Joint Transformation Roadmap

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Joint Transformation Roadmap

Executive Summary

I. Introduction. The *Joint Transformation Roadmap* documents the processes and planned activities to achieve transformational improvements in U.S. joint military capabilities being undertaken and planned by the Joint Staff, Combatant Commands, and the Combat Support Agencies, as well as selected activities by the Services. Prepared in response to the April 2004 *Transformation Planning Guidance (TPG)* tasking, this document is intended to play a number of roles in advancing the development of transformational joint warfighting capabilities. In conjunction with transformation roadmaps submitted by the Services, this document will be used by the Director of Force Transformation to support the formulation of his *Strategic Transformation Appraisal* that will be provided to the Secretary of Defense in January 2004. For the broader U.S. defense and national security community, this document provides detailed information on current and planned joint transformation activities, which can be used to facilitate coordination of these activities with other transformation efforts.

The transformational activities described in this roadmap directly support the four defense transformation pillars defined in the *TPG* and the top priorities of the Department of Defense.[1]

- Near-term progress in fielding improved joint command and control, intelligence, surveillance, and reconnaissance, and strike capabilities called for in the new global strike concept, set forth in the *Strategic Deterrence Joint Operating Concept (JOC*), as well as enhanced joint capabilities identified in the Major Combat Operations and Stability Operations JOCs, will provide greatly improved means for employment in **the global war on terrorism**.
- The initiatives described herein--from the development of the *Joint Operations Concepts (JOpsC),* joint operating concepts, joint functional concepts, and enabling concepts to the accelerated fielding of new, "born joint" capabilities in command & control and other areas, coupled with enhanced joint experimentation, joint exercises and other forms of joint training, will greatly strengthen **joint warfighting capabilities**.
- The incorporation of the new concepts, doctrine, technologies, processes, training and professional military education laid out in this roadmap will significantly contribute to efforts to **transform the joint force**. Taken together, they will instill a military culture that empowers innovation and risk-taking by joint warfighters operating in the distributed battlespace of the future.
- The new capabilities and processes described in the Joint Intelligence section will contribute significantly to the **optimization of intelligence capabilities,** as will leveraging the connectivity, enterprise services, and specialized applications

[1] Secretary of Defense. "Top Priorities for Next 16 Months (8-03-12/04). 25 August 2003. Attachment to "Legislative Priorities for Fiscal Year 2005." Memorandum. 24 September 2003.

provided by the Global Information Grid, and the increased speed of decision provided through the transformation of joint command and control.

- The full range of enhanced joint intelligence, command and control, strike and protection capabilities that will help deter or deal with the **proliferation of weapons of mass destruction** in the years ahead will be strongly influenced by the requirements derived from the *Major Combat Operations, Homeland Security*, and *Strategic Deterrence Joint Operating Concepts*, and capabilities created with the guidance of the relevant joint functional concepts.
- Refinement and implementation of the emerging *Homeland Security Joint Operating Concept,* supported by the more detailed Protection and Joint Command and Control Functional Concepts, will help define and develop the capabilities needed to fulfill DoD's roles in **homeland security**.
- The translation of the *Stability Operations Joint Operating Concept* into enhanced concepts and capabilities, including corresponding changes in joint training and professional military education, will support DoD efforts **to more effectively deal with pre-war opportunities and post-war responsibilities,** particularly those associated with post-war stability operations.

It is important to recognize that the activities described in the *Joint Transformation Roadmap* represent only a sample of the myriad of planned and ongoing transformational activities within the joint community and the defense agencies. The activities described in the executive summary represent only a selection of this sample.

II. Joint Concept Development. The Department of Defense (DoD) approach to military transformation is concept-driven and capabilities-based. It is framed by the ***Joint Operations Concepts (JOpsC)*****,** an overarching concept for the conduct of future military operations, and is being further developed by the joint operating concepts (JOCs), joint functional concepts, and joint enabling concepts. The JOCs describe the integrated use of joint military capabilities to accomplish particular types of operations. The four initially specified **joint operating concepts**, currently under development by selected combatant commands (COCOMs) under the oversight of Joint Staff J-7, address ***major combat operations, strategic deterrence, homeland security,*** and ***stability operations***. The joint functional concepts describe how to provide critical military capabilities in a particular functional area that supports the full spectrum of military operations. The five currently specified **joint functional concepts** - ***protection, force application, joint command and control, battlespace awareness,*** and ***focused logistics***, are being developed under the oversight of Joint Staff J-8. Both the JOCs and the joint functional concepts, whose initial formulations are to be approved early in 2004, will be translated into enhanced joint capabilities through the newly established Joint Capabilities Integration and Development System (JCIDS).

III. Decision Superiority and the Global Information Grid. Decision superiority is a key enabler for each of the new joint concepts, operational processes and organizations addressed in this roadmap. The foundation of decision superiority is the Global Information Grid (GIG), the "globally interconnected, end-to-end set of information capabilities, processes, and personnel for collecting, processing, storing, disseminating, and managing information that is provided to joint warfighters, defense policymakers,

and support personnel" (DoDD 8100.1). GIG development is guided by the DoD CIO vision for information support, "Power to the Edge! - People throughout the trusted, dependable and ubiquitous network are empowered by their ability to access information and recognized for the inputs they provide." Transformational GIG initiatives include:

- **GIG Bandwidth Expansion.** This program will expands terrestrial data handling capacity to 100 sites, each with a mean throughput capacity of 10 Gigabits/second. IOC 2004, FOC 2005
- **Transformational Communications Satellite.** This new satellite constellation will greatly expand wideband satellite communications and provide internet protocol-based, on-orbit routing capability. IOC approximately 2010.
- **Teleport Program.** This program will enhance throughput and interoperability for the deployed warfighter through access to and between military and commercial satellite communications systems. DISA is implementing Teleport in three generations. Generation One will be operational in 2006, with Generation Two capabilities scheduled for completion in 2007 and Generation Three in 2012.
- **Joint Tactical Radio System (JTRS).** JTRS will provide the communications and networking capability for mobile forces that, together with the GIG BE and TC initiatives, will enable robust enterprise-wide networking. JTRS ultimately will replace virtually the entire current inventory of tactical radios and SATCOM terminals. Furthermore, JTRS will have an inherent mobile networking capability that will enable mobile forces to remain connected to an IP network. JTRS Cluster 1 (ground vehicular and Army rotary-wing aviation) is expected to enter low-rate production by FY06, with the handheld, maritime/fixed, airborne, and small form-fit clusters to follow. The other clusters are expected to reach IOC between FY08 and FY10.
- **Internet Protocol Version 6 (IPv6).** This next generation network layer protocol of the Internet will improve mobile computing, end-to-end security, and quality of service and will facilitate network convergence. DoD will transition to the new Internet protocol by 2008.
- **Horizontal Fusion (HF) Initiative**. This OSD-managed initiative is a portfolio of net-centric capabilities that facilitate user access to and use of the data that is available on the network, implementing the "smart pull" strategy of information dissemination. . HF is funded at $1.243B in the FY04 FYDP.
- **GIG Enterprise Services (GIG ES).** This investment portfolio integrates existing and future efforts to develop, acquire, field, operate, and sustain net-centric enterprise level IT services (i.e., applications and associated data) within the GIG architecture. Employing a net services architecture, GIG ES consists of both core enterprise services, termed **Net-centric Enterprise Services (NCES)**, as well as functionally-focused warfighting and business services. NCES is expected to achieve Milestone A/B approval in second quarter FY 2004. Spirals 1 through 3 of NCES Increment 1 are scheduled to begin providing an initial set of core enterprise services beginning in FY 2005. NCES Increment 1 release is scheduled for third quarter FY 2006. Subsequent Increments will follow with additional capabilities and services approximately every 12 months. The plan for

fielding the functionally-focused warfighting and business services is still under development.

- **DoD Net-Centric Data Strategy**. This initiative addresses the means by which data is posted, tagged, advertised, retrieved and governed, as well as methods that facilitate trust in the data.
- **Interoperability.** Network centric warfare is the transformational operational concept, and information interoperability is the essential enabler of network centric warfare. The ***DoD Integrated Interoperability Plan (IIP)*** has been recently developed to promote improved information interoperability throughout the Department. It provides guidance and direction to improve joint interoperability in the areas of family of systems assessment, operational validation, metrics and standards development, certification, and capability development governance. It also directs specific actions to improve joint interoperability in six areas identified by the TPG. A key joint interoperability initiative addressed in the JTRM as well as in the IIP is the **Joint Distributed Engineering Plant (JDEP)**, an OSD and Service-funded initiative created to support joint interoperability. JDEP facilitates access, coordination, scheduling, and technical support to replicate joint operational environments through the reuse of existing hardware- and software in-the-loop capabilities across the DoD and industry. The JTRM also addresses key allied/coalition interoperability initiatives, including the **Combined Communications and Electronics Board (CCEB),** the **Multinational Interoperability Council (MIC),** and **Multinational Information Sharing (MNIS)**.
- **Information Operations (IO)**, including computer network attack/exploitation/defense, psychological operations, military deception, electronic warfare, operations security, and public information, will play an important role in Defense transformation. The integrated plan for developing IO capabilities is contained in the ***DoD IO Roadmap***, which is expected to be signed by early November 2003
- **Information assurance (IA)** is an essential enabler of decision/information superiority and interoperability. Given the pivotal role to be played by the GIG in net-centric operations and Defense transformation, the reliability and protection of information services will be crucial, and failure to adequately address information assurance would provide a vulnerability for adversaries to exploit The ***DoD IA Strategic Plan*** guides key information assurance initiatives include cryptographic modernization, the **DoD Public Key Infrastructure Roadmap**, and computer network defense activities.

IV. Joint Command and Control. Leveraging the capability provided by the GIG, significant enhancements in joint command and control will play a pivotal role in transforming DoD operations and warfighting. Moreover, future joint C2 will itself be transformed into a coherent, integrated, net-centric capability spanning all levels of command – national/strategic, operational, and tactical - with capabilities tailored to each level and to the commander's mission and forces. The future, transformational Joint C2 capability will be *agile, robust, resilient*, and *net-centric***.** Future capabilities will improve and accelerate each phase of the decision cycle, including enhanced

capabilities for commanders and staffs to collaborate in order to better and more rapidly comprehend their operational environment, to make better decisions more quickly, and to understand how their decisions will affect the ongoing campaign. Transformational C2 will be supported by the recently adopted **Unified Command and Control Structure (UCS)** concept that addresses the management level functions (plan, organize, direct and monitor) of the President, the Secretary of Defense, and the COCOMs in the execution of the new set of "strategic strike" missions identified in the *2001 Nuclear Posture Review*.

The following transformational C2 capabilities are under development:

- **Standing Joint Force Headquarters (SJFHQ).** This initiative will create a standing body of planners, who possess the full range of skills and training necessary to plan and conduct effects-based, joint operations. With an initial capability to be fielded at each of the COCOMs in FY05, the SJFHQ will provide the manning, equipment, training, and procedural enhancements needed to become a core around which the staff of a regional COCOM or a JTF commander can operate across the spectrum of operations--from daily routine, through pre-crisis, to crisis response. The **Deployable Joint C2 (DJC2)** system will provide the material component of the SJFHQ.
- **Common Operational Picture (COP).** The COP is a shared, composite view, tailored to the user, of conditions, locations, and events in the battlespace. Elements of the COP are: the order of battle, location, status, and assessed intentions of the opposing force; friendly force order of battle, location, status, and intentions; non-combatant units locations and intentions; status of friendly space assets; geo-spatial data; weather; logistics; political-military factors; and media reports. By providing shared awareness, the COP enables speed of command and self-synchronization among units. The Joint C2 FCB shall oversee development of the future COP, based on the JC2/GIG ES architecture. Target IOC for the JC2 COP is FY06, and for the tactical COP (CTP) FY08.
- **Adaptive Mission Planning and Rehearsal (AMP&R).** AMP&R will provide the capability to rapidly plan operations and continually adapt the plan to changing situations. Several AMP&R initiatives are underway. Block II of the **Secure Enroute Communications Package-Improved (SECOMP-I)** will be fielded in FY07, and will help provide enroute mission planning and rehearsal capability to combatant command and Army elements on the move, with particular focus on supporting forced entry and early entry operations. The tactical aviation **Joint Mission Planning System (JMPS)** and **Special Operations Forces Planning and Rehearsal System (SOFPARS)** will also add capability increments during this period. By 15 February 2004, the Office of the Deputy Assistant Secretary of Defense (Resources and Plans) and the Joint Staff J-7 will complete a study of how to transform current operational planning at the national and theater level into the **Adaptive Planning System** that is required to meet emerging threats and missions.
- **Collaborative Information Environment (CIE).** The CIE is the aggregation of hardware, software, and procedures that leverages the GIG to enable sharing of

information and collaboration within and among staffs, including interfaces with both DoD and commercial communications pathways. USJFCOM will provide an interim CIE toolset in conjunction with the initial fielding of the SJFHQ in FY05. The interim CIE toolset will transition to the GIG NCES collaboration capability by FY08.

- **Joint Fires C2.** Future Joint Fires capability will be transformed by the networked integration of sensors, shooters, and command nodes across the joint force. Joint Fires C2 initiatives include: the DoD Distributed Common Ground/Surface System (DCGS) (ongoing capability enhancements), Joint Fires Network (IOC for Build 6.1 1QFY04), Advanced Field Artillery Tactical Data System (AFATDS) (ongoing capability enhancements), Digital Targeting Folders, IP-enabling of "Shooters" and Sensor Feeds (by FY08), Tactical Data Link (TDL) Integration (as an interim ground targeting network), Digital targeting brief ("9-line Brief") for joint close air support (operational testing planned for December 2003), and Combat ID upgrades (including replacement of Mode 4 with Mode 5 IFF by FY08).
- **Protection C2**. The **Single Integrated Air Picture (SIAP)** combines an engineering process with a supporting resource base to enhance air and missile defense C2 capabilities, primarily at the tactical level, including provision of a Common Tactical Picture of the air space. This transformational battlespace awareness initiative, which will play a critical role in offensive and defensive air operations, is focused on integration of legacy systems as well as developing new applications that will leverage the objective GIG architecture. The Air Force-developed **Joint Defense Planner** and Navy-developed **Area Air Defense Commander** capability provide advanced C2 for theater air and missile defense. These systems should be merged into a common air/missile defense planning and control service under the JC2 architecture.
- **Cross-Functional Joint C2 Programs and Initiatives** include **Global Command and Control System-Joint (GCCS-J)** and its follow-on, the **Joint C2 (JC2)** capability. While the JC2 architecture is still under development, it will leverage the GIG ES architecture and employ a similar net services approach. The IOC for JC2 is FY06. DJC2 will be the deployable variant of GCCS-J/JC2, utilizing common software. The **Family of Interoperable Operational Pictures (FIOP)** initiative provides an engineering process with a supporting resource base for enhancing joint C2 capabilities, primarily at the tactical level, including provision of various Common Tactical Pictures. FIOP efforts are focused on integration of legacy systems as well as on developing applications that will leverage the objective GIG architecture.
- **Synchronizing Service C2 Initiatives**. In order to facilitate planning for their integration, the JTRM provides brief descriptions of the major Service initiatives relating to C2 transformation. To complement ongoing Service cooperative initiatives, the Joint C2 FCB shall oversee the development of a common architecture and a structured synchronization process to ensure that the transformational goal of truly joint-interoperable C2 at all levels of command will be realized.

V. Joint Intelligence. As a complement to next generation Joint Command and Control, transformational efforts in **Joint Intelligence, Surveillance and Reconnaissance (JISR)** will significantly enhance the exploitation of U.S. intelligence advantages through the integration of sensors and processing capabilities into a coherent whole that will provide near real time, integrated, relevant and responsive intelligence to the full spectrum of users. The new JISR concept supports and relies on collaborative planning and execution among inter- and multi-national agencies, the intelligence community, and the joint force commander and his Service components across the range of military operations.

Some of the key transformational joint intelligence initiatives highlighted in this document include:

- **Distributed Common Ground/Surface System**. DCGS is the Department's ISR network-centric enterprise that provides the Task-Process-Exploit-Disseminate/Task-Post-Process-Use capabilities for the Joint Task Force and below. It is the key component for providing fused ISR-based decision quality information for effective Joint C2. Testing of the DoD DCGS is being integrated into Joint National Training Capability events, with an initial event tentatively scheduled as part of Combined Joint Task Force Exercise (CJTFEX) 04-02. The January 2003 Interoperability Senior Review Panel Memo directs the DoD DCGS Council to develop a roadmap and plan to migrate Service DCGS to the (Joint) DoD DCGS that is based on an interoperable, net-centric architecture, with migration to be completed by 2008.

