

REPORT DOCUMENTATION PAGE

Form Approved
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1. REPORT DATE (DD-MM-YYYY) 17-05-2003		2. REPORT TYPE FINAL		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE The Yellow Sea: Operational Features of the Physical Environment				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Brian C. McCawley, CDR USN Paper Advisor (if Any): N/A				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Joint Military Operations Department Naval War College 686 Cushing Road Newport, RI 02841-1207				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution Statement A: Approved for public release; Distribution is unlimited.					
13. SUPPLEMENTARY NOTES A paper submitted to the faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.					
14. ABSTRACT An analysis of the challenges posed by the operational factor of space in a theater demonstrates its dramatic impact on the employment of naval forces. The environment of an area of ocean: its size, depth, climate and oceanographic properties, combined with the physical and political geography of the surrounding land, determine the survivability and mission effectiveness of naval forces deployed there. This paper will analyze the physical environment of the Yellow Sea in order to demonstrate how the factor of space, and its interplay with force and time, affects the employment of the U.S. Navy's current premier weapon system, the Carrier Strike Group (CSG), in the Korean Theater of Operations. This analysis will then be used to provide the recommendation that the Yellow Sea is not suitable for CSG operations in the initial phase of the joint effort to defeat a North Korean invasion of the Republic of Korea.					
15. SUBJECT TERMS Yellow Sea, Environment, Operational Factors, Carrier Strike Group					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT UNCLASSIFIED	b. ABSTRACT UNCLASSIFIED	c. THIS PAGE UNCLASSIFIED			Chairman, JMO Dept
				26	19b. TELEPHONE NUMBER (include area code) 401-841-3556

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The Yellow Sea: Operational Features of the Physical Environment

By

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A paper submitted to the faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: _____

17 May 2003

Abstract

An analysis of the challenges posed by the operational factor of space in a theater demonstrates its dramatic impact on the employment of naval forces. The environment of an area of ocean: its size, depth, climate and oceanographic properties, combined with the physical and political geography of the surrounding land, determine the survivability and mission effectiveness of naval forces deployed there. This paper will analyze the physical environment of the Yellow Sea in order to demonstrate how the factor of space, and its interplay with force and time, affects the employment of the U.S. Navy's current premier weapon system, the Carrier Strike Group (CSG), in the Korean Theater of Operations. This analysis will then be used to provide the recommendation that the Yellow Sea is not suitable for CSG operations in the initial phase of the joint effort to defeat a North Korean invasion of the Republic of Korea.

Table of Contents

Introduction	1
Considerations of Space	3
Considerations of Space and Force	10
Considerations of Space and Time	17
Recommendations	18
Conclusion	19
Bibliography	20

List of Illustrations

Figure	Title	Page
1.	Topography of the Yellow Sea Floor	5
2.	Composition of the Yellow Sea Floor	5

Introduction

The physical environment of an area of ocean, its size, depth, and oceanographic properties combined with the physical and political geography of the surrounding land determine the mission effectiveness of forces deployed there. An analysis of the challenges and problems posed by the operational factor of space in a theater of operations demonstrates its dramatic impact on the employment of naval forces. This paper will analyze the physical environment of the Yellow Sea in order to demonstrate how the factor of space affects the employment of the Navy's current premier weapon system, the Carrier Strike Group (CSG), in the Korean Theater of Operations. This analysis will then be used to provide recommendations as to the suitability of the Yellow Sea for CSG operations in order to maximize its contribution in the initial phase of the joint effort to defeat a North Korean invasion of the Republic of Korea.

As it is currently envisioned by US and South Korean planners, a North Korean attack would consist of an offensive of overwhelming firepower and violence known as a "One Blow Non-stop Attack." Concurrently there would be limited use of chemical weapons against targets in the forward area and ballistic missile strikes against US and ROK bases, ports and C3I nodes in South Korea. These would be supported by hundreds of operations undertaken by DPRK special operations forces throughout South Korea and Japan in order to create a second front. The goal of North Korea during this operation would be to move southward as quickly as possible while gaining control of the South Korean strategic rear in order to prevent the introduction onto the peninsula of any additional US or allied forces. The latest iteration calls for "Occupying south Korea, All the Way to Pusan, in Three Days." Although this is probably understood as unrealistic,

the leadership of the DPRK does believe that if conditions are favorable, their goal could be attained in three to four weeks.¹

