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Building the Intelligence Foundation For Network Centric Warfare

by

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

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

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ABSTRACT

The world is undergoing an information revolution with the rapid advance of information technologies. Undoubtedly, information operations is becoming more dynamic and essential to daily activities of the United States military services. Within the Department of Defense (DoD) many concepts have evolved which formulate utilizing the virtual information domain to support operations in the traditional physical domains of land, sea, air and space. One such concept, Network Centric Warfare (NCW), defines and describes how the US military should organize and fight in the information age. By incorporating an *intelligence analysis grid*, the concept of NCW will optimize the utility of available information and produce shared battlespace awareness. It is apparent that for DoD to bring the concept of NCW to fruition, it needs to combine various military assets to perform the function of turning all types of raw information into useable intelligence. To accomplish this, it will be necessary to establish a framework of joint multi-source analysis and reporting centers to optimize the utility of information.

The backbone of this architecture would be to establish a system of interconnected ground stations that would perform the processing, exploitation, and dissemination (PEDs) functions on information collected by a multitude of sensors. Using a robust C4 architecture, these ground stations would feed off globally deployed sensors and could dynamically support different theaters/CINCs, depending on daily priorities/tasking. For the purposes of this paper, the arbitrary designation *Joint Intelligence Ground System* (JIGS) fulfills this vision. Through multi-service implementation of the JIGS concept, a new dimension of intelligence integration and interoperability will be realized. More importantly, combining service specific capabilities and leveraging modern information technologies to collect, analyze, fuse and rapidly disseminate intelligence at the operational level will lay the much needed foundation for NCW.

Background

The world is undergoing an information revolution with the rapid advancement in information technologies. This revolutionary change encompasses increasing military dependencies on information at all levels of war. The May 1997 Quadrennial Defense Review details information superiority as a key component for transforming U.S. forces in the future. It describes information superiority as the backbone of military invention.

> "The ongoing transformation of our military capabilities – the so called Revolution in Military Affairs (RMA) – centers on developing the improved information and command and control capabilities needed to significantly enhance joint operations. With the support of an advanced command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) backbone, the United States will be able to respond rapidly to any conflict; warfighters will be able to dominate any situation; and, day-to-day operations will be optimized with accurate, timely, and secure information. Just as much of the non-defense world has become increasingly interconnected through the growth of inter-netted communications, the DoD is working to provide a complementary, secure, open C4ISR network architecture." [1]

Undoubtedly, information operations is becoming more dynamic and essential to daily activities of the United States (US) military services. This includes capitalizing on the power of information to ultimately fight and win the nation's wars. In the Gulf War, US and allied forces brought to the battlefield a new degree of flexibility, synchronization, speed and precision by leveraging information. [2] Battlefield advantages gained through C4ISR capabilities in Operation ALLIED FORCE also exemplified an increased relevance of information. [3] In the future, the reliance on robust information architectures to support and execute military operations will only continue to grow in importance.

Within the Department of Defense (DoD) many concepts have evolved which formulate utilizing the virtual information domain to support operations in the traditional physical domains of land, sea, air and space. One such concept, Network Centric Warfare (NCW), defines and describes how the US military should organize and fight in the information age. NCW is defined as "an information-superiority concept of operations that generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization." [4] In essence, the concept of NCW is designed to translate information superiority into enhanced military might. Information superiority means trying to know everything about an adversary while keeping the adversary from knowing much about oneself. It means turning the "balance of information and knowledge" in one's favor, especially if the balance of forces is not. It means using knowledge so that less capital and labor may have to be

expended. This form of warfare may involve diverse technologies, notably for command and control, for intelligence collection, processing and distribution, for tactical communications, positioning, identifying friend-or-foe, and for "smart" weapons systems. [5] This paper will explore why and conceptualize how a jointly integrated, global intelligence architecture will be paramount in order for NCW to fully optimize its potential for operational commanders. Specifically, my research will address why a fourth grid, the intelligence analysis grid, should be an inherent part of the NCW construct, and that the military services should team to rapidly Process, Exploit, and Disseminate (commonly known as PEDs within the DoD community) operational intelligence within the concept of NCW-based operations.

Introduction and Thesis

With more than 20 years of service in the US intelligence community, my experience and knowledge has led me to the conclusion that DoD should build a jointly integrated, global architecture, utilizing state-of-the-art information technologies to process, analyze, and disseminate operational intelligence to the warfighter. The backbone of this architecture would be to establish a system of interconnected ground stations that would perform the PEDs functions on information collected by a multitude of sensors. Using a robust C4 architecture, these ground stations would feed off globally deployed sensors and could dynamically support different theaters/CINCs, depending on daily priorities/tasking. For the purposes of this paper, the arbitrary designation *Joint Intelligence Ground System* (JIGS) fulfills this vision.

The DoD has worked hard to build a joint architecture to integrate service resources for the purposes of intelligence collection, processing, exploitation, production, and dissemination at the strategic level. These joint organizations include functionally aligned agencies (Defense Intelligence Agency, National Reconnaissance Office, National Security Agency, National Imagery and Mapping Agency, Central MASINT Office). Also included are several mission ground stations (to analyze overhead data), Joint Intelligence Centers and the Joint Analysis Center (intelligence production facilities for each unified CINC), and Regional SIGINT Operations Centers (analyze SIGINT from strategic overhead and ground-based sensors). In addition, DoD has undergone a transformation to ensure that strategic C4ISR architectures are standardized and interoperable. However, at the operational and tactical levels it's primarily been the responsibility of each individual military service to program/produce intelligence architectures. "Despite a decade of effective operations, the services tend to develop C4ISR capabilities and

doctrine independently." [6] Developing formidable intelligence capabilities in a predominately "downsizing" fiscal environment has been a challenge for all of the services. The indigenous ISR architectures include battlespace sensors to collect raw data and service-specific ground-processing centers to provide near-real-time, multi-source intelligence support to theater decision makers/warfighters. This evolution includes the individual services taking sole responsibility to plan, train and equip the necessary linguists, imagery interpreters, signals analysts, reporters, etc., needed within their respective intelligence profession to provide support. With the advent of more responsive and proactive information-based systems, the concept of NCW will require new forms of intelligence teaming and dynamics. It is apparent that for DoD to bring the concept of NCW to fruition, it needs to combine various military assets to perform the function of turning all types of raw information into useable intelligence. In a dynamic environment, where time is of the essence, this intelligence process is called first-phase analysis and production. The NCW concept of performing first-phase intelligence envisions a system where multiple sensors will quickly feed information directly to the shooters. The construct of NCW includes a sensor grid, information grid, and engagement (shooter) grid. [7] However, further examination indicates that NCW needs to incorporate an *intelligence analysis grid* in order to optimize the concept of shared battlespace awareness. To accomplish this, it will be necessary to establish a framework of joint multi-source analysis and reporting centers to optimize the utility of information.

