Journal of Engineering and Applied Sciences 13 (Special Issue 3): 3255-3260, 2018
ISSN: 1816-949X

Combined Theater-Level Command and Control

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Abstract: The Korean Agency for Defense Development (ADD) has been developing a Republic of Korea (ROK) Command Control Communications and Intelligence (C^3I) Master Plan to address South Korea's C^3I architecture including Automated Data Processing (ADP) support. Information about the ROK's theater-level Command and Control (C^2) information management system is described in this study. The ROK government is developing or conceptualizing a ROK national C^2 ADP system. The system would provide operational information management support to the ROK national-level C^2 organizations as well as to the tactical-level commanders. The potential interactions and information exchange between the existing and planned ADP systems and US commanders would be an important part of the combined interoperability consideration. The ROK ADP system is reflected in this study as a potential future ROK national security.

Key words: Automated Data Processing (ADP), tactical communications, command control Communications and Intelligence (C^3I), interoperability, survivability, security

INTRODUCTION

The operational situation in the Korean theater is potentially volatile for several reasons. The continued hostile relationship between the North and the South, the ability of North Korea to launch a surprise attack, North Korea's continued nuclear and ballistic missile developments and the short distance between the De-Militarized Zone (DMZ) and the capital of the ROK, Seoul are the most significant contributing factors. Along with the ROK military forces, the United States (US) has an important role in the defense of the ROK under the mutual defense treaty (Vyas *et al*., 2015; Evans, 2016). The IT (Information Technology) revolution is the driving force behind the ongoing defense digitization in tactical network in the ROK armed forces. Certain US Army Air Force tactical units are stationed in Korea in peacetime and additional reinforcement units from all four services are planned for deployment to the Korean Peninsula or the surrounding waters during crisis and war. To succeed in defending the ROK, C^2 support for the Korean theater must be survivable, capable of providing accurate and timely intelligence and battlefield management information to the commanders and able to support effective planning, control and execution of tactical operations. Because of the close interactions between the ROK and US forces operating under a combined forces commander, timely and efficient information exchange among the combined and national C^2 support systems is crucial. Park studied interoperability study of joint tactical communications systems (Park, 2015, 2016). Ackerman described ROK military networks under threat and the Secret Internet Protocol Router Network (SIPRNET) and the Combined Enterprise Regional Information Exchange System (CENTRIXS) (Ackerman, 2013). Ali and Wexler (2013) studied US Army's future communications network, Warfighter Information Network-Tactical (WIN-T) which represents the tactical network providing secure voice and data communications for soldiers on the battlefield. Hussain *et al*. (2014) studied the framework for interoperability of heterogeneous command, control, communication, Computer and Intelligence (C^4I) systems for defense architecture. During the last decade United States Forces Korea (USFK) has worked aggressively to strengthen the readiness of the forces and to improve the interoperability between ROK and US systems and to upgrade C^4I infrastructure (Lee and Stumpf, 2016). All US combat forces in the pacific theater are under the Combatant Command (COCOM) of the US Commander-in-Chief, Pacific (USCINCPAC) in peacetime. Operational command of forces assigned to USCINCPAC is exercised through the USCINCPAC component commands and subordinate unified commands (Feickert, 2013; Weeks and Meconis, 1999). The USCINCPAC component commands are Pacific Air Forces (PACAF), Pacific Fleet (PACFLT) and US Army Western Command (WESTCOM). Subordinate unified command are USFK, US Forces Japan (USFJ) and the Alaskan Command (ALCOM). Deployed US forces are under the command and Operational Control (OPCON) of US component commanders or as in the case of some Army units, under the operational control of subordinate unified

commanders. US Forces in Korea are positioned in country under the 1954 Mutual Defense Treaty between the US and the ROK and are under OPCON of Commander, USFK (COMUSK). COMUSK has four component commands: the Eighth US Army (EUSA), US Naval Forces Korea (USNFK), US Air Forces Korea (USAFK) and Special Operations Command, Korea (SOC-K). COMUSK also serves as Commander, EUSA. The major US Army unit in Korea is the 2nd Infantry Division (2ID). US Air Forces in Korea are under OPCON of the Commander, 7th Air Force.

This study describes an operationally oriented framework of C^3 systems and the Theater Automated Command and Control Information Management System (TACCIMS) and the Korean Intelligence Support System (KISS).

MATERIALS AND METHODS

Combined theater-level commands: The principal ADP systems supporting the combined theater-level commands are the TACCIMS and the KISS. Korean joint forces command and the service's headquarters in December 1999 decided to upgrade to the GCCS-K (Global Command and Control System-Korea). It is worth studying TACCIMS to understand combined theater-level command and control in Korea. These systems and their functional capabilities are briefly described in this study.