- **Dynamic JISR Concept**. The Dynamic JISR Concept applies a net-centric approach to the management of intelligence, surveillance and reconnaissance capabilities to integrate sensors and processing capabilities into a coherent whole and thus better support the knowledge demands of the Joint Force Commander and his staff, his components and multi-national coalition forces. This concept supports and relies on collaborative planning and execution across the full range of military operations among inter- and multi-national agencies, the intelligence community and the Joint Force Commander and his Service components.

- **Blue ISR Forces Database**. This initiative will support more effective ISR operations and enable collaborative collection management of ISR capabilities by providing rapid access to information on capabilities and availability of Blue Force ISR sensors and processors.

- **Operational Net Assessment (ONA).** The ONA prototype, being developed by USJFCOM, is an integrated planning, operations and intelligence process, which synthesizes information available across the interagency community into actionable knowledge based on a coherent understanding of the adversary, his perception of us, and the operational environment.

- **Horizontal Fusion Enterprise Services**. DIA is involved in this portfolio of initiatives overseen by ASD (NII), seeking to leverage leading-edge concepts of data and network management to make tactical and intelligence data visible to the warfighter. In FY04, key horizontal fusion capabilities will be demonstrated through the Horizontal Fusion Enterprise Services "proof-of-concept" pilot called QUANTUM LEAP.

- **Hard and Deeply Buried Target (HDBT) Intelligence Visualization.** This DIA-led activity will produce 3D and 4D models, based on all-source assessments and reverse engineering, enabling users to rapidly understand the character of the HDBT and calculate anticipated munition effects.

- **HUMINT Transformation.** DIA's Directorate for Human Intelligence (HUMINT) is pursuing a transformation initiative to provide more dynamic, global HUMINT operations through improved business process and supporting applications that are more rapid intuitive, adaptive, reliable and supportive of precision tasking and real-time collection reporting. DIA will also shift its HUMINT operations to a TPPU construct and expand use of web-based applications and state-of-the-practice technologies in order to process and manage requirements and resultant data in an automated, efficient and flexible manner.

- **NGA Migration to an All-Digital Environment**. NGA and the National System for Geospatial Intelligence (NSGI) will migrate to an all-digital environment to enable collaboration among geographically dispersed users from various intelligence disciplines.

- **DCGS SIGINT Support Activities (SSA) Program**. Under USD (I)'s DCGS multi-INT strategy, NSA is developing a migration path for the evolution of operator workstations and ground stations, including airborne, maritime and ground SIGINT elements of the DCGS, which will result in a fully connected and interoperable "intra-network" utilizing the JTA, Unified Cryptologic Architecture (UCA), Joint Airborne SIGINT Architecture (JASA) and Service cryptologic architectures.

VI. Joint Deployment, Employment and Sustainment (JDES). Transformational efforts in JC2 and JISR are complemented by the recently initiated Joint Deployment, Employment, and Sustainment effort at USJFCOM. JDES is pursuing a two-path approach to improve and then transform joint deployment, employment and sustainment activities by combining them into a single, coherently joint, continuum of activity. The JDES plan calls for rapid prototyping of capabilities to improve the current joint warfighting processes for deployment and sustainment. The JDES efforts are being led by the Joint Logistics Transformation Center (JLTC) and the Joint Deployment Process Owner (JDPO). JLTC is developing the vision, future concept and strategy for the JDES effort, while JDPO is leading efforts to streamline deployment processes.

VII. Joint Concept Development and Experimentation. Joint concept development and experimentation play an essential role in developing and delivering transformational

joint capabilities to the warfighter. Experimentation will not only help to refine the JOpsC, the JOCs, the joint functional concepts, and Service operational concepts – which will all be living documents - but will also provide the warfighter with a rapid and effective tool for evaluating new capabilities and for incorporating the most promising elements into acquisition processes on an accelerated timeline.

The current ***USJFCOM Experimentation Campaign Plan*** establishes a two-path experimentation strategy. The ***Joint Prototype Path*** is designed to facilitate the development of prototype capabilities that can be honed rapidly and provided quickly to combatant commanders. The focus of this path is on improving capabilities through the refinement of promising new concepts. The ***Joint Concept Development Path*** is designed to conduct experiments that produce actionable recommendations on longer term capability development efforts to assist senior DoD leaders in making informed decisions about future force investments, with a focus on developing next-generation capabilities.

JFCOM experimentation is complemented by a number of independent initiatives programs for accelerating the identification, development and fielding of promising new material and non-material opportunities for achieving transformational advances in joint warfighting capabilities: The ***Transformation Initiatives Program***, to be developed and managed by the Office of Force Transformation, provides special funding and other support to augment the ability of combatant commanders to pursue unforeseen, but potentially high-payoff joint transformation initiatives during the current fiscal year. Similarly the JFCOM-led ***Joint Rapid Acquisition Program*** will support a more rapid acquisition of promising systems by using bridge funds to initiate development of promising initiatives in the current fiscal year. Joint RAP will be targeted on joint initiatives of the COCOMs, Services and defense agencies.

VIII. Joint Science & Technology. Science and technology investment has historically been, and will continue to be another key enabler of transformation in warfighting. The current DoD S&T program is supporting transformation through an investment strategy based on operational goals and including long-term transformational capability advances. At the same time, the joint S&T process is also undergoing profound change, creating significant near-term opportunity to give the joint community a more effective voice in S&T decisions. Since 1997, the principle vehicle for reviewing and managing Joint S&T requirements has been a series of three "roadmaps" written by the Office of the Director, Defense Research & Engineering (DDR&E) under the Undersecretary of Defense for Acquisition, Technology & Logistics (USD-AT&L): the ***Basic Research Plan***, the ***Defense Technology Area Plan*** and the ***Joint Warfighting Science & Technology Plan (JWSTP).*** The JWSTP is the primary vehicle for providing a "joint perspective" to ensure that DoD technology development efforts are linked to critical capability challenges associated with future joint and coalition warfare.

Although the categorization scheme used in the JWSTP is being changed from the previously used Joint Warfare Capability Objectives (JWCOs) approach to new

capabilities based on "functional areas," opportunities exist to further strengthen the voice of the joint warfighter in the S&T investment process.

IX. Training and PME. Finally, as outlined in the ***Strategic Plan for Transforming DoD Training***, DoD is transforming training and professional military education (PME) to ensure that our greatest asset – our people - can fully leverage the transformational potential afforded by new technologies, concepts, and organizations. Within the domain of training, the processes and key initiatives for supporting transformation include **joint knowledge development and distribution**, a **joint national training capability**, and a **joint assessment and enabling capability**. Within the domain of Joint PME (JPME), key transformational initiatives include joint development for senior-level DoD leadership, an update to the JPME curriculum for mid-level officers, and the creation of a new JPME 101 curriculum for junior officers.

I. Introduction

> *To accomplish this transformation, DoD is implementing processes that assess existing and proposed capabilities in light of their contribution to future joint concepts. The process must produce capability proposals that consider the full range of DOTMLP-F solutions in order to advance joint warfighting.*
>
> Richard B. Myers
> Chairman of the Joint Chiefs of Staff
> Chairman of the Joint Chiefs of Staff Instruction
> (CJCSI) 3170.01C. 24 June 2003

A. Overview

U.S. Joint Forces Command (USJFCOM) has prepared this initial *Joint Transformation Roadmap (JTRM)* on behalf of the joint community in accordance with the *Transformation Planning Guidance (TPG)* that was issued by the Secretary of Defense in April 2003. This roadmap documents the processes and planned activities to achieve transformational improvements in U.S. joint military capabilities that are to be undertaken by the Joint Staff, USJFCOM, the other combatant commands, and the combat support agencies, as well as through selected efforts by the Services. It describes how these processes and activities are consistent with the conceptual framework, established in the *Joint Operations Concepts (JOpsC)* that guides the identification and development of all future military capabilities. The *JTRM* also describes how the *JOpsC* derives from the current Defense and Military Strategies and supports the Secretary's operational goals for military transformation and a common vision of joint warfighting.

The *JTRM* is to be used to assist in the transformation planning and implementation activities of those organizations. It is also intended as a ready reference for members of DoD, the U.S. Congress, and other U.S. government organizations, for identifying and tracking the transformation-related activities of the joint community.

Military transformation is defined in the *TPG* as "a process that shapes the changing nature of military competition and cooperation through new combinations of concepts, capabilities, people, and organizations that exploit our nation's advantages and protect against our asymmetric vulnerabilities to sustain our strategic position, which helps underpin peace and stability in the world."[2] As such, military transformation may be measured and distinguished from other important modernization activities in terms of both its means and effects. Transformation is often indicated by a combination of advanced technologies, innovative concepts and organizational reconfiguration, that, taken together, change how warfare is conducted within one or more domains. Most importantly, military transformation is comprised of new concepts and capabilities that bring about dramatic capability improvements in an existing warfare domain, or open up an entirely new domain.

[2] Office of the Secretary of Defense, *Transformation Planning Guidance*, April 2003. p. 3.

Although transformation is often disruptive to the organizations which undertake it, the transformation of the U.S. Armed Forces is necessary to sustain the military preeminence of the United States and to provide the future capabilities needed to achieve U.S. national security objectives in a dramatically changing, uncertain, still dangerous global security environment. As the world changes, the United States is confronted with a broadening array of missions in which it must apply military power to protect and advance the security of the nation.

The QDR Defense Strategy established four key defense policy goals – assure, dissuade, deter, defeat – that guide the development of U.S. forces and capabilities, their deployment and use. It also assigns missions to the Armed Forces to achieve these goals and to serve as a basis for force planning. The Military Strategy is the Armed Forces' plan to carry-out missions assigned by the Defense Strategy. It defines defensive, offensive, and anticipatory actions that commanders take to achieve military objectives in support of the defense policy goals. The Military Strategy applies a set of overarching principles--agility, decisiveness, and integration--that guide how commanders are to achieve their supporting objectives. The Military Strategy provides the context to describe the desired attributes and capabilities of the joint force and lays the foundation for the development and application of a capability-based force. The Military Strategy, as the foundation for other strategic documents, supports near-term operational planning, while providing a common joint vision of future operations that serves as an azimuth for joint force transformation.

The Joint Chiefs and the *TPG* have directed selected combatant commands to develop new joint operating concepts for designated portions of the range of military operations, including MCO, strategic deterrence, HLS, and stability operations. In each of these areas, transformation is necessary to ensure that joint forces are capable of accomplishing assigned missions in the face of a range of intelligent, determined, and adaptive foes.

The *TPG* provides guidance for transforming how we fight, how we do business, and how we work with others. The *JTRM* addresses primarily the first of these areas - transformation of the operating force capabilities. In this area, the *TPG* states that the supporting strategy for force transformation rest on four pillars:

1. Strengthening joint operations (addressed in all sections).
2. Exploiting U.S. intelligence advantages (addressed primarily in Section V)
3. Experimenting in support of new warfighting concepts (addressed primarily in Section VII)
4. Developing transformational capabilities (addressed all sections. Science and technology and training initiatives are addressed in Sections VIII and IX respectively)

The Secretary's priorities for force transformation are defined by the six operational goals for force transformation as established during the 2001 QDR and further described in the *TPG*:

1. Protect critical bases of operations and defeat the threat of Chemical, Biological, Radiological, Nuclear, and Enhanced Conventional (CBRNE) weapons and means of delivery to ensure U.S. ability to generate forces in a timely manner without being deterred by adversary escalation options
2. Assure information systems in the face of attack and conduct effective information operations
3. Project and sustain U.S. forces in distant anti-access or area-denial environments
4. Deny enemies sanctuary through persistent surveillance, tracking, and rapid engagement with high volume, precision strikes, to permit the United States to prosecute a rapid campaign that reinforces deterrence by denying any adversary hope of achieving even limited objectives, preserving escalation options or maintaining command and control of forces over an extended period
5. Enhance the capability and survivability of space systems and supporting infrastructure.
6. Leverage information technology and innovative concepts to develop an interoperable, joint C4ISR architecture and capability that includes a tailorable joint operational picture

The objectives of joint force transformation are also guided by recent U.S. military experiences in Operation Enduring Freedom in Afghanistan and Operation Iraqi Freedom, as well as other sources of evolving thought within the defense community about the nature and imperatives of future warfare. Additional force transformation objectives that have been discussed by the Secretary of Defense and other senior DoD leaders include:

- Focusing efforts on creating capabilities for pre-emptive and preventive actions in self-defense, vice responding once attacked, within an overall framework of shared, knowledge-empowered, effects-based operations.
- Providing a greater proportion of the force with capabilities characteristic of the Special Operation Forces (SOF), including an “expeditionary” orientation, a depth of regional knowledge, ease of insertion, high agility, and a rapid deployment-employment capability
- Developing a more rapid and seamless continuum of operations from deployment and employment through sustainment
- Developing forces that can be employed in a precise and responsive fashion from forward garrisons and sea bases, and, when needed, from strategic distances
- Accelerating the speed of decision to achieve decision dominance over the adversary and thus foreclose many of his options
- Empowering greater initiative and self synchronization among increasingly joint, tactical units
- Implementing widespread use of geo-spatial, time-tagged, fused intelligence and other data that supports superior, widely shared, battlespace awareness, which is available to the fully networked force via the ubiquitous open architecture,

Internet Protocol (IP) network that includes various enterprise services and specialized mission applications
- Increasing exploitation of unmanned aerial, surface, ground, and undersea systems for surveillance and reconnaissance as well as force employment
- Designing, developing and procuring systems to be inherently or "born" joint and seamlessly integrated, rather than merely interoperable
- Expanding joint training and experimentation, including the conduct of high-resolution, live and virtual training
- Re-engineering the mobilization process to provide combatant commanders with a more efficient and responsive mechanism to mobilize Reserve Component units and individuals
- Developing tools, processes, and organizations capable of conducting effects-based planning and agile command and control at a rate commensurate with dynamic, rapidly unfolding operations

The transformational activities described in this roadmap directly support the top priorities of the Secretary of Defense.[3]

- Near-term progress in fielding improved joint command and control and joint intelligence, surveillance, and reconnaissance capabilities called for in the new global strike concept, set forth in the *Strategic Deterrence* and *Stability Operations Joint Operating Concepts*, will provide greatly improved capabilities for employment in **the global war on terrorism**.
- The initiatives described herein--from the development of the *Joint Operations Concepts (JOpsC),* joint operating concepts, joint functional concepts, and enabling concepts, to the accelerated fielding of new "born joint" capabilities, supported by joint experimentation, joint exercises and other forms of joint training, are key elements of a comprehensive effort to strengthen **joint warfighting capabilities**.
- The incorporation of the new concepts, systems, technologies, processes, training and professional military education laid out in this roadmap will significantly contribute to efforts to **transform the joint force**. Taken together, they will instill a military culture that empowers innovation and risk-taking by joint warfighters operating in the distributed battlespace of the future.
- The capabilities described in the Joint Intelligence section will contribute significantly to the **optimization of intelligence capabilities,** leveraging the connectivity and capabilities provided through the Global Information Grid, and the increased speed of decision provided through the transformation of joint command and control.
- The full range of enhanced joint intelligence, command and control, strike and protection capabilities that will help deter or deal with the **proliferation of weapons of mass destruction** in the years ahead will be strongly influenced by the requirements derived from the *Major Combat Operations, Homeland*

[3] Secretary of Defense. "Top Priorities for Next 16 Months (8-03-12/04). 25 August 2003. Attachment to "Legislative Priorities for Fiscal Year 2005." Memorandum. 24 September 2003.

Security, and Strategic Deterrence Joint Operating Concepts, and the concepts and architectures developed in the relevant joint functional concepts.

- Refinement and implementation of the emerging *Homeland Security Joint Operating Concept*, supported by the more detailed concept and capability development efforts under the *Protection* and *Joint Command and Control Joint Functional Concepts*, will help define and develop the capabilities needed to fulfill DoD's roles in **homeland security**.
- The translation of the *Stability Operations Joint Operating Concept* into enhanced concepts and capabilities, including corresponding changes in joint training and professional military education, will support DoD efforts **to more effectively deal with pre-war opportunities and post-war responsibilities,** particularly those associated with post-war stability operations.

