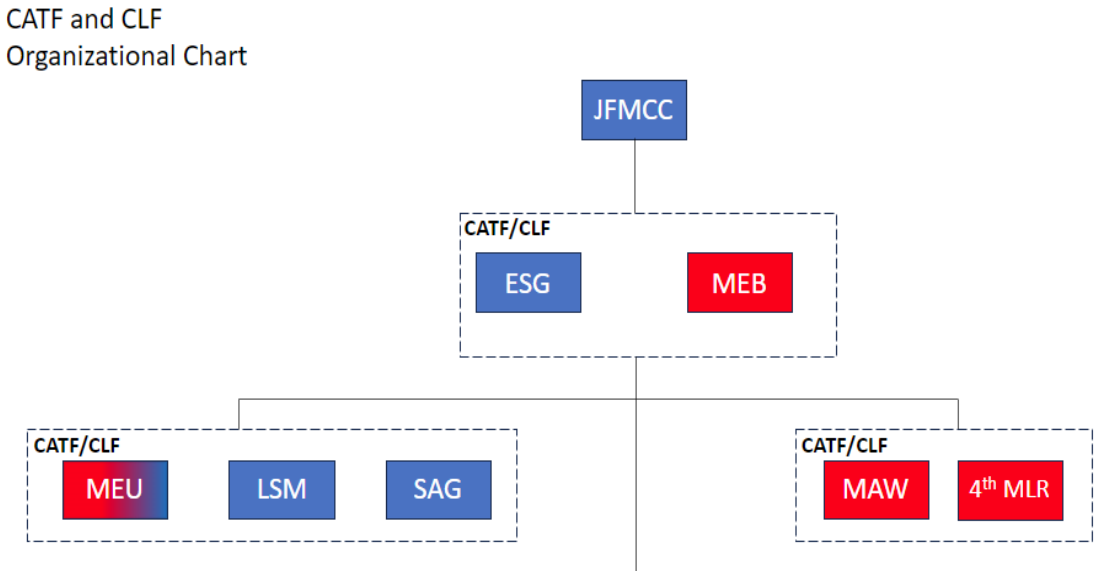

Figure 4. CATF and CLF Organizational Chart

In the shared construct, the LSM squadron falls underneath a CATF, organized with the staff capability and know-how to properly provide operational management of the LSMs. Similarly, the MLR falls underneath the CLF. Both parent units, CATF and CLF (represented in our game by an Expeditionary Strike Group [ESG] and a Marine Expeditionary Brigade [MEB][23]), each have shared equity in the operational command and control construct and are jointly responsible for operational success.

2. Dominant Parent Approach–Navy

A second, Navy-centric approach designates a higher-echelon formation that controls the LSMs and designates them for MLR missions as needed. The Navy is the dominant parent in this option and, as such, will retain operational control of the LSMs

[23] The Expeditionary Strike Group (ESG) and Marine Expeditionary Brigade (MEB) are the standard Navy and Marine Corps 1-star-level commands employed as CATF and CLF, respectively.

within the overarching command and control structure (see Figure 5). Per Navy doctrine, the Composite Warfare Construct (CWC) model will also apply here (DON, 2020; JCS, 2021).

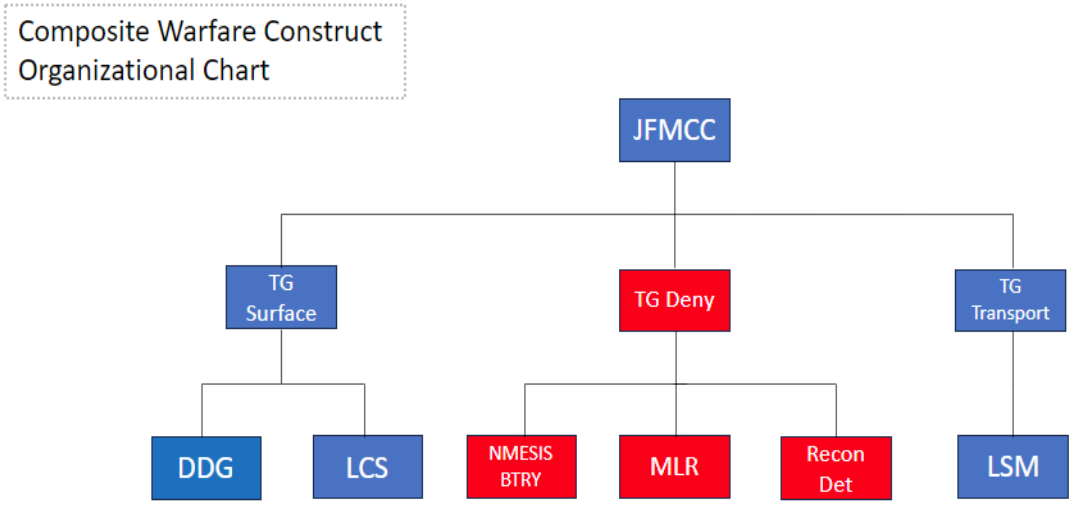

Figure 5. Composite Warfare Construct Organizational Chart

In an operational context and given the CWC structure, the LSM unit and the MLR would most likely participate in the Surface Warfare and Littoral Warfare components (DON, 2020; USMC, 2023). For our purposes, this was assumed to be true, and the Task Groups were organized accordingly.

3. Dominant Parent Approach–Marine Corps

Finally, with *FD2030* and the creation of the MLR as primary drivers for the Marine Corps' efforts behind the LSM acquisition, the Marine Corps could also serve as the dominant parent. We assumed the Marine Corps would use its primary command and control construct, the Marine Air Ground Task Force (MAGTF), to form an organizational command and control structure that integrates the LSM into a Marine-dominated formation (see Figure 6).

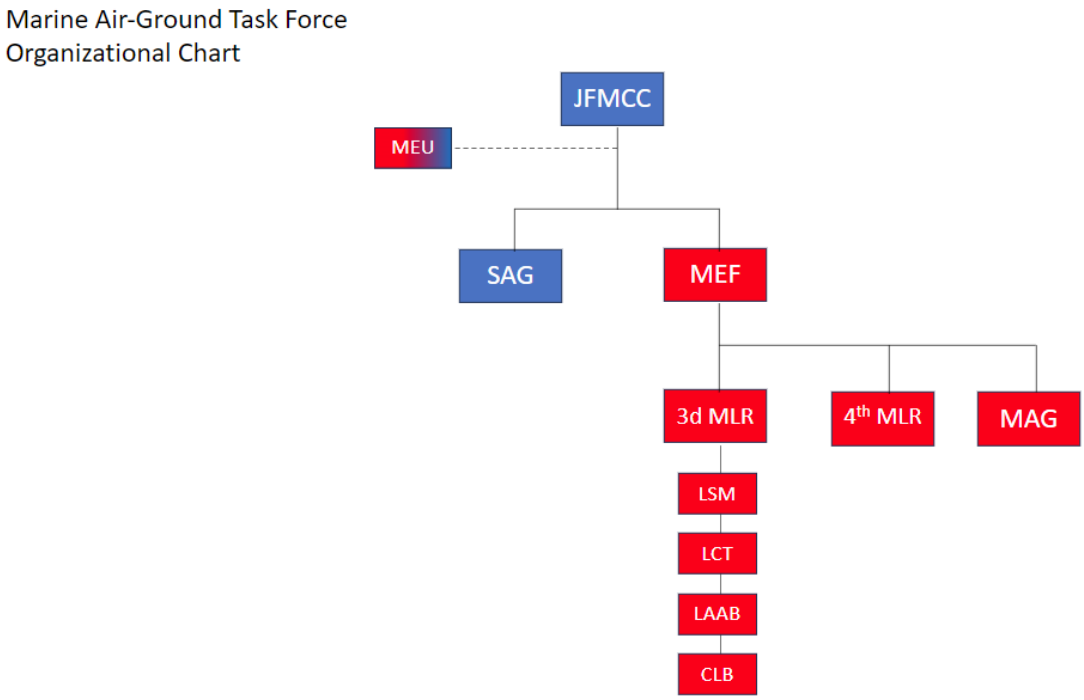

Figure 6. Marine Air-Ground Task Force Organizational Chart

This approach is unique compared to the current organization and doctrine. The Marine Corps is tasked with manning, training, and equipping the land forces for amphibious operations (DON, 2020). Of the current ship-to-shore connectors, only the ACV is operationally controlled by the Marine Corps. The LCAC and LCU, which are much larger and most like the future LSM, are operated and controlled by the Navy during operations. For our purposes, the LSM squadron was placed under the direct command of a Marine Corps O-6 at the MLR to afford the MLR commander maximum influence over the operational employment of the LSMs as the littoral maneuver force.

H. CASE STUDY APPROACH TO EVALUATION

These three command and control structures represent three distinct options the Navy and Marine Corps have as they deliberate the acquisition and integrate the LSM into current formations. To fully explore and evaluate the implications of these options, we decided on a case study approach to look closely at these command and control structures' efficacy and effectiveness. To facilitate our case study, we created and designed a

wargame, sponsored by the Marine Corps Warfighting Lab 21st Century Amphibious Operations branch, to examine the command and control implications of integrating the LSM into the JFMCC command and control structure during a potential future conflict in the South China Sea set in the year 2045.

III. METHOD

A. INTRODUCTION

Wargaming, a simulation of military operations utilizing free thinking players that helps in the investigation of human decision making (Appleget, 2022), was chosen as the best fit for comparing different C2 structures for the LSM due to the innumerable aspects associated with a C2 structure. This differs from simulations where specific criteria are controlled to collect data on specific outputs. Additionally, wargaming provides a deeper level of examination as opposed to selecting case studies. In our investigation, there are too many variables to consider when choosing an optimal C2 structure, and it is difficult to control for repeatability; wargaming is the most effective and economical way to evaluate the structures (Sherfey, 1992), as we are focused not just on the LSM's effectiveness but also on the organizational connections associated with the LSM. Through this lens, looking at the connection quantities and qualities during a wargame that mimics a future real-world problem, we can identify a potentially optimal C2 structure for the LSM within the context of current and emerging Naval doctrine. The development of the wargame followed Dr. Appleget's *The Craft of Wargaming*, where we developed the wargame through five phases: initiate, design, develop, conduct, and analyze (Appelget et al., 2020, pp. 37–38). This process guided our methodology for identifying the optimal C2 structure for the LSM.

B. INITIATE

The first step we took in developing the wargame was verifying the problem and desired outcome for the wargame. This focused the wargame on the LSM and how different C2 structures would influence the use and required communication of the coordination and employment of the LSM. By understanding the problem, we were able to identify the following essential questions regarding the optimal C2 structure: what was the quantity and type of communication that occurred in the C2 structure regarding LSM employment, and where was the information centralized in the C2 structure and did it have the capacity to process the information, did the LSM controlling unit have the appropriate decision

making ability for the LSM employment, what is the complexity of the C2 structure in regards to information flow, and is the C2 structure flexible in the employment of the LSM. These questions arise from the needs of a successful command structure that Martin Van Creveld lays out in his book, Command in War. He clearly states that although a single set of characteristics does not constitute success in every situation, the factors that we chose to gather data on are generally found in all successful commands (Van Creveld, M. 1985). The verification of the problem and identification of essential questions that had to be answered enabled the design of the wargame.

C. DESIGN

Several different types of wargames can be conducted, all for a specific reason. Our problem set required a game that enabled communication and could show how different relationships of the units within a blue cell[24] would interact. A hybrid wargame was chosen to incorporate the unique aspects of open wargames and closed wargames. Open wargames allow for all players to be present in the same room and are able to see the moves that the opposite team is making or attempting to make and in a closed wargame, neither side can see what the other is doing and has to make decisions off of what a white cell,[25] or administrative cell, is informing them (Appleget et al., 2020, pp. 52–54). The hybrid version was chosen to allow for the blue cell to operate in a closed setting where they did not have all the information while the white and red cell[26] could be controlled to produce problem sets that involve the LSM and their employment.

We decided to run our wargame with a free-kriegsspiel[27] (Appleget et al., 2020, pp. 2), a wargame type that allows for the free development of plans against a player acting as the enemy also known as the red cell. This allowed for discussion on strategy for blue

[24] A blue cell consists of all the friendly units playing in the wargame.

[25] A white cell is the control center for the wargame (Appleget et al., 2020, pp. 154), this is also where adjudication of game interactions is conducted and where subject matter experts may be employed to determine adjudication when models are not applicable (Appleget et al., 2020, pp. 173).

[26] A red cell consists of all enemy forces that the blue cell is playing against. This cell can either consist of active players or given present moves that enable a desired scenario.

[27] Kriegsspiel is the German word for wargame and is commonly used in exchange as a tie to its origin in the training of Prussian army officers (Appleget et al., 2020, pp. 36).

cell units and did not restrict decisions or choices with the LSMs as a rigid-kriegsspiel would have. A hybrid, free-kriegsspiel also allows for limited inclusion of restrictions that focused gameplay on the problem at hand and forced interactions that may have been avoided by more timid players. We also decided to use a technique called "red teaming" where the red cell is given information beyond what that cell would typically know about the way the blue force will fight to enable the desired scenarios and actions (Appleget et al., 2020, pp. 163) for the blue cell to take with the LSMs and how it would react in changes to authority in the different C2 structures.

1. Scenarios

Through using a free-kriegsspiel, scenarios could be modified to force problem sets that the C2 structures would need to face. Understanding the different possible C2 structures identifying the CWC style, MAGTF style, and CATF/CLF style structures lead to the need for the development of three different scenarios or vignettes in our wargame. With the MLR being the primary users of the LSMs (O'Rourke, 2023), we placed the three different scenarios in the South China Sea where they would primarily be operating. To keep in mind when the LSMs would be fully operational to the Marine Corps (Office of the Chief of Naval Operations, 2022) and The U.S. Navy's *Force Design 2045* (USN, 2022), all of the scenarios were placed in 2045, enabling the use of emerging and current technology and doctrine. The placement of the time frame of the scenario forces conversations between players into the possibilities of the impact of future technology that could work with and against the employment of the LSMs furthermore would bring conversation into how coordination throughout the command and control structures could work. These conversations provide the critical aspects of the data analysis.

Needing to test three different C2 structures we split the wargames into three different days with each C2 structure being played each day. This allowed for appropriate game play length and player preparation. Due to the possibility of having players participate on multiple days across the different C2 structures, we were forced to place each scenario in a new location to avoid a player from repeating the same actions as the day before, making each scenario fresh for every player. The three locations chosen were

the Taiwan Strait, played by the CWC C2 structure; Natuna Besar and surrounding islands, played by the MAGTF C2 structure; and the Spratly Islands, played by the CATF/CLF C2 structure. Each scenario involved several small islands within a contested area. These locations were selected due to their relevance to current events between United States allies and adversaries in the South China Sea, as well as their similarity in aspects while being geographically separated.

