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Amphibious Operations for US and ROK Combined Forces

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Abstract: We study an amphibious operation involving the US marine for combined forces in Korea and the Advanced Combat Direction System (ACDS) and command and control Automated Data Processing (ADP) systems. The ACDS which was proposed in the late 1970's is a centralized, automated command-and-control system and it upgrades the NTDS for aircraft carriers and large-deck amphibious ships. Former NTDs collected information from ship's active and passive sensors, correlates hostile tracks and provided an integrated display of air, surface and subsurface situations for the ships operations officer. The NTDS was located in the ship's combat information center. There are two basic steps to the upgrade of the Combat Direction System (CDS) systems currently employed on ships. We discuss two basic steps and amphibious operations for combined forces in Korea. The rogue North Korean regime is plowing ahead with its missile technology and there are escalating threats in Korea Peninsula. US and ROK combined forces may decide to establish a functional component command to integrate planning and to improve combat efficiency significantly by use of amphibious operations. The ACDS replaced the NTDS (Naval Tactical Data System) due to growth in operational requirements both in the areas of combat direction needs and Battle Group/Battle Force (BG/BF) command and control. An amphibious operation is a military operation which uses maneuver principles to transition ready-to-fight combat forces from the sea to the shore in order to obtain an advantage over a hostile nation. Interoperable information systems to provide timely dissemination of information for amphibious planning, rehearsals and execution are required. Amphibious operations require a flexible communications system to support rapid decision making and to maintain a high tempo of operations. It must be reliable, sufficient for the mission, flexible, sustainable and survivable.

Key words: ACDS, NTDS, tactical communications amphibious operations, Afloat correlation system, communications, amphibious

INTRODUCTION

Hostilities today are deterred by binational defense team. The global security landscape is marked by long-lasting conflict, constant change, enormous complexity and escalated uncertainty (Trevithick, 2017). The maritime operational environment will become increasingly complex and more lethal. Democratic People's Republic of Korea (DPRK) may be one of the most heavily monitored places on earth. The desire for increased attention on DPRK's nuclear and missile programs is very surprising. The role of the Republic of Korea (ROK)/United States (US) Combined Forces Command (CFC) is to deter or defeat if necessary and is to maintain peace and security and the willingness to take that commitment into battle if the need arises. On April 19, 2017, the USS Carl Vinson carrier-led arrived in Western pacific ocean near the Korean Peninsula to commence the maritime operations, annual South Korea-US key resolve and Foal Eagle exercises. The move of the Vinson strike group is in response to recent North Korean provocations. The use of automated information management systems to support mobility operations for force projection is essential to maintaining data management and inputs into and interfaces between automated systems. These systems support a wide range of Command and Control (C^2) functional activities including mission planning and support, reporting and briefing and data communications (Park, 2016, 2015). Tactical data links are usually are used for C^2 of specific forces. Users of the C^2 Automated Data Processing (ADP) systems include. Battle Group/Battle Force (BG/BF) commander and his staff warfare area commanders for Anti-Air Warfare (AAW), Anti-Submarine Warfare (ASW), Anti-Surface Warfare (ASUW) and Strike Warfare (STW) operations and Battle Group/Battle Force multi-warfare area coordinators for Electronic Warfare (EW) and Command Control Communication and Counter Measure (C^3/CM) operations and aircraft and helicopter coordinators for integration and coordination ASUW/STW, Search and Rescue (SAR), Logistics Support and other support operations. Link 11 is the US

Navy shipboard version of Tactical Data Information Link-A (TADIL A) which standardized communications link that transmits digital information. Link 11 is an automatic, high-speed, computer-to-computer, data link that provides for the exchange of tactical data between ships and aircraft. NATO and US Department of Defense (DOD) defined Link 11 as Military Standard, MIL-STD 6011 (Sorroche *et al*., 2006). The Naval Tactical Data System (NTDS) is making use of the TADIL A system to support the battle group commander at sea (Simensen, 1992). The NTDS collects information from ship's active and passive sensors, correlates hostile tracks and provides an integrated display of air, surface and subsurface situations for the ships operations officer. On aircraft carriers it also, performs the airspace control function. The NTDS is located in the ship's Combat Information Center (CIC). NTDS computers, display devices, non-real-time displays and operators are linked together to share displays of tactical strategic information. The system provides on line collection, processing, presentation, storage and dissemination of operational and intelligence data received from sensors such as radars, sonars, optical devices, navigation and Electronic Counter Measure (ECM) equipment, Identification, Friend or Foe (IFF)/Selective Identification Feature (SIF) equipment and aircraft and other ship's data links through the C^2 processor (Abdalla, 2015).