The disparity in numbers of North Korean versus United Nations' forces stationed on the peninsula places a premium on forces that can respond quickly to counter North Korean aggression. The striking power of the navy ships that are allocated to the Korean Theater and available in the opening days of a conflict will be critical in defeating the enemy offensive. This power projection capability is in the form of the seventy aircraft of the carrier's embarked air wing as well as the land-attack and surface-to-air missiles of its escorts. The Korean peninsula is flanked by the sea; to the east lies the Sea of Japan and to the west is the Yellow Sea. Together the two nations of North and South Korea have a coastline in excess of 4,900 km. North Korea possesses over half of that length. Because of its vast coastline and the narrowness of the peninsula, the Democratic People's Republic of Korea is vulnerable to sea based power projection, whether these assets are located either in the Sea of Japan or in the Yellow Sea. The physical characteristics of these two locations each present the Joint Force Commander with unique challenges and opportunities to best employ the capabilities of the naval forces assigned.

An initial analysis shows that positioning the CSG in Yellow Sea offers several significant advantages to the Joint Force Commander. The CSG's transit to position in the Yellow Sea is to conduct. Although the distances from US Navy bases in Japan to likely operating areas in either the Yellow Sea or the Sea of Japan are similar, ships en route to the Sea of Japan must transit a significant choke point, the Straits of Tsushima.

¹ "Armed Forces, Korea, North," in *Jane's Sentinel Security Assessment – China and Northeast Asia* [database on-line]. Date posted: 5 February 2004, accessed 10 May 2004.

Although these straits are bordered by allied nations, South Korea and Japan, transiting any such choke point can be dangerous as it offers the enemy an opportunity either to conduct reconnaissance or attack the transiting force. The route into the Yellow Sea is less vulnerable as it does not transit such a choke point. This benefit is also applicable to the logistic effort required to sustain operations. The South Korean capitol of Seoul is home to nearly one quarter of its population and only 20 miles from the Yellow Sea. It is also only 20 miles from the Demilitarized Zone (DMZ). This proximity means that maritime striking power based in the Yellow Sea could contribute more to the defense of Seoul than it could if it were based in the Sea of Japan. Additionally, the preponderance of North Korean population centers and infrastructure is on the west coast. These, too, would be more accessible to the striking capability of a CSG positioned in the Yellow Sea. Despite these advantages, however, a close inspection of the environment off of the west coast of the Koreas, as well as the involvement of the political sphere, reveals significant risks compared to operating a CSG in the Sea of Japan. The additional risks of operating in the Yellow Sea result in a less survivable CSG and a decrease in its ability to successfully carry out its mission because of higher force protection requirements.

Considerations of Space

The Yellow Sea is a gulf of the Pacific Ocean between China and the Korean Peninsula. It is a relatively small, semi-enclosed body of water that stretches from the Chinese mainland in the north to a line running from the north bank of the Yangtze river to the south side of Cheju Island in the south. To the north it includes the gulfs of Korea, Chihli and Liaotung. These boundaries give it a length of approximately 620 miles / 1000 kilometers, a maximum width of 435 miles / 700 kilometers and an area of

approximately 180,000 square miles / 466,200 square kilometers. It receives the waters of China's Yellow River and Yangtze. These rivers carry a significant amount of sediment from central Asia, over 1.6 billion tons annually, which they deposit in the Yellow Sea and from which the sea derives its name.² Both have formed large deltas at their point of entry. In addition, all of North Korea's significant rivers, including the Yalu, Ch'ong-ch'on and Yesong, flow to the Yellow Sea.

Not only is the Yellow Sea a relatively constricted area, but it is also quite shallow. Overall, the average depth of the water is only 144 feet / 44 meters. Generally, there is a gradual slope down from the Chinese coastline into a seafloor valley formed by the path of the Yellow River meandering south to the Okinawa trough.³ Within fifty kilometers of the Korean coastline the average depth is only 20 meters.⁴ The bottom of the sea is predominately composed of fine-grained material, primarily mud and sand. The small-grained material is the sediment deposited by the large Chinese rivers and carried out to the middle of the sea bottom by tides and currents. The coarse grained sediment, gravel, that makes up the major portion on the eastern side of the Yellow Sea is deposited there by the rivers of the Korean peninsula.⁵ The topography and composition of the sea floor are depicted in the attached figures⁶.