B. Process

The DoD approach to military transformation focuses on developing and fielding dramatically improved joint capabilities. This effort has begun with the drafting of a new, overarching concept for the conduct of future military operations called the *JOpsC*. The approach includes a series of JOCs that build on the *JOpsC* and are designed to lay out the vision for conducting selected operations from the range of military operations in 2015. These are complemented, in turn, by a series of new functional concepts that are designed to guide the conduct of key military functions across the full range of military operations. Enabling concepts elaborate on the JOCs and functional concepts in key areas. Together, the JOCs, functional, and enabling concepts provide the basis for identifying, developing, and evaluating future military capabilities that contribute to the Secretary's transformation goals and support the common vision of joint warfighting.

The translation of this new set of joint concepts into military capability requirements is guided by the newly established JCIDS process, as set forth in the 24 June 2003, Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01C. This process for joint capability development is designed to support "the need for a joint concepts-centric capabilities identification process that will allow joint forces to meet the full range of military challenges of the future." As General Richard Myers, Chairman of the Joint Chiefs of Staff, has noted:

> "Meeting these challenges involves a transformation that requires the ability to project and sustain joint forces and to conduct flexible, distributed and highly networked operations. To achieve substantive improvements in joint warfighting and interoperability in the battlespace of the future, coordination among DoD components is essential from the start of the JCIDS process."[4]

As noted previously, JCIDS is a capabilities-based process, which is part of the new DoD approach to systems procurement and capability development. It reflects the

[4] Richard B. Myers. Chairman of the Joint Chiefs of Staff. Chairman of the Joint Chiefs of Staff Instruction 3170.01C. . *Joint Capabilities Integration and Development System*, 24 June 2003, p. 1.

imperatives of rapid global change in both technologies and the security environment itself. Figure 1 below presents a simplified depiction of the JCIDS process. As shown, strategic policy guidance drives the formulation of the *JOpsC*. The *JOpsC* describes how the Joint Force intends to operate during the next 10 to 15 years.[5] It also shapes the more detailed joint operating concepts and joint functional concepts, which, in turn, create the framework for the construction of integrated architectures depicting how these concepts will be implemented in particular contexts.

The development and validation of the requirement for a new "family of systems" capability includes a phased series of analyses. The initial step involves completion of a Functional Area Analysis (FAA), including cross-capability and cross-system analysis that identifies the operational tasks, conditions, and standards needed to achieve key military objectives within a specific capability area.[6] Following completion of the FAA, the organization seeking the enhanced capability carries out a Functional Needs Analysis (FNA), which assesses the ability of the current and programmed joint capabilities to accomplish the tasks associated with a particular future military challenge under the full range of operating conditions and to the designated standards identified in the FAA.[7] The final step in the JCIDS requirements process is the completion and approval of a Functional Solutions Analysis (FSA). This operational assessment reviews all potential doctrine, organization, training, materiel, leader development, personnel, and facilities (DOTMLP-F) approaches to filling or mitigating the capability gaps identified in the FNA, and recommends a specific set of actions to create the needed capability.[8] JCIDS thus focuses on holistic solutions to capability needs, including the development of human capabilities in conjunction with or as a compliment to materiel solutions.

[5] *Joint Capabilities Integration and Development System*, p. A-1.
[6] *Joint Capabilities Integration and Development System*. p. A-3.
[7] *Joint Capabilities Integration and Development System*. p. A-4.
[8] *Joint Capabilities Integration and Development System*. p. A-4.

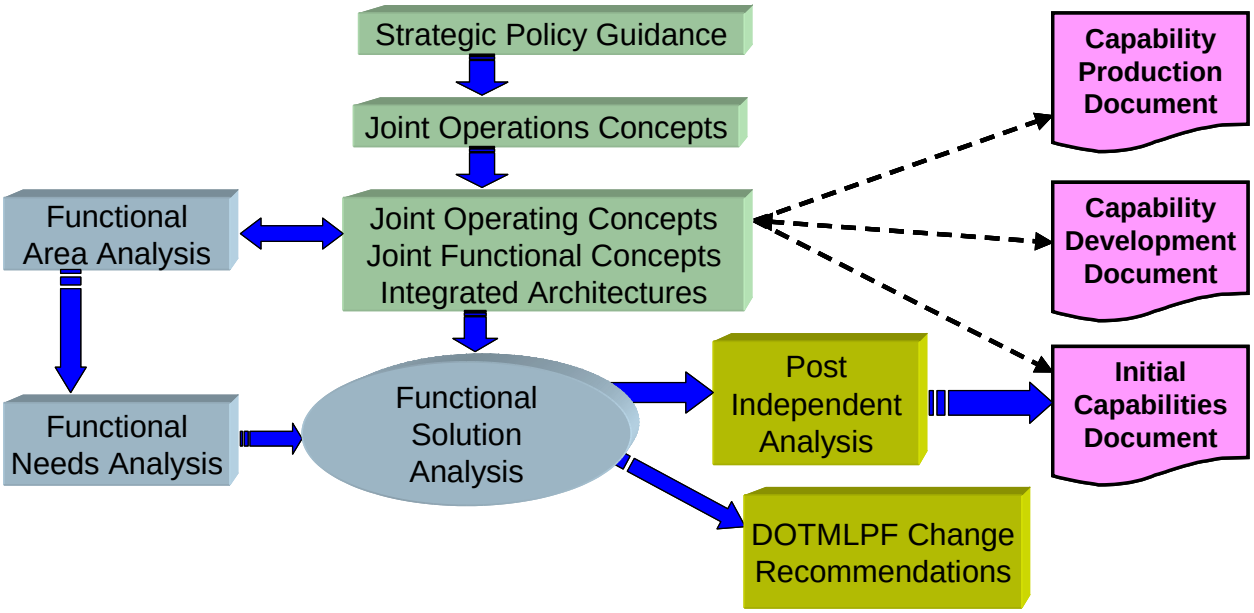

Figure 1: The JCIDS Analytical Process

The Functional Solution Analysis may lead to recommendations for change in DOTMLP-F processes in conjunction with or in lieu of a materiel solution to address identified capability shortfalls. Where a DOTMLP-F approach alone is insufficient, the FSA process, in combination with other analysis, may make the case for a materiel approach. This recommendation of a materiel family-of-systems solution derived from the JCIDS analysis is captured in an Initial Capabilities Document (ICD), which, if approved by the Joint Requirements Oversight Council (JROC), will lead to a Milestone-A (MS-A) decision by the Defense Acquisition Board (DAB) or Information Technology Acquisition Board (ITAB), as appropriate.

The development of a new or expanded joint capability, as described herein, is pursued by one or more Services, with JFCOM exercising oversight responsibilities. JFCOM generally does not perform a direct program management role in these activities.

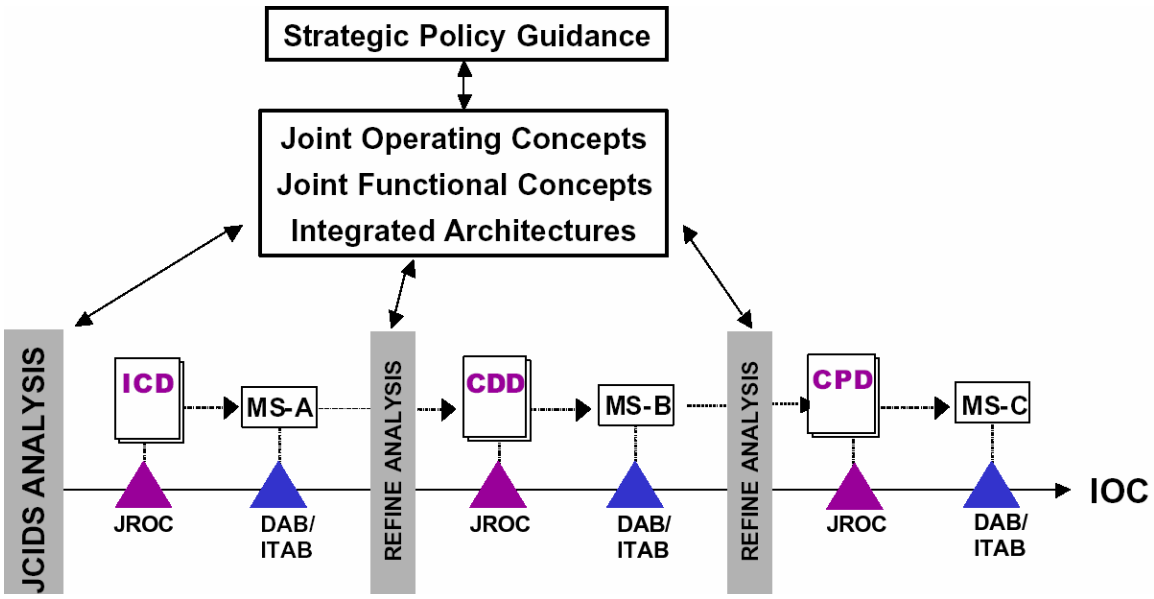

Figure 2: The JCIDS Process and Acquisition Decisions

The materiel approach proceeds via an evolutionary acquisition cycle in which refined analysis from the JCIDS process is a key input to a decision on whether and how to proceed forward to develop an affordable, supportable, and militarily useful "increment of capability." The information needed to develop such a program is outlined in the Capability Development Document (CDD), which supports a Milestone-B (MS-B) decision to proceed with the program. The development of this capability, in conjunction with further JCIDS analysis, informed by the appropriate joint operating concepts, joint functional concepts and integrated architectures, in turn, leads to a Milestone C (MS-C) decision concerning whether to move forward to field the developed capability. The Capability Production Document (CPD), which emerges from the JCIDS process, addresses the production attributes and quantities required to support the MS-C decision and thus take the program forward to operational deployment.

Within the JCIDS approach for translating innovative joint concepts into new joint capabilities, joint and Service war-gaming, experimentation, and operational prototyping play a critical role. War-gaming, experimentation, and prototyping are being employed to help generate and refine new joint operating, functional, and enabling concepts. Wargaming, experimentation, and prototyping are combined in different ways to support the Functional Solutions Analysis, helping to explore and evaluate materiel solutions to capability shortfalls. The combination of these approaches also plays a key role in further refining the concepts, with feedback to the Functional Needs Analysis and Functional Area Analysis. Indeed, a single cycle of experimentation may involve each element of the JCIDS process, beginning with an evaluation of material solutions that also advances the concept, leading to a new understanding of the requirements within the functional area and where the needs are, and producing new insights into how the range of materiel and non-material solutions could meet those needs.

The implementation of the JCIDS process by the joint community and the Services will be supported by a series of new, Web services-based information tools. USJFCOM-led

work to implement "born joint" systems and processes within the joint command and control arena, for example, will be supported by the Joint Battle Management Command & Control Concepts, Architectures and Requirements System (JCARS). Within USJFCOM, JCARS will provide an integrated environment with common tools to link Service, defense agency, and joint stakeholders' efforts to develop and manage capability-based operational requirements, integrated operational and system architectures, configuration management, Planning, Programming, Budgeting, and Execution documentation, and acquisition program documentation to support, DOTMLP-F capability change requests, and C4ISR technology assessment. Initial JCARS capability for data warehousing and process management will be implemented by August 2004.

C. Integration and Interoperability

A key aspect of operating force transformation is to achieve significantly improved joint and coalition force integration and interoperability. This aspect directly supports Pillar 1 of the transformation strategy, because better integration and interoperability enables the force to make better use of its inherent capabilities. Recent operations have shown the need for improvements in this area. Improvements in integration and interoperability are essential to realizing all of the capabilities addressed in this roadmap.

Integration is defined in *Joint Publication 1-02* as "the arrangement of military forces and their actions to create a force that operates by engaging as a whole." In other words, integration is the ability to fight together effectively, including the ability to provide mutual support. It is achieved through common doctrine, information sharing (including shared situational awareness) and collaboration, meaningful joint training, and common/interoperable command & control, communications, intelligence, and support capabilities. The roadmap to develop these integrating capabilities is addressed in the following paragraphs and in Sections III, IV, and IX.

Interoperability is defined in *Department of Defense Directive (DoDD) 4630.5* as "the ability of systems, units or forces to provide data, information, materiel, and services to and accept the same from other systems, units, or forces and to use the data, information, materiel and services so exchanged to enable them to operate effectively together."

The DoD *Integrated Interoperability Plan (IIP),* recently submitted by the Commander USJFCOM to the Secretary of Defense for approval, provides a comprehensive strategy and set of recommended actions for improving joint and coalition *information interoperability*. The provisions of the IIP are summarized in Section III. Interoperability in other domains, including logistics support, weapons/weapon system interfaces, and airborne refueling, is also important to the goal of fielding an integrated joint force. USD (AT&L), assisted by CJCS and COMUSJFCOM, is responsible to provide appropriate guidance to the Services and defense agencies to ensure interoperability in these domains.

D. Joint Doctrine Development

The CJCS is responsible for leading the development of joint doctrine. Our doctrine provides the fundamental principles that guide the employment of joint forces in common action toward common objectives. It underpins what we teach in our joint training, education, and leader development programs; it also influences the development of Service and multi-Service doctrine; and it interacts with other key DOD systems. While joint doctrine's core elements are enduring in nature, doctrine and its development process must be flexible as well as responsive to lessons learned from joint exercises and recent operations, innovative ideas from joint concept development and experimentation, and emerging technological capabilities.

The Joint Doctrine Development System is currently undergoing transformation that will improve the development process and its products. First, a consolidation initiative is reducing the number of doctrine publications, eliminating redundancies, and synchronizing revision within functional areas. Also, the revision of the Joint Doctrine Development System policy will provide new guidance on the nature of joint doctrine and its relationship to strategy, concept development and experimentation, training, education, and joint operations planning. This will facilitate incorporating validated transformational concepts in emerging doctrine. Finally, the Joint Staff is developing the Joint Doctrine Electronic Information System (JDEIS), which will provide user-friendly tools for rapid access to joint doctrine and related materials, on-line courseware, lessons learned, and a capability for improved on-line doctrine development.

Although these improvements are significant, additional focused effort is required to ensure the joint doctrine development process, products, and resources accommodate emerging transformation initiatives. The Joint Doctrine Development Community should carefully consider doctrine-related transformation requirements and program additional resources as necessary to ensure a responsive, comprehensive approach to the development and revision of joint doctrine. In addition to current efforts mentioned above, the Joint Staff and USJFCOM should work with all doctrine stakeholders on the following initiatives:

- Streamline the doctrine development process, with a goal of reducing current development and revision timelines. This includes maximizing "fast-track" and "out-of-cycle" revision opportunities.

- Reduce the time between doctrinal revisions to accommodate lessons learned and promote joint doctrine that is horizontally and vertically current.

- Develop a system to promote publication of electronic "changes" to discrete joint doctrine elements rather than waiting for a full revision cycle to publish revised doctrine.

- Strengthen the relationship between joint doctrine development, joint concept development, joint experimentation, and joint education and training to facilitate the incorporation of validated, value-added ideas in joint doctrine.

- Publish doctrine-related reference products that can help joint forces understand how to use emerging ways and means to improve joint operations.

- Establish the appropriate links to the Joint Capabilities Integration and Development System.

- Ensure JDEIS supports the above initiatives, including electronic relational databases, collaborative review procedures, and the capability to change discrete joint doctrine elements automatically, concurrent with other approved changes.

E. The Joint Transformation Roadmap

The *Joint Transformation Roadmap*, detailed in the body of this document, is guided by the transformational concepts and imperatives highlighted in this introduction. JCIDS is the official process through which those concepts and imperatives are translated into new joint capabilities that will underpin both the transformation and modernization of US forces and enhanced warfighting capabilities in a rapid, iterative, and analytically rigorous fashion.

The *Joint Transformation Roadmap* is both a descriptive and prescriptive document. It details the commitment to build on ongoing work and to move ahead to support transformational objectives. It focuses on specific transformational initiatives being pursued by the joint community, identifying who is the executive agent and what kinds of activities are planned. It includes processes to ensure the achievement of key transformational objectives and rough order-of-magnitude projections of spending, where possible. In some places, this document also recommends procedural steps to address current shortcomings associated with joint military transformation.

The sections that follow present key selected transformational activities that are occurring across the joint community. These include joint concept development, decision superiority and the Global Information Grid, several efforts to greatly improve Joint Command and Control, Joint Intelligence, Joint Deployment, Employment and Sustainment, Joint Concept Development and Experimentation and Prototyping, Joint Science and Technology, and Joint Training and Professional Military Education. While limitations on space prevent this document from discussing in detail every program with transformational implications, the sections were chosen, after careful review, as representative of the core thrust of transformational activities being pursued by the joint community.