TACCIMS: A predecessor to TACCIMS, the Theater Automated Command and Control System, Korea (TACCS-K) has been operational since 1985 to support C^2 information management functions of CNCCF's staffs and subordinate commands. TACCS-K was developed by the US for the CFC. The system consisted of 30 host computers (WICAT mini-computers) and 122 work stations (IBM PC/AT) located throughout the Korean theater. Fifty-three of the workstations are configured bilingual, capable of both english and Hangul, ROK and US staffs have been using the system for such tasks as report preparation and electronic mail (e-mail). The terminals are also capable of supporting word processing, spreadsheet and local data bases using commercial software. TACCIMS is intended to build on the TACCS-K experience, modernizing the hardware and expanding the software applications. The TACCIMS program is a combined effort with both US and ROK participation including management structure, funding, system engineering and contractors. Under a bilateral Memorandum Of Agreement (MOA) signed in 1987, the ROK has constructed a third tunnel in CP TANGO as well as the new Command Center in Seoul (CC Seoul) as its

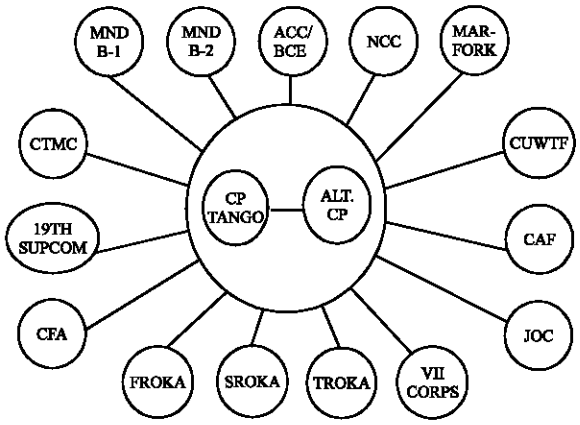

Fig. 1: A conceptual illustration of TACCIMS network

contribution to the program. Under the same agreement, the US is funding the hardware, software, installation, maintenance and training of TACCIMS. Initial Operational Capability (IOC) is anticipated to be sometime in 1990. TACCIMS will consist of work stations at key combined, ROK and US theater-level commands. All of the TACCMS work stations will be Goldstar PC 386-2 using the UNIX operating system with an 80386 processor, a 80387 co-processor, a 10 MegaByte (MB) Random Access Memory (RAM), a 1.2 MB floppy disk drive, two 44 MB removable internal hard disks, a Hangul-English keyboard and a 12 inch high resolution monitor, work stations within a command facility will be interconnected with the Ethernet Local Area Network (LAN) Inter-facility connections will be provided by data links. Figure 1 is a conceptual illustration of the TACCIMS network. The lines in the figure represent logical connectivity rather than physical transmission links. Given appropriate communications arrangement, any node in the network can be connected to any other node in the network. The TACCIMS computers will operate at a SECRET/ROKUS security classification level. The system is designed to provide automated support to a number of staff functions including: Office Automation (word processor, spreadsheet, etc.), e-mail, message handling (outgoing distribution via. AUTODIN with automated, release authorization/verification, internal distribution using e-mail), data base management, Hangul/english translation briefing support and map graphics.

KISS: This system has been developed as a USFK/CFC initiative to support the intelligence information management needs of both the US and combined forces at echelons above corps. IOC was reached in June 1986, The initial capability available, referred to as release I, included mainframe processors at CP TANGO and remote

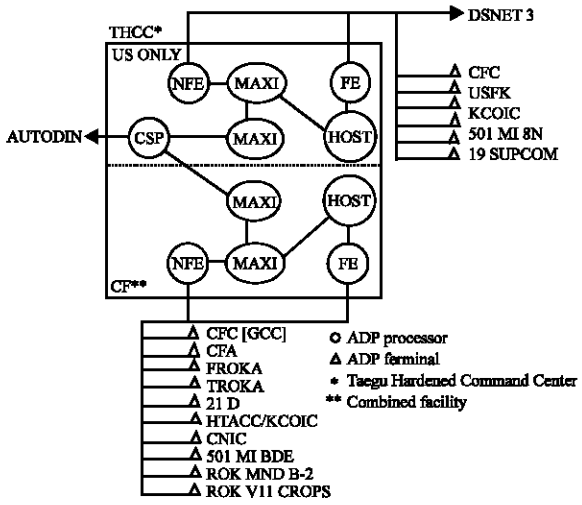

Fig. 2: Illustration of KISS configuration

terminals at selected organizations/elements in TANGO and elsewhere. The system provided an automated message handling capability between the users but there was stand-alone information storage or processing capability at user locations. By July 1988 (Release II), additional software was added to the central processor, capable of supporting Indications and Warning (I and W) and Collection, Exploitation and Dissemination (CED) and Peace/War analysis (P/W) activities. Databases necessary for the conduct of these activities are gradually being built up. Release III is scheduled for early 1990. The total number of terminals will increase. New workstations with stand-alone processing and graphics capabilities will be added. The mainframe processors will be relocated from CP TANGO to the THCC (Taegu Hardened Command Center) at Camp walker. Figure 2 illustrates the general configuration of KISS as of Release III. The system consists of a US subsystem and a Combined Facility (CF) subsystem.