NTDS

Korean Navy is implementing the naval tactical Command, Control, Communications and Intelligence (C^3I) system and has developed KNTDS (Korea Naval Tactical Data System). In order to get interoperability between US and ROK, KNTDS ships have Link 11 connectivity with USN NTDS ships at a preset frequency. The NTDS functions include providing target tracking capabilities for all aircraft, missiles and ships, providing situation displays and decision aids, providing target track, warfare, mission, readiness, communications management capabilities on NTDS-equipped ships. Providing weapons control, controlling ECM and ECCM operations through the Electronic Warfare Control Module (EWCM), controlling surface and underwater operations, displaying sonar data and providing underwater fire control. The KNTDS connectivity shown in Fig. 1 includes TADIL A/Link 11 data exchange among and between surface platforms and installations. Figure 1 is a diagram of the system being procured by the ROK government for the land-based version of the KNTDS. TADIL J connectivity will be possible when it becomes available to the fleet. The existing connectivity includes interfaces with the landing force Tactical Air Direction Center (TADC)/Tactical Air Command Center (TACC) and Tactical Air Operations Center (TAOC). It also includes

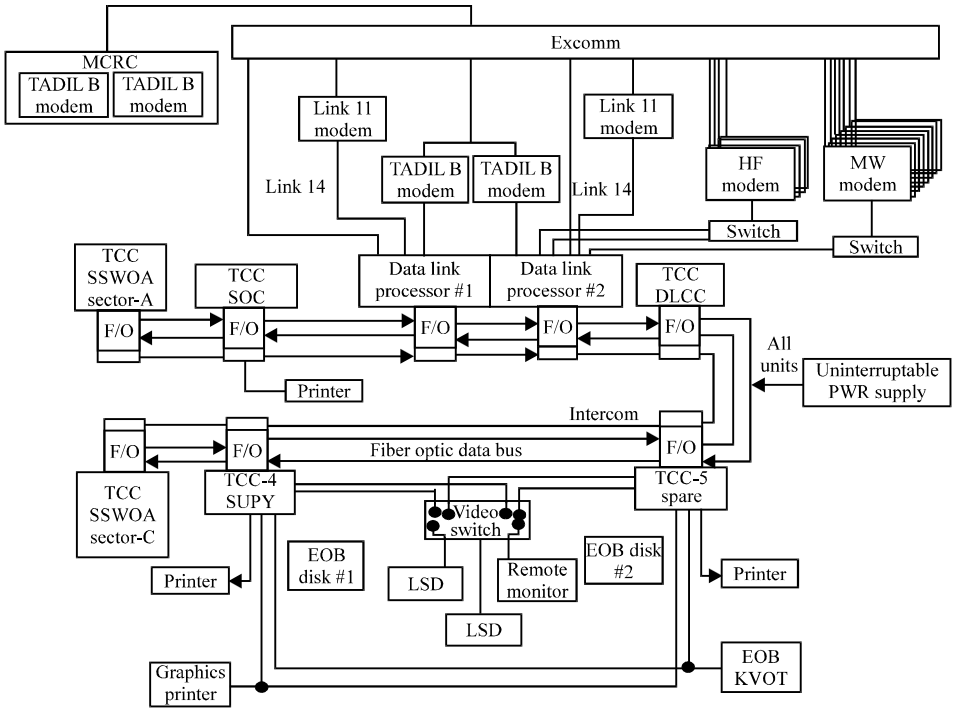

Fig. 1: Land-based KNTDS

interfaces with the Air Force Control and Reporting Center (CRC), the Airborne Warning and Control System (AWACS) and the Navy Airborne Tactical Data System (ATDS). TADIL C/link 4A is sued for ship/shore-to-aircraft and aircraft to ship/shore computer interfaces and may be established for one or two-way operation. Link 14 is used for NTDS computer output via. radio to ships and other centers that are not NTDS-equipped. NTDs is also, connected to intra-task force voice and teletype circuits.