Beyond the concept of NCW, there are several other reasons why DoD should build a jointly integrated, global architecture to process, analyze, and disseminate operational intelligence to the warfighter—including the theater CINC, Joint Forces Commander (JFC), and individual component commanders. Besides filling a current void in the US intelligence community, these reasons include the rapid advance in information technologies, which are proliferating the amounts of raw data collected by ISR sensors and subsequently available for analysis. The same advance is also rapidly advancing military weapon systems whose computer-driven precision capabilities are dependent upon real-time/high-fidelity intelligence. Another is the ongoing DoD trend of replacing manned ISR platforms that perform onboard intelligence processing and analysis with unmanned ISR platforms which downlink collected information to ground stations for processing and exploitation. A final reason is the low density/high-demand aspect of DoD intelligence resources. Most notable examples are the high demand and short supply of both imagery and signals intelligence analysts. For instance, in Operation ALLIED FORCE there were barely enough Serbian linguists to perform real-time exploitation on data collected from the various

airborne ISR platforms (RC-135, U-2, and EP-3's). [8] The concept put forth in this research paper envisions building a network of fixed intelligence ground stations, interconnected with forward deployed elements, referred to throughout as JIGS (*Joint Intelligence Ground System*). Intelligence professionals, representing each military service, will team to dynamically feed off the plethora of ISR sensors and support the theater with relevant intelligence. The JIGS architecture would utilize the concepts of reachback and distributed operations where information (not people) will be rapidly moved between geographically separated locations to perform the PEDs functions. In rapid succession, a vast array of intelligence products such as voice reports, textual reports, soft/hard images, graphical displays will be provided to the operational commanders/warfighters. Through multi-service implementation of the JIGS concept, a new dimension of intelligence integration and interoperability will be realized. More importantly, combining service specific capabilities and leveraging modern information technologies to collect, analyze, fuse and rapidly disseminate intelligence at the operational level will lay the much needed foundation for NCW.

Operational Warfare…The Need For Jointness

Professor Milan Vego, defines operational warfare as, "Practical application of operational art in planning, preparing, and conducting fundamental warfare areas on land, sea, and airspace." [9] In conjunction with technological advances, the physical battlefield domains of ground, sea, air, and space have essentially become overlapped. Vice Admiral Arthur Cebrowski, in a recent presentation at the Naval War College, stated, "Information instantaneously traverses all physical domains and devalues the traditional factors of geography and distance." In future military operations, autonomous service employment of sea, air, ground, or space power will be virtually unrealistic. As Joint Publication 1 clearly states, "The nature of modern warfare demands that we fight as a team." [10]

With the advent of the Goldwater-Nichols DoD Reorganization Act of 1986, a renewed focus on joint doctrine has been incorporated into all DoD components. Joint Vision 2020 states, "The primary purpose of military forces has been and will be to fight and win the Nation's wars." The overall goal of joint strategy is the creation of a combined/integrated force that is dominant across the full spectrum of military operations. Success in countering dynamic threats will require the skillful integration of all military instruments of power into a joint force tailored to the specific situation and objectives. The joint force, because of its flexibility and responsiveness, will remain the key to operational success in the future. Strategic goals will be achieved through "full

spectrum dominance" – the ability of US forces, operating unilaterally or in combination with multinational and interagency partners, to defeat any adversary and control any situation across the full range of military operations. [11] The integration of core competencies, to include intelligence assets, provided by the individual Services is essential to the joint team effort. The JIGS concept will fill the void currently existing at the operational-tactical level. The existing JICs and JAC do not perform the first-phase PEDs functions on information collected from the current suite of DoD sensors; they primarily function to perform second- and third-phase intelligence analysis and production. A fully integrated, interoperable JIGS architecture will be a key component to realizing the vision of NCW at the operational level of war.

Basic Background on Intelligence

Intelligence is defined as "The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign countries or areas" or "Information and knowledge about an adversary obtained through observation, investigation, analysis, or understanding." [12] Intelligence is more than basic information. It is knowledge that is prepared against a specific target whether geographic, material, or human for a specific customer/consumer. The very word *knowledge* highlights the need for human involvement to turn raw information into intelligence. Intelligence sources and methods are manifested in several forms often referred to as specific intelligence disciplines. These are Human Intelligence (HUMINT), Imagery Intelligence (IMINT), Measurement and Signatures Intelligence (MASINT), Open Source Intelligence (OPINT), and Signals Intelligence (SIGINT).

Operational Intelligence is defined as "Intelligence intended to support planning, preparation, and execution of a major operation or campaign; it is conducted in a given theater of operations plus adjacent areas of interest; it is a fusion of strategic and tactical intelligence." [13] Professor Vego takes the definition one step further, "Operational intelligence represents a fusion of national- and theater-strategic intelligence with tactical intelligence to provide accurate, comprehensive, relevant, and perhaps most important of all, timely depiction of the military and nonmilitary situation in a given theater or area of operations…its purpose is to support major operations or campaigns." [14]

A look at the historical perspective of operational intelligence reveals that ground and surface-based systems traditionally have been developed as proprietary stove-pipe systems to process, analyze, and disseminate data generated by independent airborne and national collection sensors.