II. Joint Concept Development

A. Overview

The development and continuous refinement of a series of new joint concepts is becoming the cornerstone in the efforts to create and maintain the future military capabilities needed by the U.S. Armed Forces to be able to continue to fulfill the array of demanding missions that they will be called upon to perform in the years ahead. The recently adopted JCIDS process, the official DoD approach for military capability development, recognizes the importance of these joint concepts. These new concepts, in conjunction with technology development and organizational adaptation, will serve as the engines of change for meeting the military challenges and seizing the opportunities presented by the Information Age. JCIDS is grounded on the proposition that the key to both the modernization and transformation of U.S. military capabilities is an innovative, capabilities-based process that is guided by a clear depiction of how the joint force intends to operate across the range of military operations in the 2010 to 2015 period and beyond.

DoD recognizes that because both technology and the global security environment continue to evolve, joint concept development is an iterative process. This process is based on ongoing efforts that involve creative operational thinking, rigorous analysis, operational prototyping, experimentation, and evaluation of lessons learned from military operations. Under these dynamic circumstances, the joint operations, operating, and functional concepts discussed below are never "final." Rather, they describe the latest innovative thinking on how best to conduct a particular type of future joint operation or function as we envision it today. As always, testing and experimentation must validate new concepts before they are implemented. To that end, the concepts are always subject to major adjustment as new concepts, often harnessing new, advanced technologies, emerge. Concept development, in this sense, is an institutionalized process of discovery, continuously developing new operational concepts of various types to better provide the critical capabilities needed to sustain clear-cut U.S. military superiority for years to come.

Joint concept development occurs within an evolving framework that currently includes the overarching *Joint Operations Concepts (JOpsC*), four initial supporting joint operating concepts (JOCs), five initial joint functional concepts, as well as a series of joint enabling and Service enabling concepts to support them. Figure 3 shows the relationship between higher level political and military guidance, the *JOpsC*, and the supporting joint operating concepts, joint functional concepts, and enabling concepts.

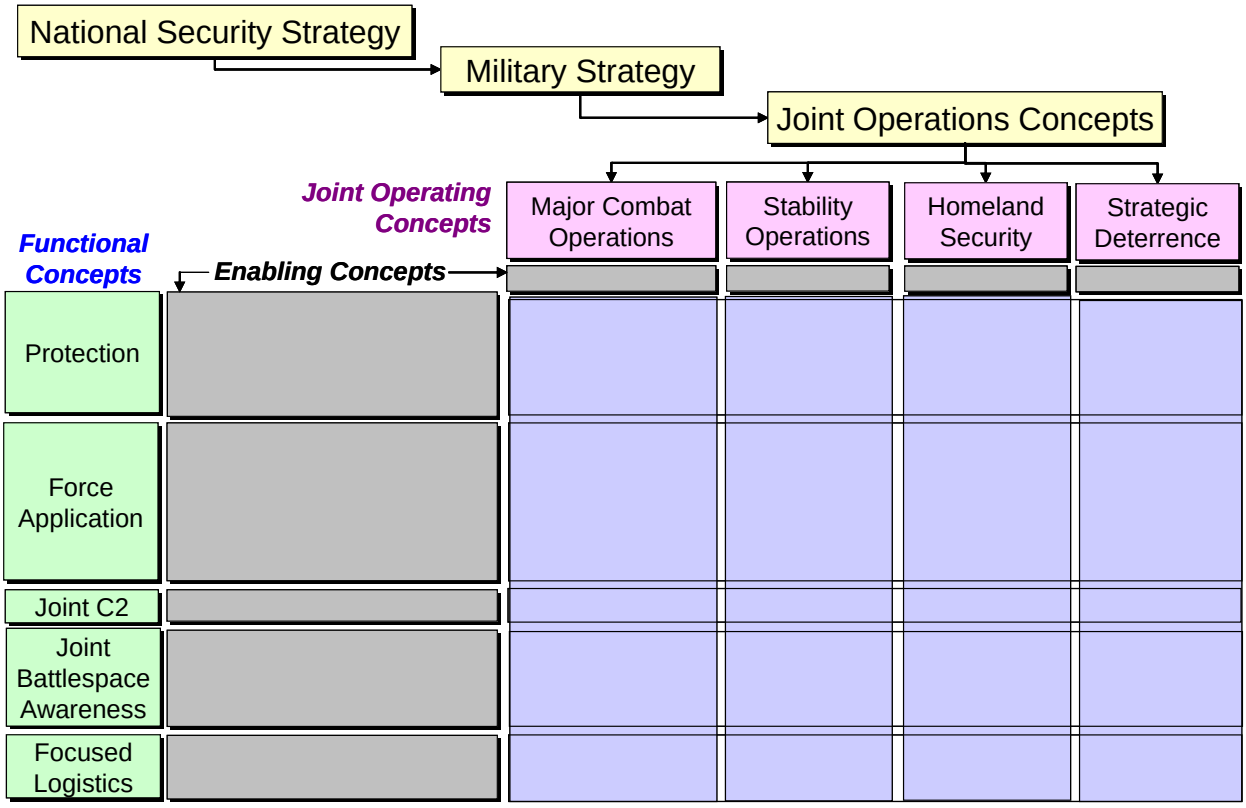

Figure 3: The Joint Concept Development Framework

The *JOpsC* describes how the joint force intends to operate within the next 15 to 20 years. As such, it provides the operational context for the transformation of the U.S. Armed Forces by linking strategic guidance with the integrated application of joint force capabilities.[9] As a key point of reference for the JCIDS process, the *JOpsC* also provides the foundation for the development of joint operating and functional concepts that drive the development and acquisition of new military capabilities through changes in doctrine, organization, training, materiel, leadership development and education, personnel, and facilities."[10]

The *JOpsC* is developed in accordance with OSD and CJCS guidance and intent for future joint force operations. The *JOpsC*, in turn, provides the context for force transformation. The *JOpsC* thus serves as a framework, which enables the development of subordinate joint operating, functional and enabling concepts.[11] It focuses on joint military operations at the operational and strategic level of war and crisis resolution and describes the integration of emerging capabilities across the domains of air, land, sea, space and information, and the development of supporting concepts to obtain these capabilities.[12]

[9] *Joint Operations Concepts*. November 2003. p. 3.
[10] CJCSI 3010.02A; GL-2. Also cited in *Joint Operations Concepts*, p. 3.
[11] *Joint Operations Concepts*, p. 4.
[12] *Joint Operations Concepts*, p. 4.

The *JOpsC* also identifies a series of common core capabilities as well as key attributes the joint force must possess in order to meet the goal of achieving dominance across the full spectrum of military operations. The common core capabilities include: achieving common understanding of all dimensions of the battlespace throughout the joint force; making decisions and taking action throughout the joint force faster than the opponent; adapting in scope, scale, and method as the situation requires; rapidly deploying selected portions of the joint force that can quickly transition to execution, even in the absence of developed infrastructure; creating and sustaining continuous pressure throughout the battlespace for as little or as long as it takes to accomplish strategic or operational aims; disintegrating, disorienting, or destroying any opponent with a combination of lethal and non-lethal means; conducting deployment and sustainment activities in support of multiple simultaneous, distributed, decentralized battles and campaigns; and accomplishing all these capabilities in an inter-agency and multi-national context.

The *JOpsC* notes that in order to provide these common core capabilities, the 21st century joint force must be fully integrated, truly expeditionary, comprehensively networked, decentralized with integrated joint capabilities extended down to the tactical echelons, adaptable with regard to its versatility across a wide range of missions and environments, possess the ability to tailor joint force operational capabilities to deal with specific challenges, capable of attaining decision superiority vis-à-vis the adversary, and increasingly lethal[13]

[13] *Joint Operations Concepts*, pp.10-17.

B. The Joint Operating Concepts and Their Role in Capability Development

The joint operating concepts (JOCs) are guided by and extend the basic guidelines of the *JOpsC*. They describe how the future joint force will operate within specific segments of the range of military operations, identifying "how a future Joint Force Commander will plan, prepare, deploy, employ, and sustain a joint force to meet selected contingencies." The objective of JOC development is to specify the operating concepts in sufficient "measurable detail" to guide experimentation, provide a basis for the development of measures of effectiveness, and help guide senior DoD decision-makers in comparing family-of-systems capability alternatives and making programmatic choices.[14]

The joint operating concepts, together with the first versions of the joint functional concepts, will help to identify the desired operational capabilities needed for selected future military operations to guide joint capability development and force planning. The Joint Chiefs and the *Transformation Planning Guidance* issued by the Secretary of Defense in April 2003 selected four broad, joint operating concepts for initial development: Major Combat Operations, Stability Operations, Homeland Security, and Strategic Deterrence. The initial set of JOCs is being developed by three of the combatant commands, as discussed below. This section describes the main points of this first group of joint operating concepts.

1. Major Combat Operations[15]

The *Major Combat Operations Joint Operating Concept (MCO JOC*) describes an approach to warfighting that exploits the capability of all instruments of U.S. national and multinational power to achieve full spectrum dominance over an organized and capable adversary. The major combat operations referred to in this joint operating concept are large-scale operations conducted against a nation state or states that possesses significant regional military capability and the will to employ that capability in opposition to or in a manner threatening to U.S. national security. The concept describes an operational level approach to warfighting that proposes a synergistic blending of diverse national and coalition diplomatic, informational, and economic capabilities with overmatching military force in order to create a situation with which the adversary can neither cope nor effectively respond to U.S.-led efforts.

According to the *MCO JOC*, the central objective of U.S. joint forces in a major conflict will be to achieve decisive conclusions in combat (win the conflict)) and set conditions for a decisive conclusion of the confrontation (win the war); to use swiftly executed, simultaneously and sequentially applied, overmatching power in a set of contiguous and non-contiguous operations; and to employ joint power at all points of action necessary-all to compel the enemy to accede to U.S. will. This is to be accomplished through the

[14] *Joint Operations Concepts*, p. 18.
[15] Major portions of this section are drawn from Department of Defense, United States Joint Forces Command. *Major Combat Operations Joint Operating Concept*, Version 0.92, 9 January 2004.
[15] The joint, interagency and coalition force will be referred to as "combined force" throughout this document.

fluid and *coherent* application of joint military action in conjunction with joint and coalition power and interagency coordination throughout the deployment-employment-sustainment of the joint/coalition force. The joint force commander and his staff will employ an effects-based approach and leverage a knowledge-enhanced force in a networked environment that operates with increased levels of collaboration, precision, unity of purpose, and coherency in action to achieve strategic and operational objectives.

As a result, future U.S. joint forces will move from today's paradigm of applying overwhelming force to applying overmatching power, from deconflicting Service actions to coherent joint actions, from mostly sequential to mostly simultaneous operations, from contiguous to non-contiguous operations, and from being joint only at the operational level to becoming joint at the point of action

U.S. forces will seek not merely to destroy the enemy militarily, but to continuously shape the battlespace to effectively engulf him in every dimension. As combined forces are brought to bear with unpredictability, speed, relentlessness, and seeming omnipresence, all integrated to maximize shock, they will be capable of exerting continuous pressure on the adversary, thus making the battlespace increasingly hostile for him, rendering continuing resistance increasingly difficult and ultimately futile.

The *MCO JOC* emphasizes the importance of creating the six building blocks that provide the foundation for U.S. success in future major combat operations. It discusses the efforts that must be taken to prepare America's military forces to: 1-Fight with a warrior's ethos; 2-Develop flexible, creative, and resourceful leaders at all levels; 3-Train all elements of the joint force under conditions that foster the skills, culture, and modes of thinking needed to execute future concepts; 4-Uphold the values of American democracy as they execute military operations; 5-Field the capabilities needed to maintain adaptive force dominance over potential adversaries; and 6-Provide assured access and rapid force projection to key overseas theaters, despite enemy anti-access and area denial efforts.

The image of how the joint force would fight in a future major combat operation set forth in this joint operating concept includes several simultaneous aspects of the joint/coalition campaign.

The *MCO JOC* asserts that major combat operations will be carried out as campaigns comprised of sequential, parallel and simultaneous battles and engagements that are distributed throughout the battlespace. It notes that the future joint force must have adaptive capacity and operational durability for sustained combat to defeat tomorrow's complex and adaptive adversaries. The *MCO JOC* emphasizes that translating decisions into actions against 21st century adversaries will also demand true coherence among all military, DoD and Federal agencies, as well as coalition partners. An integrated and cooperative approach for applying all elements of national and coalition power to the military problem will help create coherent effects designed to compel the adversary forces to ultimately succumb to our will.

The *MCO JOC* identifies eleven execution principles, which provide conceptual tools that are to be adapted to specific situations to guide the planning and execution of a specific major combat operation. These principles are:

- **Start with a Strategic Purpose in Mind.** Develop the commander's intent, expressed in terms of the operational effects to be achieved, at every level of the chain of command throughout the combined force. These cascading commanders' intents should reflect the overarching strategic purpose laid out by national political leadership and the desired end state for the military campaign established by the joint force commander.

- **Employ a Knowledge-Enhanced, Effects-Based Approach.** Treat the adversary as a complex system-of-systems and identify his higher purposes as well as the subordinate purposes of key adversary elements. Then identify the effects to be achieved by the simultaneous, integrated application of the full range of joint and coalition capabilities against enemy centers of gravity, decisive points, and other critical areas and activities in order to achieve these purposes. These effects will include physical or behavioral outcomes that result from an action or set of actions undertaken to achieve them. Use the effects-based approach as the framework for campaign design.

- **Use Mission Orders Throughout the Chain of Command.** Use mission orders to convey the commander's intent, that is, the purpose of the operation and the effects needed to achieve it. These mission orders should include higher level intent, the assigned mission defined in terms of the desired end state and the effects to be achieved to accomplish it, specification of supporting and supported relationships among force elements, and a listing of any constraints or limitations on operations. The use of this type of orders encourages autonomy, initiative, and freedom of action at all levels, while also facilitating decentralization and collaboration.

- **Generate Relentless Pressure by Deciding and Acting Distributively.** Carry out operations at the strategic, operational, and tactical levels at a relentless pace that yields no unintended pauses for the adversary. The combination of rapid, decentralized decisions, leveraging shared, near-real-time understanding, and the coherent, rapid, and precise execution of operations across a widely distributed area will generate constant pressure and contribute to the adversary's sense of futility and hopelessness.

- **Engage the Adversary Comprehensively.** Mount concurrent operations throughout the battlespace to thwart enemy efforts to establish operational exclusion zones. Carry out entry operations into theater through multiple points of entry and apply force along multiple axes, destroying key adversary war-supporting infrastructure such as telecommunications, electrical power generation and distribution, and vital transportation arteries and carrying out decisive combat operations. These parallel efforts will feature multi-dimensional

integration of precision engagements and agile maneuver, combined with tactical assault, in operations that occur throughout the enemy's area of operations.

- **Achieve Coherency of Action.** Harness the full potential of joint, interagency, and coalition capabilities by leveraging the synergies available from combining the competencies and capabilities from each of these sources. Thus, the joint force commander will "maneuver" various elements of national power and mount a wide range of "engagements" in order to generate complementary and reinforcing effects on the enemy.

- **Employ a Joint, Interagency and Multinational Force with Collaborative Processes.** Develop organizational arrangements and processes to support effective collaboration with joint, coalition, U.S. civilian agency, and multinational civilian organization partners in order to promote coherent actions and enable dynamic adaptation.

- **Gain and Maintain Access.** Mount simultaneous operations with tailored forces to forcibly neutralize the adversary's various anti-access and area denial efforts, including his use of undersea mines, submarines, cruise and ballistic missiles (possibly carrying CBRNE weapons), strike aircraft, unconventional forces, and integrated air defenses. Undertake these operations in order to ensure the use of needed lines of communication and infrastructure. These dynamic, in some cases, forcible entry operations will involve forces with reduced logistics footprints that rely much less on fixed airfields and seaports in the operational theater to swiftly introduce highly capable, "immediately employable" forces into the battlespace.

- **Align Deployment, Employment and Sustainment Activities.** Align and synchronize deployment, employment, and sustainment activities to enable future joint forces to conduct multiple, distributed, decentralized battles and campaigns. The combination of rapid, global employment, superior strategic mobility, high endurance, and worldwide sustainment capabilities will provide the basis to swiftly project and sustain agile, responsive, joint combat power from the sea, from the air and over land. The synergy of properly aligned deployment, employment, and sustainment activities will also produce greater freedom of action, unrivaled access to the battlespace, and constant positional advantage over the opponent.