The Airborne Data Combat System (ATDS): ATDS is an airborne, computerized data gathering and processing system featuring autonomous automatic air and surface target tracking and interceptor control and a capability for high-speed automatic data exchange via. TADIL A and TADIL C with NTDS, Tactical Data System-(TDS) and Combat Data System (CDS) equipped ship units. ATDS is also all-weather and carrier-capable tactical airborne, E-2C Hawkeye aircraft, integrated with an Electronic warfare Support Measures (ESM) system for passive detection and identification. Primary ATDs-equipped E-2C missions are Airborne Early Warning (AEW) and defensive air fighter control. Alternative missions include control of photo reconnaissance, surface surveillance, search and rescue and radio relay operations. It can also, perform these missions for strike and anti-surface warfare operations. Central connectivity includes TADIL A /Link 11 with NTDs, TDs and CDS-equipped ships, Marine Corps Tactical Air Operations Center (TAOC) and Tactical Air Direction Center (TADC)/Tactical Air Control Center (TACC) and other service TADIL A-capable air control facilities. TADIL C/Link 4A connectivity is possible with appropriately equipped tactical aircraft. A TADIL J capability is possible when a Joint Tactical Information Data System (JTIDS) terminal is included in the system for exchange of data with JTIDS-equipped aircraft, ships and ground stations. The marine corps Tactical Air Operations Module (TAOM) and Advanced Tactical Air Control Center (ATACC) will be JTIDS equipped for Korean joint forces operational facility.

The Advance Combat Direction System (ACDS): The ACDS was proposed in the late 1970's to replace the NTDS due to growth in operational requirements both in the areas of combat direction needs and BF/BG command and control. There are two basic steps to the upgrade of the CDS systems currently employed on ships. The first step of the CDs upgrade (ACDS Block 0) is the replacement of the first and second generation computers and displays with current technology computers (AN/UYK-43) and displays along with the companion software to drive the new hardware suite. The second step (ACDS Block 1) consists of development of a new high performance software program which provides an increased system track capacity effective operational range level of automation and operation support and increased interoperability between AEGIS and non-AEGIS combatants. ACDS Block 1 is companion upgrade with the Command and Control Processor (C^2P), JTIDS, the E-2C upgrade and the introduction of the TADIL J link standard. Without ACDS Block 1, full TADIL J interoperability cannot be supported. Development of the ACDS places emphasis on the acquisition processing. and management of information on aircraft carrier (CV)/aircraft carrier, nuclear-powered (CVN) and Guided Missile Cruiser (CG)/Guided missile Cruiser, Nuclear powered (CGN)/Guided missile Destroyer (DDG) ships, leading to increased new and track capacities and better information display for decision-making as well as TADIL J message standards through JTIDS/C^2P.

The Aloat Correlation System (ACS): US Navy established an operational requirement for an automated data fusion capability couple of decades ago and consolidated the Afloat Correlation System (ACS) program with Navy Command and Control System (NCCS) afloat programs to provide battle force information systems effectively. Main functions of the ACS are to merge data collected from battle group sensors and to correlate data by establishing relationships between new contacts of air, surface and subsurface platforms and to transfer data to other systems for presentation while providing automated decision aids to battle group commanders. ACS is the portion of the Tactical Flag Command Center (TFCC)/Flag Data Display System (FDDS) that performs the afloat multisource fusion function for the BG, providing a wide-area tactical track picture to FDDS and EW countermeasure and tactically significant nonorganic tracks and nonorganic to organic tracks correlation candidates to ACDS. It also provides the means of integrating nonorganic track data with the force organic picture for timely support to the Officer in Tactical Command (OTC)/Composite Warfare Commander (CWC) and other warfare commanders. The ACS wide-area ocean surveillance picture focuses on extended ranges. ACS derives its correlated products from information systems via. Tactical Data Information Exchange A (TADIX A), other nonorganic and cryptologic information from Command Communications Service Designator (CCSD) like EWCM (Electronic Warfare Communications Module). Additionally, the ACS provides BG (Battle Group) track data to