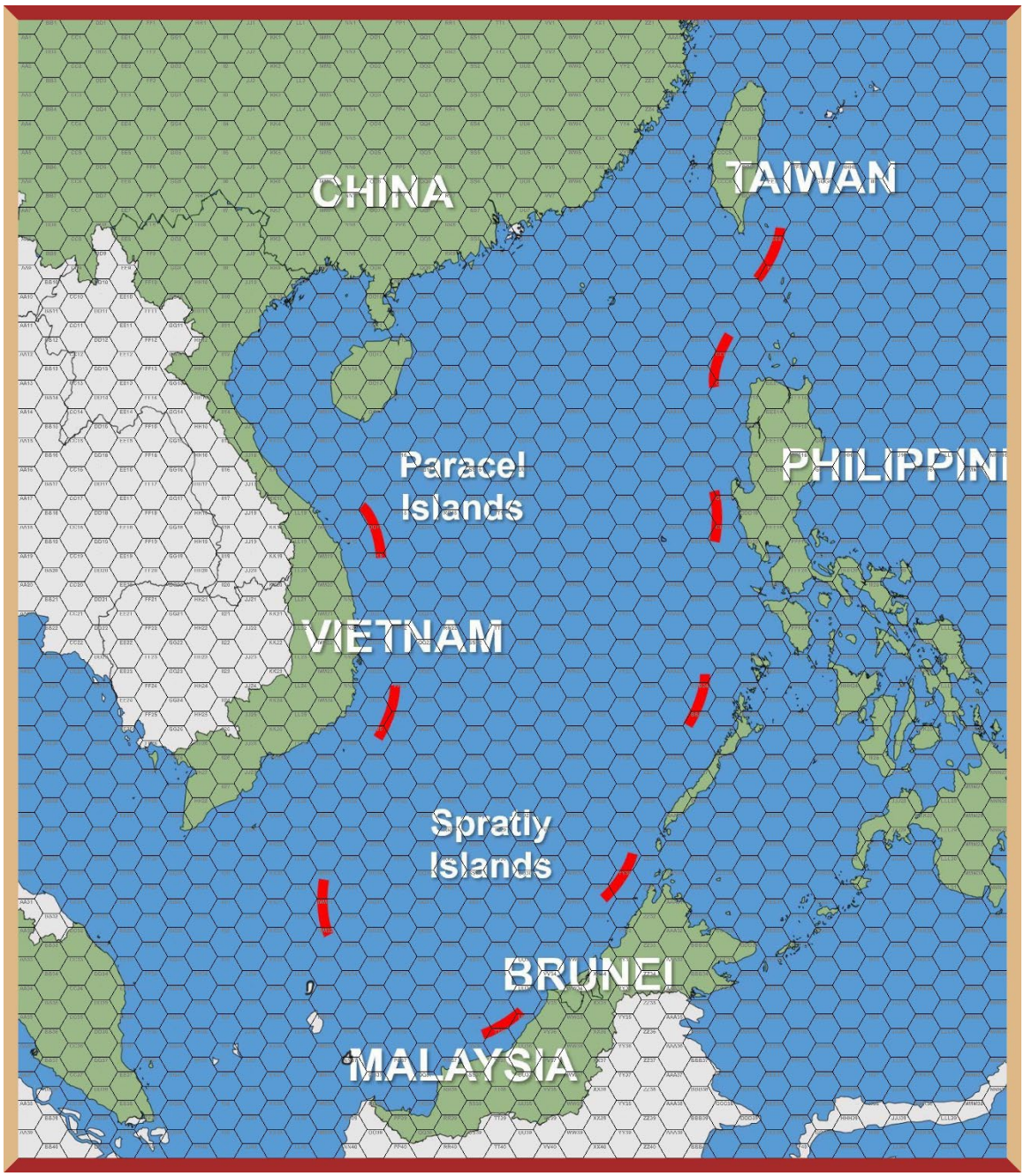

Figure 7. Gameplay Overall Situation Map

The overall situation for all three scenarios is the same and laid out as follows. There has been significant movement across the globe in the escalation towards full conflict from uniformed and plain clothed Chinese and its vassal states like North Korea. China has been developing sea basing across the South China Sea in an effort to legitimize their claim

of the 9-Dash Line,[28] resources in the area, and set themselves as the predominate world power. In early March 2045, Chinese Coast Guard and Navy push nearby countries' navies out of the 9-Dash Line area. Then the Chinese government declares military exclusion zone of 9-Dash Line at United Nations (shown in Figure 7). The overall scenario is further developed in three different locations that are the three wargame scenarios that were played.

a. Taiwan Strait Scenario

People's Liberation Army (PLA) forces belonging to the Southern and Eastern Theater Commands launched a large-scale amphibious operation against Taiwan. PLA forces belonging to the Southern and Eastern Theater Commands launched a large-scale amphibious operation against Taiwan. Navy and Marine Corps assets are sent to islands in the Luzon Strait to deny PLA forces freedom of maneuver in the area; the scenario map is shown in Figure 8, with associated hexagonal grid system overlaid.

[28] The 9-Dash Line is represented in Figure 7 by the nine red dashes; it is commonly used by the People's Republic of China to describe claimed territorial waters in the South China Sea.

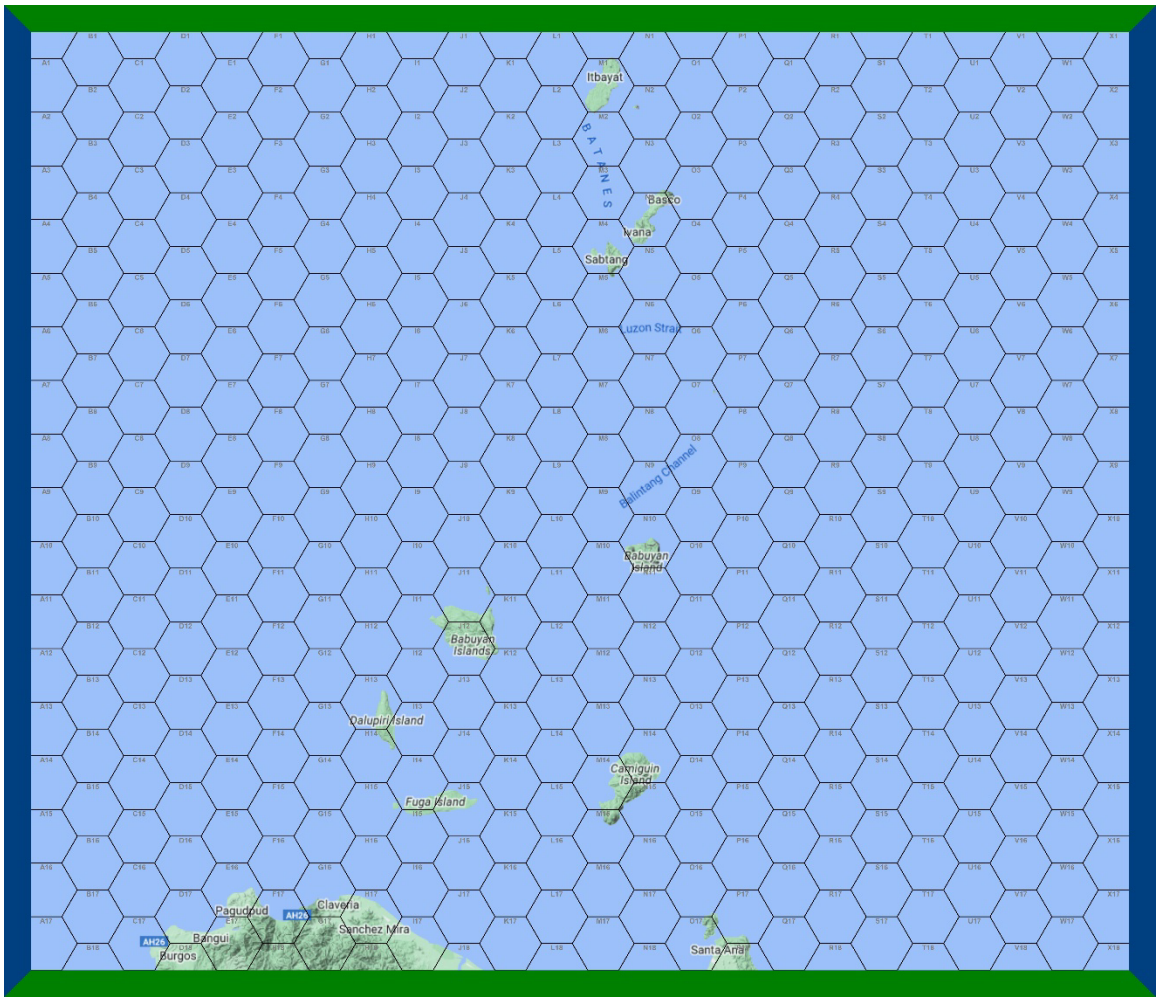

Figure 8. Gameplay Map of the Taiwan Strait Scenario

b. Natuna Besar Scenario

PLA-Navy (PLA-N) is beginning military escorts of cargo and oil ships in vicinity of Natuna Besar from oil rigs throughout the area. With the 12th MLR already deployed to Natuna Besar, the JFMCC must retain sea control around the southern portion of the South China Sea in order to support de-escalation operations in the region; the scenario map is shown in Figure 9, with associated hexagonal grid system overlaid.

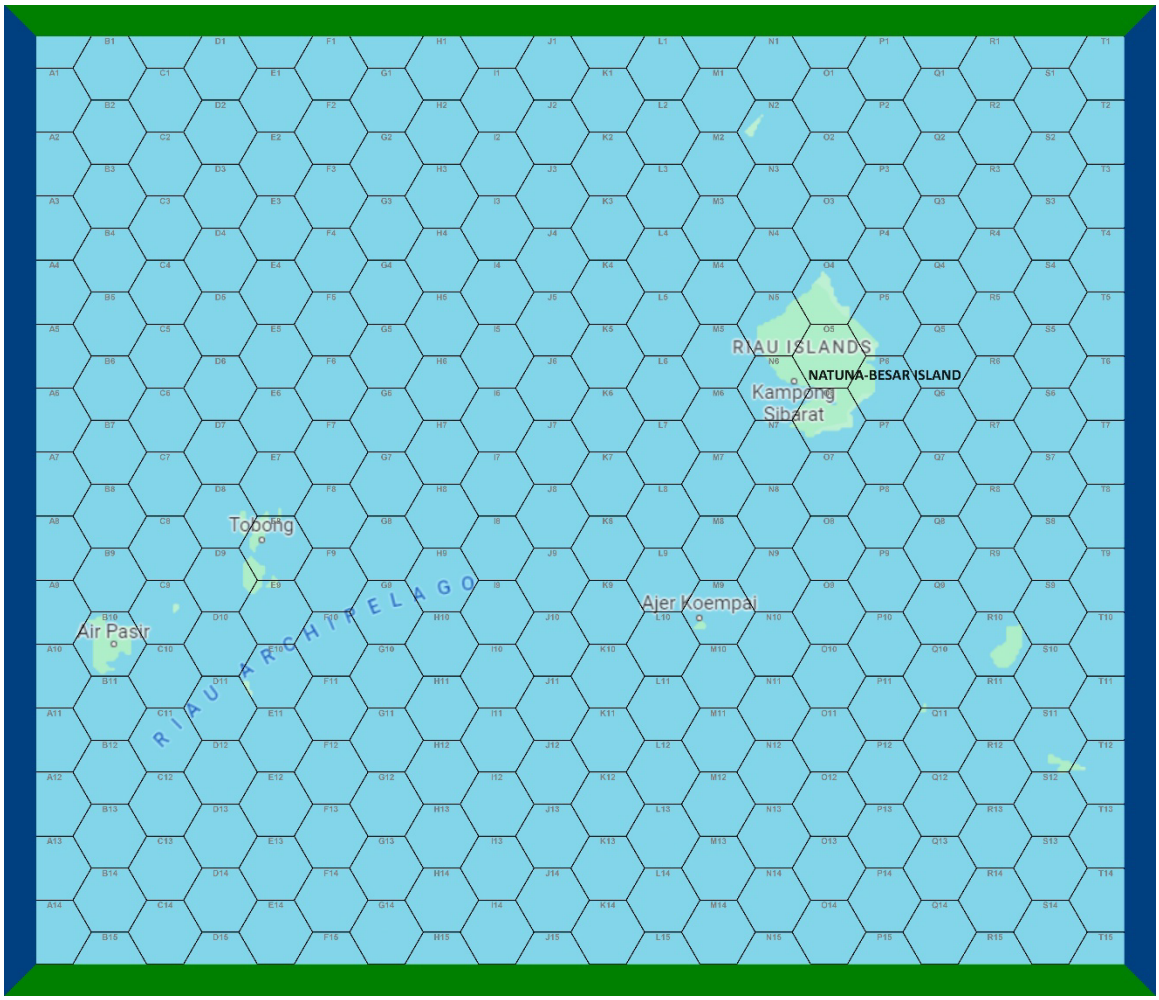

Figure 9. Gameplay Map of the Natuna Besar Scenario

c. Spratly Islands Scenario

There have been increasing indications of PLA-N & PLA-Marine Corps (PLA-MC) operations ramping up operations throughout known bases in the Spratly Islands furthering Chinese claim to the area. To lessen the claim and strategic positioning of the Chinese in the South China Sea, the JFMCC [7th Fleet], has been tasked to secure friendly territory and gain sea control in the Spratly Islands; the scenario map is shown in Figure 10, with associated hexagonal grid system overlaid.

Figure 10. Gameplay Map of the Spratly Islands Scenario

2. Methods, Models, Tools

a. Game Play

Each day of the wargame had a new game location, C2 model, and situation document given to the blue and red players the night before the game to separate the scenarios from players who may be playing more than one day. Each situation was detailed in the standard five-paragraph operations order format to increase familiarity and data recall. The blue cell player teams had the initial 30 minutes of game time to develop an initial overall plan together before splitting into separate planning rooms where they would need to communicate over a digital chat for further coordination and planning (example of room layout shown in Figure 11.). This initial planning session mimics the training and organization that would occur prior entry into any conflict as the integration of the personnel in the C2 structures will not be ad hoc in the future. The chat rooms available to the different blue planning teams fell in line with the organizational chart for that day's scenario. The wargame was conducted with 20 minutes of real time equating to 12 hours

of game time. This enabled decision making turns every 20 minutes with game units being adjudicated with intelligence sensors and engagement interactions throughout the turns. Each wargame scenario was played for two and a half hours to enable scenario development, thorough conversation, and create several opportunities for LSM employment.

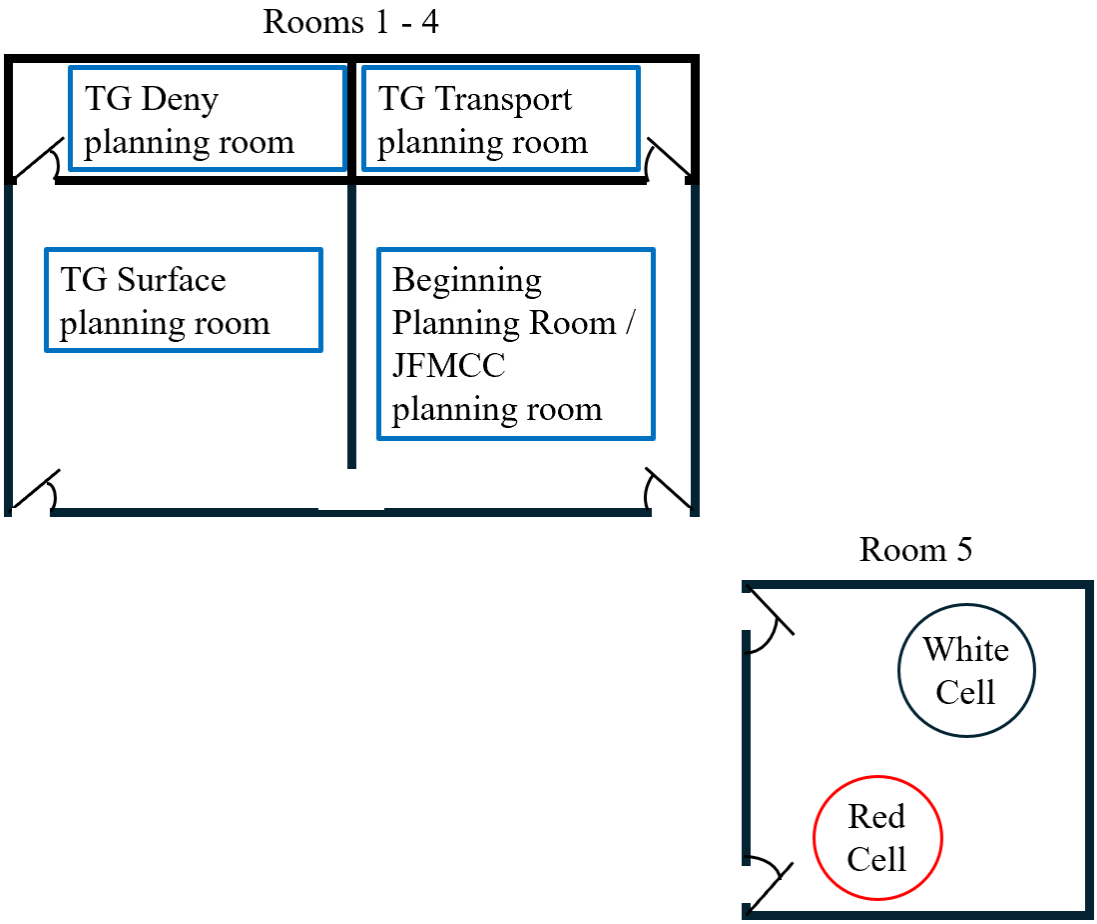

Figure 11. Gameplay Room Layout

To keep the wargame focused on LSM employment and to enable the focus on evaluating C2 structures, limitations were placed upon the wargame. During all scenarios foreign entities other than the red cell were listed as friendly as to not create limitations in operational employment but foreign assets were not available for tasking to force the use of organic assets. Strategic assets such as submarines and bombers were also limited by

the white cell to create the need for employing organic assets and creating a conversation between units in the C2 structures. Finally, the white cell would set constraints for blue cell units to progress to an objective with a no later than time to enable coordination, movement, and interaction.

b. Adjudication

To adjudicate the wargame, a white cell, operating in a separate space from the blue cell but co-located with the red cell, controlled the wargame movements and injects to the wargame. Interactions between the blue cell and the red cell were identified and managed by the white cell and outcomes were placed into the chat window for the scenario. Injects between red and blue cells included force on force engagements, discrepancies in locations, delivering of sensor information, weather updates, and communication statuses. Through these interactions, the white cell could drive the blue cell to incorporate LSMs problem sets and force interactions between blue and red units. As the red cell was co-located with the white cell it did not operate completely independently but rather in coordination towards the white cell's objectives. This included allowing the movement of LSMs or having the red cell engage blue cell units when there might have not been a need to engage. Adjudication enabled the gameplay to reach desired outputs from the game and did not force a clear winner as in some kriegsspiel wargames.

c. Spreadsheet Models

To adjudicate over the engagements of red assets and blue assets, a homogeneous salvo and probabilistic model was utilized to present engagement outcomes to both red and blue cells. In this model several assumptions were required that created realism to the scenario and wargame that may have been left out if only dice rolls were the adjudication method. Assumptions such as detection was required for engagement to occur, targets had to be within realistic unclassified planning range of the weapon system, assets could only fire what it is capable of utilizing and fire a weapon that was designed for the target (i.e., a torpedo could not be fired at a ground target). These assumptions created the sense of realism for the scenarios and wargame, but the model also had limiting assumptions such as all attacks needed to be homogeneous and simultaneous attacks could not be calculated.