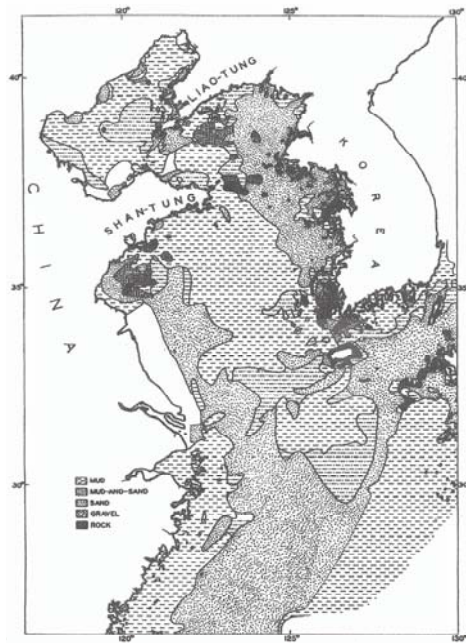
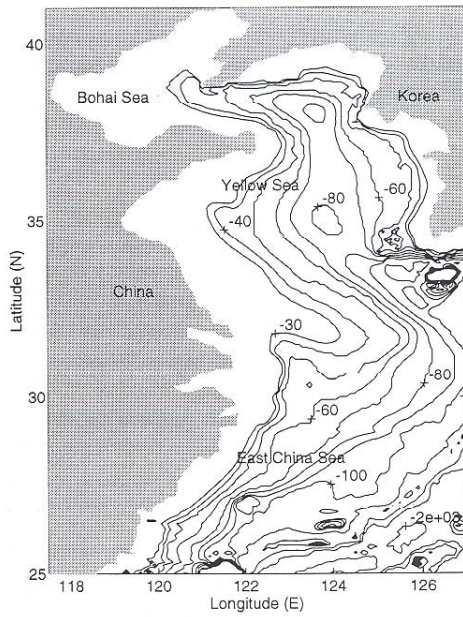
² Northeast Fisheries Science Center website. "Large Marine Environment 48: Yellow Sea." Available from <http://na.nefsc.noaa.gov/lme/text/lme48.htm>; Internet; updated 2003, accessed 6 May 2004.

³ Ibid.

⁴ Peter Chu, Carlos Cintron, Steven Haeger and Ruth Keenan. "Acoustic Mine Detection Using the Navy's CASS/GRAB Model." Monterey, CA: Naval Postgraduate School, 2002. Available at <http://www.demine.org/SCOT/Papers/ChuP2.pdf>: 2.

⁵ Korea Ocean Research and Development Institute website. "Oceanographic Setting of the Yellow Sea." Available from <http://www.kordi.re.kr/atlas/yellow/Intro.htm>; Internet; updated 2003, accessed 6 May 2004.

⁶ Chu, 2.



Due to the shallow depth of the water, the hydrographic properties of the Yellow Sea are dominated by the climatic conditions of the area. Hot, wet summers and cold, dry winters are the normal conditions. During the winter and fall the water remains at a generally constant low temperature, regardless of depth. During the spring and summer

multiple temperature layers develop. These are the Mixed Layer, a Thermocline and the Deep Layer, which remains in place throughout the year.⁷ In addition to the effects of climate, the wet summer monsoons and dry winter monsoons, the fresh water discharge from rivers and the inflow of warm, salt water from the south play a part in the variance in water properties and circulation across the breadth of the sea and through the seasons.⁸ The Yellow Sea has an extremely wide tidal range. This is magnified in the eastern part of the region, along the Korean coastline. The maximum tidal range of the sea is eight meters; this occurs at Incheon.⁹ Such dramatic tidal shifts can adversely affect the performance of mine clearance equipment and personnel as well as inhibit ship control at slow speed, hampering their ability to avoid detected mines.

The physical characteristics of the Yellow Sea described in the preceding paragraphs make the region a complex environment that poses difficult challenges to sonar technology. This has a large impact on the CSG's ability to conduct anti-submarine warfare as the performance of sensors designed for use in the blue-water environment can be hampered in the littorals. The magnitude of the challenge is even more severe for mine clearing efforts because of the small signature of the target.¹⁰ Operators may encounter a mixture of sound propagation profiles due to the shifting patterns of thermal distribution, the different salinity levels throughout the regions of the sea and the numerous boundary levels present. Additionally, the different types of sea bottom found across the area each have varying capabilities to absorb, scatter or reflect the sound energy. This can have dramatic effect on sonar detection ranges and the CSG's

⁷ Ibid, 3.