Ocean Surveillance Information System (OSIS) via. Officer-in-Tactical Command Information Exchange Sub-system (OTCIXS) and correlates diverse track numbering schemes to support multiple BG operations and BF (Battle Force)/BG track hand-off. The OSIS provides intelligence support to fleet and headquarters units.

PLANNED ROKN SYSTEM

Recognizing the need for an automated tactical command and control support capability and for interoperability between the US Navy and the ROK Navy for successfully countering North Korean subsurface, surface and airborne threats, the ROK government initiated an effort in obtaining the NTDS and the TADILA/Link 11 data link. The initiative was made in recognition of the fact that NTDS capable ships and aircraft are able to generate a clear picture of the threat in near-real-time. This capability provides the necessary decision aids and displays required, so that, commanders can make decisions on how to combine battle forces and coordinate the use of all of their warfighting resources. Data links provide timely, accurate, interoperable C^2 information, so that, command decisions can be executed in a timely manner. In the early 1980's, ROKN plans called for development and implementation of a secure KNTDS system connecting its three ROK naval commands sea combatants, the Naval Operational Command (NOC) and Naval Command Center (NCC). Interoperability was planned with both the US Navy and the ROK Force. A 2 phase program was envisioned. The phase 1 program (1986-1988) was an operational feasibility demonstration of interoperability with the US Navy. The phase 2 effort (Post, 1989) was to implement KNTDs in the ROKN fleet. Contractual negotiations were halted by the ROK government in 1986 but interest and efforts to reach agreements continued. Activities continued in preparing documentation to assure software compatibility (via. message standards), developing a Configuration Management Memorandum of Understanding (CM MOU) regarding operating procedures and data link employment and a TADIL A/Link 11 Communication Security (COMSEC) hardware for interoperability. It was agreed that all of these actions were essential for a successful implementation of the KNTDS program. In early 1989, the ROK government made a contractual agreement to purchase the phase 1 increment of the KNTDs and demonstrate the operational value of the system. The phase 1 demonstration system which is being procured from litton industries, consists of system elements to be installed at the ROK Navy second fleet Command Center

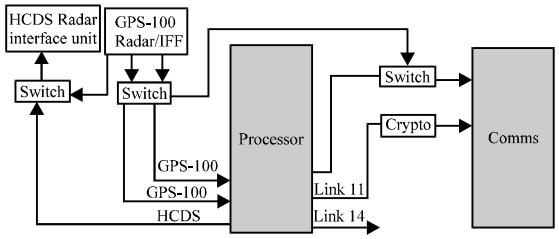

Fig. 2: Systems of Baengnyong-do and Dokchok-do

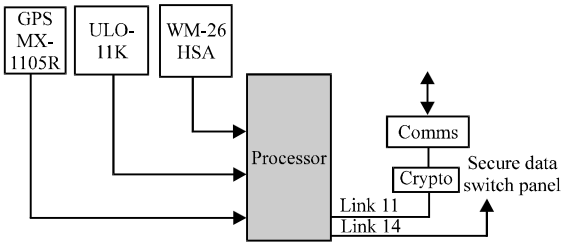

Fig. 3: Systems of Seoul (FFK-952)