In situations such as these, a subject matter expert (SME) was required to deliver adjudication on the engagement. Furthermore, due to the integration of emerging technologies, modeling of weapons engagements would not be accurate, and the white cell was required to deliver engagement adjudication.

d. Injects

Scenario injects to the wargame from the white cell were placed in the wargame to force changes in decision cycles to test the strength of the flexibility and complexity of the C2 structures. Through the introduction of weather related injects to all three scenarios, communication would be limited to higher echelons changing the original method of coordination, this not only tested flexibility of the C2 structure but also tested if the LSM controlling unit had the appropriate decision-making ability in a degraded environment. These injects were placed in all three scenarios directed at the JFMCC to account for changes across the C2 structures.

3. Player Roles

As the Naval Postgraduate School's student population comprises mid-career U.S. Navy, Marine Corps, Army, Air Force, Coast Guard, civilian, and international students we were able to have players occupy specific units in each C2 structure. The specific units that had the players were chosen as they held the role of the controlling unit for the LSM and were integral for the coordination and employment of the LSM as well as in a position that would be consistently engaged throughout the wargame scenarios to enable decision making. For the CWC C2 structure we had players occupy the roles of the JFMCC, Task Group Surface, Task Group Deny, and Task Group Transport who controlled the LSMs. For the MAGTF C2 structure we had players occupy the roles of the JFMCC, SAG, MEF, and the MLR who controlled the LSMs. For the CATF/CLF C2 structure we had players occupy the roles of the JFMCC, CATF/CLF, and the MLR, in this structure the CATF/CLF controlled the LSMs. Each of these units would be able to control smaller units and assets but retain control over important decisions concerning the LSMs. The placement of the players also created a focus on thought processes and communication links for the LSM vice attempting to fill every possible unit within the C2 structures.

D. DEVELOPMENT

Development of the wargame became an iterative process with the design phase where we conducted a blind play test, conducted redesign of the wargame, and then conducted another blind play test to confirm all changes had the desired effect. During these tests we verified player roles, our method of wargaming, scenario details and injects, and data collection method. These play tests incorporated players attempting to "break" the game, find holes in our methods while verifying our essential questions would be presented during the play of the wargame and would address our problem statement. The play test players did this by running a shortened version of the wargame and then we the recorders/ controllers we able to analyze the effectiveness of the design. The goal of the development phase is to determine that the wargame provides the structure to enable the extraction of data for us to analyze and answer our essential questions (Appleget et al., 2020, p. 121).

E. DATA COLLECTION AND ANALYSIS

Data throughout the wargame were collected in two ways, first through the message traffic that occurred on the digital chatrooms and second through observation by design team recorders. Recorders were located in the blue cell planning rooms observing and hearing conversations within the units themselves creating a deeper understanding of the flexibility of the C2 structures as well as an understanding of the capacity of the central unit's ability to process information. Although the digital chat room provides the quantifiable data on message direction and volume, this metric alone would not be sufficient in capturing what an optimal C2 structure would encompass (Van Creveld, 1985, pp. 262), much of the data collected in a wargame was observation based (Appleget et al., 2020, pp. 141). With the essential questions identified, observers were able to apply ordinal scaling to the metrics.

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IV. ANALYSIS AND FINDINGS

A. INTRODUCTION

This chapter presents the findings of the wargame described in the previous chapter and discusses how each C2 structure differed in its effectiveness towards the employment of the LSM during the varied scenarios. The wargame was analyzed through the quantity and type of communication that occurred between the unit that had operational control over the LSM and units either subordinate or higher to the LSM controlling unit. The wargame was also analyzed to show the quantity of communication between units that were not in the direct command hierarchy of the LSM and resulted from a need for resource coordination (Sengupta et al., 1996).

We also examined each C2 structure for the effectiveness of each C2 structure as it relates to the requirements drawn from Martin Van Creveld's Command in War (Van Creveld, 1985). Effectiveness of a C2 structure is broken down into categories of information capacity and centralization, decision making ability within the operational context, complexity, and flexibility.

B. COMMUNICATION QUANTITY

This measure looked at the quantity of communication that occurred between the different units that were in play in each scenario. This basic measurement gives insight into the level of understanding that occurred between higher echelons, subordinates, and adjacent units to the LSM controllers. We first looked at the number of messages that involved the LSM from any unit directed at a higher echelon, depicted as "up" in Tables 1 through 3. By comparing the amount message traffic across the C2 structures that is going to a higher command we see the number of times either information is needed to be requested as from an LSM adjacent unit, or approval is being requested from an LSM controlling unit. This showed the clarity of the operational picture for that unit and the ability to operate independently. Looking at the comparative amounts of message traffic between adjacent units we can derive the level of resource coordination, action coordination, and information coordination (Sengupta et al., 1996) that needed to occur at

that level. Finally, looking at the quantity of message traffic going to subordinates concerning the LSM depicts the amount of direction required in order to utilize the LSM. In tables 1 through 3 below, the quantity of the three categories is tallied from unit specific communication channels as well as the overall coordination chats for each structure. Also shown in Figures 12 through 14 are graphical depictions of the LSM message richness for each C2 structure during their respective scenario. The richer or higher quantity of message traffic between the two units, the thicker the line is represented (Sengupta et al., 1996).

1. CWC C2 Message Quantities

In analyzing the message quantities in the CWC C2 Structure, we saw that a significant amount of the message traffic occurred in the across category (shown in Table 1 and graphically in Figure 12). This was due to the amount of resource coordination that was required between the Transport Task Group who controlled the LSMs and the Deny Task Group, the MLR, who utilized the LSM. Furthermore, action coordination (Sengupta et al., 1996) was also required for escort and coordination with the Surface Task Group who owned all other surface assets. In comparison to other C2 structures there was a significant increase in across message traffic for the CWC C2 Structure. It is important to note the number of messages going up and down between the JFMCC and the Transport Task Group, over twice the number of the MAGTF and CATF/CLF C2 Structure. This displays the little battlesight picture that the Transport Task Group possessed during the scenario and the burden of decision-making the JFMCC possessed in this structure.

Table 1. CWC C2 Structure, LSM Chat Counts

Units Chat	Up	Across	Down	Total
Deny- Transport	-	20	-	20
JFMCC – Deny	7	-	3	10
Transport – Surface	-	20	-	20
Surface – Deny	-	5	-	5

Units Chat	Up	Across	Down	Total
JFMCC – Transport	18	-	11	29
All Unit Chat	6	10	8	24
Total	31	55	22	108

*Highlighted sections are chats with the LSM controlling unit

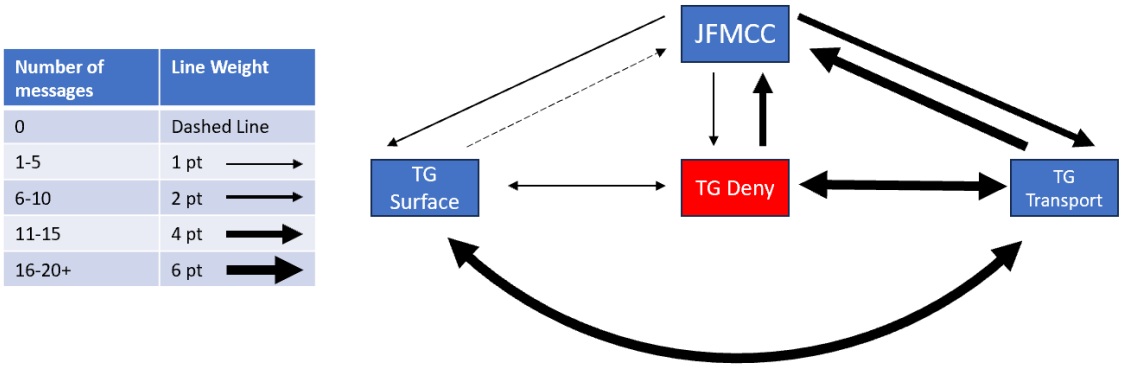

Figure 12. CWC C2 Structure LSM Message Richness. Adapted from Sengupta et al. (1996).

2. MAGTF C2 Message Quantities

The MAGTF C2 structure's amount of LSM messages shows the MLR operated mostly independently from other units and only presented updates to their higher command, MEF, when required. The graphical depiction in Figure 13 shows limited message traffic to and from the MLR shows that the command was able to coordinate their movements on their own with the LSM reducing the amount of resource coordination with higher and adjacent units. This also shows that either the SAG and JFMCC had a full operational battlesight picture of the MLR or did not need to have oversight of the LSM movements. The MAGTF C2 structure shows the least amount of messages concerning the LSM out of all of the tested C2 structures (shown in Table 2), this again shows the independent operation of the MLR and fits within the Marine Corps Concept for Stand-in Forces (USMC, 2021).

Table 2. MAGTF C2 Structure, LSM Chat Counts

Unit	Up	Across	Down	Total
All Unit Chat	-	8	2	10
MLR – MEF	9	-	5	14
SAG – MEF	-	-	-	0
JFMCC – MEF	1	-	-	1
Total	10	8	7	25

*Highlighted sections are chats with the LSM controlling unit

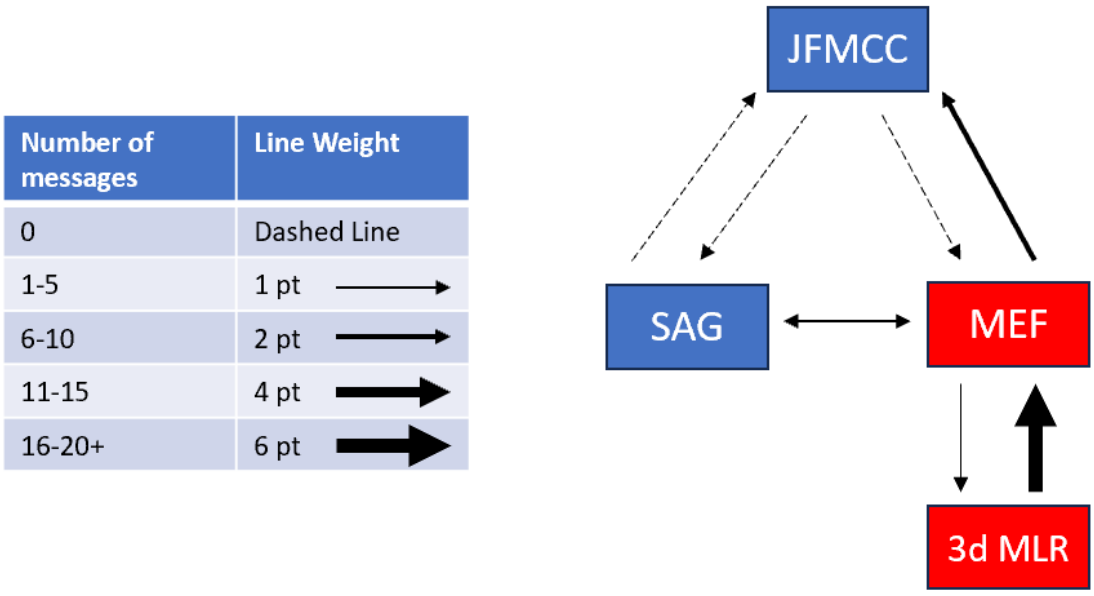

Figure 13. MAGTF C2 Structure LSM Message Richness. Adapted from Sengupta et al. (1996).

3. CATF/CLF C2 Message Quantities

The message quantity for the CATF/CLF C2 structure shows the CATF/CLF creating the majority of the LSM specific messages. In this C2 structure, the LSM was controlled by the CATF/CLF and utilized by its subordinate, this led to an increased number of directing messages sent from the CATF/CLF to the MLR for the use of the LSM (graphically shown in Figure 14). The CATF/CLF also created the most action coordination messages to allow MLR movements to be synchronized with requests sent to the CATF/CLF's higher unit, the JFMCC. With the limited number of messages, it is clear the amount of resource coordination required outside of the CATF/CLF was limited due to the CATF/CLF controlling all surface vessels. Although not the lowest total number of messages sent of all of the C2 structures tested (shown in Table 3), it did have the lowest number of messages going up and down showing clarity in operational pictures for all units being played in this scenario.

Table 3. CATF/CLF C2 Structure, LSM Chat Counts

Unit	**Up**	**Across**	**Down**	**Total**
All Unit Chat	3	12	-	15
MLR – CATF/CLF	5	-	6	11
JFMCC – CATF/CLF	1	-	1	2
Total	9	12	7	28

*Highlighted sections are chats with the LSM controlling unit

Number of messages	Line Weight
0	Dashed Line
1-5	1 pt
6-10	2 pt
11-15	4 pt
16-20+	6 pt

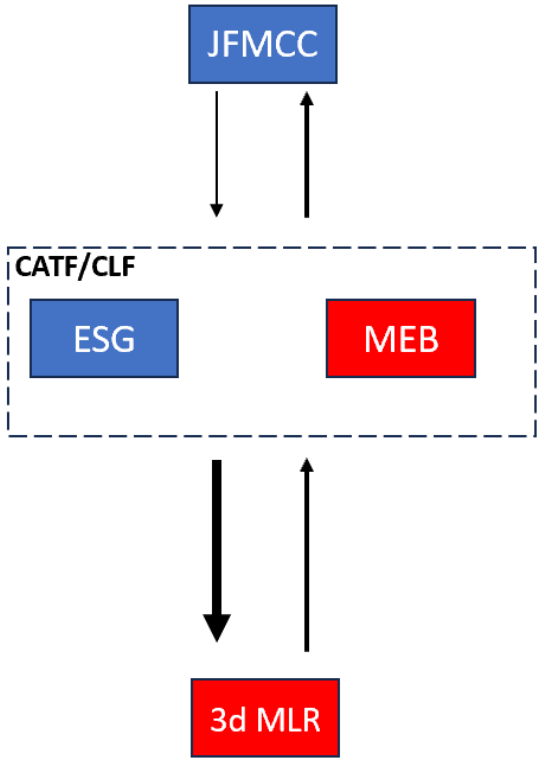

Figure 14. CATF/CLF C2 Structure LSM Message Richness. Adapted from Sengupta et al. (1996).

C. VAN CREVELD METRICS

1. Information Centralization and Capacity

This metric is derived from Martin Van Creveld's idea that to complete a task, commands must be designed to either operate with less information or increase information processing capacity (Van Creveld, 1985). In this sense, the task was the operational employment of the LSM in support of the MLR's maneuver. We looked at the three command and control structures to see first if the information had a high or low level of centralization and then identified by its performance of the task to identify if the organization had a high or low capacity to process information. Through this categorization we were able to evaluate the C2 structures as high medium, and low, as shown in Table 4. Placing the best fit of information centralization and capacity mix as a high marking.