- **Protect People, Facilities, and Equipment Throughout the Battlespace.** Comprehensively protect the joint/coalition force throughout the extended battlespace, that is from locations of origin in the homeland or abroad to points of employment, including the potentially vulnerable areas for staging, transit, and theater bed down. Key components of this protection will focus on defense against CBRNE weapons, both to avoid casualties and to maintain the high tempo of operations, and on the protection of friendly centers of gravity such as computer networks and space-based capabilities.

- **Achieve Decisive Conclusions.** Integrate military, diplomatic**,** information and economic efforts to achieve strategic objectives and the desired end state**.** Focus operational and tactical level actions on achieving decisive conclusions that, in turn, produce strategic success by disorienting, disintegrating, dislocating or destroying the adversary**.**

The lead for the ongoing development and refinement of the *MCO JOC*, including many of the joint capabilities listed above, is USJFCOM.

2. Stability Operations[16]

The *JOpsC* describes stability operations as "military operations conducted in concert with the other elements of national power and multinational partners to maintain or re-establish order and promote stability."[17] These are global and regional military operations that establish, shape, maintain and refine relations with other nations. Included are operations to ensure the safety of American citizens and protect the interests of the United States while maintaining and improving the U.S. ability to operate with multinational partners to deter hostile ambitions of potential aggressors.

The *Stability Operations Joint Operating Concept* recognizes this broad spectrum of potential military operations, which can help enhance stability that is identified in the JOpsC. It identifies four basic cases in which instability could prompt intervention by the United States or a multinational coalition: 1-An allied or friendly state requests U.S. or multinational assistance in protecting itself from subversion, lawlessness, and insurgency; 2-A hostile state acts in ways that are inimical to U.S. or allied vital or important interests or employs a level of coercion against its population that exceeds norms of international behavior; 3-A nation or region becomes ungovernable, collapses economically, and disintegrates into sub-national units under the control of warlords and their militias, or worse, into anarchy; and 4-A national or transnational organization, whose ideology involves significant degradation of human rights that places at risk large segments of the population and acts in ways that destabilize legitimate governments, threatens whole regions, and exceeds the norms of international behavior.

The initial *Stability Operations JOC* is focused on the second case, stability operations associated with a major conventional combat operation. This concept describes stability operations as multi-agency operations that involve all instruments of national and multi-national action, including the international humanitarian and reconstruction community, to support major conventional combat operations if necessary; establish security; facilitate reconciliation among local or regional adversaries; establish the political, social, and economic infrastructure; and facilitate the transition to legitimate, local governance.

This JOC identifies three distinct types of stability operations associated with an MCO: **preventative actions** conducted prior to a possible conflict where the joint military force

[16] Section is drawn from the draft *Stability Operations Joint Operating Concept,* Version 0.89A, 14 January 2004.
[17] *Joint Operations Concepts*, p. 18.

plays a supporting role in actions that seek to manage tensions and thus avoid war and to set conditions for successful combat, should war occur; **those actions conducted during major conventional combat operations** when the joint force, as the supported agency, seeks to create conditions favorable for the long term success of U.S. and coalition post-conflict stability and reconstruction efforts while focusing primarily on ensuring effective prosecution of combat operations to achieve victory; and **restorative stability operations** carried out in the wake of an MCO by the joint force in a supporting role to help achieve the strategic objectives of the war. Such stability operations involve some of the most complicated and challenging missions assigned to the U.S. military and require a focused approach to create the unity of effort and coherency of action needed to achieve the nation's strategic aims.

The major objectives and challenges of an MCO-related stability operation vary substantially, depending on its relation to the conflict. Prior to war, the preventative actions may involve employing irregular forces to wage unconventional or guerrilla warfare against the potential foe, shows of force with regular forces to demonstrate resolve, and military assistance to regional friends and allies to strengthen their capabilities, should war occur. In stability operations conducted concurrent with a major war, properly trained and configured joint stability forces are in the lead, supported by interagency partners, and focused on performing selected governmental functions associated with maintaining public safety and establishing security and order in areas under friendly control, collecting information from the civilian populace, controlling civilian movement in the battlespace, and restoring emergency public works and services, all to be accomplished with minimal impact on the continuing war fight.

Finally, the main objectives in a restorative stability operation conducted following the end of major combat operations are: *restoring law and order*; *providing humanitarian relief*; re*establishing civil authority*; *restoring essential services* such as food and water distribution, waste removal, power generation and distribution, and basic medical services; and *assisting in initial efforts at economic reconstruction* until the security environment permits access for indigenous and international civilians to perform these tasks. All of this activity, carried out by joint and coalition stability forces acting in support of civilian authority, must be undertaken expeditiously in order to pave the way for a transition to continuing governance and reconstruction led by legitimately elected, indigenous civilian authorities.

The latter two MCO-related stability operations will be conducted simultaneously, distributed throughout the theater of war. Both will require a combination of detailed situational understanding; a coercive posture against obstructionists; unified direction from legitimate civil authority: integrated, multi-agency unity of purpose and coherency of action: organizational endurance; and popular support over time.

The *Stability Operations JOC* highlights three different types of capabilities--coercion, socialization, and inducement, which are likely to be employed in combination to deal with "spoilers", indigenous elements that would seek, in varying degrees, to obstruct achievement of U.S. and multinational strategic and operational objectives.

Joint forces will mount coercive operations in an effort to neutralize total spoilers with whom they cannot negotiate and to contain or intimidate those actors, who malevolently seek to gain advantage in the uncertain situation. Such coercion will generally involve actions that create negative reinforcement for targeted groups through the application of force, or denial of desired goods or services. Depending on the type of stability operation, coercive actions could include significant combat operations, ambushes of or raids on terrorists, withholding food deliveries from hostile groups, freezing bank accounts of uncooperative leaders in international institutions, and the like.

U.S. joint forces will also undertake socialization measures during a stability operation in order to inhibit the development among the indigenous population of hostile attitudes toward United States and other coalition forces and to inculcate instead, more favorable attitudes. These socialization efforts include education measures, psychological operations (PSYOPS), and any other means for fostering a belief among the leaders and general population of the target country that they will be able to make significant progress toward a more peaceful and prosperous condition by cooperating with the United States and its coalition partners.

Inducements, including political, financial, or other concessions or payments, will often be used during a stability operation to mollify and possibly convert problematic actors, who are open to negotiation.

For each mission type, and in different stability operations contexts, the mix of coercion, socialization, and inducement employed will change over time as the conditions change and the necessary progress required to establish and maintain a safe and secure environment and begin the transition to indigenous civilian control is achieved.

The *Stability Operations JOC* posits and discusses a series of principles to guide commanders as they develop and execute campaign plans that employ joint forces to conduct stability operations. These include:

- **Organize military and civilian agencies to achieve unity of purpose and coherency of action** by having a joint civil-military structure develop and carry out a practical plan
- **Develop reliable local intelligence** to gain and maintain a detailed and sophisticated understanding of the situation
- **Impose security by adopting both an assertive and an engaging posture** that anticipates potential trouble and disrupts spoiler efforts to undermine stability
- **Defeat those violently oppose security and the creation of a "new normal state of affairs"** by isolating total spoilers from popular support and precisely applying military power to eliminate them
- **Neutralize, co-opt, or induce others who threaten security and the creation of a "new normal"** via socialization and inducements
- **Act with precision quickly** to preclude or preempt threats, while **balancing restraint and the use of overmatching power to** minimize collateral damage

- **Act from a position of legitimacy; act at the direction of legitimate civil authority, when it is established** to build and maintain support among the local populace
- **Pursue interim conditions leading to a better "next state of affairs" in the stability process** by establishing a secure environment, restoring basic services, and fostering hope for a better future
- **Operate within the law** by establishing an appropriate political mandate and acting in accordance with democratic values and respect for life and property, and
- **Incorporate information operations into every action, tactical and operational**, to maintain legitimacy, create the "new normal," and defeat spoiler disruptive efforts

The lead for the ongoing development and refinement of the Stability Operations JOC is USJFCOM.

3. Homeland Security[18]

The *Homeland Security Joint Operating Concept* is premised on the assertion that a secure U.S. homeland is the nation's first national security priority and is fundamental to the successful execution of the U.S. National Military Strategy. Moreover, security of the homeland is essential to America's ability to project and sustain power globally and to honor its far-flung security commitments. The American homeland today faces a wide spectrum of threats ranging from traditional national security threats (e.g., ballistic missile attacks) to law enforcement threats (e.g., drug smuggling), along with threats such as international terrorism that fall in a "seam" that lies somewhere in between. Consequently, no single federal department--the Department of Defense, the Department of Homeland Security, or the Department of Justice, or federal agency is solely responsible for securing the homeland against all threats. The Homeland Security JOC describes how, when directed by the President, future U.S. joint forces intend to perform a set of military missions--Homeland Defense (HLD), Civil Support (CS), and Emergency Preparedness (EP), to defend the people or territory of the U.S. homeland in the 2015 timeframe.

The central idea for the **Homeland Defense** mission within the *Homeland Security JOC* is to protect the homeland from external threats and aggression using integrated operational and tactical, offensive and defensive measures integrated into a proactive, layered and comprehensive defense in depth that covers three conceptual regions of the world, beginning at the external source of the threat.

- **Forward Regions -** In foreign land areas, sovereign air space, and sovereign waters outside the homeland that make up this conceptual region, U.S. forces seek to deter, prevent, and defeat threats to aggression against the United States before they can directly threaten the homeland

[18] Section drawn from the draft Department of Defense, *Homeland Security Joint Operating Concept*, January 2004.

- **Approaches –** In the approaches extending from the limits of the homeland to the boundaries of the forward regions, military operations focus on detecting, preventing, and defeating transiting threats en route to the homeland as far as possible from the homeland using the full portfolio of military capabilities.

- **Homeland –** In the U.S. homeland, which consists of the land masses of the continental United States, Alaska and Hawaii, the U.S. territories and possessions in the Caribbean and the Pacific Ocean, and the immediate surrounding sovereign waters and air space, the U.S. Armed Forces seek to deter aggression and defend against external threats.

The *Homeland Security JOC* focuses on the defensive activities that are carried out in the third conceptual region, the U.S. homeland. The Homeland Defense (HLD) mission within the JOC includes four mission sets for execution of by the U.S. joint force-- **National Air and Space Defense**, **National Land Defense**, **National Maritime Defense**, and **Cyber Defense***.*

The *Homeland Security JOC* also encompasses DoD's mission to provide various types of **Civil Support (CS)** to federal, state, and local executive authorities, when directed by the President. This support falls under the broad category of **Military Assistance to Civil Authorities (MACA) and** consists of three subordinate mission sets:

- **Military Support to Civil Authorities (MSCA***),* a mission involving DOD support following natural or manmade disasters, chemical, biological, radiological, nuclear or high explosive (CBRNE) consequence management and other support as required;

- **Military Support to Civilian Law Enforcement Agencies (MSCLEA)**, a mission involving DOD support to civilian law enforcement agencies. This includes, but is not limited to, combating terrorism, counterdrug operations, border patrol augmentation, and critical infrastructure protection;

- **Military Assistance for Civil Disturbances (MACDIS)**, a mission involving DOD support normally based on the direction of the President, to suppress insurrection, rebellions, domestic violence, and provide federal supplemental assistance to the states to maintain law and order.

Finally, the HLS JOC includes DoD responsibilities for **Emergency Preparedness (EP)**. These responsibilities involve the mission sets of **Continuity of Operations (COOP***)*, **Continuity of Government (COG0***),* and other EP roles to sustain Federal Government functions under extraordinary circumstances, as directed by the President.

The U.S. Armed Forces need a series of capabilities to carry out these HLS missions. These capabilities include the ability to: detect, prevent, and defeat potential threats to the homeland via timely, even preemptive attacks carried in forward regions; detect, prevent, and defeat ballistic missile and airborne attacks on the homeland; detect and defend against hostile space systems, detect, prevent, and defeat maritime threats to

the homeland; deter and defend against physical and cyber threats to DoD assets and the defense industrial base in the homeland; project power to defend the homeland; and prepare for and mitigate the effects of multiple, simultaneous CBRNE events.

USNORTHCOM, with the support of NORAD, drafted the *Homeland Security JOC*.

4. Strategic Deterrence[19]

As defined within the *Strategic Deterrence Joint Operating Concept (SD JOC),* strategic deterrence involves prevention of adversary aggression or coercion threatening the vital interests and/or the national survival of the United States by convincing our adversaries not to take such actions. Such deterrence is achieved by decisively influencing an adversary's decision-making process. To this end, the *SD JOC* describes how joint forces will plan, prepare, deploy, employ, and sustain to achieve strategic deterrence objectives set forth by the national leadership of the United States.

In order to achieve these objectives, joint force operations and activities (the means) must decisively influence (the ways) the potential adversary's "center of gravity" of potential adversaries--the decision-making calculus of key adversary leaders. The *Strategic Deterrence JOC* emphasizes that formulating an effective set of strategic deterrent joint operations and activities requires the joint force commander to undertake serious efforts to gain an understanding of the adversary's point of view, decision calculus, and inclinations, including his risk-taking propensities. Moreover, effective strategic deterrence may be applicable across the full range of conditions, in peacetime and crisis, as well as during armed conflict, when deterrence bears on escalation or de-escalation, war termination, and post-hostilities operations.

The authors of the *Strategic Deterrence JOC* note that they propose to broaden the concept of deterrence beyond one that focuses solely on threatening potential adversaries with unacceptable retaliatory damage as the main means of deterrence. The *Strategic Deterrence JOC* identifies three fundamental approaches to influencing an adversary's decision-making process in order to achieve deterrence of acts that would cause grievous harm to the United States. The first is to credibly threaten to ***deny the adversary the benefits or gains*** he might seek, should he undertake a hostile act, an approach often described as "deterrence by denial." The second is the familiar approach of credibly threatening an adversary that should he embark on a course of action that would pose a grievous threat, one will ***impose serious costs*** on him that will be viewed as too painful to endure The third is to ***induce adversary restraint*** by constraining one's own actions and thus reducing his incentives to undertake the hostile actions we wish to avoid due to his belief about the consequences of such restraint. The *Strategic Deterrence JOC* emphasizes that these three approaches are mutually reinforcing, and should be pursued in an integrated fashion to deter threats to U.S. vital interests.

[19] Excerpted from the draft *Strategic Deterrence Joint Operating Concept*. Version 0.4, 7 January 2004.

Due to the breadth of the potential adversary actions the United States will seek to deter, the *Strategic Deterrence JOC* notes that a wide range of enabling concepts and capabilities, several of which directly connect to other JOCs, are needed to provide the means to underwrite the three aspects of the concept.

Key capabilities that are needed to support strategic deterrence include:

- **Global situational awareness**, including improved understanding of the likely intentions, views, and inclinations of the leaders of hostile states and non-state actors;

- **Command and control capabilities**, including robust, secure, reliable connectivity among the senior national leadership, the COCOMs, and the forces to support timely planning and execution of strategic deterrence operations;

- **Overseas presence** that visibly demonstrates U.S. security commitments in key regions, assists in intelligence monitoring of events and adversary capabilities, and helps provide the basis for timely, effective force projection response;

- **Military cooperation and integration with coalition partners and allies** that strengthen both the image of U.S. commitment to our allies and our collective capabilities for effective political and military response;

- **Force projection capabilities**, including the ability to decisively defeat an adversary in a major combat operation, will provide a powerful, combined benefit denial and cost imposition deterrent threat to any would-be aggressor

- **Nuclear strike capabilities** that can provide the ultimate means to terminate a conflict, deny benefits, and rapidly impose devastating costs;

- **Active and passive defenses**, including air and missile defenses that protect U.S. projection forces and the homeland, WMD/E protection measures, homeland security consequence management measures, and critical infrastructure protection;

- **Inducement operations** such as sharing warning of potential aerospace or terrorist attack with potential adversaries or exercising restraint in war aims to encourage reciprocal restraint;

- **Strategic deterrence information operations** that can both communicate U.S. political resolve to deliver on its deterrent threats and provide computer network attack and defense capabilities that can be employed to impose costs by disrupting critical networks and to deny benefits by protecting key U.S. military networks;

- **Space control capabilities**, including space situational awareness, protection of friendly space systems, prevention of adversary use of space systems and

services, and the ability to negate space systems and systems used for hostile purposes in order to ensure that the United States and its allies can access and utilize space while adversaries are denied such opportunities; and

- **Global strikes** of limited duration that are carried out rapidly and designed to achieve desired effects against highly valued adversary assets.