at Inchon with TADIL A links to three ships of the Ulsan class ships, designated as Frigate Korea (FFK) class and coastal defense sites on the islands of Baengnyong-do and Dokchok-do. Figure 2 displays the systems for Baengnyong-do and Dokchok-do and Fig. 3 displays the system of seoul, FFK-952. The second fleet command center will function as net controller and the other land-based sites and ships will functions as Participating Units (PUs). A test and evaluation program was carried on the US NTTSA (Naval Tactical Interoperability Support Activity), San Diego, California and NTISA Det. 5 in far-East Asia. The purpose of the test effort was to verify the correct implementation of the TADIL A message standard in the KNTDS. The testing was carried on in two phases. The 1st phase was validation of the testbed software system. Testing involved modem landline transmission covered by COMSEC and was carried on iterative basis until US Navy could verify that ROKN Link 11 Software portion of the KNTDS program be interoperable with the US Navy's NTDS system. The 2nd phase of testing was to ensure that the operational hardware and software for the ROKN Link 11 was interoperable with the US NTDS system.

CFC/USFK have taken a number of measures in recent year to taken enhance the physical survivability of the major C^2 ADP systems. For example, the TACCIMs in CP TANGO and KAIS/KCSS in KCOIC should be as survivable as the hardened facilities. The major systems have a high degree of nodal dependency. The KISS and KAIS/KCSS systems are each located in a single facility. These facilities or their communications outlets can still

be rendered in operational by hostile enemy actions. The overall TACCIMS network relies on a central node at CP TANGO. Without this node, connectivity among the rest of the TACCIMS users would not be possible unless the backup at the Alt CP is activated. However, data communications for TACCIMS connectivity between the Alt CP and the other command facilities do not appear to have been resolved. This consideration is particularly important if the Alt CP is to be relocated frequently in wartime rather than to remain stationary at a fixed location. The availability of communications connectivity between users of a particular s ystem at different operating facilities is also dependent on the survivability of the communications transmission network. Redundant communications connections between the various ADP nodes are part of the TACCIMS and KISS requirements. As of February 1990, communications circuits for TACCIMs connectivity are still being KISs specific plans for redundant routing do not appear to have been made. For connectivity, provisions appear to have been made to carry the data traffic over different transmission networks. However, in some cases the transmission conduits of the two different networks could be physically located in the same cable duct. A very limited deployable ADP support capability is available in case the main facilities become degraded or non-operational. The KISS program plans to acquire a few deployable terminals for the field armies but this is still subject to funding availability. A deployable TACCINMS with tactical satellite communications is planned for the ALT CP. However, TACCIMs for the field armies will be situated in the fixed bunkers or garrisons. While a research station can be deployed in a mobile shelter, its interactions with the other TACCIMs nodes and the associated communications requirements have not yet been addressed.

AMPHIBIOUS OPERATIONS

This study focuses on current and planned US marine C^2 ADP systems and any potential need unique to the interfaces between the marines support systems and any combined or ROK systems.

US marine corps systems: Substantive C^2 ADP support is available for manne air operations. Existing ADP systems include the Tactical Air Operations Module (TAOM) and the Marine Air Traffic Control and Landing System (MATCALS). The TAOM is the Marine's version of the USAF MCE. It supports air surveillance, control and airspace management functions. Like, the MCE, the TAOM is capable of TADIL A, TADIL B and a number of other message standards. The MATCALs assists in air traffic control and landing at the airfields. Currently, there is no ADP support for overall Marine Air Ground Task Force (MAGTF)-level command and control or for control of Marine ground forces. The need for C^2 ADP support to commander, MAGTF and for the ground force commanders has long been recognized and there is an intense effort by the USMC to identify the specific requirements and determine the most appropriate systems. A Tactical Combat Operations (TCO) system is envisioned to support the MAGTF Combat Operations Center (COC) for overall force control. An Advanced Tactical Air Command Center (ATACC) system is being developed for the marine TACC using Non Developmental Item (NDI) equipment and some NDI Software. At the tactical level, ADP systems supporting maneuver control and fire support are being planned. While the specific details are still being determined, the marines systems are expected to be operational and technically very similar to the Army MCS and AFATDs maneuver control and fire support functions, respectively.

