USAWC STRATEGY RESEARCH PROJECT

THE COMMUNICATIONS BRIDGE: PLANNING AND IMPLEMENTING STRATEGIC COMMUNICATIONS FOR OPERATION ENDURING FREEDOM AND BEYOND

by

Lieutenant Colonel Michael S. Yarmie
United States Army

COL Gordon Thigpen
Project Advisor

U.S. Army War College
CARLISLE BARRACKS, PENNSYLVANIA 17013

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ABSTRACT

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For the past several years many combatant commanders have listed strategic communications and C4 reach-back capabilities among the top four items on their Integrated Priority Lists (IPLs). These requirements in whole or in part remain unresolved today. Operation ENDURING FREEDOM (OEF) further validated the urgent need of strategic reach-back communications from the Area of Operations (AOR) to the Continental United States (CONUS). This Strategy Research Project (SRP) will analyze the strategic communications infrastructure that the military planned, installed and operated to support operations in the Central Command AOR. The analysis will include: an overview of reach-back communications for voice, video, and data services employed on OEF; address current Army shortcomings in providing the communications for OEF to meet the needs of the combatant commander; and, develop a framework for planning and providing strategic communications capabilities on future operations.

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PREFACE

First, I would like to thank my advisor, COL Gordon Thigpen, for his time, perspective, and guidance on this project. Second, I greatly appreciate the many discussions with COL Mark Bowman, LTC David Dodd and MAJ Kelly Knitter. Their insights and perspectives on Operation ENDURING FREEDOM deployments and mission execution were invaluable. I would especially like to thank COL Bowman for his review and focused comments on this project.

LIST OF ILLUSTRATIONS

THE COMMUNICATIONS BRIDGE: PLANNING AND IMPLEMENTING STRATEGIC COMMUNICATIONS FOR OPERATION ENDURING FREEDOM AND BEYOND

In America's fight against terrorism, Operation ENDURING FREEDOM (OEF) set many technological and doctrinal benchmarks for the employment of both conventional and unconventional forces. A key enabler in conducting the asymmetric fight against Al Qaida and the Taliban regime was the employment and integration of critical strategic communications resources on an unprecedented scale. The networks that integrated sensors and information systems were built from an intricate array of tactical and Commercial-Off-The-Shelf (COTS) products and equipment. This deployed equipment ultimately provided vital reach-back communications. From a subscriber or user perspective, reach-back communications are viewed as those services which permit access back to home station. Another view with regard to reach-back data services is the opinion that reach back data services are most often thought of as those that go back into the "Internet Cloud". Nonetheless, in any remote or isolated area, the complexities involved in installers', operators' and network managers' providing reach-back communications are enormous. The same held true throughout the first nine months of OEF in Uzbekistan, Afghanistan and Pakistan.

The final communications architectures that supported the operational headquarters and commanders in the Afghanistan Area of the Central Command (CENTCOM) Area of Responsibility (AOR) incorporated reach-back communications vastly different from the original planned concept of communications support. In fact, the final plan for tactical resources in terms of equipment and personnel exceeded the original mission concept more than sevenfold.[1] At first look such an increase in itself may seem surprisingly excessive, however, the operational mission expansion necessitated voice, video, and data services of significant magnitude. With the advantage of hindsight it appears that a tenfold increase in personnel and equipment would have been more appropriate given the growth of the mission.[2] The network configurations that framed the reach-back communications structure during OEF have heralded an urgent need for the Army to immediately develop and implement new communications doctrine to support the military's achieving full spectrum dominance as articulated in JV2020. The Army's successes in providing strategic signal support to the warfighters on OEF were anything but easy and nothing short of complex. Nevertheless and in spite of many difficulties, the critical information went through. The daunting task today is now to capitalize on the insights gained from lessons learned and incorporate this understanding of communications into a strategy to support the Army in the interim as it transitions to the Objective Force.

As a baseline this paper will first review communications employed to support OEF in the CENTCOM AOR with specific consideration given to the requirements, planning, and execution, as well as shortcomings and lessons learned. This discussion will provide a reference point for the future communications innovations and doctrinal improvements necessary for the Army Signal Regiment's transformation. Today's increasing asymmetric combat environments provide unique and pivotal challenges to support the warfighter. Three areas that will not be addressed in the scope of this paper are vulnerabilities, operational risks assumed by leaders on the ground during OEF, and the contracting processes that were involved in transitioning tactical communications services to commercial services. Vulnerabilities and operational risks are discussed in the Army Central Command (ARCENT) After Action Review (AAR) draft dated May/June 2002.

Clearly, implementing new communication technologies and doctrine as enablers of Army Transformation will have a price tag. Leaders at all levels must not fixate on the question, "How can we afford the new technologies and implement new doctrine?"; rather, leaders must conclude that we cannot afford not to. The Army simply cannot maintain its relevance as a fighting force and achieve information superiority, and hence full spectrum dominance, without dedicating the resources for it. The scope of this paper is geared toward the audience of operational military leaders and communications professionals who have a basic understanding of Command, Control, Communications, and Computer (C4) requirements needed to support component and Joint Task Force (JTF) commanders and staffs in the field.

REACH-BACK COMMUNICATIONS – THE BUILDING BLOCKS

WHAT IS REACH-BACK COMMUNICATIONS - REALLY?

The term reach-back communications does not have a standard definition either in Joint or Army doctrine. A definition used widely among military communications specialists is that reach-back communications are those communications services that are extended back into a fixed site location, which subsequently connects into the Defense Information Systems Network (DISN). This extension into the DISN provides secure and non-secure data services, voice services and video services. The DISN is defined as:

> the DOD's [Department of Defense's] consolidated worldwide enterprise level telecommunications infrastructure that provides end to end information transfer network for supporting military operations. It is transparent to its users, facilitates the management of information resources, and is responsive to national security and defense needs under all conditions in the most efficient manner.[3]

The main components of the DISN that support the deployed warfighting commander are his associated telecommunications equipment, long haul telecommunications infrastructure, and fixed facilities that are also referred to as fixed sites.[4] The fixed facility that provides connectivity for these services into the DISN is also more commonly referred to as a Strategic Tactical Entry Point or STEP site. STEP sites provide military forces the ability to access strategic communications infrastructure worldwide for voice, video, and data services. In the information technology age, STEP sites are the communications lifelines to commanders in forward deployed areas.

THE REQUIREMENT FOR REACH-BACK COMMUNICATIONS

Joint doctrine does not specify "how to" guidelines to provide reach-back communications. Rather, joint publications and instructions focus on the attributes that communications services must have in order to sufficiently and adeptly support the combatant commander's or the JTF commander's mission information requirements. Communications systems supporting the combatant or JTF commander must be rapidly deployable, flexible, and agile to support the complexity of changing missions in austere or unpredictable environments. Current Army doctrine states:

> Effective communications and computer systems that ensure connectivity through the ASCC's [Army Service Component Command's] battlespace are vital to planning, mounting and sustaining a successful major operation. Operations, CSS, and intelligence all depend on responsive systems that tie together various aspects of joint and multinational operations. The ASCC commander needs home station, en route, and intertheater/intratheater communications that are secure, flexible, and deployable. These systems must operate with joint forces, civilian agencies, and multinational or coalition forces.[5]

Most communications support packages for JTFs or Army Service Components do not have a fixed structure. Forward-deployed strategic communications teams must have the flexibility to meet the information needs of the supported headquarters to provide the special and routine voice, video, and data services. A principle challenge is to accurately plan and identify subscriber requirements to ensure limited critical resources are properly allocated.