In general, older generations of ground stations were developed by a single service for a single collection platform, and commonly a single discipline sensor suite. Affiliated ground stations were designed specifically to support an individual collection platform which often carried a Single-INT sensor suite. These ground stations were also accomplishing certain specialized functions of interest to that service. The uniqueness of these ground stations often resulted in some significant problems. For example:

- **Data could not be shared with other services due to specialized formats.**
- **Remote access of imagery and products and remote exploitation capability was very limited.**
- **The ground station for one suite of sensors could not process raw data from another suite of sensors.**
- **Economies of scale could not be realized. Ground station capabilities that were functionally similar were being developed independently without common technical and architectural objectives.**
- **Multiple stand-alone communications architectures were required to enable these ground stations to operate.**
- **System uniqueness presented training problems that caused analysts and maintainers to learn to operate and maintain different systems.** [15]

Traditionally separate intelligence disciplines and/or platform-specific data were collected, processed, exploited, and disseminated individually, usually by a single agency or service. In basic terms, very rarely was multi-INT or all-source analysis/fusion immediately performed at the operational level. "When service requirements converge—such as reconnaissance and intelligence capabilities—interservice capability is desirable. This reduces research and development and acquisition costs, facilitates communication and information exchange, and simplifies command and control challenges." [16] Many DoD initiatives are attempting to improve interoperability and information sharing across the intelligence disciplines. One such initiative that is building on information age capabilities is the concept of NCW.

Concept of Network Centric Warfare

NCW is a concept that is still evolving. Enabled by the information management and networking technologies developed by the commercial world, NCW seeks to electronically link military components by utilizing three separate grids. The information grid contains the C4 assets needed to connect the sensors and shooters (two primary grids). The sensor grid contains the various sensors capable of providing increased battlespace awareness. The engagement or shooter grid refers collectively to operational forces. With enhanced command and control, NCW intends to improve speed of command and enable self-synchronization as a means for achieving

information dominance. Self-synchronization is intended to minimize the amount of time taken to observe and orient within the OODA (observe, orient, decide, and act) Loop, and to increase the effective application of available combat potential. It appears that NCW needs to incorporate an *intelligence analysis grid* in order to optimize the utility of available information and produce shared battlespace awareness. The intelligence analysis grid would provide the means necessary to turn various sources of raw data into usable intelligence for operational commanders and warfighters.

"Those who can most quickly and effectively process, analyze, prioritize, disseminate, and correctly act upon available information will gain a distinct advantage." [17]

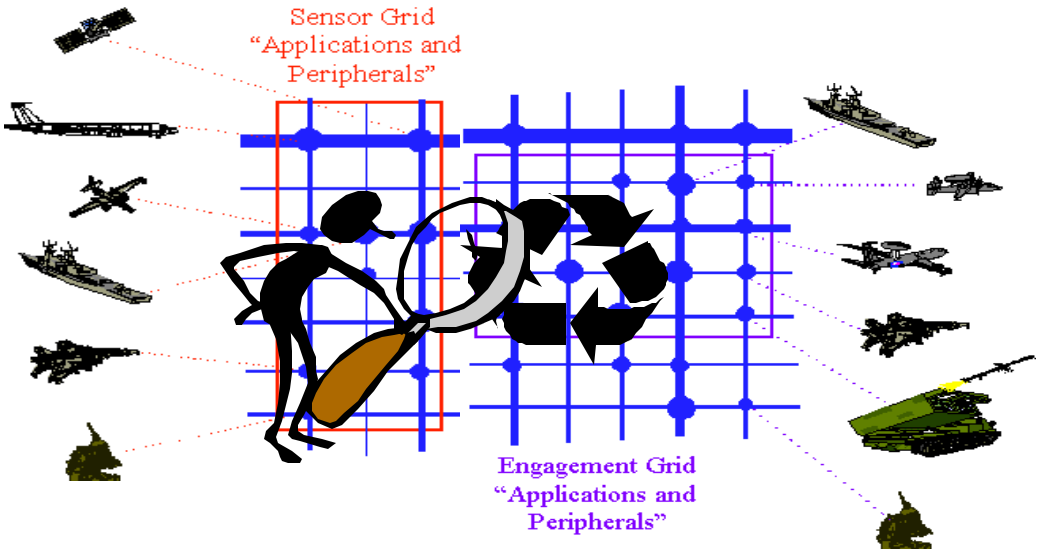

Figure 1. Network Centric Warfare is missing an Intelligence Analysis Grid

NCW promises several advantages over the current so-called platform-centric concept employed today. Speed of command and self-synchronization together promise to shift the focus of warfare from enemy attrition to one in which high operations tempos and rates of change will lock-out enemy alternatives while locking-in blue force successes. In doing so, the NCW concept can potentially "offset a disadvantage in numbers, technology, or position." [18] Achieving the goals of NCW will require three key enablers: responsive information collection, processing and dissemination; exploitation of technical innovations; interoperability and single, integrated C3 architecture." [19] The overriding goal of the JIGS concept is to incorporate these enablers into a single ISR package.

Intelligence, Surveillance, and Reconnaissance Platforms & Sensors

In their book, *Revolution in Warfare*, Thomas Keaney and Eliot Cohen state, "Conventional warfare depends, increasingly, on the skillful manipulation of electronically transmitted information. In the Gulf War, it did not always prove possible to deliver the necessary information to the right place at the right time…as the quantity of information available to the armed forces increases, so does the need to process it quickly…the advantage goes overwhelmingly to combatants who can quickly bring together information from many sources…information has become the high ground of modern warfare." [20] Recent DoD doctrine has embraced this theme of information superiority and/or full-spectrum dominance. There are many ongoing initiatives to improve both platform and sensor capabilities. One common trend is moving the DoD ISR systems/sensor architecture from traditionally manned platforms to unmanned aerial vehicles (UAVs). The increased use of UAVs offers advantages from both a resource and operational perspective. UAVs cost less than traditional manned ISR platforms and are more expendable because there is no concern for loss of life. The operational ability of higher endurance UAVs to provide 24-hour coverage in an area of interest with high quality sensors gives the theater CINC additional advantages and capabilities. It is important to note that all UAVs require a ground-based architecture to perform C2 and PEDs functions on downlinked data. It is important to drive-home the point that the current JICs/JAC are not equipped to perform these functions. To further elaborate the requirement, the following table lists ISR platforms that either exist or are in final development that will require a ground-based PEDs architecture to process and analyze collected data.