The *Strategic Deterrence JOC* discusses an end-to-end concept for the planning and executing customized global strikes that could be rapidly carried out over extended ranges. This enabling concept links focused intelligence, surveillance, and reconnaissance (ISR) collection and analysis, responsive command and control, and a wide range of kinetic and non-kinetic precision strike means in a highly reliable fashion. The JOC also emphasizes that if this global strike capability is to have cost imposition and benefit denial deterrent value, the threat of its use must be credibly communicated to potential adversaries.

The lead for the development and refinement of the *Strategic Deterrence JOC* is United States Strategic Command (USSTRATCOM).

C. The Joint Functional Concepts and Their Role in Capability Development

The joint functional concepts will complement joint operating concepts and serve as guides to joint and Service capability development. While each of the joint operating concepts is focused on a particular type of future operation within the range of military operations, joint functional concepts describe generic approaches to providing a particular capability across the range of military operations. Individual joint functional concepts often lay out enabling concepts that describe how future U.S. joint forces will provide the desired joint capabilities needed to perform critical tasks identified within a functional area. These enabling concepts must provide a level of specificity that can be captured in a series of architectural views, support experimentation and enable the development of metrics for capability performance in the various functional areas.

The five functional concepts currently under development at the direction of the Joint Chiefs of Staff are Protection, Force Application, Focused Logistics, Battlespace Awareness, and Joint Command and Control (Joint C2). As will be the case for the JOpsC and the joint operating concepts, the functional concepts will continuously be reviewed and refined through an iterative process that involves various types of experimentation in order to leverage the possibilities afforded by new ideas, new technologies and alternative organizational constructs.

1. Protection[20]

The *Protection Joint Functional Concept* focuses on providing the capability to prevent harm to personnel (combatants and non-combatants), physical assets, and information required to ensure the joint/combined force's fighting potential can be applied at the decisive time and place against the full spectrum of threats and to prevent serious

[20] Drawn from the draft *Protection Joint Functional Concept*, Version 1.0, 31 December 2003.

damage to the American homeland and to the homelands of allies. Protection will be achieved through the tailored selection and application of multi-layered, active and passive, lethal and non-lethal defensive measures within the air, land, sea, space, and cyber domains across the range of military operations. In the projected future warfare environment, protection will, of necessity, be provided against attacks that are undertaken by both state and non-state actors on the United States, our forces at home and abroad, allies, and friends. Protection must be proactive, focused and carried out in depth by layering integrated, military and interagency capabilities in a manner tailored to the threat.

The *Protection Joint Functional Concept* emphasizes that the joint force must be capable of protecting itself during deployment, that is, from the point of origin through transit and arrival in theater, during employment, sustainment, and ultimately, redeployment. The goal of these efforts will be to prevent the enemy from employing attack capabilities against the joint force that would restrict or prevent it from achieving decisive results at a time and place of our choosing

Achieving the desired degree of joint protection will involve the synergistic application of multiple, related, but independent, protection functions. These functions comprise a "protection construct." The protection construct depends upon and supports the other functional capability areas in order to conduct the protection mission. The internal functions of the protection construct work as a system-of-systems to sense, understand, decide upon, and execute defensive actions to neutralize adversary attack capabilities. The *Protection Joint Functional Concept* identifies the following activities within the protection construct as those that must be integrated via specific enabling concepts to provide protection: *detect* adversary actions; accurately *assess* the adversary actions to develop actionable intelligence; *decide* on an appropriate course of action, *issue a* timely *warning* to friendly forces of the ongoing adversary attack*, task* force elements to execute the selected course of action, to direct focused activities to *defend (actively and passively)* against the attacks, and *recover* in minimum time following the attack.

To implement the protection mission, the *Protection Joint Functional Concept* identifies three protection mission capability areas (MCAs): Personnel Protection, Physical Asset Protection and Information Protection. A series of enabling concepts, built in accordance with the sequential functions of the protection construct, are under development that will guide the creation of the needed future capabilities to address the mission capability elements in each of the three mission capability areas.

The Protection Joint Functional Concept also calls for more tightly integrating protection activities within and among the MCAs, and for more effectively integrating DoD protection activities in general with multi-national and civilian law enforcement agencies.

The Joint Staff's J-8 Directorate is the lead for the ongoing development of the *Protection Joint Functional Concept*.

2. Force Application[21]

Force application is the use of *engagements* and *maneuver* to create the effects necessary to achieve assigned mission objectives. Thus it focuses on two major activities: *maneuver* of forces into and through the battlespace to gain a position of advantage for engagement in order to generate or enable the generation of the desired effects on the enemy; and *engagement* to impose friendly combat power on the enemy (including the use of kinetic and non-kinetic means to create lethal and non-lethal effects). The concept emphasizes that more effective *synchronization,* that is, the arrangement of military actions in time, space and purpose to produce maximum combat power at a decisive place and time, is the single attribute of force application that has the greatest potential to transform this capability in the years ahead.

Maneuver is an activity that is clearly fundamental to force application. Often closely linked to the use of firepower, maneuver is employed in combination with fires or the potential for fires to achieve a position of advantage in the battlespace and thus create the desired effect. The maneuver of forces to create or support effects requires a series of actions. First the more modular, smaller, lighter future joint force must be able to quickly move strategic distances and, in some cases, enter directly into the fight. Then these forces must seize the initiative and move quickly and at will through all domains, including complex, urban terrain, to seize fleeting opportunities and carry out engagements across the depth and breadth of the battlespace. Future joint forces will apply continuous pressure and operate at a tempo that enables them to operate within the enemy's decision cycle.

Engagement, which often occurs between opposing, lower echelon maneuver forces, is designed "to bring the enemy under fire" and thus rapidly create desired effects. The *Force Application Functional Concept* broadens the notion of "fires" beyond classic kinetic fires (missiles, bombs, direct fire weapons) to include non-kinetic capabilities such as computer network attack and psychological operations, as well as electronic jamming and new, directed energy weapons, many of which can produce non-lethal effects. U.S. forces must be versatile and accurate in order to create necessary effects under all conditions and in all environments. In addition, given the emphasis on generating a wider range of effects, metrics for measuring success must broaden beyond traditional tallies of physical results—enemy armor/aircraft damaged or destroyed, territory occupied, to the measurement of behavioral effects with regard to enemy leadership, forces, and other targeted groups.

An exemplar vignette of a "war fight" in 2015 presented in the *Force Application Functional Concept* discusses the various actions that will be needed for effective future force application. The vignette emphasizes the critical role of timely, persistent and ubiquitous ISR capabilities in helping provide the superior, widely shared, battlespace awareness required to detect, identify, and target the most critical enemy nodes for attack and to immediately assess the effectiveness of these engagements. It points out as well the key role to be played by joint command and control in planning and directing

[21] Drawn from the draft *Force Application Functional Concept*, December 2003.

precision, high volume engagements, employing the full range of kinetic and non-kinetic, lethal and non-lethal means, including global offensive information operations. The vignette also notes the importance of a timely, accurate depiction of the rapidly changing battlespace in enabling agile, dispersed friendly forces to maneuver to positions of advantage and engage enemy forces in a decentralized and self-synchronizing mode of operations. The net result will be a speed of maneuver combined with a rapid succession of high tempo engagements against key centers of gravity that will relentlessly pressure the enemy on multiple fronts, leading to the crumbling of his cohesion and the collapse of his will to keep fighting

The force application concept identifies and discusses eleven attributes associated with improved, future combinations of maneuver and engagement, including the issue of synchronization noted earlier. These broad categories of desired qualities include:

- **Lethal** - able to create desired effects using destructive capabilities
- **Non-lethal** - able to create desired effects using incapacitating, non-fatal capabilities
- **Discriminating** - able to limit collateral damage and undesirable second order consequences of force application
- **Predictive** - able to accurately estimate the effects of force application
- **Streamlined** - able to rapidly make and disseminate decisions
- **Networked** - having the elements of the joint force connected to one another via the Global Information Grid
- **Tailored** - able to scale forces to fit the mission
- **Strategically agile** - able to apply force rapidly across strategic distances
- **Tactically agile** - able to move through all domains of the battlespace, into and within the theater
- **Synchronized** - able to integrate the actions of widely distributed forces in time and space
- **Tactically dominant** - able to overmatch the enemy and dominate all encounters in the battlespace

The J-8 Directorate of the Joint Staff is leading ongoing development of the *Force Application Functional Concept*.

3. Focused Logistics[22]

The *Focused Logistics Joint Functional Concept* seeks to build sufficient *capacity* into the future U.S. deployment and sustainment pipeline, to exercise sufficient *control* over the pipeline from end-to-end, and to provide the ability to rapidly adjust to changing political and military constraints while providing a high degree of *certainty* to the supported joint force commander that forces, equipment, sustainment, and support will arrive where needed and on time. The concept describes a comprehensive, integrated approach for transforming DoD logistics capabilities and for dramatically improving the quality of logistics support. The foundation for this transformation in logistics will be

[22] Drawn from the draft *Focused Logistics Joint Functional Concept*, Version 1.0, December 2003.

effective use of a real-time, Web-based, network centric information system that tracks and predicts logistics demands while also providing accurate, actionable asset visibility as part of a common operational picture.

The central idea of focused logistics is expressed in the following hypothesis:

If we can
- Build sufficient capacity into the deployment and sustainment pipeline;
- Exercise sufficient control over the pipeline from end to end; and
- Provide a high degree of certainty to the supported joint force commander that the required forces, equipment, sustainment, and support will arrive on time;

Then the expected result will be
- More timely and precise delivery of mission-ready forces and their essential support to destinations specified by the supported joint force commander;
- Right-sized (and potentially reduced) combat support and combat service support footprint in the joint or combined operations area; and
- More cost-effective logistics support for the warfighter.

Two major ongoing initiatives—the Logistics Transformation Initiative and the Force-centric Logistics Enterprise—are key building blocks that are helping lay the foundation for logistics transformation. These initiatives represent a shift from supply-based logistics to an open and more agile, customer-oriented, distribution-based logistics capability. These initiatives will provide the foundation for real-time logistics situational awareness and will help increase warfighter confidence in future logistics support by:

- Optimizing logistics business processes,
- Transitioning to a logistics system open architecture that provides interoperable and actionable logistics information, and
- Enhancing logistics response to the joint warfighter.

The Logistics Transformation Initiative has already started establishing the foundation for focused logistics capabilities through four significant efforts:

- **Customer Wait Time (CWT).** CWT measures the total elapsed time between when a customer's documented requirement is established and when that same customer acknowledges receipt of the material requested.
- **Time-Definite Delivery (TDD).** Using a simplified priority ordering system, TDD will give the customer a high degree of confidence that assets will be delivered within the time frame established by the customer.
- **Total Asset Visibility (TAV)** and **In-Transit Visibility (ITV).** TAV provides visibility of all assets in process (being acquired or in maintenance), in storage, or in transit. DoD will fill gaps in ITV capability by using automatic identification technology at critical nodes for accurate source data collection and a collaborative information operating environment for the exchange of actionable information.

- **Web-Based, Collaborative Information Environment**. This approach will leverage web technologies to obtain real-time, access to accurate, actionable information to help operators and logisticians achieve real-time situational awareness.

The Force-centric Logistics Enterprise (FLE) is the implementation phase of DoD's comprehensive program to integrate logistics with operational planning and to meet warfighter requirements for more agile and rapid support. FLE initiatives will enable rapid projection and sustainment of joint forces, compression of supply chains, and reduction of cycle times. The FLE provides for enterprise integration achieved through use of proven commercial enterprise solutions and enterprise-wide policies and procedures. This integration will result in warfighter focused weapons systems and end-to-end warfighter support. .

The joint logistics and joint warfighting science and technology communities have identified seven critical new or improved capabilities essential to transforming DoD logistics efforts to meet the needs of the future joint warfighter. The seven major capabilities needed for Focused Logistics are:

- **Joint Deployment/Rapid Distribution -** A fully enabled, full spectrum-capable mobility system, supported by a robust infrastructure, with the appropriate deployment and distribution processes and capabilities to carry out optimized rapid power projection, maneuver within the operations area, and sustainment at the place and time required.

- **Agile Sustainment -** Agile, responsive organizations and processes that can provide flexible, tailored sustainment, including precision tactical resupply, by employing commercial best practices and employing monitoring, diagnostic and prognostic devices to anticipate demand for current and next generation supported weapons systems.

- **Operational Engineering -** More effective, efficient, responsive, tailored engineering support, including new tools for rapid engineer assessments and contingency planning, that will make more effective use of pre-positioning, contract, and host nation capabilities to more rapidly meet warfighter operational needs while reducing lift requirements.

- **Multinational Logistics -** Improved interagency and multinational logistics interoperability, particularly with regard to peacekeeping, stability, humanitarian assistance, and foreign disaster relief operations.

- **Force Health Protection -** Strengthened protection of Service members from all health and environmental hazards across the full range of military operations and activities via a life-cycle health maintenance program for our people and providing better support of the health needs of the fighting forces and their families across the continuum of medical services

- **Logistics Information Fusion -** A robust, agile, survivable, end-to-end, net centric information grid, supported by needed enterprise services, that can capture and exploit timely, accurate data to merge operational and logistics information into a single, integrated, common operational picture that increases asset visibility and enables more efficient use of logistics resources to support operational needs.

- **Joint Theater Logistics Management -** Visualization and decision support tools as well as a fully collaborative capability to allow a joint force commander to be able to effectively synchronize, prioritize, direct, redirect, integrate, and coordinate common-user and cross-Service logistics commodities and functions

All these efforts are directed toward creating a logistics system that will be characterized by a network centric, distribution-based, anticipatory, demand-driven, performance-based approach to the logistics enterprise. A Web-based, shared data environment will enable shared operational and logistics situational understanding as well as collaborative planning and execution by logistics units that are agile and adaptive.

The Joint Staff Logistics Directorate (J-4) has the lead for the development of the *Focused Logistics Joint Functional Concept*, working through the Focused Logistics Working Group and under the guidance of the Focused Logistics Functional Capabilities Board (FCB).

4. Battlespace Awareness[23]

Although battlespace awareness is an important factor in decision-making at all echelons, for purposes of the *Functional Concept for Battlespace Awareness*, such awareness is the situational knowledge with which the joint force commander (with his staff) plans operations and exercises command and control at the operational level of war. The *Functional Concept for Battlespace Awareness* is designed to provide commanders and warfighters with "actionable intelligence" that allows them to make better decisions faster by enabling a more thorough understanding of the environment in which they operate, relevant friendly force data, the adversaries they face, and those non-aligned actors that could aid in or detract from blue force success in the battlespace.

In the future, efforts to create superior battlespace awareness will involve a wide range of capabilities to include precision collection planning, new forms of technical collection, enhanced HUMINT, and a constellation of highly responsive sensors (unattended, human, intrusive, and remote) to provide persistent, redundant and tailored coverage of the battlespace. A "producer interactive network", continuously synchronized with operations, will enable all force elements to subscribe to both real time and archival, fused data. Software agents will broker data and products, posting some unprocessed information. All users will be provided with access to common data, enabling joint, allied, and coalition warfighters to construct tailorable, relevant pictures.

[23] Drawn from the draft *Functional Concept for Battlespace Awareness*, Version 2.1, 31 December 2003.

Advanced fusion, assessment, and modeling and simulation capabilities will help provide friendly forces with an understanding of the adversary's potential courses of action through rapid and continuous forecasting of alternatives. This will enable commanders to make operational decisions more rapidly and effectively by enhancing actual and predictive cognizance. The ISR collection and assessment activities that support superior battlespace awareness will also be greatly enhanced through precise monitoring of current and potential future uses of these resources, thus permitting commanders to quickly re-task multiple sensors and assessment assets to react to emerging operational situations.

Battlespace awareness has a pervasive effect on all aspects of military operations. It is the key to increasing the reach, persistence and agility of our military capabilities while also increasing the range of military options available. Substantial improvements in such awareness will allow joint forces to rapidly overcome enemy anti-access and area denial efforts, to bring combat power to bear at critical points to achieve desired effects, to avoid enemy denial and deception, and to thwart enemy attempts to harm U.S. forces and interests around the world. Accurate battlespace awareness regarding the status of our own forces and the activities that support them will make possible highly responsive, focused logistics practices that move the right personnel, supplies, and assets in the right quantities to the right place at the right time.