During OEF, General Franks, the CENTCOM Commanding General (CG), made the decision to have his headquarters and planning staff remain in Florida while the ARCENT CG and his staff deployed to Kuwait to serve as the Combined Forces Land Component Commander (CFLCC). Adding to the command structure of the operation, and hence contributing to a significant increase in the communications requirements, was the appointment of Major General (MG) Hagenbeck, 10th Mountain Division Commander, as the CFLCC Forward

(Fwd) with his headquarters initially based in Uzbekistan. Specialized reach-back communications packages provided critical assets to synchronize staff planning functions among all levels. Communications packages for the operation provided data services that also supported collaborative planning tools to conduct mission analysis, as well as voice communications to command and control operations.

Additionally, analysis and integration of strategic intelligence information heavily relied upon reach back communications. Although the military intelligence community greatly used a communications system called Trojan Spirit II (which is actually a dedicated intelligence reach-back platform), a tremendous amount of intelligence analysis and collaborative planning occurred over the classified systems through the DISN. Reach-back communications were absolutely vital in providing time sensitive intelligence to leaders in the Afghanistan Theater. Of particular note was the fact that reach-back communications provided commanders the ability to receive extensive reports and synthesized information from senior analysts in the Continental United States (CONUS).

THE BUILDING BLOCKS

As previously stated, reach-back communications systems provide connectivity from the area of operation back into the DISN. To facilitate a better understanding of how reach-back communications systems function, this section will elaborate on the basic components, equipment, and services reach-back platforms provided to the warfighters involved in OEF. These paragraphs will include discussions on long haul transmission systems that provided the path and the components of the system that provide voice, video teleconferencing (VTC), and data to/from the Area of Operation (AO).

Military Tactical Satellite (TACSAT) systems are the primary long haul assets of choice to connect back into the STEP sites. OEF employed multi-channel Super High Frequency (SHF) Ground Mobile Forces (GMF) terminals identified as AN/TSC-85s or AN/TSC-93s, which use the X-band on the Defense Satellite Communications System (DSCS). An AN/TSC-93C terminal is capable of establishing a point to point configuration with a maximum data rate of 2.496 Mbps, and is often called a spoke terminal. An AN/TSC 85C terminal is capable of establishing links to four other satellite terminals with a maximum data rate of 4 Mbps, and is referred to as a hub. The maximum data rates are only possible if there is enough bandwidth or space available on the satellite. Satellite system employment limitations include having a clear look angle (this simply means that there are no physical obstructions between the path of the satellite antenna and the satellite) and ensuring that the terminal is in the footprint of the satellite (the area that the satellite can cover on the ground).

Tropospheric (TROPO) systems are another type of long haul system. Large TROPO systems AN/TRC-170 (V2) models can provide up to a 2 Mbps pipe at their maximum planning range of 150 miles in quad diversity, and a data pipe exceeding 4 Mbps at 100 miles. Smaller TROPO systems, AN/TRC-170(V3)s, have a planning range of 100 miles. TROPO systems require specific take-off angles relative to distance between terminals. Also, other planning considerations are their operating in Line Of Site (LOS) or tropospheric mode for Beyond Line Of Site (BLOS) operations. The biggest problem network planners must resolve is to find terrain that profiles to provide a good transmission path. The major advantage of TROPO systems is that they do not depend on limited space resources and bandwidth availability.

The two primary data networks that reach-back communications support are the Secure Internet Protocol Routing Network (SIPRNET) and the Non-secure Internet Protocol Routing Network (NIPRNET). The SIPRNET provides a medium for classified information from the point of presence into the DISN. The SIPRNET is secured end to end by Trunk Encryption Devices (TEDs). The standard SIPRNET is classified Secret; however, higher classifications may be used on approved systems that have the appropriate encryption key. NIPRNET is more than simply a means to provide users the ability to access the Internet; it is the backbone for many Standard Army Management Information Systems (STAMIS) such as the personnel database system called SIDPERS. NIPRNET provides subscribers with protection against intrusion and malicious activity.[6] As in any computer network, both systems require routers, servers, hubs, switches, and the appropriate software. System administrators are also concerned about firewall protection to preclude unauthorized access and maintain information surety.

VTC use has evolved to become a standard command and control mechanism of choice by senior leaders. It provides users with the ability to conduct face to face coordination despite geographical separation. H.320 is the joint standard protocol for VTCs, which is regulated by the Defense Information Systems Agency (DISA) as the lead government agency. Combatant commanders and their staffs view tactical VTC as a critical warfighter requirement, and VTC plays an integral role in the command and control of forces.

A multiplexer is an "electronic piece of equipment which allows two or more signals to pass over one communications circuit."[7] Multiplexers essentially provide the means for communications technicians and operators to break out large composite circuits into smaller bandwidth increments. The three primary multiplexers on OEF were the Promina 800, the Promina 400, and the FCC-100. Other than having the largest capacity, Promina 800s can perform dynamic bandwidth management functions i.e. if a circuit goes out, then the Promina 800 may be programmed to automatically reallocate a lower priority circuit to ensure that critical systems remain in operation.

Voice services incorporate a variety of tactical and commercial two wire and four wire telephones. These include STU/STE phones and Defense Red Switch Network Phones (DRSN).

An AN/TSC-143 or TRIBAND system is a complex communications system and is the heart of a medium communications package that will be described later in this paper. The TRIBAND is a prototype system that is unique to the 504th Signal Battalion, 11th Signal Brigade. This asset is a signal system that combines a long haul satellite capability with an onboard switchboard (also referred to as a Switch Multiplex Unit or SMU) that can provide encrypted or unencrypted phones and contains a Promina 400 for signal multiplexing capability. The TRIBAND is appropriately named because it can operate on three different satellite frequency bands all in the SHF range, the X-band, Ku-band and C-band. X-band is also often referred to as military band because of its frequent use by military forces. Ku-band and C-band are commercial satellite bands on the government or DOD may lease airtime, but it is expensive. By changing out a few antenna parts and wave-guides for the appropriate band, the TRIBAND can be in the footprint of a satellite almost anywhere in the world. Although the terminal can only operate on one of its three bands at a given time, the TRIBAND has a significant advantage over the classic terminals of its size. The AN/TSC-93 can only provide one link to a distant terminal, whereas the TRIBAND is a hub terminal and can connect up to three other satellite terminals. As stated previously, the AN/TSC-85 can provide 4 down-links, but the vehicle and associated equipment require significantly more airframes than a TRIBAND, or a larger aircraft such as a C-5 or a C-17.