- **National Satellites (Various: IMINT, MASINT, SIGINT)**
- **Commercial Satellites (Various: IMINT)**
- **U-2 (IMINT, SIGINT)**
- **Low-Altitude UAV (Hunter: Electro-Optical [EO], Synthetic Aperture Radar [SAR]**
- **Medium-Altitude UAV (Predator: EO, SAR, Infrared [IR])**
- **High-Altitude UAV (Global Hawk and Dark Star: EO, SAR, SIGINT).**
- **F-16R (EO)**
- **F/A-18D ATARS (EO, SAR)**
- **RC-12 (Guardrail: SIGINT)** [21]

In an article titled, *Kosovo and the Current Myth of Information Superiority*, Timothy Thomas states, "Improvements in the art of battlefield visualization or conceptualization, including the vital element of interpretation must be made. The human interpreter of information is every bit as important as the human user of information." [22] The JIGS concept would provide the human

assets/capability to perform multi-platform, multi-INT interpretation of information within a common framework. This high-tech concept will allow for near-real-time integration and fusion of available information. The JIGS would provide a joint service architecture to rapidly process and correlate data from multiple sensors and quickly disseminate a multitude of products to operational users.

Laying the Foundation for NCW: Constructing a Joint PEDs Architecture

Joint Vision 2020 states, "Information, information processing, and communications networks are at the core of every military activity." [23] In his book, *The Next World War*, James Adams captures the immediate challenge, "The information revolution is not simply technical in nature; it has powerful conceptual and organizational dimensions as well. The new meanings of power and information…favor the argument that wars and other conflicts in the information age will revolve as much around organizational as technical factors." [24] DoD still has a long way to go organizationally to meet the rapidly evolving challenges of the information age. Besides investing in new ISR sensors/platforms and C4 linkages to fight wars, DoD must also program the necessary resources to build a robust architecture to rapidly turn raw information into intelligence. Given the extraordinary volume of information that will be available from various sources in the future, the DoD intelligence community should merge first-phase processing and analysis efforts. This economy of force would deliver the most relevant information to warfighting commanders in a timely and usable manner.

The purpose of the JIGS-type architecture would be to optimize the ability to conduct information-based warfare while institutionalizing the concepts of NCW. Both fixed and deployable components which are networked to provide near real-time (NRT) information processing, exploitation, reporting and dissemination of intelligence products to operational consumers worldwide will be incorporated. The JIGS can best be described as a physical and virtual consolidation of multi-service intelligence ground system resources at core and contingency locations. These material and human resources will be used to complete the needed exploitation of multi-INT intelligence provided by national satellites, commercial satellites, U-2, F-16R, FA-18D, RC-12, and various UAV assets to support Unified Command and other operational-tactical consumers.

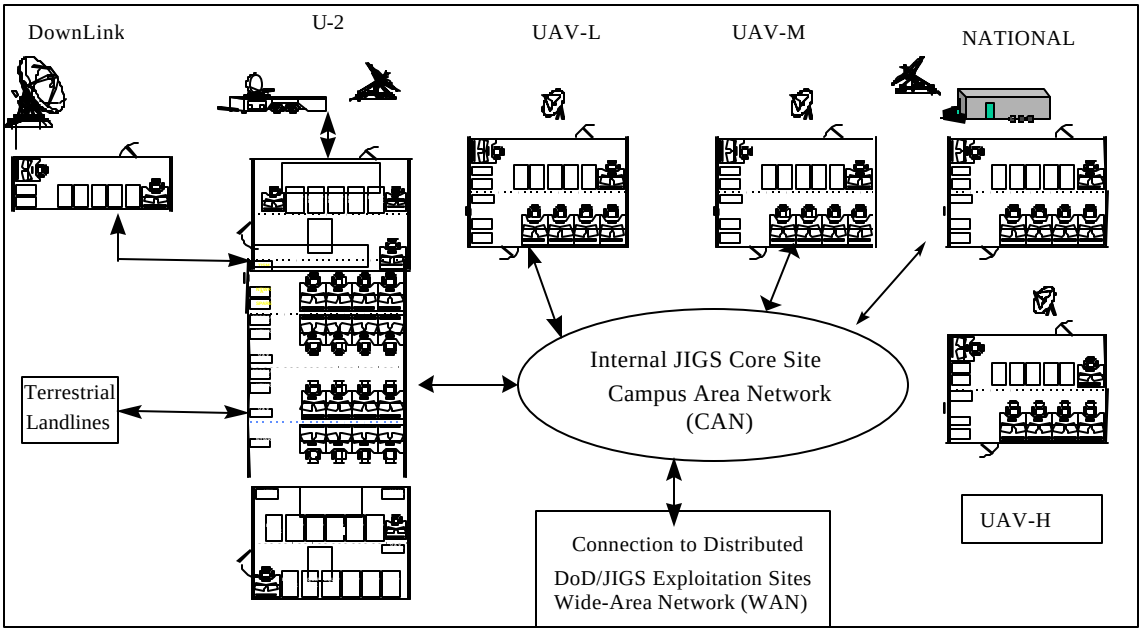

Figure 2. Nominal JIGS Core Location Intelligence Analysis Configuration

JIGS would encompass both current and projected imagery intelligence (IMINT), Signals Intelligence (SIGINT), Measurements and Signatures Intelligence (MASINT) assets. The system will possess a single Multi-INT baseline that conforms to Department of Defense (DoD) standards and commercial technologies. This will promote interoperability with other DoD Command, Control, Communications, Computers and Intelligence (C^4I) components, reduce operational employment and sustainment costs, and provide quality improvements to the intelligence force through improved operational training, career development opportunities, and reduced deployment requirements. JIGS would operate from garrison and/or deploy to various echelons of command in accordance with Unified Command operational requirements. Fielding would be in two basic configurations, core locations and forward deployed elements.