⁸ Korea Ocean Research and Development Institute website.

⁹ Ibid.

¹⁰ Chu, 1.

ability to prosecute any underwater contacts. It also affects the likelihood of the mine burying itself in the bottom and becoming still more difficult to find and counter. Further complicating the problem of locating and identifying any subsurface objects, silt runoff from the many rivers that feed the Yellow Sea can result in poor water clarity. This can degrade optical sensor performance and inhibit mine clearance operations.

A further element of the Yellow Sea's physical environment is the topography of the coastline. The western side of the Korean Peninsula has an extremely complicated, creek-indented coastline with many islands located just offshore. Possession of several of these islands in the vicinity of the Demilitarized Zone (DMZ) is still contested by the DPRK and the ROK. There is a narrow, irregular coastal plain along the majority of the west coast of the Korean peninsula in which a large percentage of both North and South Korean cities are located, including both Pyongyang and Seoul. The portion of the coastline at the western end of the DMZ is marked several features of note. To the south of the border are the marshes of the delta formed by South Korea's principal river, the Hangang, after it passes through Seoul. Just to the north is a low-lying peninsula extending into the Yellow Sea. Inchon, the entry port for Seoul is so close to the border that North Korean coastal defense missiles deployed on this peninsula in the Haeju-Sagon-ni area can interdict maritime traffic entering the harbor.¹¹

The physical environment of the Yellow Sea described in the preceding pages presents a long series of challenges for the CSG attempting to conduct operations in the Yellow Sea during the initial phases of an effort to defeat North Korean offensive thrust across the DMZ. A further aspect of the environment that must be considered when

¹¹ "Navy, Korea, North." In *Jane's Sentinel Security Assessment – China and Northeast Asia* [database online]. Date posted: 5 February 2004, accessed 10 May 2004.

determining the utility of the Yellow Sea for CSG operations is the possibility of the involvement of, or interaction with forces or assets of countries in the region. The People's Republic of China dominates the Yellow Sea in a way that neither North nor South Korea could ever duplicate. Her size, the length of her coastline and the military might she has arrayed along that coastline make it imperative that the PRC be factored in to any equation to determine CSG stationing. If, for the purpose of this paper, we assume that the PRC would not become actively involved in a conflict on the Korean peninsula, she still may pose a risk for the CSG. The Yellow Sea is well within the "first island chain" within which the People's Liberation Army Navy (PLAN) aims to achieve "effective control of the seas."¹² Although the PLAN currently has poor capabilities in over the horizon targeting, it is in the process of being modernized. It is developing improved radars, electronic warfare techniques and space based systems, with a goal of improving this weakness.¹³ Thus, China is well situated to track the location of contacts of interest in the Yellow Sea. Due to the proximity of the conflict and the very real potential for massive destruction on her doorstep, in the event of an open conflict, she would have a very powerful incentive to correct any gaps in her coverage. The key question then becomes "what would she do with the information?" Just as the United States did not get physically involved in military operations in the Falklands but did provide critical intelligence to the British, China could avoid active involvement while providing their erstwhile allies with a degree of support. The location data that the Chinese could provide to the North Koreans would be much more accurate than any such

¹² "Navy, China." In *Jane's Sentinel Security Assessment – China and Northeast Asia* [database on-line]. Date posted: 19 November 2002, accessed 10 May 2004.

¹³ Ben Shepard and Howard DeVore, "Jane's Special Report. China's Aerospace and Defence Industry." [Available on database on-line]. Date posted: 5 December 2000, accessed 17 May 2004..

data that the DPRK could generate by itself. Due to line of site limitations, the North Korean radar sites cannot provide data on the southern portion of the Yellow Sea. And despite doctrinal emphasis, the KPN's capability to passively locate targets using signals intelligence is limited due to obsolete equipment.¹⁴ Therefore, in order to determine the CSG's location, they would be forced to use air or naval platforms. It is very unlikely that any of their platforms, either air, surface or subsurface, would survive long enough during hostilities to search for and find the carrier in this area, far offshore, and then attack it or pass the coordinates back to enable someone else to engage.