Army Field Manual (FM) 11-45, Signal Support to Theater Operations, is currently under revision. One concept that will remain in the new FM 6-02.45 will be signal units' supporting a CFLCC, ASCC, or JTF with small, medium, or large contingency communications packages. Current doctrine states that a contingency communications packages should provide voice, video, and data services, but does not specify requirements in terms of the number of subscribers supported for each communications package. A complicating factor is that no two Echelon Above Corps (EAC) signal brigades have the same standardized reach-back communications packages. Since the 11th Signal Brigade was the strategic signal unit that deployed to OEF, this paper will reference the 11th Signal Brigade's convention of small, medium and large communications packages. Size and airlift requirements matter significantly in planning strategic deployments, and these requirements can be greatly reduced with smaller and lighter systems with greater capability. The size of the package, however, does not simplify the complexity involved in the installation of the overall system. Also, an obvious challenge facing communications planners and leaders is the deliberate tradeoff made to facilitate strategic lift at the expense of tactical/operational mobility. Once a communications package arrives in theater it does not possess enough organic transportation assets to move the soldiers, their personal gear, tents, spare parts and equipment. This problem limits the mobility of the communications package once it arrives in theater. Additionally, site dispersal and the geographic layout of the communications site may significantly increase the need for more cargo capability and lift due to cable and wire requirements.

A small contingency communications package offers the smallest footprint and also supports the smallest number of subscribers. Planning capabilities for a small communications package are 30 telephones, 50 SIPRNET, 50 NIPRNET and a VTC suite. These services are integrated with an FCC-100 multiplexer. Ten personnel and three vehicles with trailers are necessary to support this mission. The illustration below provides further resolution.

(AN/TSC-93 w/ FCC-100, LTU, VTC and Spoke C4EP)

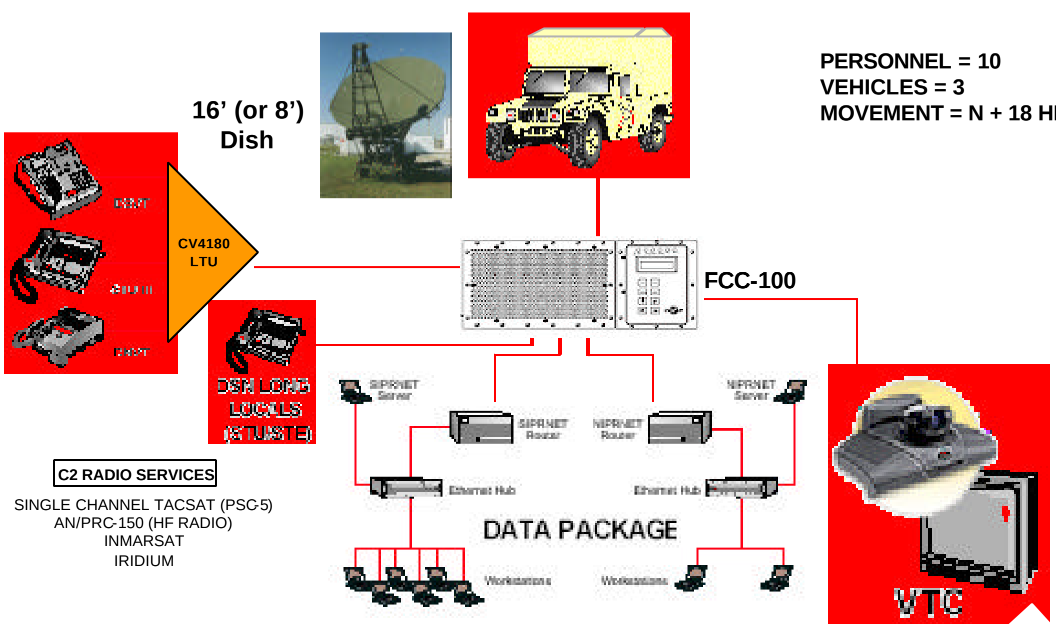

ILLUSTRATION 1.CONTINGENCY COMMUNICATIONS PACKAGE - SMALL[8]

A medium contingency communications package provides a marked increase in capability. The center point is the TRIBAND terminal. This communications package provides the most capability with the smallest footprint on the ground. A medium package is designed to provide telephone services for 120 telephones, 150 SIPRNET subscribers, 150 NIPRNET subscribers, and one VTC suite. Personnel requirements consist of 13 soldiers, and the package has three vehicles and trailers. Originally the TRIBANDs were prototype terminals that the new START-T systems were scheduled to replace in 1999. Since the vendor defaulted on the START-T contract, the TRIBANDs underwent a major systems overhaul upgrade upon their return from OEF in the summer of 2002. The 11th Signal Brigade paid for this $2.9 million upgrade with Operation and Maintenance (O&M) funds. The TRIBAND systems in their current configuration will be in use for at least the next five years.

(AN/TSC-143 w/VTC and Spoke C4EP)

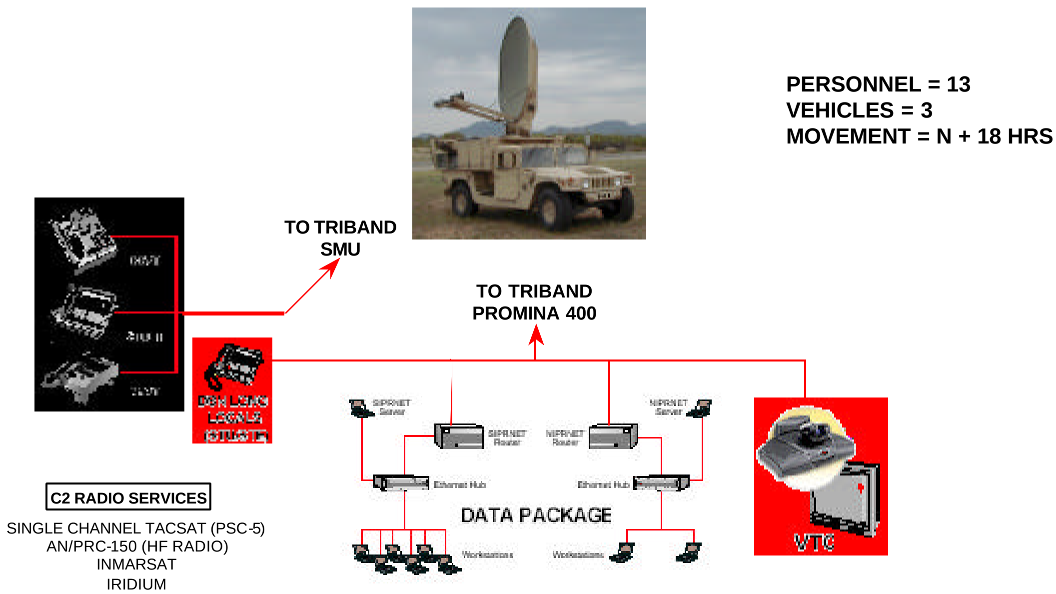

ILLUSTRATION 2. CONTINGENCY COMMUNICATIONS PACKAGE - MEDIUM[9]

A large contingency communications packages contains an AN/TSC-85 for reach-back, an AN/TTC-56 Single Shelter Switch (SSS) to support 300 telephones, data servers and equipment to support 300 SIPRNET and 300 NIPRNET users, a Promina 800, and a VTC suite. This package is supported by 20 personnel, 9 vehicles, and assorted trailers.