Table 4. Information Centralization and Capacity Categorization

Centralization	Capacity	Overall
High	High	High
High	Low	Medium
Low	High	Medium
Low	Low	Low

First looking at the CWC C2 structure, we identified that the information was centralized on the JFMCC. The CWC C2 structure forces the centralization of information on the overall commander while the structure has a low capacity of information processing shown in the wargame through the time it took the information on the LSMs employment to reach the JFMCC and subsequently return back to an appropriate command for action. This mismatch of information centralization and organization capacity created delays that limited the ability of the LSM. For this reason, we evaluated the CWC C2 structure as a medium fit for information centralization and capacity.

For the MAGTF C2 structure, the MEF was identified as where the information was being centralized making it high for centralization. Due to the LSMs not being organic (DOD, 2022) to the MEF, and LSMs organic to the MLR, in this C2 structure required the MEF to conduct further action coordination with the MLR for LSM employment. This created a low capacity of information processing within this C2 structure. Given the low capacity for making direct LSM decisions at the center of information flow, the MAGTF C2 structure is a medium fit for information centralization and capacity.

For the CATF/CLF C2 structure, the CATF/CLF was identified as the central node of information flow for the structure which makes the centralization of the information in this structure high. It also possessed high capacity to make direct decisions with the LSMs as they were organic to the CATF/CLF. Due to the high centralization and high capacity of information processing the CATF/CLF C2 model was identified as a high fit for information centralization and capacity.

2. Decision Making Ability

This measurement focuses on the decision-making ability of the unit controlling the LSMs in the overarching operational situation and not just the tactical situation. An ability to sense what is occurring in the joint operational area as well as track and determine the location of enemy assets as well as friendly assets in a joint operational area (JOA) is key to success in this measurement. MCDP 6 states, a C2 system should help to gather information quickly at the decision-making level, at the right time, in order to gain tempo over the enemy (USMC, 2018). This leads to the requirement of an appropriate level of situational information collection ability to make decisions with organic assets. Van Creveld also states that commands should not only have the latitude to make their own decision but also be given the organizational means to act on those decisions (Van Creveld, 1985, pp. 271). We evaluated the C2 structures on their sensing capability as high or low and their timeliness of action as fast or slow. Through these evaluations we placed the C2 structures on scale of incapable, situationally capable, and fully capable, as shown in Table 5, in respect to their ability to make appropriate decisions with the LSM within the organic assets that they possessed.

Table 5. Decision Making Ability Categorization

Sensing Capability	Timeliness	Capability
High	Fast	Fully Capable
High	Slow	Situationally Capable
Low	Fast	Situationally Capable
Low	Slow	Incapable

For the CWC C2 structure we evaluated the placement of the LSM at the Task Group Transport as incapable. We evaluated the sensing capability as low; this is due to the limited number of organic assets it would possess for identifying and tracking adversary and civilian surface, subsurface, and air vessels. It required the assets from the Task Group Deny and JFMCC for situational insight for where and when it could place its LSMs. This inability to operate in a contested environment limits the decision making of the Task

Group Transport in the CWC C2 structure, which goes against MCDP 6's idea that a command and control system must principally work in a wartime environment (USMC, 2018). Due to the range of the LSM and the need to operate in a contested environment, the timeliness of the decision making on the Task Group Deny is low, resulting in the categorization of incapable of decision making for the CWC C2 structure.

The MAGTF C2 structure was evaluated as situationally capable for its decision-making ability. The sensing capability of the MLR which controls the LSM in this structure is high but limited to the range of its organic assets. With the proposed range of the LSM being around 6,500 miles (O'Rourke, 2023), the MLR can only appropriately control the LSM within the range of their organic weapon systems and collection assets. Within the MLR's own designated operation area, they would have the full decision-making capability for the LSM. However, within the Concept of Stand-In Forces, the LSMs would be positioned outside the contested area ready to conduct resupply or further maneuver operations (USMC, 2021). This required positioning places them outside of the MLRs exclusive environment and further into their higher command's environment (Lawson, 1980, p. 7) creating a degradation in the timeliness in which the MLR can make decisions. This places the timeliness as a slow marking and results in the situationally capable categorization and increased requirement for the higher command to influence decisions.

The CATF/CLF C2 structure was evaluated as being fully capable for its decision-making ability for LSM employment. Its organic assets that were able to see throughout the joint operations area marking it as a high for sensing capability and the CATF/CLF possessed the assets to protect the LSMs during in the contested area. The CATF/CLF was able to absorb relevant information quickly and employ the LSMs with the MLR to enable mission accomplishment for the blue force. Furthermore, the CATF/CLF could quickly make the decisions required for the LSM marking the timeliness as fast. The high sensing capability and fast timeliness categorizes the CATF/CLF C2 structure as fully capable in its decision making ability.

3. Complexity

> The more numerous and differentiated the departments into which an organization is divided, the larger the number of command echelons superimposed upon each other, the higher the decision thresholds, and the more specialized its individual members, then the greater the amount of information processing that has to go on inside the organization. (Van Creveld, 1985)

A simple C2 structure reduces the scope of confusion and reduces the amount of information required to conduct operations (Van Creveld, 1985). The three C2 structures were evaluated during their wargame scenarios to be simple, average, or complex. The structures were evaluated on not just their line and block layout shown in Table 6 as number of units, but also in the amount of LSM action, resource, and intelligence coordination (Sengupta et al., 1996) occurred during the respective wargame scenarios, shown in Table 6 as coordination requirements. Together, these two attributes can categorize the C2 structures complexity. Ideally an organization will be categorized as simple.

Table 6. Complexity Categorization

Number of Units	Coordination Requirements	Complexity
High	High	Complex
High	Low	Average
Low	High	Average
Low	Low	Simple

The CWC C2 structure enabled specialization in duties during the operation which allows for command by negation and decentralized execution (DON, 2017b) however, as Task Group Transport required resource coordination with Task Group Deny the decentralized nature of the CWC was not as apparent. This also increased the required coordination across the CWC C2 structure to inform and coordinate with other adjacent units. Due to the amount of coordination required, we evaluated the CWC C2 structure as high for coordination requirement. The CWC C2 structure possessed the most units out of the three evaluated so it is shown as high for number of units. We therefore evaluated the CWC C2 structure as having a complex C2 structure in regard to the LSMs.

The MAGTF C2 structure was shown as a C2 structure with few adjacent units when it came to the LSM. The few numbers of units within this C2 structure places it as a low within the number of units. With the majority of decision making occurring within the MLR and limited coordination occurring with the MEF, the amount of information required to be shared on the LSM was reduced. For this reason, we evaluated the coordination requirement as a low. With these markings, we identified the MAGTF C2 structure as being a simple C2 structure in regard to the LSMs.

The CATF/CLF C2 structure had the least amount of units of the three C2 structures evaluated and is marked as a low on the number of units. The CATF/CLF C2 structure showed that the majority of coordination occurred within the CATF/CLF command and only action or information coordination was required outside of the command. This follows Van Creveld's principle of processing information inside the unit but as the CATF/CLF was an expansive unit the internal coordination was significant. Due to the fact that more LSM coordination messages were required than in the MAGTF C2 structure, this C2 structure was evaluated as having high coordination requirements. Together the low number of units and the high coordination requirement places the CATF/CLF C2 structure has having average complexity in regard to the LSMs.

4. Flexibility

The Concept for Stand-In Forces states that command relationships for stand-in forces needs to be flexible to orchestrate the actions of the units within the contested environment (USMC, 2021). MCDP 1, Warfighting, lays out the idea that flexibility enables the ability to take advantage of an enemy's vulnerabilities which enable opportunities for success in combat (USMC, 1997). Each of the C2 structures were evaluated throughout the scenarios for its flexibility in the use of the LSM and set to a scale of high, medium, and low levels of flexibility. We based the flexibility of each C2 structure from Carl Von Clausewitz's On War, where he states that flexibility in an army can be shown through units being easily detached and reattached to perform missions without disturbing the C2 structure (Clausewitz et.al., 1984, pp. 293).

The CWC C2 model was identified as having a high level of flexibility for LSM use. This structure allowed the JFMCC to direct Task Group Transport to support Task Group Deny but also reserved the ability to use the LSMs for resupply missions or as decoys for the strategic mission at hand. This ability to flex from directly support the MLR and the LSMs main purpose to one that could have strategic implications, shows the flexibility of the CWC C2 structure to take advantage of the friendly and enemy's situation.

The MAGTF C2 model was shown to have a low level of flexibility for its ability to use LSMs. This is due to the limited mission of the MLR. As the MLR being the primary unit to serve as stand-in forces (O'Rourke, 2023), they would primarily utilize LSMs in a pre-crisis manner (MLR, 2023) which limits the use of the LSMs to a role of transportations, resupply, and limited actions as a sensor as seen in this model's wargame scenario. The tactical placement of the LSMs reduces the potential use of the vessel from its controlling command from use in directly operational or strategic means. Furthermore, if the LSMs were to be removed from the MLR, the movement of the MLR within an archipelago would be more complicated as there would be no established resource coordination channels.

The CATF/CLF C2 model was identified as having a high level of flexibility for the use of the LSMs. The ability for the CATF/CLF to employ the LSMs for direct use by the MLR while reserving the ability to use the LSMs for further movements of supplies to enable other Naval Vessels and resupply missions not just to the MLR but to potentially other occupied EABOs throughout the operating area increases the flexibility of the LSMs. Furthermore, with the MLR being the primary user of the LSMs and being a direct subordinate to the CATF/CLF, LSMs are then able to be pushed down to the MLR for tactical control by the MLR if the situation calls for that method of control.

V. CONCLUSION

A. ANALYSIS CONCLUSION

From this study we identified possible C2 structures that function in wargame scenarios that are very likely in future conflict in the South China Sea. Through the wargame we identified the most appropriate structure for the LSM by analyzing the quantity of the messages transmitted and the observation of how decisions were made at the different echelons when the LSM was involved. Table 7 summarizes the findings of the Van Creveld based metrics while highlighting all favorable evaluations as green, acceptable evaluations as yellow, and unfavorable evaluations as red.

Table 7. Van Creveld Metrics Summary Table

	CWC C2 Structure			MAGTF C2 Structure			CATF/CLF C2 Structure		
Centralization and Capacity	High	Medium	Low	High	Medium	Low	High	Medium	Low
Decision Making Ability	Fully Capable	Situationally Capable	Incapable	Fully Capable	Situationally Capable	Incapable	Fully Capable	Situationally Capable	Incapable
Complexity	Simple	Average	Complex	Simple	Average	Complex	Simple	Average	Complex
Flexibility	High	Medium	Low	High	Medium	Low	High	Medium	Low

Through the analysis of the messages sent during the wargame scenarios and the evaluation of the structures through key metrics we learned that the CATF/CLF command and control structure led to the most effective use of the LSM. The CATF/CLF had the best fit for information centralization and capacity when compared to the other structures. The quantity of messages sent concerning the LSM during the CATF/CLF scenario was not the least amount, it did however have the least number of messages from the controlling unit to the supported unit. In this view of the data, the CATF/CLF required the least amount of coordination to the MLR regarding LSM usage and was able to conduct coordination with other required assets without having to submit requests to other units. However, the increased amount of internal coordination required increased the complexity of the CATF/CLF C2 structure to average.

Using Lawson's models of the C2 process (Lawson, 1980, p. 6-7), the CATF/CLF structure controlled the effect that the MLR could have on the higher echelon's environment and placed it where it needed to be for the operation. By controlling the LSM, the CATF/CLF was able to conduct coordination quicker around the MLR for surface actions and allow the MLR to conduct advanced basing operations as it was designed labeling it as the only C2 structure evaluated as fully capable. Furthermore, with the CATF/CLF's organic ability to sense and make sense of the operational area and strategic objectives it is in the best position to control the LSMs. The simple and flexible structure of the CATF/CLF enabled quick changes to plans and players in the wargame to take advantage of opportunities as they arose.

B. FURTHER RESEARCH

1. LSM Understanding

For further research into this problem, we recommend five areas of research. First, have the ability to draw the approved requirements for the LSM in regard to carrying capacity, defensive capabilities, and sensors. Currently, development on the LSM program has not come to an approved list of program requirements, leading to the use of Ronald O'Rourke's CRS report in 2023. Further research should investigate the garrison or port life of the LSM and its requirements. From the maintenance requirements of the LSM, the non-operational training requirements for its sailors to where the LSMs would be docked. Conduct research into the locations for the LSM where 12th MLR and 4th MLR will be stationed and the maintenance capabilities located near those locations? Conduct research into what the training requirements for the LSM be in preparation for moving the MLR from position to position would be. Lastly conduct research into the LSM's maintenance be funding and who would have the ability to facilitate that maintenance.

2. Wargame Modifications

Derivations of our wargame should be used to test the LSM command and control structure's use in contested logistics scenarios. The critical nature of sustainment for stand-in forces is how long those forces will be able to present a threat to the adversary and any significant sustainment would need to be afloat (USMC, 2021). Sustainment operations in

contest environments is also listed as required capability in LOCE doctrine (DON, 2017b). Future iterations of the wargame should be used with military professionals located at higher echelon commands as well as lower echelon commands. As in our design of our wargame, we did not record or include the service, level of experience, or military occupational specialty, a wargame that included this information could lead to different results. In this iteration, the focus could also be on the human aspect of command and control. By placing senior Navy and Marine Corps leaders in the same roles as junior leaders, the experience level and background of each player set in a designated unit role could give different information for the optimal C2 structure for the LSM.

3. C2 Structure Criteria

Very little is written on how C2 structures should be evaluated due to the diverse situations each structure may be placed. Van Creveld states that success of one command structure in one situation does not guarantee success in another situation (Van Creveld, 1985) which leads to the difficulties in evaluating one command structure against another. We evaluated the proposed C2 structures against theory, doctrine, and a scenario based test through a wargame. We recommend further research into the metrics presented in this paper that were used to evaluate the C2 structures. Having a deeper understanding of decision making ability, complexity, flexibility, and information centralization and capacity will enable a better understanding of what will make a C2 structure more likely to be successful in a future situation.

C. FINAL THOUGHTS

This thesis was developed to further the understanding of the complexities of adding a unique capability like the LSM to an organization that does not typically control assets of this type and how the integration of such an asset would be appropriately allocated. Although the Navy and the Marine Corps have a rich history of operating jointly together, the Marine Corps has not directly owned a ship with capabilities such as the LSM. The shared command and control structure is one that the Navy and Marine Corps team will need to understand, accept, and be able to translate into other aspects of the operational relationship.