JIGS Core Locations

The fixed-location hubs should be designed/built as a modular, scaleable, intelligence ground station which will satisfy time-critical unit, theater and national intelligence requirements in peace, crisis, and war. Multiple force employment options are provided that are interoperable with other DoD PEDs components for use across the entire spectrum of conflict. The use of off-the-shelf

technologies would reduce operational employment/sustainment costs and provide opportunities for quality force improvements to the intelligence force.

As a baseline capability, the JIGS would consist of four fixed ground stations located at core geographic locations (Langley AFB, VA, Beale AFB, CA, Pacific Theater, and European Theater). [25] These fixed/core JIGS locations leverage Air Force investment in the Distributed Common Ground System which is currently under development. JIGS core locations would be interconnected and have virtual access to all other components of the overall DoD intelligence system. Both operational and tactical control (OPCON/TACON) of the JIGS would fluctuate depending on evolving intelligence needs and established priorities. For instance, the CONUS-based JIGS location in California might support a U-2 mission over the Balkans during the day, a GLOBAL HAWK UAV mission against China later that night, and a Predator UAV mission in South America the next day or depending on capacity, perhaps all three simultaneously.

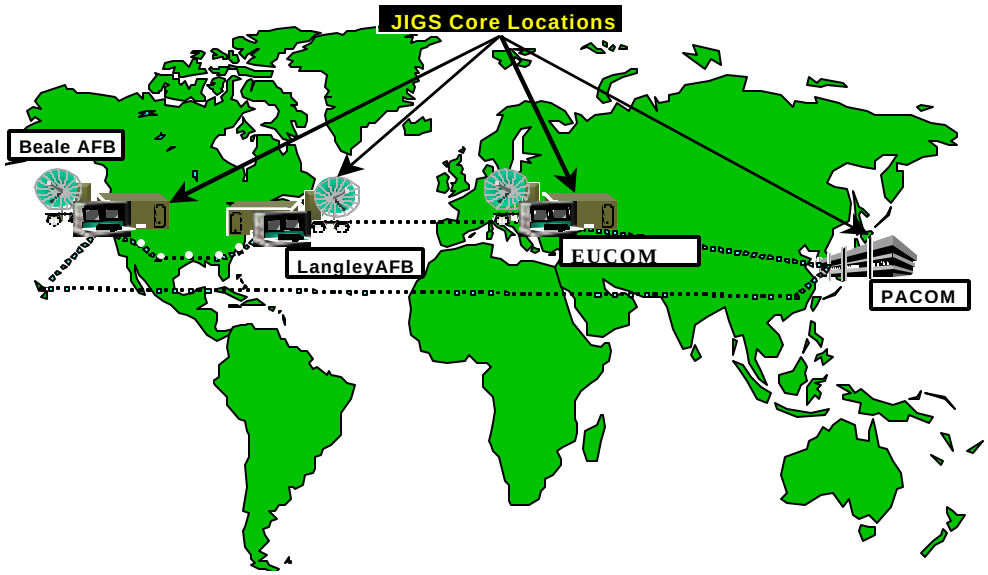

Figure 3. JIGS Core Locations

JIGS Forward Deployed Elements

During crisis or contingencies, some JIGS components would deploy forward to various echelons of command in accordance with area of responsibility (AOR) requirements and force employment options. Consequently, a portion of the JIGS hardware would be configured for operations in shelters and transit cases to maximize readiness and transportability. The forward deployed elements would embed with both the JTF and component commanders to provide direct

liaison and product support. For instance, a JIGS element co-located with the JFC could provide direct near-real-time access to multi-INT products and serve to expedite the commanders decision process and overall battle management. When possible, already existing service PEDs systems/hardware would be networked and used as forward deployed elements of the JIGS. For instance, the Navy Joint Service Imagery Processing System, Army Enhanced Tactical Radar Correlator and Tactical Exploitation System, Marine Tactical Exploitation Group, and Air Force Deployable Transit-Cased Systems should all be part of the JIGS construct for more specific tactical purposes. These elements would use push/pull architectures to move intelligence products through the various service-specific echelons, bringing tailored intelligence to meet respective service requirements.

JIGS Connectivity: Utilizing Reachback/Distributed C4 Operations

An extensive communication architecture utilizing both landlines and satellites will connect JIGS sites with their respective Unified/JTF headquarters, forward deployed exploitation components, distributed PEDs partners, and other DoD and non-DoD intelligence production centers. This connectivity will allow for sensor reachback, worldwide distributed operations, mission coordination and collaboration between various JIGS elements, the entire intelligence community, and end users.

The JIGS architecture is reliant on a robust C4 network linking core and remote locations. The intent of this communications architecture is to garner the resources and capabilities resident throughout the JIGS by allowing reachback/distributive operations whenever necessary. "Like it or not, [DoD] will have to depend on relatively small numbers of forward forces to create decisive effects…this will clearly necessitate reliance on force multipliers and some form of NCW." [26] Reachback operations allow for intelligence personnel to remain in-garrison, saving prospective deployment costs, alleviating strategic lift requirements, and maximizing force protection. Distributive operations involve the transfer/sharing of sensor input, mission data, and intelligence products as dictated by operational requirements. For instance, leveraging linguists to perform the COMINT mission from the same platform/sensor at various geographic locations simultaneously. During the initial deployment phase of any of the JIGS sensor elements (U-2, UAV, National and Commercial Satellites) there will be a need to assume temporary responsibility for that element's operational role. Distributive operations will allow for seamless transfer of that mission during the deployment phase. Upon completion of deployment and resumption of operations, the mission

can be redistributed back to the responsible organization. During normal peacetime operations, distributive operations will allow sharing of data and products in order to perform training, complete production requirements, support target material production, provide command-level briefing support, and maintain currency of database information. In addition, distributed operations can be implemented for instances of equipment failure within the architecture, or increased organizational workload (labor sharing). The focal point of managing distributive operations is envisioned to be the core location. As a central repository for the bulk of the JIGS assets, the core locations are uniquely suited to perform both mission management and reporting functions. A mission management cell could provide mission control, mission planning, message handling, multi-intelligence correlation, and exploitation support. In addition, by monitoring the status of all subordinate elements and components, the core location can determine the proper allocation of workload during a contingency or other operational surge. Connectivity between JIGS Core Locations will also allow for top-level coordination and collaboration to insure optimum use of intelligence resources.