Assessment of amphibious operations: Assessment is a process which measures progress of the amphibious force toward mission accomplishment and occurs at all levels. In order to determine progress toward accomplishing a task, creating an effect or achieving an objective assessment process starts during mission analysis when the commander and staff consider what to measure and how to measure it. The principal ROK units with which the USMC forces might need to directly interact during an amphibious operation include the ground force units, tactical air OPEACs and airborne aircraft. Interfaces are required between the marine air systems and the combined or ROK aviation organizations/platforms air operation. Table 1 identifies the key bilateral systems interfaces involving the US marines C^2 ADP systems. Only one of the interfaces in the table that between the Marine TAOM and the MCRC is currently capable of automatically exchanging information in real-time. Among these interfaces there is a potential need for an automatic interface between the USMC's fire support system and that used by the adjacent ROK ground units, so as to transfer the fire support data in real-time or near-real-time. A semi-automatic interface appears adequate for the other types of bilateral interfaces. While most of the interfaces involve systems to be fielded in the future they are identified nevertheless as a reminder of the importance in their inclusion during development or planning of the future C^2 ADP support systems.

Table 1: Potential system-level interface needs of amphibious operations

			Current interface		
Node A	Node B	Principal ADP interface	Level	Status	Future level
Between USMC and combined organizations					
MAGTF COC	CFC	TCO-TACCIMS	N/A	N/A	2
MAGTF COC	NCC	TCO-TACCIMS	3	N/A	2
MC TACC	MCRC	TAOM-MCRC ADP	3	E	3
Between USMC and ROK organizations					
MAGTF COC	ROK Div. TOC	TCO-ROK MC	N/A	N/A	2
MC TACC	ROK Div. TOC	ATACC-ROK MC	N/A	N/A	2
MC Maneuver Ech.	MC Maneuver Ech.	MC MC-ROK MC	N/A	N/A	2
MC FSCC	ROK FSCC	MC FS-ROK FS	N/A	N/A	3

MAGTF: Marine Air Ground Task Force; COC: Combat Operations Center; MC: Marine Corp; TACC: Tactical Air Control Center; FSCC: Fire Support Coordination Center; N/A: One of the systems is currently unavailable; TAOM: Tactical Air Operations Module; ATACC: Advanced Tactical Air Command Center

CONCLUSION

North Korea is a significant threat to US and the international community as well as Korea. In this study, we studied NTDS and KNTDS, planned ROKN system and amphibious operations for US and ROK combined forces. An amphibious operation involving the US marine forces can be viewed as a combination of operations afloat and the initial phase of operations Ashore. Amphibio US operations aim to get behind the enemy and secure a military strong hold to project ground and air power from behind the main front. And amphibious operations require a flexible communications system to support rapid decision making and to maintain a high tempo of operations. C^2 interactions, applicable ADP systems and information exchanges associated with the afloat and ashore parts of an amphibious operation. ROK Navies continue to research closely together as they have been in the past in ensuring TADIL-A interoperability of the KNTDS with the US NTDS it is anticipated that automated interface between the two navie's systems will be possible.

REFERENCES

Abdalla, A., Z. Yuan, S.N. Longdon, J.C. Bore and T. Bin, 2015. A study of ECCM techniques and their performance. Proceedings of the IEEE International Conference on Signal Processing, Communications and Computing (ICSPCC), September 19-22, 2015, IEEE, Ningbo, China, ISBN:978-1-4799-8918-8, pp: 1-6.

Park, Y.C., 2015. Interconnection study of joint tactical communications systems. Indian J. Sci. Technol., 8: 1-7.

Park, Y.C., 2016. Study of US and ROK bilateral C3 interoerability. Indian J. Sci. Technol., 9: 1-7.

Simensen, T.A., 1992. Link-l1 communications. BA Thesis, Naval Postgraduate School, Monterey, California.

Sorroche, J., R. Byers and N. Barrett, 2006. Tactical digital information link-technical advice and lexicon for enabling simulation (TADIL-TALES) II: link 11/11B. Proceedings of the Conference on Command, Control Research and Technology (CCRTS), September 26-28, 2006, Arctic Slope Regional Corporation, Alaska, USA., pp: 4-8.

Trevithick, J., 2017. Here's America's plan for nuking its enemies, including North Korea. Time Inc, New York, USA.