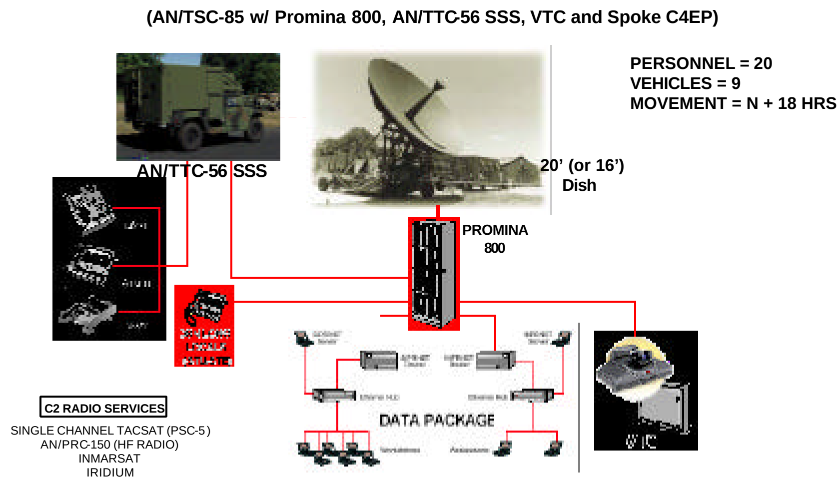

ILLUSTRATION 3. CONTINGENCY COMMUNICATIONS PACKAGE - HEAVY[10]

OPERATION ENDURING FREEDOM

THE OPERATIONAL ENVIRONMENT

As opposed to other military operations, the environment in Afghanistan posed several daunting challenges. First the rugged terrain, with its mountains and cliffs up to 20,000 feet, significantly masks any terrestrial LOS communications systems. Second, the U.S. military deployed right into the terrorists' backyard, an environment that was besieged by years of war and the most heavily mined area in the world. It is estimated that there are over 10 million mines in Afghanistan.[11] The threats and hostile nature of this environment greatly restricted ground vehicular movement. Third, the portion of the CENTCOM AOR used for OEF is eight times larger than the portion of the CENTCOM AOR used during Operations DESERT SHIELD and DESERT STORM.

THE ORIGINAL PLAN

The original communications support plan for OEF was to deploy a large communications package from the 86th Signal Battalion, 11th Signal Brigade from Fort Huachuca, Arizona to provide voice, video, and data services to subscribers. This communications support package was limited to fifty personnel and was planned to arrive in the AOR by 15 November 2001. The communications package mission was to seamlessly transition base communication services from the 112th Special Operations Signal Battalion, on the ground in Uzbekistan, in order to support the 507th Corps Support Group (CSG) and Joint Special Operations Task Force - North (JSOTF-N). The 507th CSG established the support base in Karshi-Khanabad, Uzbekistan, commonly referred to as K2. K2 would serve as a platform to launch, expand, and support operations into Afghanistan. The communicators from the 86th Signal Battalion were to transition tactical assets to commercial assets through the installation of a Deployable Ku-band Earth Terminal (DKET) and a REDCOM IGX system by 01 January 2002. The projected number of personnel at K2 was 1,800 although there were discussions of potentially increasing to 5,000.[12]

WHAT DIDN'T HAPPEN

Deploying the soldiers and equipment to the AOR was a challenge. Strategic lift ended in Turkey or Kuwait where equipment was trans-loaded to smaller aircraft for onward movement. Overall, intra-theater movement in the AOR did not allow for the regular scheduling and flow of assets into theater. Airfields in the AOR could not support the larger C-5 aircraft, and for the first several months C-17s were also unable to land. Ongoing combat operations and the need to insert troops and equipment during the hours of darkness to minimize U.S. forces' exposure also contributed to the irregular schedule of intra-theater lift. The collective competing priorities and demands for force protection and logistics, coupled with weather restrictions, significantly skewed any reasonable planning factors to establish a realistic timeline to achieve full operational capability for communications systems.

Before the first elements of the 86th Signal Battalion arrived in K2, the mission already transformed from mission creep to mission leap. While the initial communications team was in transit from Germany, the 86th picked up the additional mission to support the 10th Mountain Division Operations Center. The 10th Mountain Division Command Post would later serve as the CFLCC-Fwd in the CENTCOM AOR. These new support requirements alone would almost double the original data requirements for the communications support team, and thereby exceed its capacity. Additionally, delays of the communications team in Germany and Turkey led to subscribers' arriving well ahead of the communications support. Hence, the arriving individuals did not have adequate voice and data communications to do their jobs.

In the beginning there was no clear guidance on whom the communications team should support. As mentioned, the 10th Mountain Division mission was added while communications units were in Germany and delayed during trans-load operations. Compounding the issues was the problem that the 50 personnel listed on the CENTCOM deployment order were only the soldiers required to operate the communications vans. This figure did not include support for maintenance and supply, administration, command and control or network support. Information networks just don't happen. Networks must be planned, initiated, managed and maintained, and the process required a substantial degree of personnel overhead, especially when starting up in an austere theater. Difficulties are further compounded when multiple organizations use different standards or do not adhere to any set standards.

Equipment responsibilities were not fully defined. For example, Joint Worldwide Intelligence Communications System (JWICS) terminals are not organic signal equipment, and subscribers expected the signal communications package to provide JWICS connectivity, but this was not the case. Also, the DKET is a civilian system, which vendors provide based on a contract for a specific operation or mission. The vendor is responsible for installing, operating, and maintaining this equipment, and delays and problems incurred by a contractor greatly impact military operations.

WHAT ACTUALLY HAPPENED

The 86th Signal Battalion's large communications package with a revised personnel support structure began deployment on 23 November 2001. Unfortunately, the complete package which included the additional 25 maintenance, support and network personnel did not arrive in K2 until after 10 December. The 112th TSC-85C and SCAMPI satellite terminals remained in system until 15 March 2002 to maintain adequate voice, JWICS, and VTC support for JSOTF-N. The DKET system was finally installed on 6 February 2002.