The JIGS network would deliver near-real-time intelligence "through the wire" to operational commanders. It would also provide JTF commanders with an unprecedented capability to rapidly access national, selected theater reconnaissance and intelligence databases, and theater intelligence production center archives.

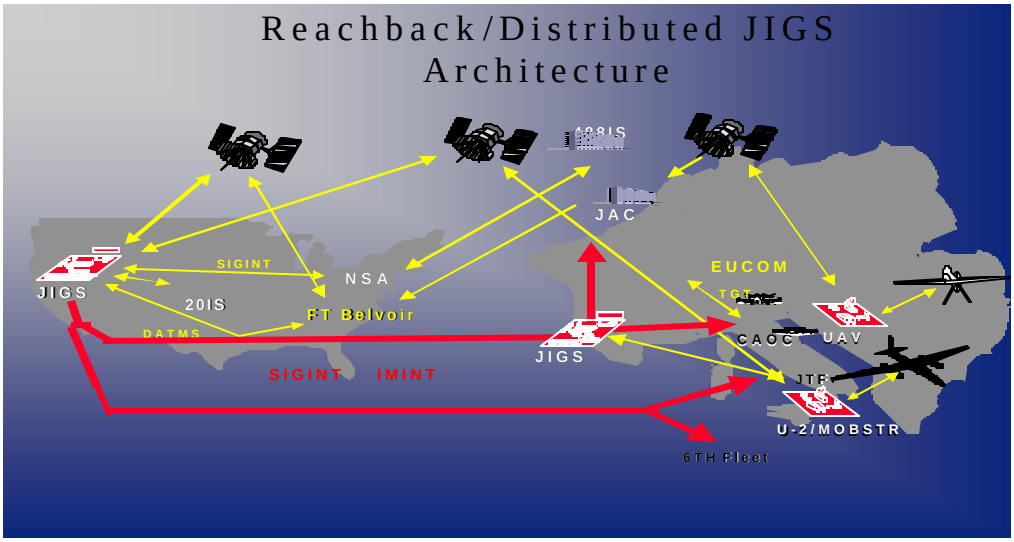

Figure 4. Nominal JIGS Reachback/Distributed Architecture

JIGS Concept of Operations

Soldiers, sailors, marines, and airman have differing perspectives of the battlespace. It is not the aim of the JIGS concept to eliminate those perspectives, but rather to draw on their unique qualities to provide a synergistic, highly integrated, and seamless intelligence mechanism. As a fully integrated component of the JTF Joint Operations Center, JIGS components will provide both operational leadership and warfighters with Multi-INT reports across the physical realms. A full-up JIGS would provide intelligence products from near real-time (NRT) IMINT, SIGINT, and MASINT to warfighters and Unified Commands nodes during peacetime, contingencies, and war. The JIGS architecture would incorporate a wide-band area network to electronically link garrison and deployed locations to support distributed exploitation operations and reduce product dissemination time to other intelligence production centers and warfighters. During peacetime, the JIGS would provide the warfighter with intelligence products of targets in a Unified Command AOR in support of governing Unified Command Operations Plan (OPLAN) objectives. During contingency and war, the JIGS would support theater campaign mission planning and execution functions. The JIGS core locations/elements would focus primarily on identifying and satisfying Essential Elements of Information (EEI) as directed by Unified Command, Joint Task Force, and/or component commander requirements. These tasks involve producing intelligence information in direct support of the objectives stated in the applicable operations plans and/or contingency plans. This time-critical intelligence would be used to determine the disposition, capabilities, and vulnerabilities of enemy forces and friendly force employment options. The JIGS operational vision would be a networked system of systems to fuse operational intelligence across the full spectrum of conflict to both national and theater level users. The goal would be to integrate the full complement of intelligence, surveillance and reconnaissance (ISR) assets to provide timely multi-intelligence information, dynamic retasking and cross-cueing of all available information. The rapid and redundant two-way communications inherent to JIGS would give the JFC, other theater component commanders and warfighting forces a seamless combat intelligence capability, making it appear as if the supporting ground station was collocated within the various operations centers. Collaboration between imagery elements within the JIGS architecture is critical to the success of distributed operations. Another critical element to this success is the ability to correlate data between all intelligence disciplines resident throughout JIGS. A program goal would be to provide the capability to view, exploit, and disseminate multiple intelligence data products at any of the JIGS workstations. This will require

the capability to correlate cues between SIGINT, MASINT, and/or HUMINT and use that data to validate imagery-derived information through an automated correlation function that produces a pre-defined format correlated report. If a deployment of a JIGS element/component is required, the appropriate assets would deploy within 24-hours from notification. This force mix of garrison and forward-deployed location intelligence support would provide theater commanders with unprecedented flexibility to support various echelons of Unified and Component Commands in multiple AORs. To the maximum extent possible, JIGS components would participate in Unified Command, regional exercises to foster and maintain personnel proficiency to support combat operations. This participation would be conducted from both garrison and deployed locations.