Additionally, the opportunity to observe, first hand, how the US conducts combat operations could be of significant intelligence value for the PRC. The operations of the CSG would draw Chinese interest and attention. Reconnaissance platforms would likely shadow U.S. forces. Involved in combat against the DPRK, the CSG commander might not be willing to wait to determine whether the unknown periscope in his vicinity is North Korean or Chinese before engaging it. Thus, the likelihood of inadvertent clashes between the CSG and PRC naval and air units operating off of their own shores would be higher. Such clashes could change the strategic setting of the conflict significantly

Contrast this situation with that on the other side of the Korean peninsula. Japan dominates the southern Sea of Japan. Although there is no guarantee that Japan would support US actions on the peninsula, given her relationship with the US, it is highly unlikely, practically inconceivable, that she would provide any support to the North Koreans. Indeed, given the capability and likelihood of North Korean attacks on bases in Japan, she might very well actively assist in operations against the DPRK. In either case,

¹⁴ Desmond Ball, "Asia, Signals Intelligence in North Korea," *Jane's Intelligence Review* 8 no 1, (1 January 1996): 31.

Japanese aircraft, whether defending only Japan or supporting US-ROK operations, would provide an element of rear security for a CSG in the Sea of Japan that would not be available to a CSG in the Yellow Sea. Additionally, the frequent peacetime exercises between Japanese Self Defense Forces and CSG assets hold the promise of excellent integration of the two forces. The presence of the CSG and the AEGIS systems of its escorts in the Sea of Japan would provide another layer of defense between Japanese cities and North Korean missile launch sites. This would likely predispose Japan to support this course of action. The ability to provide protection against theater ballistic missiles to both the CSG and Japanese territory using the same assets displays an economy of effort that would be attractive in the opening phases of a conflict.

Another country that conducts operations in the Sea of Japan is Russia. Despite the benefits of operating in the vicinity of Japan, Russian surveillance of CSG operations in the Sea of Japan would be likely. Russia could also provide location information to the North Koreans. Due to the ranges involved, however, it would be more difficult for Russia to maintain continuous surveillance of the CSG in the Sea of Japan. Therefore her information would probably not be as complete as that which could be provided by the Chinese.

Considerations of Space and Force

The Yellow Sea is already an extremely crowded body of water during peace. It is a highly productive ecosystem and an important global resource for both coastal and offshore fishing. Approximately 600 million people live in the areas that drain into the Yellow Sea. There are six coastal cities with more than ten million inhabitants.¹⁵ This vast population is heavily dependent upon the Yellow Sea to provide sufficient food for

survival. Consequently, there are huge numbers of fishing craft of all sizes operating continuously throughout both the shallow and deeper parts of the region. The Yellow Sea is also an increasingly busy highway for international commercial shipping. Trade between the three countries that border the sea, as well as their individual trading efforts with the remainder of the world, continues to expand. The port of Incheon is South Korea's second largest and handles well over six thousand ships a year.¹⁶ Ships proceeding to Chinese ports at the north end of the Yellow Sea contribute significantly to the large amount of commercial shipping present at all times. China and the Democratic People's Republic of Korea have also begun efforts to start oil exploration¹⁷, which, if successful, could further crowd the sea space. In addition, air routes into the major cities of the region continue to grow, complicating the picture over the water as well. Tracking this amount neutral traffic alone in such a small space is a significant undertaking for the CSG commander. The presence of hostile craft in the area only makes the task more difficult.

The primary mission of the Korean People's Navy (KPN) is the defense of the DPRK territorial waters and coasts. During a conflict, this would likely be expanded to include amphibious lift, naval mine warfare and interdicting enemy shipping in waters adjacent to the Korean peninsula.¹⁸ To accomplish these missions it has over eight hundred combat vessels of various types, making it one of the largest navies in the

¹⁵ Northeast Fisheries Science Center website.

¹⁶ Baltic Asia Pacific Shipping website, "Country Focus South Korea," available from <http://www.stroudgate.net/aps/countries/southkorea.html>; Internet; updated 2003, accessed 13 May 2004.

¹⁷ "Navy, China." In *Jane's Sentinel Security Assessment – China and Northeast Asia* [database on-line]. Date posted: 19 November 2002, accessed 10 May 2004.