The network continued to expand in January 2002 and in the first three weeks included four cities in Afghanistan. These sites were located at Bagram, Mazar-e-Sharif, Khandahar, and three separate locations in Kabul (including the embassy). Additionally, during the last week in January another communications detachment from Fort Huachuca was alerted and deployed to support operations in Shamsi, Pakistan. The 86th Battalion Control (BATCON) Cell in K2 and the theater Network Control Cell from the 11th Signal Brigade's Systems Control (SYSCON) Element in Camp Doha, Kuwait provided network support and integration. All 11th Signal brigade assets ultimately came under the control of the 335th Theater Signal Command for theater planning and network architectural design. By the time the mission was at its fullest geographical dispersion and the network achieved full expansion, it included over 550 soldiers from four commands and the signal brigade's four battalions, and required 10 multi-channel satellite communications terminals. At one site, for example, these soldiers provided service for

513 NIPRNET users, 1768 SIPRNET users, and installed over 700 two and four wire phones and over 150 miles of cable and wire.[13] Overall, the technical control facilities, eight communications packages, cable and wire teams, and maintenance and support personnel departed on 21 C-5 and C-17 aircraft over a period of two and a half months. This number of airframes did not include transportation to the AOR for over half the soldiers, who deployed on commercial aircraft.

Overall, the biggest hurdle both operationally and technologically was in providing data services for subscribers. The problem was in essence threefold. First, to meet the stated mission requirements the signal brigade purchased new automation hardware to include servers, routers, PIX Firewalls and port switches and issued these items to its contingency communications teams. During this step the team operators also physically mounted and configured the equipment in transportable cases for the impending trip to the AOR. Second, the operators had to program and configure the new equipment and validate all systems with the Network Enterprise Technology Command (NETCOM) Network Operations Support Center (NOSC). This included routers, servers and firewalls. Finally, the third part was to train the operators on both the hardware and software to support the customers. In some instances operators literally received a 40-hour training session, conducted a mini-exercise, and then immediately deployed. Information assurance personnel and instructors worked around the clock to ensure that operators were trained and fully prepared with a solid foundation of skills in Cisco routers, PIX firewalls and Windows NT version 4.0. Most of the soldiers who received this automation training did an outstanding job installing, operating and maintaining the network, especially since many were not automation specialists by profession.

Prior to departure, new equipment and requirements had significant impacts on soldier deployment timelines, mission training, and rehearsals. In most cases the deployment tempo was exponential, yet soldiers still completed all new equipment training. Several organizations helped by sharing the technical training burden. The Joint Interoperability Test Center's (JITC) provided training assistance on the DRSN phone system and ultimately a soldier to serve as a technician. The newer plug-and-play VTC systems that the brigade purchased greatly simplified VTC training. Unfortunately, despite the best efforts to simplify systems with new technology and products, new equipment also contributed to problems that operators did not realize until after their arrival in theater. One such example was the cable pin outs for the VTC suite TEDs were mismatched. This problem was ultimately resolved, but it did take some time.

To meet the demand for data services in six discretely separate locations, the military hired contractors to serve as systems administrators. By the Modified Table of Organization and Equipment (MTOE) that serves as a military unit's authorization document for equipment and personnel, there are only two positions in a Theater Tactical Signal Battalion (TTSB) for soldiers to serve as systems administrators. Until contracts were let and the civilian systems administrators arrived on the ground, soldiers worked many late hours and performed at experience levels well above their pay grades to meet the mission. Network management for the SIPRNET and NIPRNET were enormous tasks and sometimes total success was elusive because of a shortage of requisite expertise.

TRIBANDs operating in Ku-band literally saved the day. The DSCS had no more available bandwidth and bandwidth was extremely limited throughout the theater. By operating on the civilian SHF bands, the TRIBANDs provided exceptional flexibility and robustness to a tactical / strategic network that was initially single threaded. The TRIBAND's small footprint added a discriminating advantage by requiring minimal lift assets to move in theater.

LESSONS LEARNED

Although there are numerous lessons learned from strategic reach-back communications provided during OEF deployments, this section will focus on the major shortcomings in doctrinal procedures, training, equipment and personnel. This will include those that were identified and corrected, as well as those that still require solutions. The perspective for improving reach-back contingency communications will remain at a hierarchical level – specifically the communications support for an ARFOR or JTF Headquarters.

In some cases initial communications installation and planning on OEF were held hostage to the policies and procedures of routine operations at the STEP sites. Responsiveness to network problems is absolutely crucial when ground and air forces are in the midst of conducting combat operations. Additionally, STEP operators must identify and troubleshoot any critical systems outages, and immediately notify supervisors and network managers. The Satellite Access Authorizations (SAAs) and the Gateway Access Authorizations (GAAs) process was also too slow in response to the dynamic mission tempo on the ground. It is clearly a peacetime bureaucratic system. Delays in implementing changes and updates to the network need to be streamlined or eliminated, if there are not corrective mechanisms in place to remedy specific outages up front. Last and perhaps most significant is a lack of standardization of equipment, training, Tactics, Techniques, and Procedures (TTPs) and interfaces among the various STEP sites. This is despite the fact that most of the equipment uses standardized protocols.

The Command and Control (C2) architecture for network installation must take special mission needs into account. Special Operations Forces (SOF) teams required a majority of the single channel TACSAT bandwidth to accomplish their missions. As a result, the signal systems controllers and installers were forced to rely on Iridium phone sets with secure sleeves to engineer network planning and installation. In many cases Iridium phones proved to be unreliable. The poor reception dropped many calls and adversely impacted the rapid establishment of secure, reliable, voice and data communications for subscribers. Although some single-channel High Frequency (HF) radio systems were available, an HF C2 Network was neither given a priority nor established. Planners must ensure that theater command and control networks necessary to install strategic reach-back communications systems have a high priority. If the primary C2 system is preempted, then another reliable system must replace it to ensure the expeditious installation of communications services for users.

Traditionally, C4 equipment is the responsibility of the owner to install, operate and maintain. These older guidelines worked well, and saved significant signal manpower when soldiers provided communications on an area support basis. A new dynamic that has evolved in recent years is that the "user owned and operated" rules do not apply. Users no longer have the technical ability or skills required to perform network and data management tasks. Interoperability is absolutely critical. Today, installing computers from different systems and multiple organizations into military data networks is a detailed and complex process. Even with the urgency of an ongoing mission in a forward-deployed area, minimum certification requirements and checks must be met, or there could likely be back doors or known vulnerabilities that adversaries could exploit.

If the end-state or exit strategy for communications teams is predicated on replacing tactical communications with commercial equipment, the commercialization planning must begin immediately. The norm now is to free up limited, strategic resources for follow on missions. Leaders must assign a project officer to oversee the project. Tasks that appear to be simple, such as the installation of a DKET terminal for extension back into a STEP site or other earth station, or a cable installation in Bagram to free up tactical assets and expand support, are not simple at all. Working in an undeveloped theater complicates matters. It takes a great deal of coordination to deliver all necessary equipment needed to support the mission. In many countries, clearances are required to ship in commercial equipment. Even with a long lead-time and the use of military airlift assets, installers must still expend considerable planning effort to ensure mission success. Lastly, synchronizing systems cutover is key to minimizing service interruptions.