JIGS Tactics, Techniques, and Procedures: Operationalizing the NCW Vision

Combat Operations Intelligence Cell

Each core JIGS location would have a 24 hour/day, 7 days a week combat operations intelligence cell (COIC). This cell would be responsible for maintaining around the clock situational awareness, contact with forward deployed JIGS elements, and be responsible for synchronizing local operations with the daily air, ground, naval tasking orders. The COIC would function as the 24-hour central focal point for all external queries on operational matters involving the JIGS network. In such a capacity, the COIC would serve as a critical component to coordinate with theater leadership. Through constant "virtual" contact, the commanders intent and subsequent combat focus of JIGS would never be in doubt.

Dynamic Platform/Sensor Retasking

Because multi-INT analysts are interconnected within JIGS, they would be able to provide tip-offs and cross-cueing of data. A collaborative effort between multi-INT analysts will ensure that the use of all available platforms/sensors is optimized. For instance, an ELINT tip-off of threat activity will allow imagery analysts to steer available collection assets to get a picture and correlate, fuse, and report the specific activity. Using DoD software collaboration tools, JIGS analysts will also be able to share and receive data from other intelligence sources such as mission ground stations. Evidence from [recent] operations…suggests that collaborative tools do not significantly affect processing and production time." [27] Most importantly, JIGS would have the inherent capability, via two-way communication links, to allow technologically skilled intelligence professionals to dynamically retask ISR platforms/sensors from a reachback location

(possibly CONUS), in near-real-time. This capability would allow for maximum flexibility to quickly correlate multi-INT data from single-platforms and tip-off other available platforms/sensors to collect against specific targets of opportunity.

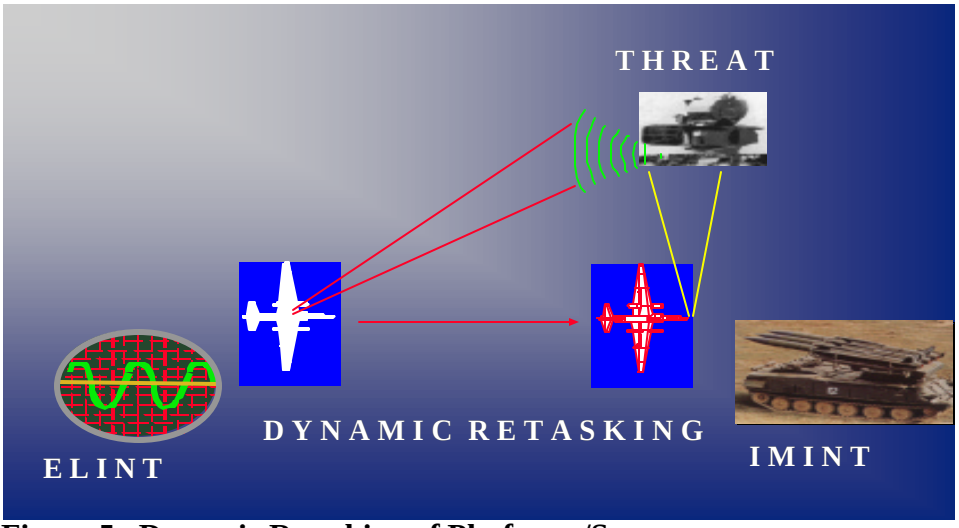

Figure 5. Dynamic Retasking of Platforms/Sensors

Situational Awareness/Threat Warning

The JIGS would have around-the-clock responsibility to provide real-time situational awareness (SA) and warning of any detected enemy threats. SA is defined as "knowing the disposition, location, and orientation of all hostile forces." [28] For operational-level SA, JIGS would perform PEDs on ISR coverage of a joint area of operations to provide dispositions of enemy forces. An example of threat warning would be ISR collection against an adversary's Integrated Air Defense System (IADS), and whenever detected active, to provide instantaneous warning over theater threat networks. In addition, SA will be enhanced through graphical reporting. JIGS analysts will accomplish this by updating the current DoD common operating picture system with real-time updates of known enemy order of battles. These data points will contain all known parameters such as type, location, heading, speed, etc., of specific targets. When coupled with all DoD sources of intelligence this reporting system will give operation entities a real-time graphical display of all known red force dispositions.

Flexible Targeting

One of the biggest lessons learned from the Gulf War and the recent operation against Serbia was the need to enhance our capability of locating and targeting mobile targets. This goal was

further exacerbated by enemy camouflage, concealment, and deception techniques. [29] There is a need for a multifaceted approach to overcome the asymmetric peril posed by mobile threats. "Rapid, effective operations to destroy or neutralize critical mobile air, surface, subsurface, and space targets, are essential to the success of future joint operations." [30] The JIGS will provide an integrated and responsive capability to help detect, locate, identify, track, and engage mobile targets. This will be accomplished by rapidly correlating available data from different platforms and sensors, both at the core location and through collaborative tools.

Precision Engagement

"Precision-guided munitions (PGMs) depend on precise intelligence…analysts must combine disparate data from all collection sources and give it to the decision maker within a definite timeframe." [31] "In the new realm of smart bombs and PGMs, today's warfighters require accurate targeting data. Imagery exploitation tools like RainDrop are leading the way." [32]
JIGS would incorporate systems like RainDrop, a proven DoD software tool, to provide an indigenous capability to create target materials for precision-guided munitions from digital soft-copy images. Once an image is collected and confirmed as an enemy weapon system, an imagery analyst would use RainDrop software to perform mensuration in order to produce precision coordinates for the target. Once the annotated image is ready it would be pushed to the operational command/control center for instantaneous shooter tasking. In Operation ALLIED FORCE the Air Force used a "reachback" architecture for RainDrop to "drop point coordinates when time and circumstances permitted." [33]

Sensor-to-Shooter

JIGS would have the ability to create sensor-to-shooter packages containing images and precise coordinates to JTF or component operation centers, which in turn could be pushed to specially configured shooters. For instance, JIGS could integrate the Rapid Targeting System (RTS) into real-world operations--placing targeting information into cockpits of airborne strike aircraft. In Operation ALLIED FORCE this combat venture resulted in enhanced situational awareness for F-15E aircrews and resulted with multiple aircraft/SAM kills...a valuable force multiplier for the air operation. [34]

Look-Shoot-Look

JIGS would enhance time-sensitive targeting by providing final target validation for Tomahawk Land Attack Missile (TLAM) and Conventional Air-Launched Cruise Missile (CALCM) strikes. JIGS liaisons would work diligently with Navy target specialists to refine Target Area Graphics (TAGS), the Navy's primary targeting tool, in turn increasing the effectiveness of each TLAM fired. When JIGS analysts discover that preplanned TLAM targets had moved or changed status, they would pass that information immediately to US Navy cruise missile shooters in time to redirect those assets against other high-value targets. Not only would this operational concept save millions of dollars worth of Tomahawks, it would prevent weapons release against aim points that no longer contributed to achieving war aims. It is this type C4I flexibility that would allow JIGS operators to also participate in dynamic retasking of a Joint Direct Attack Munition (JDAM)-equipped B-2 while enroute to a target area.