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APPENDIX. WARGAME MATERIALS

1. Road to War

Wargaming OA4604:
Road to War

UNCLASSIFIED

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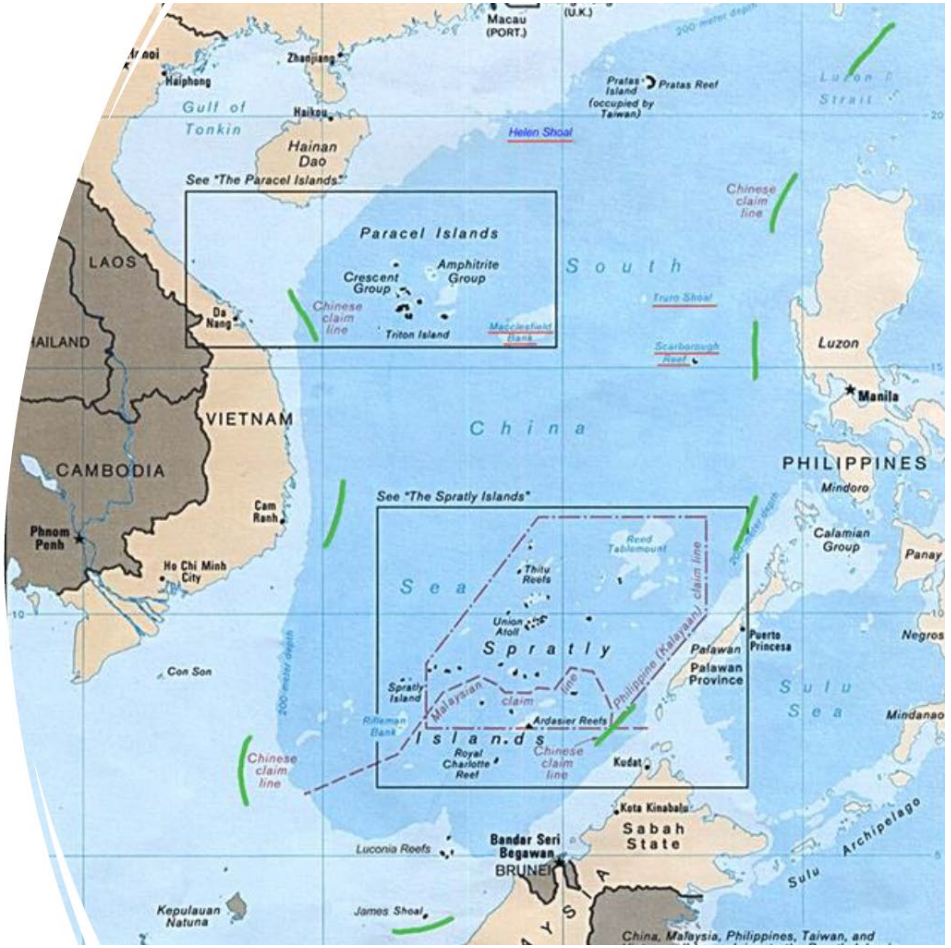
Overview

- There has been significant movement across the globe in the escalation towards full conflict from uniformed and plain clothed Chinese and its vassal states like North Korea.

- China has been developing sea basing across the South China Sea in an effort to legitimize their claim of the 9 Dash Line, resources in the area, and set themselves as the predominate world power.



TIMELINE

CHINA

Early March 2045

- Chinese Coast Guard and Navy push nearby **countries' Navies out of the 9-Dash Line area**
- Chinese Government declares military exclusion zone of 9-Dash Line at United Nations

27 March 2045

- PLA forces belonging to the Southern and Eastern Theater Commands launched a large-scale amphibious operation against Taiwan.
- The PLA-N has established a quarantine around the island of Taiwan with most of its forces operating IVO the Taiwan Strait ISO ongoing amphibious operations.

28 March 2045

- PLA-N beginning military escorts of cargo and oil ships IVO Natuna Besar from oil rigs throughout the area.

29 March 2045

- Indications of PLA-N & PLA-MC increasing operations throughout known bases IVO the Spratly Islands

Future Expectations

- World news outlets are describing the events of late as a push for China to reclaim contested land and continue to expand its claim of new lands and resources.
- Regional experts say the Chinese government is looking to expand through previous claims and island bases that have been built throughout the South China Sea in the last two decades.
- It is expected for the PLA-N and PLA-MC to defend the more outrightly expressed claims through force unlike in previous years.

- World news outlets expect the United States to take a front seat in the de-escalation and confrontation of Chinese actions while receiving indirect support from countries surrounding South China Sea as they are unable to support militarily.
- Indications of Naval amphibious shipping and Marine Corps assets moving in the South China Sea operation area has been seen.
- Units from the US Army and Air Force are being disbursed around the globe in the event of Chinese military expansion from Chinese owned ports facilities built during the Belt and Road Initiative.

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Wargaming General Rules / Requirements:

- **Friendly Foreign Assets**
  - Currently engaged in defense of homelands, assets not available for tasking/asking
  - Overflight and use of APODs and SPODs currently available
    - Use of APODs / SPODs as firing location upon enemy may result in loss of country's assets unless previously approved through CJTF
- **All requests to higher must include some form of 5 W's**
- **All requests must be written on "yellow canary" or in TEAMS chat to higher**
- **12 hours "game time" will equate to 20 minutes real time**
- **Map breakdown**
  - Single letters to double letter separation
  - Scaling (1 hex = 10 Nmi) Big Map -> 1 hex = 40 nmi
- **CSGs and MEUs will be requestable through the CJTF**
- **Play the roles of the billet(s) given, the interactions of decision- making matter**
- **ROE is restrictive, fire only when fired upon unless prior approval from TEA (Target Engagement Authority)**
- **TEA is at the JTF level** (changeable upon request)
- **NEMSIS has two missiles per launcher**
  - 4 more missiles available for reload prior to external logistical support required

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Wargaming First Moves Requirements:

- **Acetate with drawing of plan** (delivered to white cell for adjudication)
  - Big blue arrows with Units
  - TAIs (Target Area of Interest) / NAIs (Named Area of Interest)
    [Where you think you'll be shooting] [Where you want your sensors to look]
- **Quick SMEAC brief to runner**
  - Situation – What you see for the blue and red with the information given
  - Mission – what is the mission for your key elements
  - Execution – How you see each of your key elements moving throughout the operation to accomplish the mission. Also, how your units are operating together (supporting, by area, etc)
  - Admin/Logistics – Any logistical/administrative constraints to the operation
  - Communication – Plan for communicating across the commands

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4. Luzon Strait Scenario – Blue Cell Situation

Taiwan Scenario: Blue Force

Orientation

- You are part of JTF-TW, tasked with the international military response to Chinese actions against Taiwan. The JFMCC, 7th Fleet, has been tasked with the sea control mission in support of Taiwan's defense. TF7 has been tasked with the sea control mission in support of Taiwan's defenses in the waters south of Taiwan to include the Luzon Strait. Your forces, TG71 (Surface), TG72 (Deny), and TG73 (Transport), are the primary fighting forces for TF7.
- The time is now 0000 on 3 April 2045

Situation

Enemy:

- One week ago, PLA forces belonging to the Southern and Eastern Theater Commands launched a large-scale amphibious operation against Taiwan.
- The PLAN has established a quarantine around the island of Taiwan with most of its forces operating IVO the Taiwan Strait ISO ongoing amphibious operations.
- PLAN assets in the AO include 3 DDGs, 4 FFGs, and 2 SSNs. The *Shangdong* CSG is operating south of the Parcel Island and is only able to provide limited air support to the Luzon Strait AO.
- Higher and friendly intelligence has observed the presence of PLAN DDG operating IVO CCC8, FFGs IVO BBB9 and GGG8, and a CG IVO HHH8 as of 2200 02APR2045.
- PLAAF and PLARF assets on mainland China are concentrated on supporting ongoing military operations in Taiwan and are only able to provide limited support to the Luzon Strait AO.

Friendly:

- 12th MLR with a NMESIS battery is standing by at Naval Base Camilo Osias, Philippines (base is IVO FFF13, SCS map)
- TG Transport is operating IVO Naval Base Camilo Osias, Philippines (IVO FFF13, SCS map)
- CSG 5 is operating in the AO but supporting operations in northern Taiwan and may only be able to provide limited air support (request through CJTF).
- 11th MEU is operating in the Philippines Sea and may only be able to provide limited air support (request through CJTF).
- JTF-TW CO is on the USS *Blue Ridge*, located east of the Second Island Chain.
- Allies in region are not directly partaking in conflict, but all friendly APODs/SPODs are open, and overflight of friendly airspace is permitted at game start.

TF7 Mission:

Deny the Luzon Strait to PLA forces to enable USN and USMC movement in the AO.

Execution:

Commander's Intent:

- Purpose: to conduct sea denial operations in the Luzon Strait AO to enable friendly movement
- Method: subordinate commanders determine method
- End State: Luzon Strait under US control with MLR presence on Batanes and Babuyan Islands

Tasks:

- **TG71 Surface:** neutralize PLAN forces to keep sea lines of communications (SLOCs) between Japan and the Philippines and through the Luzon Strait open and under US control and to keep the push the PLAN west of the first island chain. You are the main effort.
- **TG72 Deny:** conduct sea denial and sea control operations IVO Luzon Strait to support TF Sea Control objectives. You are supporting effort 1.
    - NLT 0000 06APR2045, have NMESIS firing positions established in the Babuyan Islands with more enroute to the Batanes.
- **TG73 Transport:** facilitate movement of TG Deny within the AO. You are supporting effort 2.

Coordinating Instructions:

- ROE: follow ROE as presented in game rules.

Task Organization: CJTF-JFMCC

- Task Group 71 Surface
    - Surface Action Group
        - 3x *Arleigh Burke*-class DDGs
            - *John Finn* (DDG-113) (IVO KKK8, SCS map)
            - *Ralph Johnson* (DDG-114) (IVO LLL8, SCS map)
            - *Rafael Peralta* (DDG-115) (IVO HHH13, SCS map)
        - 4x *Independence*-class LCSs (1x MQ-8C Fire Scout each)
            - *Kansas City* (LCS-22) (IVO KKK8, SCS map)
            - *Oakland* (LCS-24) (IVO LLL8, SCS map)
            - *Mobile* (LCS-26) (IVO III13, SCS map)
            - *Augusta* (LCS-34) (IVO III13, SCS map)
- Task Group 72 Deny
    - 12th MLR
        - Anti-air capabilities dispersed within MLR
            - Stinger MANPADS
        - 3x NMESIS Plt
            - 9 launchers and ~68 Marines per Plt
            - 54 NSM per Plt
        - 1x Littoral Combat Team (LCT)
        - 1x Combat Logistics Battalion (CLB)
        - 9x SKYDIO UAS
        - 1x Raven UAS
        - 1x Puma UAS
- Task Group 73 Transport
    - 9x LSM (max capacity 54 troops each)
- CSG 5
- 11th MEU
- USS *Blue Ridge*

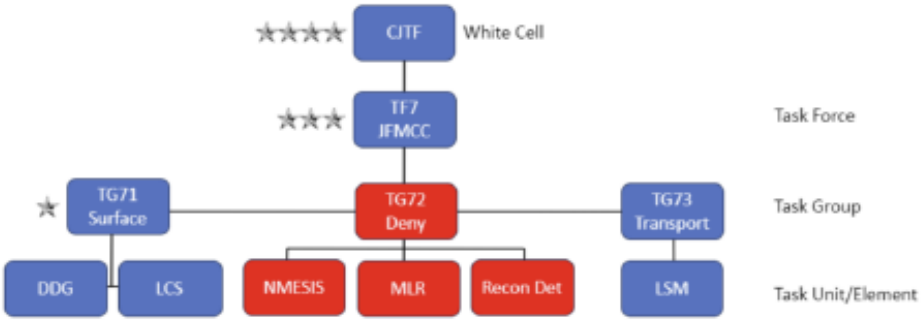
JTF/JFMCC Apportioned Assets Available:

- 2x P-8 sorties per turn, 4 hours TOS.
- 4x MQ-9B sorties per turn, 12 hours TOS.
- National assets may be available upon request.
- Limited support from CSG 5 and 11th MEU (route requests through JFMCC).
  - 2x F-35 per 24 hours, 2 hours TOS.
- 1x USMC Force Reconnaissance Plt

Assumptions:

- No nuclear/chemical/biological weapons will be used
- No mining operations as civilian shipping is still present in AO
- No units on objectives (USMC/USN)
- Cannot target mainland China

C2 Structure:



5. Luzon Strait Scenario – Red Cell Situation

Taiwan Scenario: Red Cell

Orientation:

- You are the CO of Task Force South under the command of the Southern Theater Command Navy.

Situation:

Enemy

- Higher's intelligence section has assessed that a US CSG departed Yokosuka and is enroute to the Philippine Sea and there is a US MEU operating IVO the Philippine Sea. There is also a USMC MLR based out of the northern Philippines and an unknown number of USN SSNs operating in the AO.
- EN MLCOA is to penetrate quarantine of Taiwan to support ROC defenders on the island.

Friendly

- One week ago, the PLAN conducted a series of amphibious landings along the western coast of Taiwan. PLA forces successfully landed troops and equipment ashore along Taiwan's west coast and Kinmen and Penghu islands.
- Eastern Theater Command is supporting ongoing amphibious operations and the quarantine of Taiwan and are unable to support operations in the Luzon Strait.
- The *Shandong* CSG is operating north of Taiwan ISO landing operations IVO the capital of Taipei.
- PLAN ships have established a quarantine around the island of Taiwan, with most of the force along the western shore ISO amphibious operations.
- PLARF and PLAAF assets from mainland China are supporting ongoing operations on Taiwan and may only be able to provide limited support to the Luzon Strait AO.

Mission:

Prevent the USN/USMC from breaching the quarantine of Taiwan in the Luzon Strait AO.

Execution:

Commander's Intent:

- Purpose: We must prevent the USN/USMC from breaching the quarantine of Taiwan ISO ongoing amphibious operations.
- Method: Neutralize any USN/USMC assets enroute to Taiwan.
- End State: Quarantine around Taiwan remains in place.

Coordinating Instructions:

- ROE:
    - TF South is authorized to use lethal force against any entity demonstrating minimal threats towards friendly forces.
    - Minimal threats include actions such as reconnaissance, ambiguous actions, or uncooperative behavior.
    - Positive identification of a target as an enemy combatant is encouraged but not required prior to engaging potential threats.

- Units within TF South have the inherent right to use force in self-defense against imminent threats.
- TF South may conduct preventive strikes against known enemy assets and positions if there is credible intelligence of an imminent threat.
- All actions should minimize collateral damage to civilian infrastructure, non-combatants, and environmentally sensitive areas.

Task Organization: TF-SOUTH

1x *Renhai*-class CGs

- *Dalian* (@HHH8)

2x *Luyang III*-class DDGs

- *Zibo* (@CCC10)
- *Tangshan* (@CCC8)

4x *Jiangkai*-class FFGs

- *Huangshan* (@GGG8)
- *Hengyang* (@GGG8)
- *Yuncheng* (@BBB9)
- *Yulin* (@BBB11)

2x SSNs (@YY12 and @JJJ11)

3x WZ-7 (Land-based ISR UAV)

Assets Available:

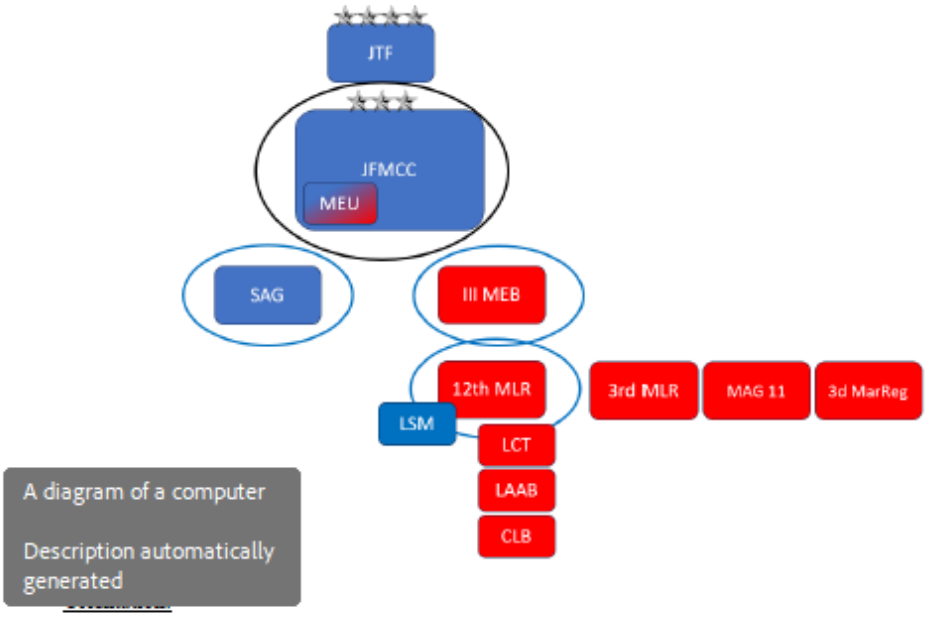
- PLARF land-based fires Medium-Range Ballistic Missile (MRBM) may be available on request:
  - 2x DF-21D (per game) (Target at naval vessels, particularly aircraft carriers)
  - 2x DF-26 (per game) (Target at military installations, bases, and infrastructure)
- PLAAF ground-based aircraft may be available on request:
  - 2x WZ-7 (ISR) per turn, 12-hour Time on Station (TOS)
  - 1x J-15 X2 (Target at vessels and aircraft) per turn, 2-hour Time on Station (TOS)

Assumptions:

- No nuclear/chemical/biological weapons
- All friendly Airports of Debarkation/ Seaports of Debarkation (APODs/SPODs) open at start.
- There are no PLA troops on islands other than those of Taiwan and China

6. Natuna Besar Scenario – Blue Cell Situation

Natuna Besar Scenario: Blue Force



A diagram of a computer

Description automatically generated

- It is April 3rd, 2045

Situation:

Enemy:

- Contention over freedom of navigation within the Strait of Malacca has escalated between China and American forces and the PLN has begun targeting both shipping and military vessels in the area they deem a threat to their movement.
- The PLN has begun providing armed escorts for their supply ships for vessels transiting from the Strait of Malacca towards the Spratly Islands.