The *Functional Concept for Battlespace Awareness* is being developed under the leadership of Joint Staff's J-2 Directorate and Defense Intelligence Agency (DIA), with J-3 as a strong participant. More detailed discussion of the concept is included in Section V of this roadmap, which addresses Joint Intelligence.

5. Joint Command and Control[24]

The *Joint Command and Control Functional Concept* focuses on achieving agile C2 capability in 2015 by dramatically improving the speed and quality of commanders' decision processes and the decisions they make, while also enhancing their ability to oversee and adapt their plans during execution. At its core, command and control is about decision-making and the individuals who make decisions. These improvements are made possible by connecting individual commanders and their staffs across echelons and functions of a military organization and enabling collaboration during decision-making via the GIG-enabled, networked infrastructure.

Future Joint C2 will also:

- Allow people in large organizations to interact with the directness, informality, and flexibility typical of small, cohesive teams or organizations;

- Allow commanders and staffs to tailor the C2 system as required by quickly assembling cohesive teams and by adopting C2 procedures suited to each situation rather than relying on "one size fits all" procedures; and

[24] Drawn from the draft *Joint Command and Control Functional Concept*, Version 1.0, 31 December 2003.

- Allow the joint force to exploit the benefits of decentralization--initiative, adaptability, and increased tempo--without sacrificing coordination and unity of effort.

The Joint C2 Functional Concept envisions a dynamic, decentralized, distributed, deployable and highly adaptive form of joint C2.

A much more complete discussion of the Joint Command and Control Functional Concept, which is being developed by the Command, Control, Communications, and Computer Systems Directorate (J-6) of the Joint Staff, is found in Section IV of this roadmap, which addresses Joint C2.

D. Enabling Concepts

To provide a greater level of specificity and technical detail, the joint operating concepts and functional concepts discussed in this section are often broken down into more focused enabling concepts. Enabling concepts crosscut functional and operating concepts, describing how particular tasks or procedures are performed within the context of the broader operating concept or functional area. These concepts must be developed, experimented on and validated with sufficient specific detail to directly link capabilities to military tasks.

Enabling concepts are being developed both in the joint arena and by the Services when they fall within a Service core competency.

III. Decision Superiority and the Global Information Grid

A. Overview

Decision superiority is the process of making "better decisions arrived at and implemented faster than an opponent can react, or in a non-combat situation, at a tempo that allows the force to shape the situation or react to changes and accomplish its mission."[25] The ability to achieve decision superiority is an essential attribute of a joint force and is fundamental to the application of operational concepts that are based on speed and agility. Decision superiority combines battlespace awareness and command and control. It enables commanders to rapidly develop alternative courses of action, communicate decisions to subordinates, generate required effects, assess results and conduct appropriate follow-on operations. The desired result is the employment of tailored force packages that integrate Service core competencies for effective joint and combined operations.

Decision superiority is founded upon information superiority, which is the key enabler for transforming DoD operational processes and organizations into Information Age, net-centric constructs. Information superiority is defined in Joint Publication 1-02 as "that degree of dominance in the information domain which permits the conduct of operations without effective opposition." These concepts of information and decision superiority undergird all of the new joint operational concepts and transformational capabilities addressed in this roadmap.

Information superiority may be further defined as the ability of one's own and friendly forces to use information for their own purpose and to deny or exploit the adversary's use of information. Thus information superiority has both an "information support" and an "information operations/information warfare" component.

The DoD vision for information support services, developed by the DoD Chief Information Officer/Assistant Secretary of Defense for Networks and Information Integration (ASD (NII)/DoD CIO) is as follows:

> **DoD GIG Vision:** ***Power to the Edge! People throughout the trusted, dependable and ubiquitous network are empowered by their ability to access information and recognized for the inputs they provide.***

Information superiority, and the corollary concept of decision superiority, provide the foundation for all of the new joint operational concepts and transformational capabilities addressed in this roadmap.

The GIG is the single most important enabler of information/decision superiority, and hence an essential enabler of DoD transformation. The GIG, as defined in DoDD 8100.1, is "the globally interconnected, end-to-end set of information capabilities,

[25] *Joint Vision 2020.*

associated processes, and personnel for collecting, processing, storing, disseminating, and managing information on demand to warfighters, defense policymakers, and support personnel." The GIG satisfies the legislative mandate for an integrated technical architecture (ITA) required by Title 10 USC, section 2223. The 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. It also includes national security systems as defined in section 5142 of the Clinger-Cohen Act of 1996 (reference (e)). The GIG supports all DoD, national security, and related Intelligence Community missions and functions (strategic, operational, tactical, and business), in war and in peace. The GIG provides capabilities from all operating locations (bases, posts, camps, stations, facilities, mobile platforms, and deployed sites). The GIG provides interfaces to coalition, allied, and non-DoD users and systems." As such, much of the Information Technology (IT) transformation is centered on transforming the GIG.

Figure 4 provides a high-level systems view of the GIG.

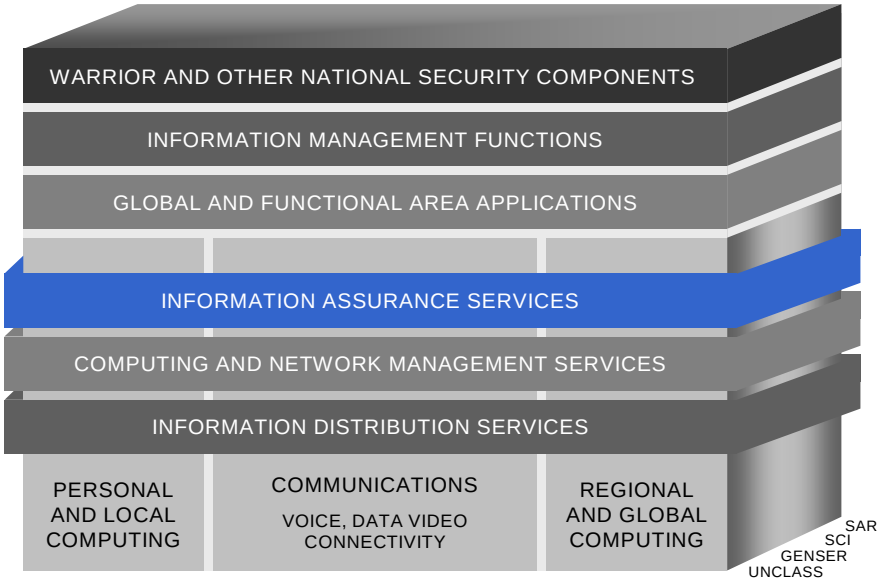

Figure 4: Global Information Grid

The foundation component guides the planning and implementation of the other components. It addresses the areas of policy, process, architecture and standards, and recognizes that net-centricity will require changes in doctrine and governance. These communications (transport) layer provides a comprehensive terrestrial and space network, achieving the vision of a secure, ubiquitous global network for all users. The computing and applications layers provide the net-centric environment to support GIG Enterprise Services and user applications and tools for warfighting and business operations. NetOps, (which includes Information Assurance), and Data Management are the cross-cutting components. The data management focus is on tagging all data assets with metadata to support discovery, which enables smart pull. NetOps is the

organizational and procedural framework to monitor, manage, coordinate, secure, and control the GIG.

The future GIG architecture will employ a robust communications layer founded upon expanded terrestrial bandwidth, the transformational satellite communications, Teleports, and the JTRS. It will utilize Internet Protocol version 6 (IPv6) standards for internetworking and incorporate common enterprise services, horizontal fusion capabilities, and enterprise data management. This future GIG architecture, termed the "objective" architecture for the purposes of the Joint Transformation Roadmap, is expected to be largely in place by FY10 or FY11. It will dramatically improve joint interoperability and information-related capability at the levels of communications/networking, data, and enterprise services.

Full realization of the GIG vision and related capabilities is fundamental to gaining and maintaining information/decision superiority and achieving the DoD vision of "power to the edge." The GIG is the integrated technical architecture (ITA) required by Title 10 USC, section 2223 and supports the transformational goal of fundamentally joint, net-centric, distributed forces, capable of rapid decision superiority and massed effects across the battlespace. It can lead to accomplishing future missions more successfully with smaller forces and fewer casualties. Furthermore, GIG deployment directly supports three of the six QDR operational goals--leverage information technology to develop an interoperable, joint C4ISR architecture and capability, conduct Information Operations, and enhance space operations, and is an underlying premise for the other three—protect critical bases of operation, project and sustain U.S. forces in anti-access/area denial environments, and deny enemies sanctuary through persistent ISR and precision strikes. Information superiority is a key enabler of efforts to transform joint force operational capabilities.

Deployment of the GIG, including the initiatives described below and related efforts, is proceeding under the leadership and overall direction of the Assistant Secretary of Defense for Networks and Information Integration (ASD (NII))/DoD Chief Information Officer (CIO). The ASD (NII) efforts are directed at creating a ubiquitous, secure, robust, trusted, protected, and routinely used enterprise infrastructure, populated with the information and information services needed to enable network centric operations in warfighting as well as business functions. The Director for Command, Control, Communications, and Computer Systems, (J-6) on the Joint Staff, plays a key role in guiding the implementation and operation of the GIG vision.

DISA is also is a key implementer of the DoD GIG vision, carrying out transformation efforts across the DoD enterprise, along with the Services, combatant commanders, other Defense and government agencies, as well as with the private sector. DISA is responsible for planning, engineering, acquiring, fielding, and supporting global net-centric solutions and for operating the Global Information Grid. As a combat support agency, DISA provides key components and services with military value-added features for building the net-centric enterprise: global terrestrial networks and links to space networks; computing services to exploit the network and support applications; GIG network operations, including information assurance, to maintain and protect the data

and the network; joint applications and tools needed for a capabilities based force; and information/data management to help ensure all information is discoverable. In addition, improving Presidential communications capabilities is a national priority and a DoD responsibility in which DISA plays a major role. DISA's contributions to joint C2 transformation are addressed in the Joint C2 section. The transformation to a net-centric environment is based on adopting and adapting to Information Age technologies. The figure below summarizes the direction of this transformation. For example, the limited operational picture that comes from a "push" of information to the "edge" user will be replaced with situational awareness that is "pulled" by the various users and based on a view that is "common," since it is derived from shared, cross-correlated, time-tagged, geo-spatially referenced data, but tailored to each user's information needs and preferences, based on his function and location. While "smart pull" will become the predominant means of information dissemination, "smart push" will continue to be used for time/mission critical information, such as missile launch warnings, when needed.

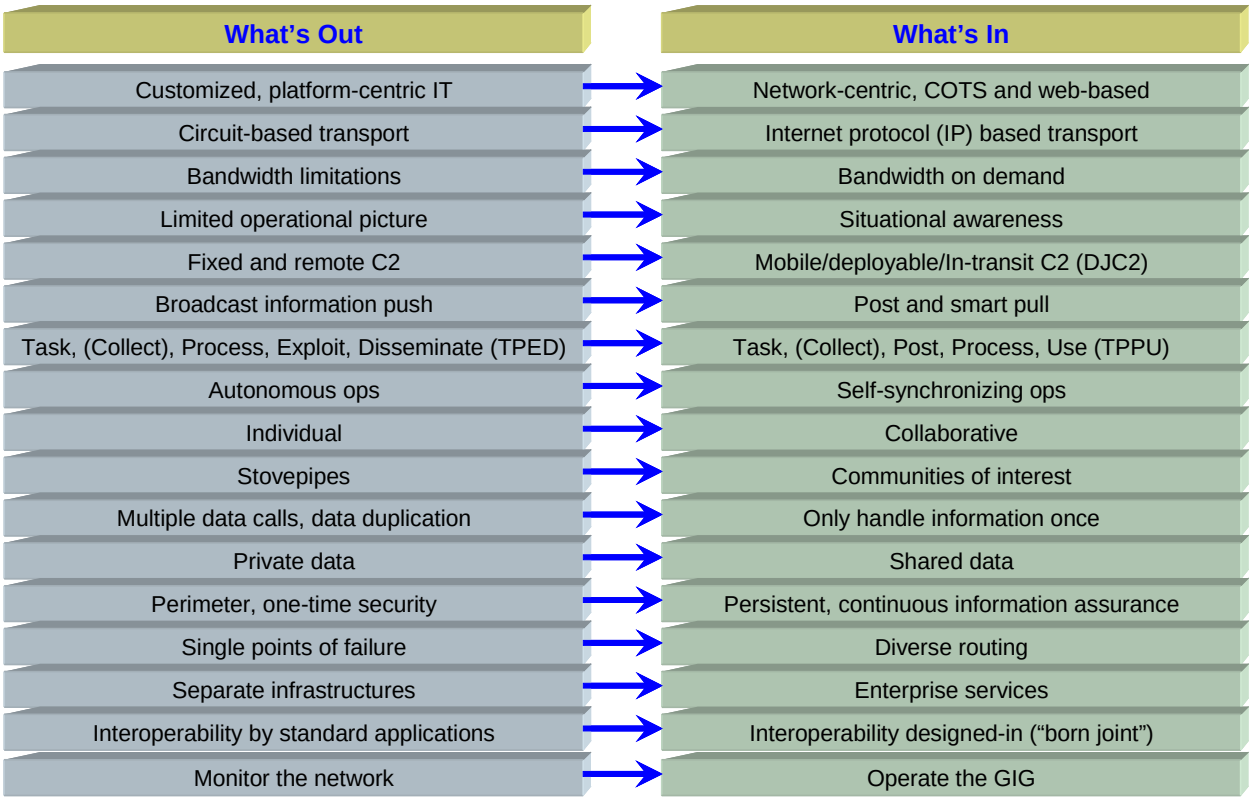

Figure 5: Direction for Transformation

These transformation efforts must be accompanied by changes in organizational processes, cultures, and behaviors to move power to the edge, such as new ways of thinking about how to accomplish missions, how to organize and interrelate, and how to acquire and field the systems that support the warfighter.

Business modernization must also be addressed because the principles that apply to net-centric warfare[26] must be incorporated in the business functions and processes that support the warfighter. These efforts involve both the DoD Chief Financial Officer and the CIO. The CIO involvement includes ensuring that net-centric architectural tenets are reflected in business process improvements, system acquisition oversight, and ensuring that IT infrastructure capabilities are in sync with the business functions' requirement for these capabilities.[27]

B. GIG Transformation: DoD Initiatives

1. Transformational Communications Architecture

The Transformational Communications Architecture defines the transport element of the GIG and will be composed of three integrated segments. The terrestrial segment will be based upon fiber optics and includes the GIG Bandwidth Expansion (BE). Along with GIG-BE, DoD components are developing base and installation-level bandwidth expansion strategies that will provide a bridge from the installation-level telecommunications infrastructure to the expanded GIG. Teleports provide the media junction between space and terrestrial assets. The wireless or radio segment will be based upon the software programmable JTRS. JTRS is a family of software-defined radios with inherent cross-banding and IP routing capability. The space-based segment (Transformational Communication Satellite) will provide satellite communications capability with greatly increased bandwidth and integrated, multi-agency networking capability based on the Internet Protocol.

GIG Bandwidth Expansion. The DISA-led GIG-BE initiative will provide a transport system that delivers high-speed internet protocol services to key operating locations worldwide, using leading edge technologies from commercial industry. GIG-BE will expand bandwidth, allowing the use of more robust information tools such as collaborative applications for C2, and near real time video for ISR applications. GIG BE initiative provides a network "redundancy" that ensures assured access to a reliable network, one with diverse information pathways. Specifically, GIG-BE will connect over 100 key intelligence, command, and operational locations. Current plans call for the completion of the backbone upgrades and access to approximately one third of locations in FY 04 and the remaining locations in FY 05. DISA will also work to synchronize and rationalize various network efforts among the Services, Intelligence Community, and DISA.

[26] For the purpose of this document, net-centric warfare is defined as "An information superiority-enabled 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. In essence, NCW translates information superiority into combat power by effectively linking knowledgeable entities in the battlespace." *Network Centric Warfare, Developing and Leveraging Information Superiority, 2nd Edition (Revised)* by Alberts, Garstka, and Stein.

[27] Based on testimony from Mr. John Stenbit, ASD(NII), before the Subcommittee on Terrorism, Unconventional Threats and Capabilities, House Armed Service Committee, 3 Apr 2003.