Individual operator training is absolutely essential. Soldiers must be first technically proficient on the specific piece of equipment for which they are responsible. Next, they must understand how to integrate their equipment into the overall communications system or network. Integrated training at all levels is an absolute must. On the job training in the field is not a replacement for formal instruction and should never be the norm. Many operators received a significant amount of formal training to install, operate, and troubleshoot data systems; however, most did not have an assigned Military Occupational Specialty (MOS) for automation. Additionally, pre-programmed routers and servers did not necessarily expedite mission execution in theater. Changing configurations and operators' limited working knowledge of data systems plagued data teams in initially installing an error-free network. Another example is commercial and tactical fiber optic training. Use of tactical fiber optic cable maximizes data throughput. Unfortunately fiber optic training is a highly specialized skill. Course availability coupled with associated costs limit the number of trained operators. Every cable and wire installer (31L) should receive fiber optic training.

Training must be realistic. Too often military exercises are dependent on cell phones and leased circuits for communications paths between geographically separated participants. Organizations must train and practice using the communications resources or a like capability that they will have when deployed in an austere, uncertain environment. Staffs should not develop their plans and battle rhythms using communications resources or data networks that will not be available during real world deployments. Soldiers must train as they fight.

Leaders must deploy with personnel who have the right skill sets. Certain skill sets are vital to mission accomplishment. Cable and wire personnel (31Ls), automation specialists (74Bs), and network technicians (251As) are in absolutely critical demand. Signal leaders on the ground must know how to work with the user-customer and be technically and tactically proficient. Most importantly, leaders must understand and interpret user requirements to validate actual needs in a dynamic and rapidly changing environment. Although successful on the OEF mission, communications leaders and soldiers expended a great deal of time, effort, and synergy in developing and training communications teams from multiple units. Units must be structured and equipment and personnel assigned in the configurations in which they deploy. Too much cross-leveling and reorganizing is a significant impediment to training and mission accomplishment.

Finally, the biggest lesson learned was "The only thing that doesn't change is the fact that everything changes."[14]

TRANSFORMATION

Joint Vision (JV) 2020 states that the military must be dominant across the "full spectrum of military operations - persuasive in peace, decisive in war, preeminent in any form of conflict".[15] To achieve this full spectrum dominance, the interleaving theme that binds dominant maneuver, precision engagement, focused logistics, and full dimensional protection coupled together with innovation is information superiority. "Information superiority is the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting the enemy's ability to do the same."[16] Communications professionals must provide the means and outline the ways to achieve this end. The missing link at this point is "How does the signal regiment transform towards the objective force?"

Today if one would ask anyone in the DOD "What does the Objective Force look like?", the answer would most likely be "I don't know, but I will know it when I see it." In the meantime the military is extremely focused in the process of transformation, and the Army, as well as the remainder of the DOD, is heavily engaged. Transformation, after all, is all about relevance. When the cold war went by the wayside during the last decade of the 20th century, budget managers in the U.S. Government looked to save money by terminating programs, equipment, and systems that were no longer needed. They also sought to back the programs that would leverage technology to provide greater benefits in the future. The responsibility to set the course for future programs and provide the critical enablers to meet the Army's transformation information requirements falls upon the Signal Regiment. There are many options for transformation and each has a cost.

At this time the Army has chosen the Warfighter Information Network – Tactical (WIN-T) as its solution for Army communications transformation. "WIN-T is the Army's Objective Force (OF) and when required, the Joint Force Commander's tactical deployed communications network…." [17] WIN-T will have an integrated network infrastructure that will provide voice, video, and data services throughout the battlespace and integrate the Global Information Grid (GIG). The GIG is defined as:

> The globally interconnected, end-to-end set of information capabilities, associated processes and personnel for collecting, processing, storing, disseminating and managing information on demand to warfighters, policy makers, and support personnel. The Global Information Grid (GIG) includes all owned and leased communications and computing systems and services, software (including applications), data, security services and other associated services necessary to achieve information superiority.[18]

Unfortunately, under the current development timelines WIN-T may not be fielded for another ten years or longer. Now, the more difficult question becomes "what to do in the meantime?"

The need for a WIN-T like system is not an Army unique requirement. Joint and combined JTF commanders require reach-back communications to integrate their battlespace. Combatant commanders are required by law to support all JTFs in their respective AORs with the means to successfully execute their missions. Every year each combatant commander has an opportunity to prioritize critical equipment and capability needs. Many of these are either not funded or are systems that might not be available to them for a number of years. An Integrated Priority List (IPL) "provides the combatant commander's recommendations for programming funds in the planning, programming and budgeting system process."[19] An IPL contains the combatant commander's

> highest priority requirements, prioritized across Service and functional lines, defining shortfalls in key programs that, in the judgement of the combatant commander, adversely affect the capability of the combatant commander's forces to accomplish their assigned mission.[20]

IPLs are one of the most important mechanisms that the combatant commanders use to help the Joint Chiefs of Staff (JCS) ensure systems, programs, and development efforts are synchronized with the combatant commanders' mission requirements. Of particular importance is that every year strategic communications requirements continue to be among the top four items on the IPLs.

COMMUNICATIONS HISTORY

Discussions on military operations in the post cold war period have recently begun to center largely around the term "asymmetric warfare". Asymmetric warfare is simply warfare fought in a noncontiguous manner. Despite the recent popularity of this phrase, asymmetric warfare is not a new concept. The Vietnam War was holistically an asymmetric war. Enclaves or fire bases were the centers of action that branched out to bring the fight to the enemy. During this period, communications were primarily unencrypted voice systems that brought with them their own series of limitations. In Operation DESERT STORM the rapid mobility and firepower of U.S. Forces quickly outran the classical, symmetric area support communications that worked so well in a relatively static European environment. To counter this shortcoming, each division command post had a multi-channel TACSAT team to provide unlimited range for voice communications from the Corps to division battlestaffs. Some units such as the 2nd Armored Cavalry Regiment (ACR) received multi-channel TACSAT systems to enhance the flexibility in their forward tactical command posts as well. General Frederick Franks, the VII Corps CG, used single-channel TACSAT to command and control the battle with his subordinate commanders, while the battlestaffs used multi-channel TACSAT systems for telephone communications to synchronize the fight among maneuver divisions and the ARCENT headquarters.[21]

Progressing through the next decade from Operation DESERT STORM, communications personnel in Somalia, Bosnia and Kosovo integrated strategic communications packages on the ground back into the DISN. In recent years the demand for data communications has grown significantly. Today, data communications, via NIPRNET and SIPRNET, is the capability that leaders and staff officers must have to do their jobs. Additionally, video teleconferencing has now become one of the preferred means of staff synchronization and command and control. No one, however, should underestimate the level of detailed planning and coordination that even simple networks require. More recently during the U.S. Army's support to the Australian Military in East Timor on Operation STABILISE, data services were extended through a Coalition Wide Area Network (C-WAN) that provided unclassified information and an International Wide Area Network (I-WAN) for coalition forces classified traffic. During this operation, automation and compatibility standards were simplified and streamlined through the implementation of the PACOM J6's "one-stop-shopping" technique in which U.S. forces provided all data equipment down to the laptops. The downside to "one-stop-shopping" is the considerable expense incurred by the provider, as well as the logistics challenge. The challenge in this case was to transport all the equipment to an austere theater and subsequently recover it at the conclusion of the mission. Over the past few years at the EAC level, contingency communications package data teams' bringing equipment from servers to laptops is becoming the normal concept of support.