¹⁸ Ibid

world.¹⁹ These force structure numbers can be somewhat misleading. Since the majority of its platforms are of 1950's design, with nearly half of them being obsolete models, the KPN is not designed for power projection. Its forte is inserting North Korean special forces into South Korea.²⁰ Infiltration operations and amphibious landings, supported by minelayers, submarines and auxiliary craft, constitute its operational art.²¹ Despite the limitations of force structure and doctrine, the threat posed by the KPN to the CSG operating in the Yellow Sea can not be dismissed lightly. It possesses capabilities that must be countered. The small fast patrol boats are well suited for operations along the Korean coast of the Yellow Sea and could make short forays out to attack US ships. The missile-armed "Soju" and "Sohung" PTGs, although limited by their small size to coastal waters and probably possessing incomplete targeting information, can pose a threat to the CSG with their SS-N-2A anti-ship missiles.²² The requirement to counter this force will have an impact on the resources that the CSG is then able to commit to striking targets ashore.

In order to properly employ the CSG in the Yellow Sea, the commander must establish the conditions necessary for the carrier to operate. This will not be an easy task as the carrier requires significant sea room in order to conduct flight operations. Exact space requirements depend on a number of factors including operational tempo, wind speed and wind direction, but a minimum thirty mile by thirty mile box is a good rule of thumb. The surface picture in the Yellow Sea in the vicinity of the DMZ during the

¹⁹ "Administration, Korea, North." In *Jane's Fighting Ships 2004-2005* [database on-line]. Date posted: 25 March 2004, accessed 10 May 2004.

²⁰ Ken Gause, "North Korean Navy Grows in Influence." *Jane's Intelligence Review* 14, (01 September 2002): 42.

²¹ "Navy, Korea, North," *Jane's Sentinel Security Assessment*.

²² ²² Gordon Jacobs, "The Korean People's Navy—Further Perspectives," *Jane's Intelligence Review* 5 no 7, (01 July 1993): 316.

opening phase of the war will be filled with contacts. The KPN will be flooding south along the coast to insert North Korean special forces into South Korea in support of the “Occupying south Korea, All the Way to Pusan, in Three Days” plan. The ROK Navy will be deploying its numerous patrol craft to interdict this flow. The commercial traffic and fishing boats discussed previously will further complicate the picture. Finding or making an appropriately sized area, sanitized of hostile or unknown contacts, in which the carrier can operate safely, will be difficult. Therefore, in order to ensure sufficient time to identify and avoid all contacts of interest, or react to counter threats, the CSG’s area of operation will have to be moved well to the south and west of this congested region. A movement of the CSG’s area of operation such as this, away from the DMZ and the ROK coast, minimizes the benefits gained by operating the CSG in the Yellow Sea.

A further task for the CSG is Anti-Submarine Warfare (ASW). North Korea has the fourth largest submarine force in the world with a total of about one hundred boats in their inventory.²³ Once again, however, the numbers do not tell the entire story. Nearly half of these are midget submarines controlled by the Korean Worker’s Party and suitable only for special forces insertion. Furthermore, their four “Whiskey” class submarines based at Pipagot on the Yellow Sea are reported to be used only for training missions and restricted to operating at periscope depth when submerged.²⁴ The KPN appears to be trying to offset the obsolescence of its “Whiskey” and “Romeo” fleet with the

²³ “Navy, Korea, North.” In *Jane’s Sentinel Security Assessment – China and Northeast Asia* [database online]. Date posted: 5 February 2004, accessed 10 May 2004.

²⁴ David Foxwell, “Sub Proliferation Sends Navies Diving for Cover: The Multiple Menace of Diesel-Electric Submarines,” *Jane’s International Defense Review* 30, (01 August 1997): 36.

development of a fleet of domestically designed “Sang-O” class boats.²⁵ The “Sang-O” is a coastal submarine believed to be based on a Yugoslav design. It is small, 116 feet in length, and slow, with a speed of only about eight knots both submerged and on the surface. The “Sang-O” was designed with a mission of swimmer delivery or mine-laying but there are some versions which can carry either two or four torpedoes.²⁶ The slow “Sang-Os” with limited targeting sensors and armed with out-dated torpedoes would have a difficult time in engaging an alert CSG. But they should not be ignored. This is especially true in the complex environmental conditions of the Yellow Sea that can dramatically degrade U.S. capability to find them. As one British expert said about the effect submarine threat has on naval operations, “Thus, even though there may be only three or four conventional submarines in the opposition order of battle, the level of clearance or avoidance that needs to be achieved by precursor operations and evasive manoeuvres is extremely high. This is still an extremely demanding problem.”²⁷ The probable presence of Chinese submarines in the vicinity will further complicate the picture. Operation of the CSG in the region will not be unhampered. Resources and effort will have to be allocated to defend against the submarine threat if the CSG desires to operate forward in the Yellow Sea.