Predictive Analysis

"Jointness extends beyond procurement. Its goal is battlespace synergism. All components acting together have a greater effect than if they operate independently." [35] Through an interconnected PEDS network and collaborative software tools, JIGS analysts could correlate recently collected intelligence with archived databases of known enemy activity. For instance, software tools providing specific emitter identification could be quickly compared with historical fingerprints and previously known locations of that specific threat system. This type of analysis could provide a predictive pattern of movement for mobile weapon systems…a key to successfully locating and engaging relocatable targets.

Combat Search and Rescue

The Combat Search and Rescue (CSAR) missions for the downed F-117 and F-16 pilots during Operation ALLIED FORCE were among the most complex and dangerous missions US forces undertook. [36] During future CSAR operations, unmanned (expendable) ISR platforms could fly over hostile territory and feed the JIGS with multi-source locational data with a more tolerable risk of being shot down. The JIGS analysts would monitor the situation using best available platforms/sensors and provide second-by-second information to rescue teams, theater commanders and national level decision-makers. Using UAVs and established

communication links, the JIGS would enhance the situational awareness and overall ability to safely recover downed pilots.

JIGS Scenario: Network Centric Warfare In-Action

A typical JIGS scenario would evolve as follows: The first indication of a mobile SAM threat comes from a SIGINT sensor on the U-2 which is downlinked to the core JIGS location. JIGS ELINT analysts quickly analyze the emissions; they identify it as an SA-6 FLAT FACE radar and within seconds broadcast a threat warning via theater threat nets (AWACs would rebroadcast to all coalition assets). The ELINT analysts then correlate the intercepted signal with an overhead mission ground station which has also collected the same FLAT FACE signal. By synthesizing two different ELINT intercepts, a refined direction finding (DF) coordinate is calculated. This DF coordinate and all known system parameters (type, capability, etc) are quickly entered into the common operating picture database and will be graphically displayed at all user locations. Simultaneously this locational data is passed to JIGS ISR mission managers who in-turn task the nearest available IRS platform/sensor, a GLOBAL HAWK UAV to take an EO image of those precise Geocords. This is immediately accomplished. Within seconds JIGS UAV imagery analysts are exploiting the image and positively identify a FLAT FACE Radar and locate an SA-6 missile TEL close by (based on knowledge of SA-6 system deployment patterns), this information is passed via voice datalinks to the JTF/JOC and/or AOC. The image is quickly mensurated via RainDrop to provide precision coordinates of the threat. The image is in turn pushed forward to the JIGS terminals located within the Joint Flexible Targeting Cell. The AOC tasks the nearest shooter an F-15E on combat air patrol to prepare to engage. The forward deployed JIGS element works diligently to produce a sensor-to-shooter package which is pushed to the F-15E. The F-15E receives the 9-line package and then rolls-in on the target, launches an AGM-130 against the SA-6 and its associated radars. Immediately after launch the JIGS mission controller tasks the lingering GLOBAL HAWK UAV to take another image. The downlinked image is quickly analyzed as a smoking hole. The theater command centers are informed, “target destroyed.” This whole process is accomplished in single-digit minutes.

Although this scenario is at the tactical level of war, it represents a new paradigm of information-based warfare which embodies the concepts of NCW and has significant operational-level implications. Unfortunately, without a JIGS-type construct, the scenario above can only be

partially realized. It is imperative for DoD to build the first-phase intelligence architecture necessary to make the vision of accomplishing time-critical targeting a reality.

Conclusion

> "Warfare that derives its power from the robust networking of well informed but geographically dispersed forces. The operational architecture consists of linked high performance information, sensor, and engagement grids. The impact of closely coupled events can be seen in the new [NCW] concepts…speed of command, and self-synchronization."
> **(Network Centric Warfare Poster, Displayed in all Naval War College Classrooms)**

Military operations in the 21st century will be conducted in an information-rich environment. For information superiority to be realized, huge amounts of "data" must be concurrently collected, processed, and fused into "intelligence" via high capacity networks that link a joint intelligence ground system architecture. Information superiority will be achieved when timely, accurate knowledge is delivered anywhere on the battlefield from around the globe at a more rapid pace than the opponent's decision cycle. Several DoD efforts are underway to build the family of sensors needed to support the variety of service shooters. However, raw data/information collected by sensors must be analyzed and correlated into useable intelligence in order to be fully relevant for shooters. At the operational-tactical levels, a JIGS-like architecture will help to breakdown and eliminate intelligence stovepipes. By leveraging technology, JIGS will also achieve an economy of force for precious intelligence resources of the military services. Most importantly, JIGS will facilitate the timeliness and utility of theater intelligence…ensuring products get to the right consumer, with the right focus, at the right time. In short, a combined effort to collect, exploit, and disseminate operational intelligence will optimize the concept of NCW, thereby supporting the full spectrum of military operations…from operations other than war to a major theater war.

To fully capitalize on the information revolution we must invest our resources wisely to maintain information superiority. We cannot afford to be caught by surprise. The time to lay the intelligence foundation to conduct NCW is now. Recommend DoD build an operational-level JIGS architecture to optimize available resources and ensure the US remains the World's leader in conducting information-based warfare.

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