Friendly:

- 12th MLR reinforced with an additional NMESIS Plt from 3rd MLR is currently deployed forward in Natuna Besar (N6 and O4) and has spent the last few months dispersed across the island anticipating increased conflict in the region.
- You were previously tasked with an ISR mission, but as PLN forces have become more aggressive in the region, your mission has changed.
- The remainder of 3rd MLR is currently located in the Philippines.
- 11th MAG is currently located in the Philippines.
- SAG Deny is currently IVO AAA22.
- The III MEB HQ is currently located in Okinawa.
- The 31st MEU is currently conducting operations east of the Philippines and is not available for support. The MEU HQ is co-located with the JFMCC.

- You are not currently aware of any enemy forces stationed on land within the Riau Islands.
- 2 friendly SSNs are operating in the South China Sea. Exact locations unknown and assets are not available for re-tasking.

Mission:

JFMCC: Conduct sea control operations in the South China Sea IOT support de-escalation in the region.

Tasks:

12th MLR: Occupy Laut and Subi-Basar Islands IVO Natuna Besar IOT support naval sea denial operations. Be prepared to neutralize enemy ships in the region.

SAG: Neutralize enemy ships transiting between Natuna Besar and the Spratly Islands between southern Vietnam and northwestern Borneo IOT deny enemy operations in the region.

III MEB: Support the JFMCC through operational fires, scouting, command and control, and additional supporting functions as required IOT support sea denial operations.

Execution:

Commander's Intent 12th MLR:

- Purpose: support naval sea denial operations
- Method: occupy Laut and Subi-Besar Islands and neutralize enemy ships IVO Natuna Besar
- End state: enemy traffic coming to and from the Strait of Malacca is denied.

Task Organization:

12th MLR:

- 12th MLR (+) on Natuna Besar
  - (3) NMESIS Plt
    - 9 launchers, ~68 Marines
    - 54 NSM
  - (1) Littoral Combat Team (LCT) (~200 Marines)
  - Anti-air capabilities dispersed within the MLR
  - 9x LSMs (max capacity 54 troops)
- ISR
  - 9xSKYDIO UAS
  - 1x Raven UAS
  - 1x Puma UAS

III MEF:

- 3rd MLR and an additional NMESIS Plt located in the Philippines
  - 9x LSMs

    - 54 NSMs
    - 9xSKYDIO UAS
    - 1x Raven UAS
    - 1x Puma UAS
- MAG 11 (fwd deployed to the Philippines)
    - Maximum of 2x F-35 sorties per day
- 1st Marine Reg
    - Ground recon platoon

SAG Deny:

- Surface Action Group
    - 2x *Arleigh Burke*-class DDGs
        - *John Finn* (DDG-113)
        - *Ralph Johnson* (DDG-114)
    - 2x *Freedom*-class LCSs
        - *Kansas City* (LCS-22)
        - *Oakland* (LCS-24)
    - 2x MQ-8C Fire Scout (1 per LCS)

JFMCC:

- Purple air on request from Hawaii/Korea
    - Korea:
        - Maximum of 4x F-35 sorties per day
        - Maximum of 2x P-8 sorties per day
- Land-based ISR assets:
    - None currently available. May be available upon request
- National assets may be available upon request

Additional Info:

- TEA is currently retained by the JFMCC

Assumptions:

- You are not authorized to target mainland China.
- Mining operations not currently authorized due to civilian shipping in the area
- All friendly air point of departure (APODs) / sea points of departure (SPODs)
- No chemical or nuclear weapons

7. Natuna Besar Scenario – Red Cell Situation

Natuna Besar Scenario: Red Cell

Orientation:

- You are the Commanding Officer of the Task Force South under the command of the Southern Theater Command Navy.
- It is April 3rd. The Americans have increased operations in the South China Sea and created tension for Chinese shipping through the Strait of Malacca.

Situation:

- Your Commander, Amphibious Task Force (CATF) has been conducting sea control and escort operations within the South China Sea IVO Malaysia, Vietnam, and Brunei. Due to increased American aggression, you have received the authority to target any American or American allied vessels/forces in the region who encroach upon your freedom of movement.
- Convoys are moving from the Strait of Malacca to the Spratly Islands.

Mission:

Ensure the freedom of movement for Chinese shipping and People's Liberation Army Navy (PLAN) operations in the South China Sea while neutralizing any detected American forces in the vicinity of Natuna Besar.

Execution:

Commander's Intent:

- Purpose: ensure freedom of movement for Chinese shipping and PLAN operations
- Method: destroy any detected American forces IVO your movement
- End State: American forces are neutralized IVO Natuna Besar

Task Organization: PLAN-TW

- Independent Naval Combatants
  - 1x DDG, 1xFFG, 1x Logistic Ship @ II38
  - 1x DDG, 1xFFG, 1x Logistic Ship @ NN30
  - 3x SSNs (KK38, II34, RR30)
- Every 40 min (transiting from Strait of Malacca to Spratly Islands)
  - 1x DDG
  - 1x FFG
  - 1x Logistic Ship
- Land-based
  - 2x WZ-7 Drones

Specifications [edit]

Data from AirForces Monthly[31]

General characteristics

- **Crew:** None
- **Length:** 14.33 m (47 ft 0 in)
- **Wingspan:** 24.86 m (81 ft 7 in)
- **Height:** 5.41 m (17 ft 9 in)
- **Powerplant:** 1 × Guizhou WP-13 turbojet or unknown type of turbofan, 43.1 kN (9,700 lbf) thrust

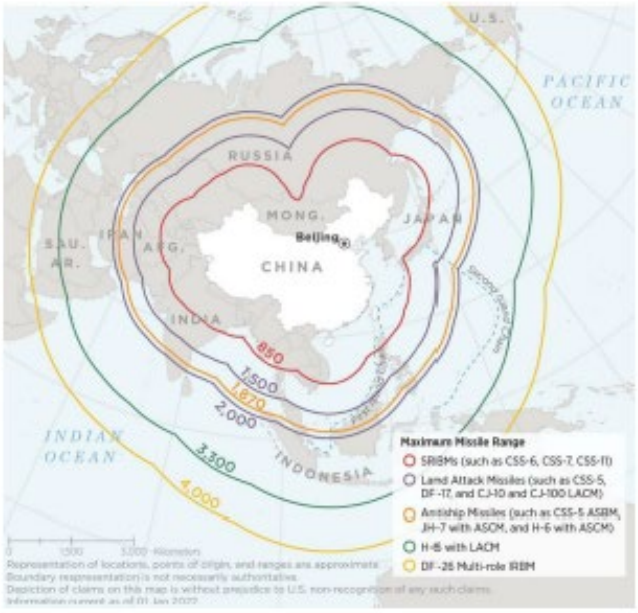
Artist's impression of the WZ-7 prototype [52]

Performance

- **Cruise speed:** 750 km/h (466 mph, 405 kn)
- **Range:** 7,000 km (4,300 mi, 3,800 nmi)
- **Combat range:** 2,000 km (1,200 mi, 1,100 nmi)
- **Endurance:** 10 hours (at maximum speed; with turbojet)
- **Service ceiling:** 18,000 m (59,000 ft)
- **Thrust/weight:** 5.8

Assets Available:

- PLARF land-based fires may be available on request:
  - SRBM:
    - DF-15
    - DF-11
  - MRBM:
    - DF-26
    - DF-21
    - DF-21D (Anti-ship)
  - Cruise Missiles (Land attack)
    - CJ-10



8. Spratly Islands Scenario – Blue Cell Situation

Spratly Islands Scenario: Blue Force

Orientation

You represent the Joint Force Maritime Component Commander (JFMCC) [7th Fleet] and its primary subordinate units: ESG-7 and III MEB. ESG-7 (CATF) and III MEB (CLF) are tasked with conducting all amphibious operations, with supporting surface and land operations, in the South China Sea in support of the Joint Task Force (JTF) and JFMCC objectives. Due to an overwhelming Chinese focus on Taiwan, the JTF has decided to increase American activity in and around the Spratly Islands to provide strategic flexibility on the southern flank of the Taiwan issue and reassure allies and partners of American resolve.

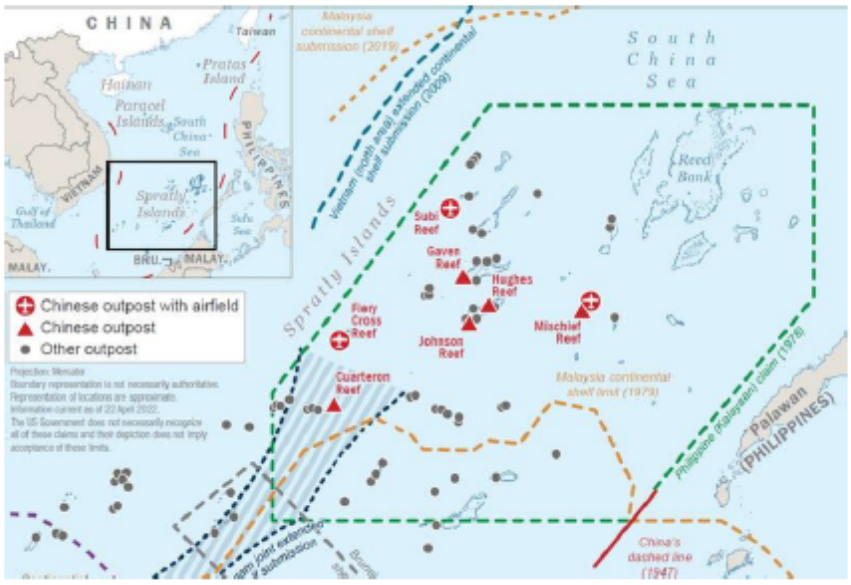
The Philippines have authorized the basing of US forces.

Start Date is April 3, 2045

Situation

Enemy:

- PLA forces belonging to the Southern and Eastern Theater Commands have launched a large-scale amphibious operation against Taiwan.
- PLAA and PLAN forces in the Spratly Islands are on high alert, particularly at their airfields on Mischief Reef, Subi Reef, and Fiery Cross Reef
- Tensions are HIGH, but no open conflict has yet occurred in the South China Sea.



- JFMCC intelligence has assessed that the PLAN has established a quarantine around the island of Taiwan with most of its forces operating IVO the Taiwan Strait ISO ongoing amphibious operations and sea control.

- PLAN assets in the Spratly Islands AO include at least 4 DDGs, 4 FFGs, and 2 SSNs. The *Shangdong* CSG is assessed to be operating IVO the Parcel Islands; it's most likely task is to support the Taiwan Strait.
    - PLAN assets have been located at the following locations within the last 48 hours:
        - 2x DDGs IVO Fiery Cross Reef [roughly 100 nm off map to WSW]
        - 2x DDGs IVO Mischief Reef [L8]
        - 2x FFGs IVO Subi Reef [D4]
        - 2x FFGs IVO Johnson Reef South [E9]
    - Additionally, an uptick in aircraft activity in and around Mischief Reef and Subi Reef has been noted.

Friendly:

- 4th MLR Fires Det (NMESIS Plt, GATR) currently located at Commodore Reef [J15]
- 3d MLR located on Palawan [Y10]
- ESG-7 and subordinate assets are in the Sulu Sea
- III MEB staff embarked on USS Blue Ridge with ESG-7
- 11th MEU is en route and is expected to enter the Sulu Sea in approximately 36 hours

JFMCC Mission: Secure allied and friendly territory and interests in the South China Sea. If hostilities commence, gain sea control in the Spratly Islands in order to provide strategic flexibility in support of Taiwan.

JFMCC Tasks to ESG-7 and III MEB:

- Maintain stand-in forces (4th MLR) on Commodore Reef
- Establish an EAB with NMESIS system on Flat Island, Nanshan Island, or West York Island
- BPT provide fires in support of Sea Control in/around the Spratly Islands

Execution:

Commander's Intent:

- Purpose: Establish two EAB(s) in the Spratly Islands in order to protect allied territory and support sea control efforts.
- End State: EABs established on Flat Island, Nanshan Island, or West York Island. All forces postured to conduct sea control operations.

JTF/JFMCC Apportioned Assets Available:

- Maximum of 4x F-35 sorties per day, 2hr Time-On-Station (TOS)
- Maximum of 4x Group 5 UAS sorties per day, 12hr TOS
- Maximum of 2x P-8 sorties per day, 8hr TOS
- Further assets may be made available upon request

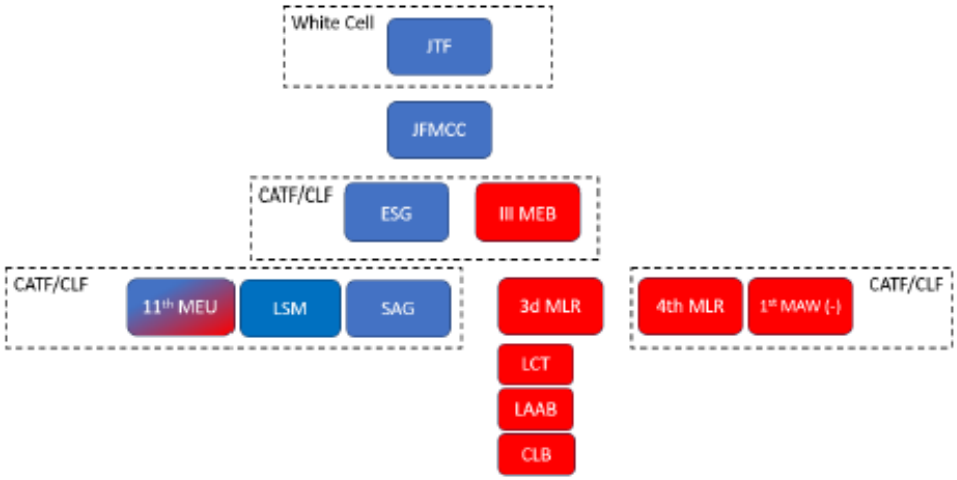
Key assumptions:

- No nuclear, biological, or chemical weapons will be used
- Actions on or strikes against mainland China are NOT authorized
- Mining operations are NOT authorized
- All friendly Air Points of Departure (APODs) / Sea Points of Departure (SPODs) open at start

Starting Requirements

- Generate ISR plan
- Generate plan to establish EAB(s)

Task Organization: JTF-JFMCC



- ESG-7 / III MEB [Embarked USS Blue Ridge, off map]
  - PHIBRON 3 / 11th MEU [Embarked LHA-7; scheduled to arrive at BB15 at H+36]
    - LHA-7 USS America (16x F-35 embarked)
    - LPD-27 USS Portland (4x MV-22 embarked)
    - LPD-31 USS Pittsburgh (4x MV-22 embarked)
    - BLT 3/5
    - VMM-165 (REIN) {16x F-35, 8x MV-22, 10x Group 3 UAS)
    - CLB-11
    - DDG-115
    - DDG-118
  - Surface Action Group #1 [BB7]
    - DDG-122
    - DDG-125
    - LCS-32
    - LCS-34
    - LCS-36
    - LCS-38
    - 9x LSMs
- III MEB
  - Force Reconnaissance Platoon [May be inserted during the intelligence phase]
  - 3d Marine Littoral Regiment (MLR) [Z9]
    - 2x Infantry Co w/ logistics and LAAD detachments
    - 2x NMESIS Platoon
    - 2x G/ATOR radar systems
  - 4th MLR detachment [Commodore Reef]
    - 1x NMESIS Platoon
    - Security Detachment