The central part of each subsystem is an IBM 4381 mainframe processor. Each processor is connected to two Modular Architecture for Exchange of Intelligence (MAXI) processors which support the KISS users in message creation, deletion, profiling, routing and dissemination. The MAXIs are in turn connected to the Communications Support Processor (CSP) which serves as an interface to the AUTODIN switch. Remote terminal/workstations are connected to either of the subsystems via. a Network Front-End (NFE) communications processor. Additional improvements planned for KISS include terminals for selected commands (e.g., B-1 Bunker, CUWTF), software improvements to allow timely database update and enhanced external interfaces with Korean Air Intelligence System (KAIS).

RESULTS AND DISCUSSION

Assessment theater level ADP support: This study assesses theater-level ADP support. The assessment focuses on interactions between the C^2 information management systems in support of the operational interfaces and information exchange needs between the theater-level command organizations. Survivability and capability aspects of the ADP systems are also addressed where necessary.

Interface and interoperability considerations: For theater-level operational command and control, coordination and information exchange are necessary among CFC (combined), ROK MND (ROK national) and USFK (US national) as well as between these organizations and their respective service component commands and other subordinate commands. Information that needs to be transferred between the unified and component commands typically includes plans, orders, intelligence summaries, situation reports, force status and readiness reports, etc. The same type of information generally needs to be exchanged among the combined, ROK national and US national commands for coordination purposes. Because of the multiple military positions ("hats") assigned to a number of the commanders and staffs, the corresponding C^2 organizations are in some cases collocated and use the same automated C^2 support systems or equipment. For example, CFC and its Ground forces Component (GCC) are Commanded by the same officer, are collocated and are supported by the same basic ADP systems. Likewise, ACC (Air Component Command) and US 7th Air Force are supported by common ADP systems. The ADP systems primarily support tactical command and control but also include information important for the theater-level command. The operational C^2 functions at CFC and GCC are primarily supported by TACCIMS and KISS. The former provides support for operations and the latter intelligence support with particular orientation towards ground intelligence. The KCSS and KAIS terminals available at HQ CFC/GCC (also at CP TANGO) primarily support the ACC LNO (Liaison Officer) teams that coordinate with other functional elements of the CFC command and are situated in the operations and intelligence areas of HQ CFC. At the ROK MNDJCS (Ministry of National Defense Joint Chiefs of Staff) level, a TACCIMS workstation will be provided at IOC (Initial Operational Capability) to support coordination with CFC and input and output of operational information. A ROK C^2 ADP system is shown as a potential future system. The purpose for including this potential system is to underscore the need for

scrutiny of a system's interface and information exchange needs while that system is being planning or developed. HQ ACC/7AF at Osan Airbase is primarily supported by the Operations Intelligence Automation (OIA) system, which consists of the upgraded version of the constant watch Korean Air Intelligence System (KAIS) and Korean Combat Service Support (KCSS) system. Additionally, a TACCIMS workstation is available to the GCC's Battlefield Coordination Element (BCE) collocated in the HTACC/KCOIC facility. Both TACCIMs and KISS are intended for the exchange or sharing of information between CFC and ACC. Actual use of these systems (or terminals) is rather loosely structured at the present time. Other combined, US and ROK C^2 organizations will be similarly supported by the various ADP systems. The NCC is to be supported by a TACCIMS workstation and a KISS terminal. USMARFOR-K (US Marine Forces, Korea) and the combined and ROK field armies will also be provided with TACCIMS workstations. These interconnected workstations facilitate information exchange and coordination between the component/ subordinate commands and CFC. Because the TACCIMs workstations have a considerable amount of stand-alone capability, the system could also assist in managing the command unique operational information at the component and subordinate commands. However, concepts for how to use the system to meet the command unique information management needs at these commands are not yet developed. The USN 7FLT will support CFC in a Korean theater operation. For command-level coordination, the necessary information exchange could be accommodated via. voice or TTY communication in most situations or through the WWMCCS (Worldwide Military Command and Control System) connectivity, if necessary. Therefore, automated interfaces between the CFC and 7FLT ADP systems might not be needed. However, as discussed later in the report concerning combined tactical air and maritime operations, a high degree of automated interaction is necessary for the tactical ADP systems directly supporting the respective surveillance and control centers. Given the need for effective information exchange among the theater-level C^2 organizations and the presence of several ADP systems at many of these organizations, a multitude of system-to-system interfaces can be expected to result. Without an overall concept identifying the particular systems interfaces most appropriate for meeting the specific information exchange needs between command organizations, the systems interfaces risk being developed and used in an ad hoc fashion. The commander's staffs would not be able to benefit from a systematic information management capability.