JUST BECAUSE WE CAN, SHOULD WE?

OEF provides the most recent example of communications challenges that the Army faces as it transforms towards the Objective Force. As already stated, deployed forces are more heavily reliant upon strategic reach-back communications than ever before, and this dependency is data centric. As technology continues to evolve, communications specialists can provide more information with greater ease down to subordinate echelons and vice versa. As the appetite for data communications increases, so does a fundamental challenge. The delineation between actual requirements, and wants or nice to have capabilities, is a constant struggle. Today's technology will enable near real time video from a soldier in his fighting position in Afghanistan to be sent to the Pentagon. Just because we have the ability, do we need to allocate resources like this? Furthermore, it appears the solution to implement most of the new sensors and soldier systems listed in the United States Army Weapons Systems 2002 book is dependent upon either unlimited bandwidth, or the availability of bandwidth on demand. Bandwidth availability is currently not limitless and will, for the foreseeable future, continue to be a restricting factor in the military's conduct of information operations.

Commanders and leaders at all levels must take a hard look and understand the subtle distinctions between the want for information and the actual requirement for information. Network planners, systems administrators, and information operations personnel must prioritize bandwidth availability with a systems approach to assist commanders and staffs. A strategic data network bridged to a remote area must be designed with constraints to preclude data bottlenecks and latency of service. If improperly managed or prioritized, data imagery provides one of the best examples of a valid requirement that could bring most data systems to a standstill. Transmitting detailed imagery requires a lot of processing power and bandwidth. Since imagery can easily fill a system to capacity, only those users who have a valid requirement for it should be granted systems permissions.

A BUSINESS CASE FOR LEADER INVOLVEMENT IN INFORMATION TECHNOLOGY (IT)

An article in last October's Harvard Business Review entitled "Six IT Decisions Your IT People Shouldn't Make" discusses how companies that managed their investment in IT most successfully were those that had their senior managers taking an active leadership role in managing a handful of critical key IT decisions.[22] The authors recommend that senior managers should take leadership responsibility for six decisions.

> The first three have to do with strategy: (1) How much should we spend on IT? (2) Which business process should receive our IT dollars? (3) Which IT capabilities need to be company wide? The second three relate to execution: (4) How good do our IT services really need to be? (5) What security and privacy risks will we accept? And (6) Whom do we blame if an IT initiative fails? [23]

Most often Army leaders leave the IT decisions mentioned above up to technicians and communications experts. Unfortunately, senior leaders have not necessarily bought into nor understand how or why critical funds are spent or resources are allocated for C4. The authors maintain that "top executives feel uncomfortable making hard choices about information technology. But when they abdicate their responsibility, they set up their company for wasted investments…."[24] Leaders at the highest levels must be involved in the IT decision processes that will affect the military as it transitions toward the objective force. Senior officers and government officials cannot abdicate their responsibilities in the IT arena, and must embrace active participation as the method to resolve information superiority issues. The cost for failure in this area is entirely too high.

THE INTEGRATED THEATER SIGNAL BATTALION

Current theater tactical signal force structure does not adequately satisfy the warfighters' requirements. Significant task organizations and cross-leveling are required for deployments to support subscribers with voice, video, and data services.[25] Simply stated, the Army communications units are not organized as they fight. Unique functional structures for signal units require complicated rules of allocation.[26] The Army must have an affordable interim solution to bridge the gap during the development and fielding of WIN-T. The establishment of an Integrated Theater Signal Battalion (ITSB) structure for EAC communications units appears to be the solution. The ITSB will realign current EAC signal battalion and company capabilities into scaleable, flexible small, medium, and large contingency communications packages similar to the ones discussed earlier in this paper.

Today the Army supports multiple JTF sized missions of strategic importance, which are a data dependent and require strategic communications services. As previously stated, networks must be planned, installed, operated and maintained. The ITSB reduces the need to conduct major task organizing and cross-leveling by standardizing the way EAC units are structured and ensuring the correct MOSs are aligned with the equipment. The major change for the signal battalion will be to shift from four line companies to three. Personnel strength that is harvested from the fourth company is placed on unit MTOEs for data and cable teams and in the battalion headquarters for network management functions.

The ITSB concept is still a work in progress and would apply to Reserve and National Guard forces as well. The Army Signal Regiment must be involved in validating the MOS structure and ensuring the training base is realigned to support the ITSB equipment list. This is especially important for TROPO systems because the Signal School stopped teaching TROPO several years ago. Additionally, those personnel who work specialized data, switch and transmission equipment in the ITSBs should receive a functional skill identifier to ensure personnel who have received expensive specialty training can be tracked to ramp up capabilities as required.

MORTGAGING OUR FUTURE

One pitfall leaders must avoid in re-looking at what the interim EAC signal structure should be is to oversimplify the problem. Outsourcing services to provide capabilities is not the solution. Outsourcing cannot provide trained soldiers who will ensure the combatant commander will have the requisite communications capabilities during short notice worldwide deployments. Commercial communications work well for exit strategies, but even the DKET terminal at K2 in Uzbekistan took a month to install once the civilian operators and equipment were on the ground.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Communications planners must be technically and tactically proficient, and be thorough in operational mission planning. C2 networks are an absolute must to facilitate the expeditious installation of communications networks. A C2 network for systems troubleshooting, fault isolation, and speedy circuit restoration is not a luxury item and should never be competing with other mission needs. Data networks are complex by nature and experts must be brought in at the beginning of the planning process. Commanders and planners cannot delude themselves and oversimplify the detailed efforts required to engineer, install, and manage a network - security considerations increase these complexities. Additionally, a realistic level of effort must be dedicated up front in identifying as many requirements as early on as possible. Planners and warfighters cannot be dismissive in realistically allocating resources to satisfy these requirements. Networks always grow and expand, and quite simply “the user will consume as much as the user is given.” Network planners, installers, and managers must always be prepared for mission expansion; however, a single threaded system, even though it may provide connectivity, does not meet the definition or requirement for a network.

Contingency communications packages are at the heart of providing the deployed warfighter information superiority in this asymmetric age. Deployments over the past decade have demonstrated that EAC signal MTOEs do not reflect how EAC communications units actually deploy and support their subscribers. The requirements for secure data and VTC services have steadily increased over the past five years. The most alarming concern is that data requirements are not reflected on communications units' MTOEs in terms of equipment and personnel. If WIN-T will not be fielded for ten years or more, an interim EAC structure to support ARFOR and JTF contingency requirements is needed now. EAC communications doctrine must reflect how units will deploy to support subscribers and this must correlate to equipment and personnel in the MTOE.