Other threats that assume greater significance as the CSG moves further north and closer inshore are mines and coastal defense missile sites. The KPN has significant offensive mine laying capabilities by virtue of her large number of patrol boats, amphibious craft, merchant ships and submarines. It is expected that this will be one of

²⁵ Ibid., 39.

²⁶ “Submarines, Korea, North,” in *Jane’s Amphibious Warfare Capabilities 05* [database on-line]. Date posted: 5 February 2004, accessed 3 May 2004.

²⁷ Richard Scott, “ASW: The New Arena,” *Jane’s Defence Weekly* 33 no 20, (17 May 2000): 23.

the KPN's primary missions early in the conflict.²⁸ Once again, the physical characteristics of the Yellow Sea make the task of countering the mining capability of the KPN quite challenging. The mobile North Korean coastal defense missile sites also threaten the forward operation of the CSG. These batteries receive targeting information from attached radar sites as well as KPN units afloat. In recent years, despite economic constraints, the KPN has shown interest in augmenting its strike capability by increasing the range of its surface-to-surface missiles.²⁹ Rather than adding more priority targets to the ATO, the most effective way of countering these two threats is to move vulnerable units, the CSG, further south, out of range.

North Korean aircraft also pose a threat to ships operating in the Yellow Sea. There are over 800 bomber and fighter aircraft in the Korean People's Air Force's (KPAF) inventory.³⁰ Despite these impressive numbers, however, analysts rate its effectiveness as low. Although it has about six wing equivalents in numbers, these would have the operational effectiveness of only about two wings.³¹ Some discount its effectiveness even further, claiming the KPAF has no real strength to oppose the more modern US and ROK air forces.³² Despite these shortcomings, the KPAF would likely use as many aircraft as possible in an offensive. The majority of these would likely be used to attack targets ashore, the primary focus of the North Korean offensive. However, if the opportunity presented itself, the large payoff of sinking or disabling a US warship

²⁸ Gordon Jacobs, "The Korean People's Navy—Further Perspectives," *Jane's Intelligence Review* 5 no 7 (- 1 July 1993): 316.

²⁹ Joseph S Bermudez Jr, "North Korea Tests Anti-Ship Cruise Missiles." *Jane's Defence Weekly On-Line*, (05 March 2003): 1.

³⁰ "Air Force, Korea, North," in *Jane's Sentinel Security Assessment – China and Northeast Asia* [database on-line]. Date posted: 5 February 2004, accessed 11 May 2004.

³¹ Michael O'Hanlon, "Stopping a North Korean Invasion: Why Defending South Korea is Easier than the Pentagon Thinks," *International Security* 22 no 4, (Spring 1998): 143.

might cause a diversion of effort. Due to the inherent mobility of ships at sea, finding and attacking them is a much more difficult task than attacking targets ashore. This is especially true for poorly trained pilots. Therefore, it is doubtful that any attack would succeed. But, whatever the size, the threat to the CSG does exist. Assets, both aircraft and missile-shooters, would have to be allocated to protect against it.

The operation of the naval assets protecting the CSG will have to be separated from the ongoing coalition air operations in the vicinity of the DMZ. Both operations must be afforded a clear engagement zone that allows time for detection, identification and engagement of contacts. Without separate engagement zones the operations run a real risk of interfering with one another. Since space in the Yellow Sea is so tight, in order to deconflict the two operations, the CSG would have to be located at the southern end of the Yellow Sea. This move would separate the individual efforts of each nation and component thereby facilitating efforts to avoid the possibility of fratricide, a very real possibility in joint and especially combined, operations. But this too would position the carrier away from the DMZ and Seoul and negate some of the original benefits gained by placing the CSG on the west side of the peninsula.

As shown in the preceding paragraphs, as the CSG is positioned further to the north, closer to the DMZ, it requires significantly greater protection. CSG assets are sharply limited by the amount of flight deck space on the carrier and the number of launch tubes in its escorts. The allocation of assets to defensive missions diminishes the capability of the force to strike targets ashore. Therefore, there exists a dilemma. As the CSG moves closer towards the Korean coast and the DMZ, it shortens the distance

³² Yihong Chang and James Foley, "Pyongyang Goes for Broke," *Jane's Intelligence Review* 15 no 3, (01 March 2003): 39.

between it and the main effort ashore, increasing its ability to contribute forces. But, it also moves into a higher threat environment and must divert more resources for its own self-defense. The threat of losing a carrier to North Korean action is a powerful incentive to err on the side of prudence and keep the carrier at the southern end of the Yellow Sea. The trade off of risks can be avoided by not deploying the CSG to the Yellow Sea. Stationed in the Sea of Japan, a CSG can take advantage of the less hostile environment in order to mount a more robust effort against targets on the eastern side of the peninsula, leaving the west coast targets to land-based air.