Table 1 shows the level of interface between principal theater-level ADP systems. The first column lists pairs of theater-level C^2 organizations whose interactions can potentially benefit from some degree of interface between ADP systems available at their respective commands. The second column lists the associated system interfaces that need to be considered. The third and fourth columns show the existing interface levels or levels designed to be achieved at IOC. The fifth column shows the interface levels potentially needed in the future that is above and beyond the existing or IOC interface capability. These potential interface needs ought to be carefully examined and validated. Where a higher level of interface capability is required in the future, actions need to be taken to ensure that interface is being planned for developed and maintained. This type of interface involves interactions between different functional systems at the same general locations for example, the KISS terminal and the TACCIMS workstation at CP TANGO. Because the databases, definitions and terminology and other procedural specifications are in most cases different between the two systems, a partially automated interface between them are complex but not impossible. A careful examination is needed to identify the specific information that needs to be automatically exchanged or updated and to bring about a commonality where required in the specification of the information of common interest between the two systems. Without this, information

Table 1: Inter-organizational interfaces between ADP systems

			Current interface		
Node A	Node B	Principal ADP interface	Level	Status	Future level
CFC	ROK MND	TACCIMS-TACCIMS	3	IOC	3
CFC/USFK	CINCPAC	WIS-WIS	3	E	3
CFC[GCC]	USFK(W) [EUSA]	TACCIMS-TACCIMS KISS-KISS	3	IOC	3
CFC[GCC]	NCC	TACCIMS-TACCIMS	3	IOC	3
CFC[GCC]	ACC/7AF	TACCIMS-TACCIMS KCSS/KAIS-KCSS/KAIS	3	IOC	3
CFC	SOC-K/CUWTF	TACCIMS-TACCIMS	3	IOC	3
GCC	CFA/ROKAFs	TACCIMS-TACCIMS	3	IOC	3
NCC	ACC/7AF	TACCIMS-TACCIMS	3	IOC	3
NCC	USMARFOR-K	TACCIMS-TACCIMS	3	IOC	3
ACC	USMARFOR-K	TACCIMS-TACCIMS	3	IOC	3

IOC-Capability at TACCIMS IOC (Initial Operational Capability); E-Existing interface at level shown; N/A-one of the systems is currently unavailable

exchange and database update must continue to rely on manual handling even though input and output of information between the systems can be facilitated with use of floppy discs or optical character readers. With a large number of different systems supporting the same organizations, this "swivel chair" method of interface becomes manpower intensive.

Survivability considerations: CFC/USFK have taken a number of measures in recent years 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 system 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 workstation can be deployed in a mobile shelter, its interactions with the other TACCIMs nodes and the associated communications requirements have not yet been addressed.

CONCLUSION

While all C^2 systems in the Korean theater ultimately support CINCCFC operations, TACCIMS is intended to be the primary system directly supporting CINCCFC in exercising OPCON of the combined force. CINCCFC and his staff would rely on the system to coordinate with the component/subordinate commands as well as with US and ROK national C^2 organizations. As described in study IV.B, the systems concept entails a number of key features unique to operations in the Korean theater. Among the most significant are an automatic Hangul-English translation capability and interfaces with other functional or command systems such as KISS, KAIS/KCSS, WIS and future ROK national C^2 ADP systems as appropriate. The Hangul/English translation capability is one of the TACCIMS operational requirements. This capability is crucial to reducing language difficulties which in many cases have impeded or prevented the necessary degree of C^2 and operational interactions and coordination between the ROK and US forces. The bilingual translation software has been under development as part of the TACCIMs program. The development of an automated language translation capability is not an easy task. Another important consideration is TACCIM'S interfaces with external systems. As the TACCIMs system matures, consideration should be given to expanding its external interface capability. Otherwise, the extent of automated support will be limited to transferring reports or messages to and from other system rather than efficient database update using information from external systems. TACCIMS was upgraded to the GCCS-K (Global Command and Control System-Korea) in December 1999.

IMPLEMENTATIONS

KISS is at a more advanced stage of implementation than TACCIMS. Application software for assisting the users in IW (Information Warfare) and CED (Collection, Exploitation and Dissemination) has already been incorporated into the system. An Integrated Data Base (IDB) necessary for certain CED activities exists but must be manually maintained because of the lack of an automatic IDB update capability. As a result, the currency of the intelligence information could be adversely impacted thereby mitigating the ability of the intelligence analysts in performing their functions. Hangul/English translation capability is a part of the original KISS concept. The KISS program office has indicated an

intention to adopt the language translation capability being developed for TACCIMS when that capability becomes available.

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