RECOMMENDATIONS

The Signal Regiment's leadership cannot afford to waste any more time in waiting for an EAC communications solution to appear. Senior decision-makers must choose how to proceed and provide an interim communications solution until WIN-T is fielded. The ITSB is a satisfactory near-term / interim solution. The ITSB standardizes units across the National Guard and Reserves and makes their structure relevant to support today's military operations. Equipment that is available in the active duty units must be cross-leveled. Shortages in the reserves and guard need to be identified, a viable cost-effective analysis conducted and a plan to resolve the shortages executed. The greatest expenses will be in the cost for satellite terminal and data package shortages. Army and joint forces should not continue to conduct routine exercises using post, camp, and station communications resources and expect the same capabilities and quality of service in a tactical, forward deployed area.

The Signal Center at Fort Gordon, Georgia must reevaluate and review the training programs no only for the ITSBs but specifically for the data and TROPO teams. At a minimum, soldiers who have unique communications and data services abilities must be issued skill identifiers. Failure to identify and track soldiers with special skills will detract from unit readiness and add to training costs. Additionally, Mobile Training Teams (MTTs), based out of the Signal Center, could greatly enhance operator training and education in the field, as well as provide substantial cost savings.

Improved data compression techniques may provide some relief to the data congestion dilemmas, but data compression is not the sole solution. Leader involvement in establishing user priorities will have the biggest positive impact on data throughput. Most importantly, leaders must enforce and educate soldiers that the old warrior ethos "train as we fight" applies to all aspects of communications.

WORD COUNT = 8,282

ENDNOTES

[1] COL Mark Bowman, G3 of NETCOM, interview by author, 21 December 2002, Fort Huachuca, AZ.

[2] LTC David Dodd, Commander of the 86th Signal Battalion, interview by author, 20 December 2002, Fort Huachuca, AZ.

[3] Joint Chiefs of Staff, "Defense Information System Network and Connected Systems", CJCSI 6211.02A, (Washington, D.C.: U.S. Joint Chiefs of Staff, 22 May 1996), GL1.

[4] Ibid., A-1.

[5] Department of the Army, Signal Support to Theater Operations, Field Manual 11-45 (Washington, D.C.: U.S. Department of the Army, 30 June 1999, 1-5.

[6] Joint Chiefs of Staff, Manual for Employing Joint Tactical Communications –Joint Tactical Systems Management, CJCSM 6231.01A, (Washington, D.C.: U.S. Joint Chiefs of Staff, 23 May 1997), B-3.

[7] Harry Newton, Newton's Communications Dictionary, 13th ed. (New York, Flatiron Books and Publishing, 1998), 452.

[8] CPT Cole Hanson, "C4 Enhancement," briefing slides, Fort Huachuca, 11th Signal Brigade, August 2002.

[9] Ibid.

[10] Ibid.

[11] MAJ Kelly Knitter, "Operation Enduring Freedom Communications," briefing slides with scripted commentary, Fort Huachuca, NETCOM, September 2002.

[12] Ibid.

[13] Ibid.

[14] Bowman.

[15] GEN Henry H. Shelton, Joint Vision 2020, (Washington, D.C.: U.S. Government Printing Office, 2000), 1.

[16] Army War College, Information Operations Primer, (Pennsylvania: U.S. Army War College, January 2002), 2.

[17] Department of the Army, United States Army Weapons Systems 2002, (Washington, D.C.: U.S. Government Printing Office, 2002), 187, (errata sheet).

[18] Joint Chiefs of Staff, Department of Defense Dictionary of Military and associated Terms, Joint Publication 1-02, (Washington, D.C.: U.S. Joint Chiefs of Staff, 12 April 2001 as amended 9 January 2003), 221.

[19]Ibid., 267.

[20]Ibid., 267.

[21] Delores M. Brooks, Kathy R. Coker, and Carol E. Stokes, The U S Army Signal Corps in Operation Desert Shield/Desert Storm, (Georgia: Office of the Command Historian United States Army Signal Center and Fort Gordon, 1994), 11.

[22] Jeanne W. Ross and Peter Weill, "Six IT Decisions Your IT People Shouldn't Make," Harvard Business Review, Vol. 80 Issue 11 (November 2002): 84.

[23] Ibid.

[24] Ibid., 85.

[25] Robert Plante, "Theater Tactical Signal Transformation – The Integrated Theater Signal Battalion (ITSB)," briefing slides with scripted commentary, Fort Huachuca, NETCOM, December 2002.

[26] Ibid.

GLOSSARY

AAR	After Action Review
ACR	Armored Cavalry Regiment
AOR	Area of Operations
ARCENT	Army Central Command
ASCC	Army Service Component Command
BATCON	Battalion Control
BLOS	Beyond Line Of Site
C2	Command and Control
C4	Command, Control, Communications, and Computer
CENTCOM	Central Command
CFLCC	Combined Forces Land Component Commander
CG	Commanding General
CONUS	Continental United States
COTS	Commercial Off The Shelf
CSG	Corps Support Group
C-WAN	Coalition Wide Area Network
DISA	Defense Information Systems Agency
DISN	Defense Information Systems Network
DKET	Deployable Ku-band Earth Terminal
DOD	Department of Defense
DRSN	Defense Red Switch Network
DRSN	Defense Red Switch Network Phones
DSCS	Defense Satellite Communications System
EAC	Echelon Above Corps
GAA	Gateway Access Authorizations
GIG	Global Information Grid
GMF	Ground Mobile Forces
HF	High Frequency
IPL	Integrated Priority List
IT	Information Technology
ITSB	Integrated Theater Signal Battalion
I-WAN	International Wide Area Network
JCS	Joint Chiefs of Staff

JITC	Joint Interoperability Test Center
JTF	Joint Task Force
JWICS	Joint Worldwide Intelligence Communications System
K2	Karshi-Khanabad
LOS	Line Of Site
Mbps	Megabits per second
MG	Major General
MOS	Military Occupational Specialty
MTOE	Modified Table of Organization and Equipment
MTT	Mobile Training Team
NETCOM	Network Enterprise Technology Command
NIPRNET	Non-secure Internet Protocol Routing Network, also sometimes referred to as unclassified but sensitive Internet Protocol Routing Network
NOSC	Network Operations Support Center
O&M	Operation and Maintenance
OEF	Operation ENDURING FREEDOM
OF	Objective Force
SAA	Satellite Access Authorizations
SHF	Super High Frequency
SIPRNET	Secure Internet Protocol Routing Network
SMU	Switch Multiplex Unit
SOF	Special Operations Forces
SRP	This Strategy Research Project
SSS	Single Shelter Switch
STAMIS	Standard Army Management Information Systems
STEP	Strategic Tactical Entry Point, also sometimes referred to as a Standard Tactical Entry Point
SYSCON	Systems Control
TACSAT	Tactical Satellite
TED	Trunk Encryption Device
TROPO	Tropospheric
TTP	Tactics, Techniques, and Procedures
TTSB	Theater Tactical Signal Battalion
WIN -T	Warfighter Information Network – Tactical

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