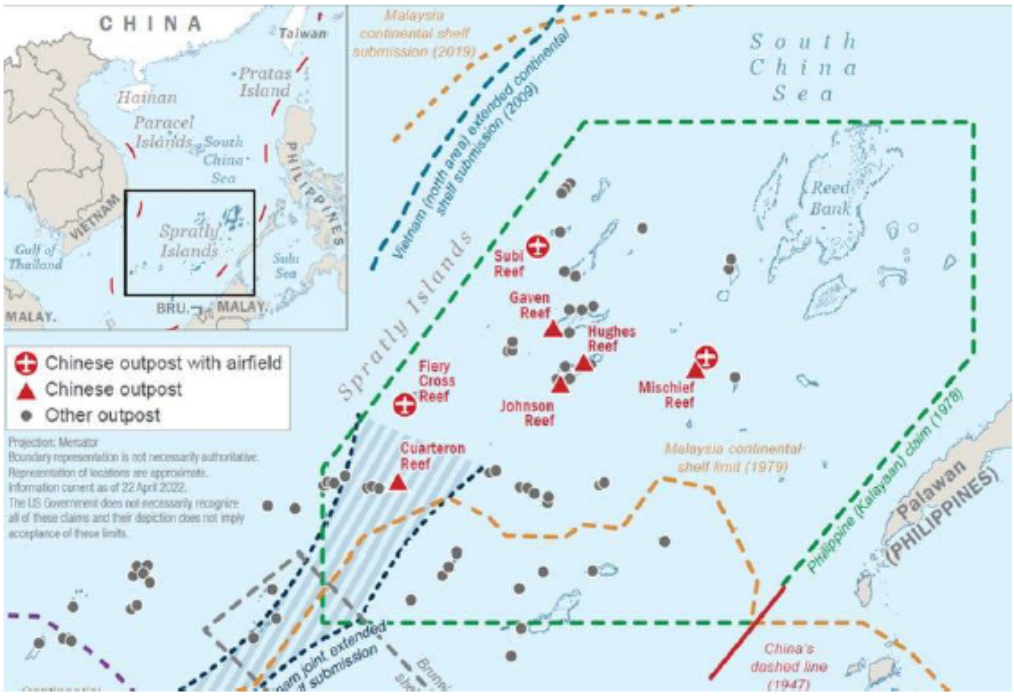
9. Spratly Islands Scenario – Red Cell Situation

Spratley Islands Scenario -RED CELL

Relevant Information:

SCS OUTPOSTS CAPABLE OF SUPPORTING MILITARY OPERATIONS

Since early 2018, the PRC-occupied Spratly Islands outposts have been equipped with advanced anti-ship and anti-aircraft missile systems and military jamming equipment, representing the most capable land-based weapons systems deployed by any claimant in the disputed SCS areas to date. In mid-2021, the PLA deployed an intelligence-gathering ship and a surveillance aircraft to the Spratly Islands during U.S.-Australia bilateral operations in the region. From early 2018 through 2022, the PRC regularly used its Spratly Islands outposts to support naval and coast guard operations in the SCS. The PRC has added more than 3,200 acres of land to the seven features it occupies in the Spratlys. China has also added military infrastructure, including 72 aircraft hangars, docks, satellite communication equipment, antenna array, radars, and hardened shelters for missile platforms.



RED

Orientation:

-You are the Commanding Officer of a Chinese Naval Task Force for the Spratly Islands

-It is April 2045. Your Task Force is directed to secure all of the Chinese outposts in the Spratley Islands.

Situation:

- Your TF is tasked with securing the southern flank of the ongoing invasion of Taiwan. You have just been authorized to conduct offensive operations in the area.

Mission: Protect Chinese airfields and do not allow US forces to expand into the Spratly Islands.

Execution

Commander's Intent: Secure Chinese interests in the Spratly Islands

Purpose: Deter US Naval actions to limit actions in the South China Sea.

End state: Commodore Reef is unable to support American forces. No additional Spratly Islands contain US stand-in forces.

Task Organization and Starting Locations:

PLAN: 4x DDGs, 4x FFs, 2x SSN

- 2x DDGs anywhere on the western side of the map
- 2x DDGs IVO Mischief Reef [K7]
- 2x FFGs IVO Tennent Reef [G12]
- 2x FFGs IVO West York Island [J2]
- 2x SSNs anywhere in SCS (not in Sulu Sea)

PLAA/AF:

- 8x J-20 [Subi Reef]
- 4x Group 5 UAS
- 8x Land-based missiles

Overall guidance:

- Strike quickly against US forces in Commodore Reef
- Priorities:
    - 1) Keep airfields operational
    - 2) Protect Chinese outposts
    - 3) Do not allow US to establish additional EABs

10. Spratly Islands Scenario – White Cell Guidance

Spratly Islands Scenario - White Cell:

- This scenario is set up for the Chinese to attack the US stand-in forces on Commodore Reef on the first turn; doesn't have to eliminate the stand-in force, but it starts the conflict.
-
- The MEU is designed to facilitate assistance and to demonstrate what it offers in tandem with the MLR. Can also be further delayed if not necessary.

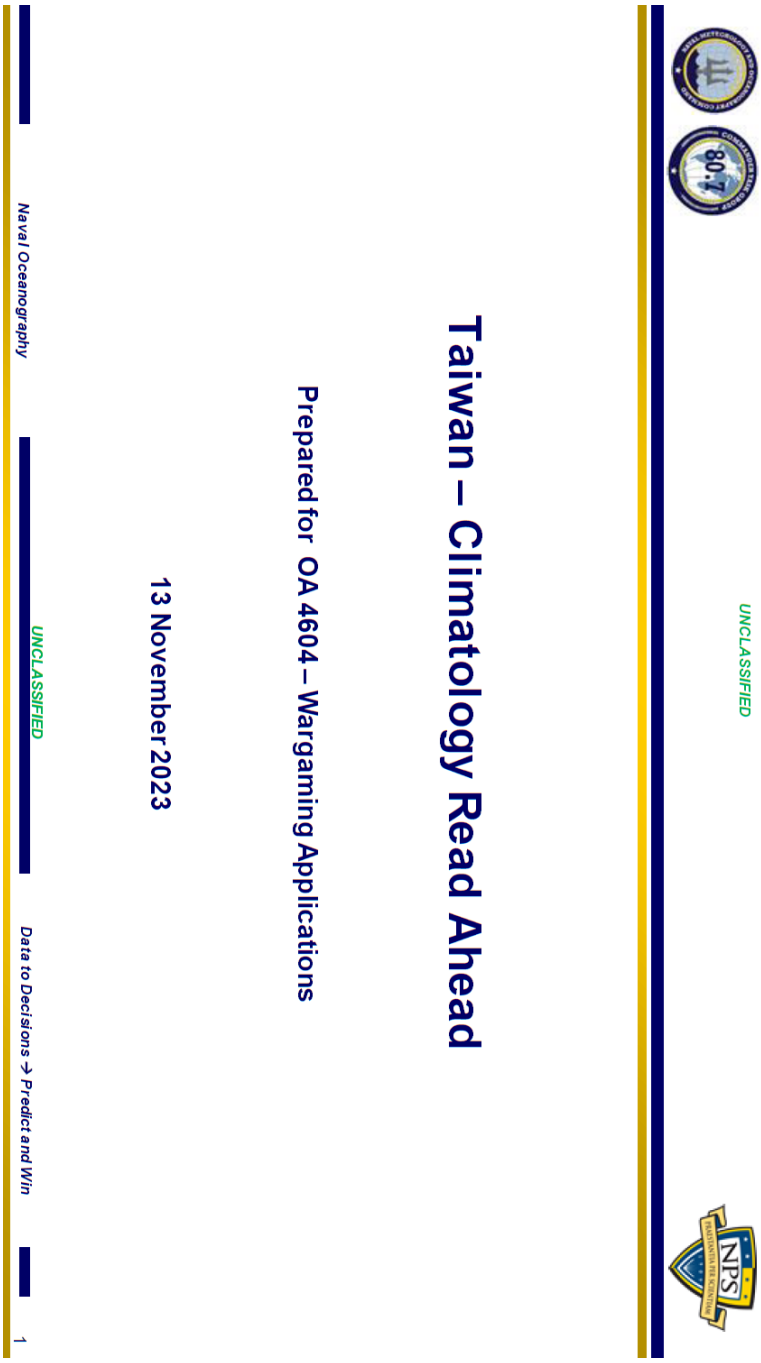
DCMP Notes

DCMP	Scenario
1. What are effective command relationships between the MLR and the LSM formations?	CATF/CLF
1.2 How will the LSMs support the MLR's objectives, including shore-to-shore movement, sustainment, and fire support?	Opportunity to use LSMs to make transit from Philippines to Spratleys
1.4 What is required for a relationship between the MLR and LSM?	Provide ample in-game opportunities for LSMs then engage with players on opinions
1.6 How should the MLR and LSM formations work together to ensure the timely flow of supplies, equipment, and personnel as required to sustain the operation?	Allow scenario to go forward as best as possible by keeping LSM and MLR forces in play (sustain casualties in the MEU and/or other blue forces)
2. What are the advantages and disadvantages of the CWC model, the MAGTF C2 model, and the CATF/CLF model for amphibious forces?	All three models run in this scenario
3. What are the options for higher echelon integrated naval headquarters to improve C2 of MLRs during amphibious operations? How effective are these options?	Tested by using a higher echelon blue player and the JFMCC in the white cell
3.3 What additional C2 capabilities can higher echelon integrated naval HQ provide?	Was the BLUE RIDGE effective? How did the MEB control the Marine forces?
3.4. What is the optimal C2 structure for employment of the MLR?	Test all three and see which one enables MLR most effectively
3.4.a. Are MLRs postured to operate as an independent unit underneath or as part of a naval campaign?	Definitely testable
4.1.a What battlespace framework was used?	Exit interview / questionairre

4.5 Who has target engagement authority?	Allow blue players to develop. Expectation is that it will be kept at JFMCC.

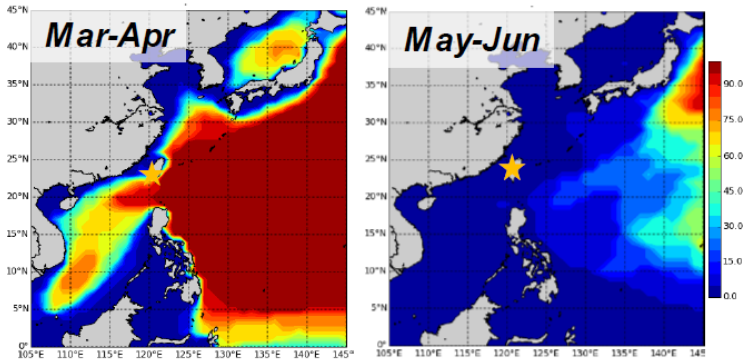
11. Luzon Strait Scenario – Climatology

(T. Hudson, S. Olsen, M. Ansley, D. Kilmartin, T. Hansen, D. Petersen, & B. Liddell, Climatology Read Ahead, November 13, 2023)



Climatological Outlook – Taiwain

Significant Wave Height Climatology (Frequency of Waves >5ft)



Taiwan				
	March	April	May	June
Maritime Ops				
Small Boat Ops	Wave Hgt	Wave Hgt		Wave Hgt
Fixed Wing Ops	Cig/Vis Precip	Cig/Vis Precip	Cig/Vis Precip	Cig/Vis Precip
Rotary Wing Ops	Precip	Cig/Vis Precip	Cig/Vis Precip	Precip
UAS Ops	Precip	Cig/Vis Precip	Cig/Vis Precip	Precip
Personnel	Precip	Precip	Precip	Precip

Key:
Cig/Vis = Ceiling/Visibility
Wave Hgt = Wave Height
Precip = Precipitation
Temp = Temperature

Favorable
Marginal
Unfavorable (above stated limits)

- **Waveheights are favorable for a Pacific transit, except in significant weather or tropical events.**

BLUF: Small boat operations will be moderately impacted until mid/late April with seas above 6ft. Afternoon showers and thunderstorms will moderately impact air operations temporarily throughout the spring

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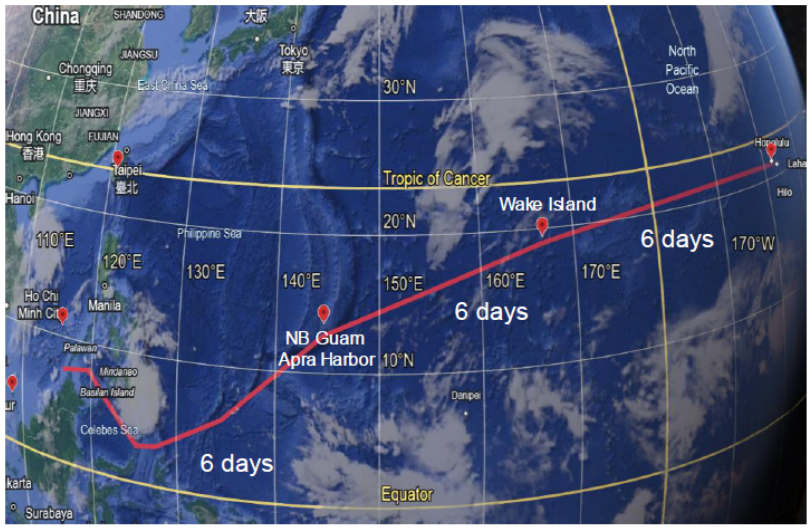
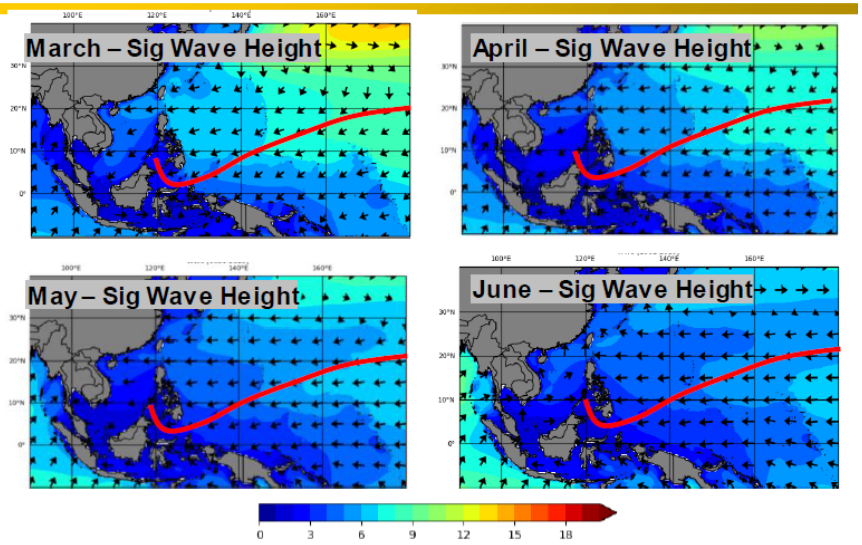
LSM Transit Overview





The LSM Transit is 5,297 NM from Pearl Harbor, HI, to the South China Sea. With a Speed of Advance of 12kts – This route is expected to be at least 18 days. The window for this transit is between the months of March thru June. Recommended resupply points are located enroute at Wake Island and Apra Harbor (Guam) for the initial 12 days of the transit. Tropical activity is minimal during this time; however, probabilities increase throughout the window with the chance of at least 1-2 storms. Seas are projected to be following through the duration. Anticipate 9-10ft seas through the duration, with seas abating to 6ft or less after Guam due to limited fetch in/around island chains.