Considerations of Space and Time

The time required for the CSG to arrive and begin operations is roughly the same whether it deploys to the Yellow Sea or the Sea of Japan. The primary difference is the issue of passing through the Tsushima Straits en route to the Sea of Japan. Once established in either location, the area available in which the CSG could operate would be roughly equal. Thus differences in the factor of time are contained in the time required for the CSG to engage targets ashore and the time available to defeat the North Korean efforts to engage the CSG. The ability to operate in close proximity to the key targets reduces the transit time for strike assets argues for the CSG being stationed in the Yellow Sea. In this position, however, the CSG can be attacked with much less time to react to it. As a result, the time available to make the decision to engage an unknown contact is compressed. As discussed in the Space-Force section, there will be a large number of units in the Yellow Sea, friendly, enemy and neutral. The CSG's connectivity with joint and combined assets on the peninsula is still imperfect. Reducing the time available to properly identify unknown contacts increases the probability of mis-identifying them.

This results in either an enemy unit being allowed to pass or, perhaps more dangerous, a friendly or neutral being engaged. The fratricide that could result from this time compression argues strongly for moving the CSG away from the threat, at least until a clearer operational picture can be developed, whether this is the result of improved technology, doctrinal changes or the maturation of the campaign.

Recommendations

Despite the proximity of the Yellow Sea to the strategically important western Korean coastal plain and the city of Seoul, the Yellow Sea is not the recommended position for a CSG in the opening phase of operations to halt a North Korean attack across the DMZ. The restricted waterspace, complex environmental parameters and congested nature of the sea itself do not afford the CSG the maneuverability and flexibility it requires in order to effectively protect itself whilst simultaneously providing strike support for forces ashore. The possibility for fratricide is also significant due to coordination difficulties that exist between CSG and forces based ashore. Efforts to obtain maneuver space result in the CSG moving away from its targets thereby negating the initial benefits afforded by being in the Yellow Sea. Additionally, the possibility for the PRC to maintain a nearly continuous track of the CSG, coupled with the increased risk of inadvertent clashes with Chinese assets present the CSG with a distinct vulnerability. For these reasons, the CSG should avoid the Yellow Sea during the early stages of a conflict. Robust surface action groups should be maintained in the Yellow Sea to interdict North Korean use of the sea and to attrite their forces operating there. Following a reduction of the KPN presence in the area, the CSG should be repositioned into the Yellow Sea to exploit the benefits discussed earlier. Increased efforts should be

devoted to improving the coordination and integration of CSG assets with USAF and ROK assets. This will require increased participation in planning and exercises as well as improved connectivity.

Conclusion

In October 2002 the Chief of Naval Operations published his vision of the Navy of the Twenty-first Century calling for a dramatic redesign of the force structure, integration and capabilities of our maritime forces. On the title page he predicted “Sea-based operations use revolutionary information superiority and dispersed, networked force capabilities to deliver unprecedented offensive power, defensive assurance, and operational independence to Joint Force Commanders.”³³ The elements of this transformational vision promise expanded power projection capability and sustained access to littorals: “Sea Strike, the projection of precise and persistent offensive power, will punish aggressors swiftly and decisively. Sea Shield will provide a layered defense to protect the homeland, sustain access to contested littorals, and project a defensive umbrella over coalition partners and joint forces ashore in distant theaters.”³⁴ If the U.S. Navy is able to effectively realize this vision in the future, it may succeed in minimizing one of the primary factors of the Operational Art, the factor of space. Until that time, however, we are forced to acknowledge the dominance of the environment and its impact on our operations. It is this dominance of the environment that makes the Yellow Sea a poor choice for CSG operations.

³³ Vern Clark, “Sea Power 21: Projecting Decisive Joint Capabilities,” *United States Naval Institute Proceedings* (October 2002): 32.

³⁴ Mike Bucchi and Mike Mullen, “Sea Shield: Projecting Global Defensive Assurance,” *United States Naval Institute Proceedings* (November 2002): 56.

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