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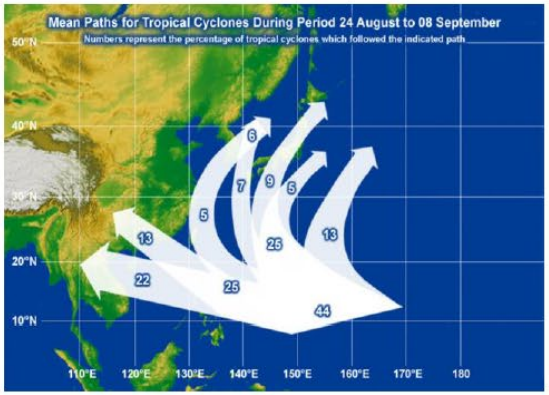
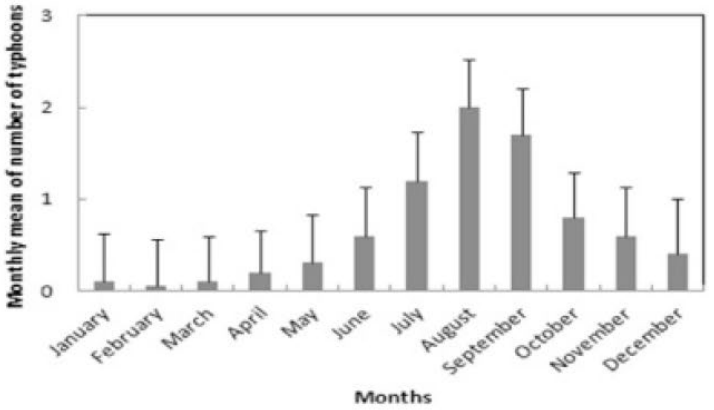
Tropical Cyclones

- Tropical cyclones (typhoons) possible all year
- Most common late summer and early fall (July through September is peak typhoon activity for SCS)
- Least common late winter and early spring

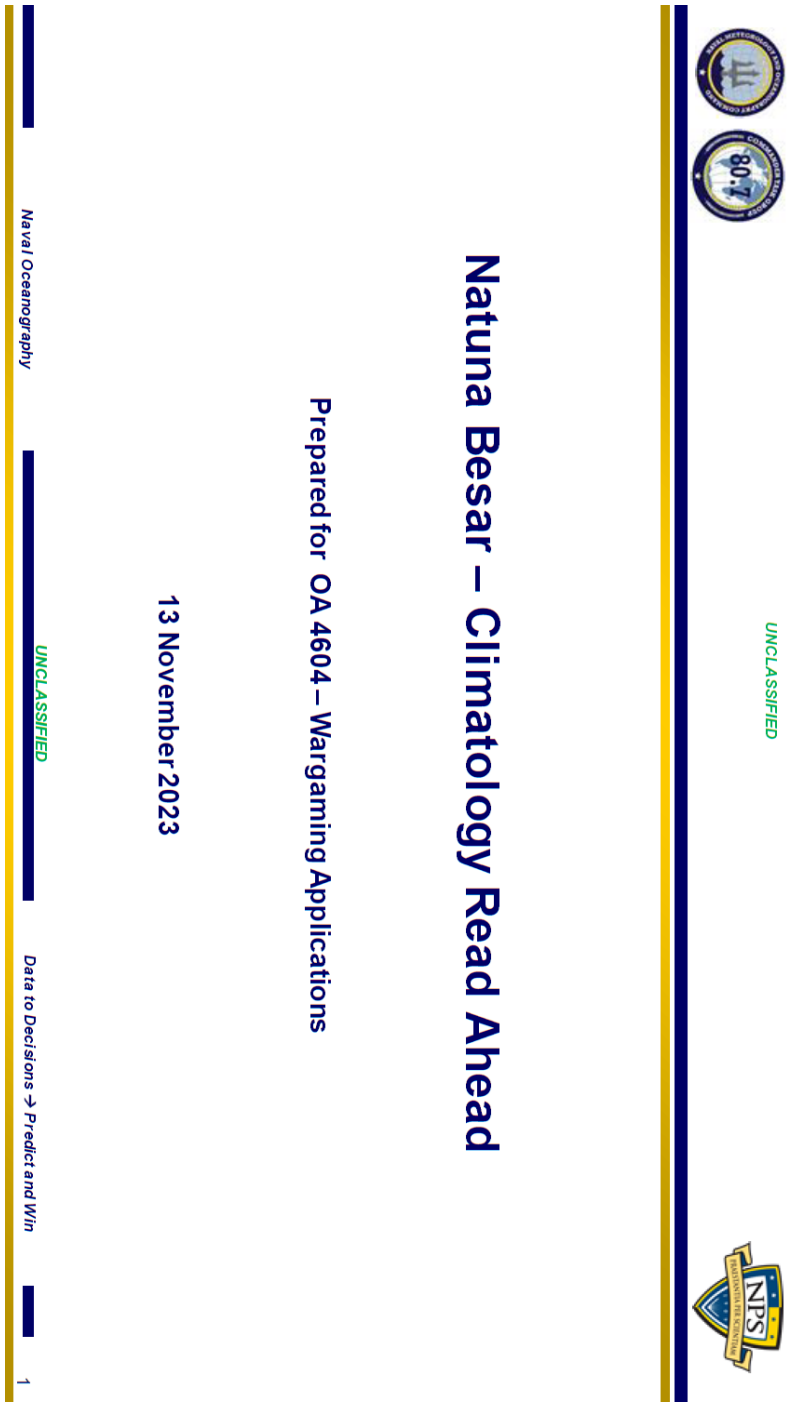




Storms track directly towards the Asiatic coast during SW Monsoon season and curve northeast during the fall transition

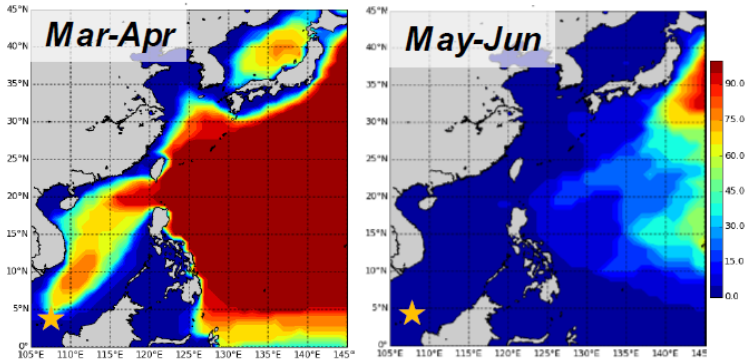
12. Natuna Besar Scenario – Climatology

(T. Hudson, S. Olsen, M. Ansley, D. Kilmartin, T. Hansen, D. Petersen, & B. Liddell, Climatology Read Ahead, November 13, 2023)



Climatological Outlook – Natuna Besar

Significant Wave Height Climatology (Frequency of Waves >5ft)



Natuna Besar				
	March	April	May	June
Maritime Ops				
Small Boat Ops	Wave Hgt	Wave Hgt		
Fixed Wing Ops		Cig/Vis Precip	Cig/Vis Precip	Cig/Vis Precip
Rotary Wing Ops		Cig/Vis Precip	Cig/Vis Precip	Cig/Vis Precip
UAS Ops		Cig/Vis Precip	Cig/Vis Precip	Cig/Vis Precip
Personnel	Temp	Temp	Temp	Precip

Key:
Cig/Vis = Ceiling/Visibility
Wave Hgt = Wave Height
Precip = Precipitation
Temp = Temperature

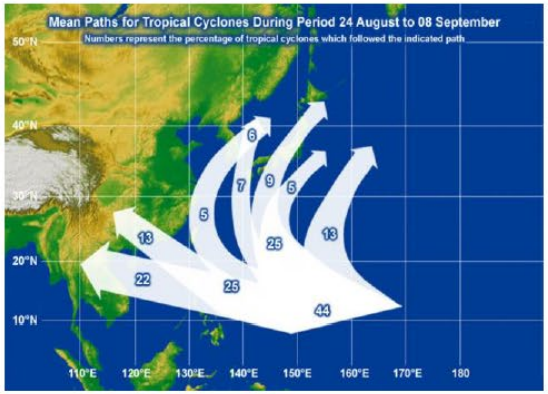
Favorable
Marginal
Unfavorable (above stated limits)

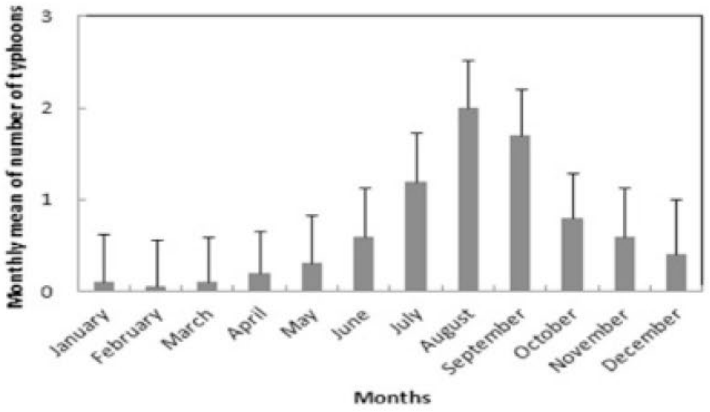
- **Wave heights are favorable for a Pacific transit, except in significant weather or tropical events.**

BLUF: Small boat operations will not be significantly impacted during the Spring/Summer transition season. Afternoon showers and thunderstorms will begin daily during afternoon hours starting at the end of April and on into the Summer.

Tropical Cyclones

- Tropical cyclones (typhoons) possible all year
- Most common late summer and early fall (July through September is peak typhoon activity for SCS)
- Least common late winter and early spring

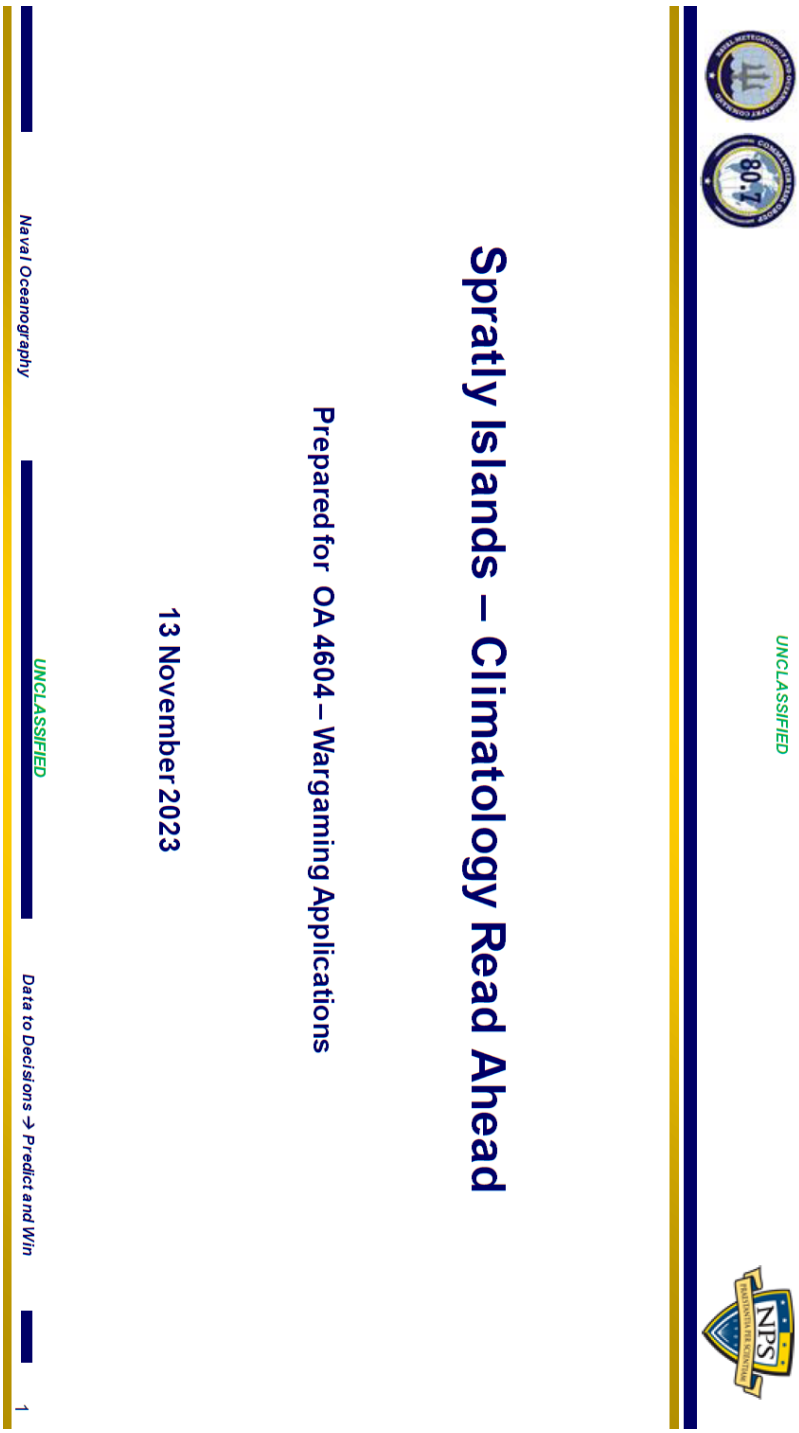




Storms track directly towards the Asiatic coast during SW Monsoon season and curve northeast during the fall transition

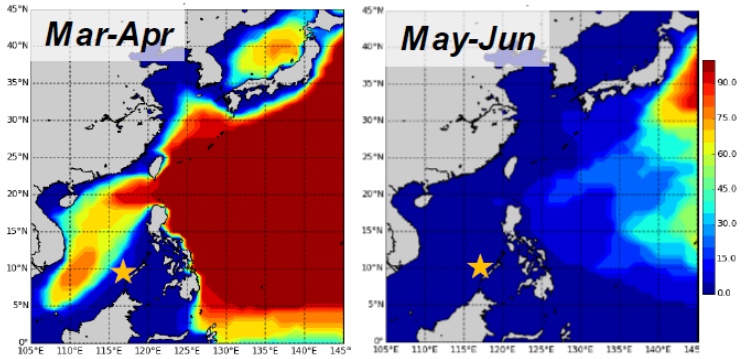
13. Spratly Islands Scenario – Climatology

(T. Hudson, S. Olsen, M. Ansley, D. Kilmartin, T. Hansen, D. Petersen, & B. Liddell, Climatology Read Ahead, November 13, 2023)



Climatological Outlook – Spratly Island

Significant Wave Height Climatology (Frequency of Waves >5ft)



Spratly Island				
	March	April	May	June
Maritime Ops				
Small Boat Ops	Wave Hgt			Wave Hgt
Fixed Wing Ops	Precip	Cig/Vis Precip	Cig/Vis Precip	Cig/Vis Precip
Rotary Wing Ops	Precip	Cig/Vis Precip	Cig/Vis Precip	Precip
UAS Ops	Precip	Cig/Vis Precip	Cig/Vis Precip	Precip
Personnel	Precip	Precip	Precip	Precip

Key:
Cig/Vis = Ceiling/Visibility
Wave Hgt = Wave Height
Precip = Precipitation
Temp = Temperature

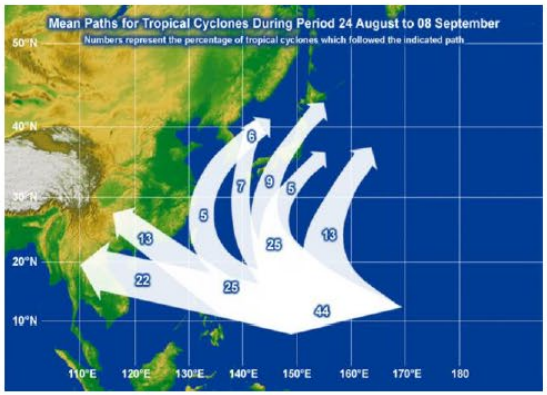
Favorable
Marginal
Unfavorable (above stated limits)

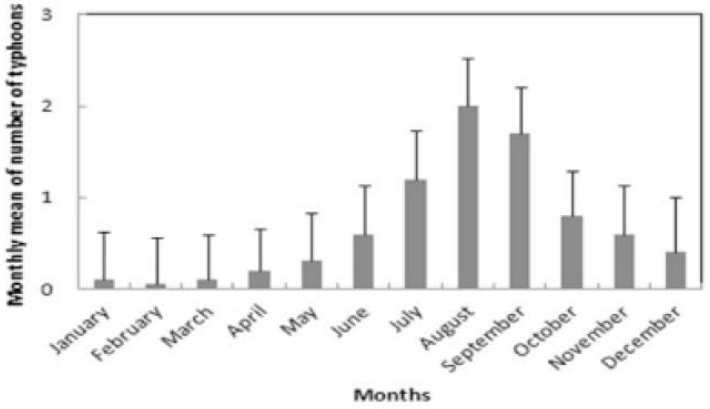
- **Waveheights are favorable for a Pacific transit, except in significant weather or tropical events.**

BLUF: Small boat operations will not be significantly impacted during the Spring/Summer transition season. Afternoon showers and thunderstorms will begin daily during afternoon hours starting at the end of April and on into the Summer.

Tropical Cyclones

- Tropical cyclones (typhoons) possible all year
- Most common late summer and early fall (July through September is peak typhoon activity for SCS)
- Least common late winter and early spring





Storms track directly towards the Asiatic coast during SW Monsoon season and curve northeast during the fall transition

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