Table 1: GIG BE Investment Plan

GIG-BE*	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	383.1	11.8	11.9	12.1	12.2	12.4

* Based on PresBud (PB) 04

Joint Tactical Radio System (JTRS). The JTRS program consists of a series of related joint acquisition activities, conducted by the JTRS Joint Program Office, designated Service Program Management Offices, and other DoD agencies. The Army has been designed as the executive agent. JTRS is a family of software-defined radios with inherent cross-banding and IP routing capability. This joint program is responsible for architecture, waveforms, and testing/certification, plus a family of Service-led programs defined by domain "clusters." JTRS will provide the communications and networking capability for mobile forces that, together with the GIG-BE and TC initiatives, will enable robust enterprise-wide networking. JTRS will replace virtually the entire current inventory of tactical radios and, ultimately, SATCOM terminals as well. Furthermore, JTRS will have an inherent mobile networking capability that will enable mobile forces to remain connected to an IP network. This will be the primary reachback conduit for non-dispersed mobile forces. JTRS Cluster 1 (ground vehicular and Army rotary-wing aviation) is expected to enter low-rate production by FY06, with the handheld, maritime/fixed, airborne, and small form-fit clusters to follow. The other clusters are expected to reach IOC between FY08 and FY10.

Table 2: Joint Tactical Radio System Investment Plan

JTRS	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	599.8	682.4	806.9	1144.2	1297.9	1025.5

Transformational Communications Satellite (TSAT). The space-based segment of the GIG transport architecture will expand current capabilities, extending the network's full capability to mobile and tactical users. It will provide satellite communications capability with greatly increased bandwidth and integrated, multi-agency networking capability. It will incorporate Internet Protocol and laser communications capabilities into the Department's satellite communications constellation

Table 3: Transformational Communications Investment Plan*

TC	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	341.4	530.8	974.8	1260.0	1792.0	2119.5

2. Teleport Program

The Teleport program will provide critical support for the deployed warfighter. The program uses a phased approach to meet communications reach-back requirements for scenarios ranging from small-scale conflicts to major combat operations. It will support warfighters with extended multi-band satellite communication capability and a seamless access to terrestrial components of the DISN. Currently the Standardized Tactical Entry Point (STEP) program provides the gateway for X-band traffic only, with a basic suite of baseband equipment at each of fifteen Defense Satellite Communications Systems [DSCS] sites.

Teleport, along with planned STEP upgrades, will greatly expand throughput and enhance warfighter interoperability through access to and between military and commercial satellite communications systems. DISA is implementing Teleport in three generations. Generation One will be operational in 2006, with Generation Two capabilities scheduled for completion in 2007 and Generation Three in 2012.

Table 4: Transformational Teleport Investment Plan*

Teleport / STEP	FY04	FY05	FY06	FY07	FY08	FY09
Teleport Dollars (M)	76.7	58.7	51.0	29.8	30.9	31.6
STEP Dollars (M)	7.4	7.6	6.6	6.7	6.5	6.7
Total (M)	84.1	66.3	57.6	36.5	37.4	38.3

* Based on President's Budget (PB) 04

3. Mobile SATCOM

Mobile satellite phones have made dramatic differences to our deployed warfighters, transforming battlefield communications, especially in the war against terrorism. Continued availability of an improved, global, handheld, secure-voice communications capability is critical. This capability, provided with Enhanced Mobile Satellite Services (EMSS), has been used extensively during Operation Enduring Freedom and Operation Iraqi Freedom. Transformational initiatives in this area include 2-way direct SIPRNet, digital encryption, and high-speed data connectivity. Program Budget Decision 82 in 2002 designated DISA as executive agent and assigned funding responsibilities to DISA and other DoD components.

Table 5: Transformational Mobile SATCOM Investment Plan*

Mobile SATCOM	FY04	FY05	FY06	FY07	FY08	FY09

Dollars (Millions)	39.6	0.0	0.0	0.0	0.0	0.0

* Based on President's Budget (PB) 04. According to PBD 082: DISA, the Joint Staff, and the User Community are to review/validate EMSS requirement before funding is provided for FY05 and beyond.

4. Internet Protocol version 6 (IPv6)

DoD will transition to the new Internet protocol by 2008. IPv6 standard is the next generation network layer protocol of the Internet, and it will improve end-to-end security and quality of service, especially for network convergence and mobile communications. This will apply to the GIG, which will involve transitioning current networks such as NIPRNet, SIPRNet, Joint Worldwide Intelligence Communications System (JWICS), and emerging DoD space and tactical communications, as well as all IP-related applications. New C4ISR, weapons and logistics systems will incorporate IP-based protocols and shift to IPv6. IPv6 will also facilitate DoD insertion of IP-based chips into equipment and allow for better battlefield management and more effective tracking of soldiers and supplies. In addition to upgrading DISA managed networks to IPv6, DISA will play an important role in the conversion to IPv6 by acquiring address space sufficient to meet DoD's near term and future requirements and by managing DoD IP address allocation, registration and control on an enterprise basis to promote interoperability and security.

Table 6: IPv6 Investment Plan – Currently Unfunded

IPv6	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	0.0	0.0	0.0	0.0	0.0	0.0

5 Horizontal Fusion Initiative

In a net-centric environment, networks have limited value without quality data that is reliable, accessible, and usable in an integrated manner. The OSD-managed Horizontal Fusion (HF) initiative is a portfolio program that enables access and use of the data that is available on the network. It is aimed at providing the tools that allow users to identify what data is available, access it, smartly pull and fuse it, and make sense of the data gathered. These tools will require investing in data content and management, as well as the acquisition of commercial applications. The HF portfolio consists of initiatives chosen for their strategic value in promoting these goals. Horizontal fusion capabilities are demonstrated in periodic Quantum Leap exercises. Application and collaboration tools and techniques also include distributed, global command and control systems. Organizations and agencies contributing capabilities to the HF portfolio in FY 2003 include the military Services, DISA, DIA, and NSA. In FY 2004, with SPAWAR as lead, DISA, DIA, and other agencies will extend the initial set of enterprise services and portal capability to support the build out of the collateral information sharing space. The HF strategy will facilitate the Operational Net Assessment process under development by USJFCOM as well as other such intelligence/information sharing activities.

The HF initiative helps to implement the complementary visions of "Power to the Edge" and "Task, Post, Process, Use" (TPPU). It is aimed at providing the tools, techniques, and procedures to allow users to identify what data is available, to access data in near-real-time, and to fuse disparate sources of data into a user-defined common operational picture. Horizontal fusion requires a substantive investment in tools and in developing and socializing techniques by which current "stovepipe" data topologies can support TPPU across the network. The initiative conducts an annual solicitation of tools and proposals against which HFI investments (managed by the ASD/NII) are made. HF proposals are selected for funding based on their promise in promoting the goals of "Power to the Edge" and TPPU. This funding culminates in a HF event titled "Quantum Leap" in which all funded initiatives are demonstrated.

The JTF WARNET Initiative's Command and Control Translator Database (C2TD) prototype is currently providing limited horizontal fusion for selected PACOM forces and should be considered for inclusion in the HF portfolio.

Table 7: Horizontal Fusion Investment Plan

Horizontal Fusion	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	149	213	210	215	226	230

6. GIG Enterprise Services (GIG ES)

The Global Information Grid Enterprise Services (GIG ES) Investment Portfolio integrates existing and future efforts to develop, acquire, field, operate, and sustain enterprise level IT services supporting the Department of Defense Global Information Grid. This investment portfolio supports ASD-NII's goal to transform the DoD information environment from broadcast and point-to-point communications to a net-centric environment. As currently defined, the net-centric environment consists of a broad class of approaches that leverage information technology and connectivity to improve the speed and quality of DoD decision-making. This new environment will (1) support posting data to shared spaces as early as possible; (2) provide users with the capability to pull whatever they need, whenever they need it, from wherever they are; and (3) provide information assurance measures. Robust net-centric enterprise services (e.g., messaging, collaboration, enterprise services management, security, discovery, mediation) will provide visibility and access to data across warfighting, intelligence, and DoD business domains and thus help to realize the goal of net-centricity.

The GIG ES Portfolio includes efforts to leverage and transform existing capabilities, develop and implement a services-oriented architecture providing core Network Centric Enterprise Services (NCES), and provide robust capabilities and services for communities of interest (COI), such as the joint command and control community, intelligence, logistics, and DoD business functions. COI capabilities will leverage the core enterprise services to implement COI specific services supporting the collaborative exchange of information to accomplish shared goals, missions, or business processes.

NCES, the largest single IT investment in the GIG ES portfolio, represents a major transformational shift in DOD IT capabilities. It moves the department towards Internet-based business models, processes and technology. NCES will include standards, specifications, guidelines, architecture definition, software infrastructure, reusable components, application programmer interfaces, runtime environment definition, reference implementation, and methodology that establishes an environment on which a system can be built. NCES will support multiple-tiers of service offerings, allowing greater flexibility in individual component selection and configuration. Fewer government-unique constraints will be placed on the subscribers systems, supporting more timely system capabilities upgrades that are decoupled from infrastructure upgrades. This approach allows systems and/or capability developers, in both the warfighting and business domains, to independently upgrade and enhance end user functionality. System infrastructure providers are able to upgrade their service offerings through an evolutionary (vice "big bang") approach. This architectural shift enables NCES to achieve platform independence. NCES will enable edge users to reach back and pull information or access services they need without having to know where the service or information resides on the network.

NCES provides essential infrastructure support for the warfighting, intelligence, and business domains. It consists of the following nine core enterprise services:

- Discovery Service provides formulation and execution search capabilities to locate data assets and services within shared space repositories (e.g., catalogs, directories, registries). This service addresses the user problem of "information overload" by helping the user to find the specific information quickly that he/she needs.

- Collaboration Service provides and controls the shared resources, capabilities, and communications (e.g. audio or video conferencing, shared whiteboard, shared file space, and chat) that allow real-time, synchronous interactions among participating group members. Asynchronous collaboration can occur through other net-centric services and applications such as messaging.

- Messaging Service provides the ability for entities/users on the enterprise infrastructure to exchange information both synchronously and asynchronously.

- Mediation Services translate, aggregate, integrate, correlate, fuse, broker, publish, or perform other transforming processes. Mediation applies to data or services.

- Storage Service provides the set of capabilities and resources necessary for the retention, organization and disposition of data.

- Application Service provides capabilities and resources necessary to provision, operate, and maintain the GIG ES applications and assured computing functions available to all users including administrators.

- Information Assurance/Security (identity and access management, assured sharing across security boundaries) provides the set of enterprise-wide enabling and control capabilities for confidentiality, integrity, and availability in accordance with established policies.

- Enterprise Services Management enables the life cycle management (planning, design, developing, organizing, coordinating, staging, implementing, monitoring, maintenance, and disposition) of all the capabilities of, and services provided by, GIG Enterprise Services (GIG ES). It thereby enables NETOPS of GIG systems, networks, and their defense, through standard technological solutions (people, tools, and integration).

- User Assistance provides automated or manual capabilities that learn and apply user preferences and patterns to assist users to efficiently and effectively utilize GIG resources in the performance of tasks. In the context of the GIG, a user represents any person, object, or entity that has the authority to interact with the GIG. User Assistant provides presentation capabilities, decision aids and tools, as necessary, to maximize user efficiency and performance of their task, with operator aids designed to support specific user tasks and tailored to the information needs of the targeted user.

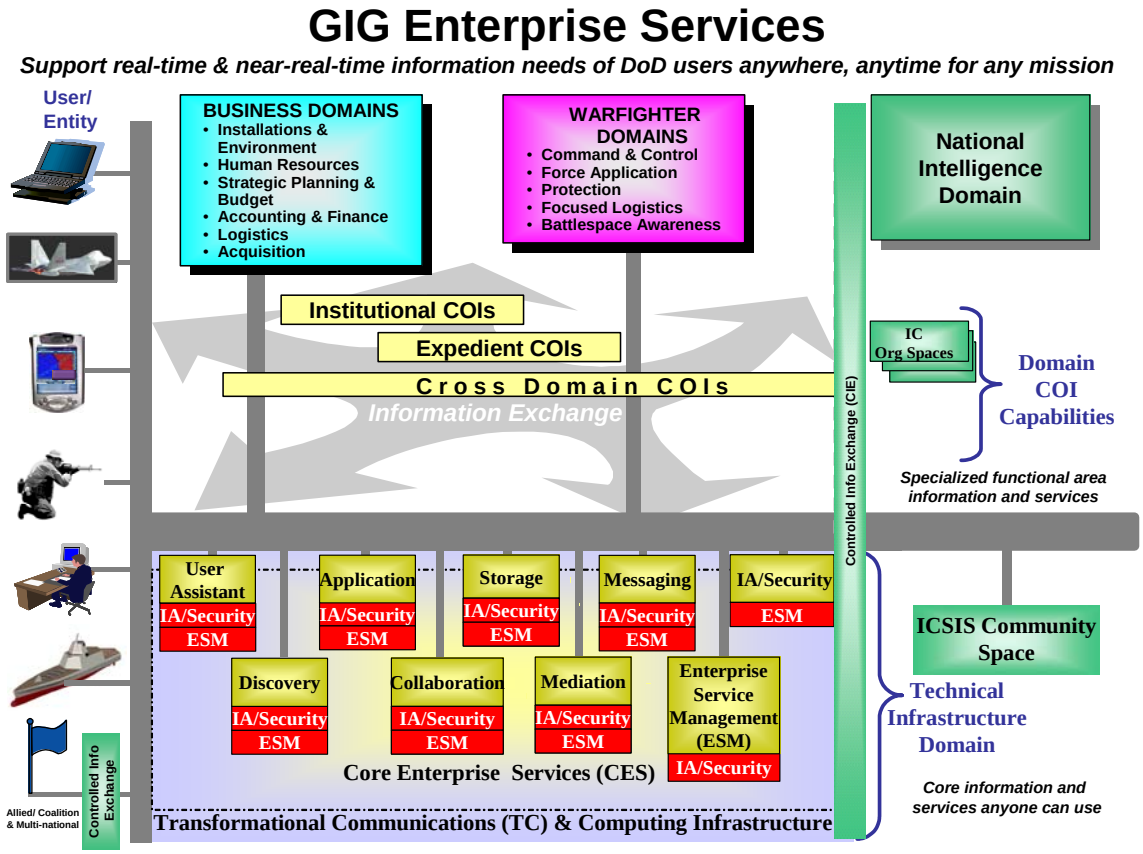

Figure 6: High-Level Operational Concepts View of GIG ES

NCES is expected to achieve Milestone A/B approval in second quarter FY 2004. Spirals 1 through 3 of NCES Increment 1 are scheduled to begin providing an initial set of core enterprise services beginning in FY 2005. NCES Increment 1 release is scheduled for third quarter FY 2006. Subsequent Increments will follow with additional capabilities and services approximately every 12 months. Scheduled release of Community of Interest services for the Command and Control Community will be timed to coincide with NCES and JC2 release schedules.

Domain leads will be designated and will be responsible for appointing executive agents for the various communities of interest (COIs) within their domains, and for guiding/coordinating the DOTMLP-F development efforts within their domains and with other domains. The GIG ES domain leads, Core Enterprise Services executive agents, and COIs must work closely together to ensure that the roll-out of services, applications, and supporting communications are synchronized.

Table 8: NCES Investment Plan*

NCES	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	40.8	56.7	78.5	64.4	67.4	73.6

* Based on President's Budget (PB) 04. Figures reflect funding for the DISA-managed NCES component.

7. DoD Net-Centric Data Strategy

This initiative addresses means by which data is posted, tagged, advertised, retrieved and governed, as well as methods that facilitate trust in the data. The DoD Data Management Strategy decentralizes data management responsibilities down to various COIs, and establishes requirements and standards for data tagging across all of DoD. It encourages the sharing of data through web-based services. To support the DoD Data Management Strategy, DISA established and maintains the DoD Metadata Registry and Clearinghouse, a repository of all structural and semantic metadata, including Extensible Markup Language (XML) metadata components, to promote data exchange and reuse.

8. Network Operations (NetOps)

NetOps is the integrated, end-to-end capability that monitors, manages, and directs the net-centric operations of the GIG. It includes doctrine, force structure, tactics, techniques and procedures (TTPs). NetOps encompasses all activities directly associated with the net-centric, enterprise management of GIG computing, communications and information assurance assets.

Today's DoD warfighter and eBusiness users rely on information from across the enterprise to execute missions, from routine actions to combat operations. NetOps enables Joint and Coalition Task Force operations by assuring timely access to critical

data and enterprise information services. It supports the combatant commands (COCOMs) by implementing end-to-end information management across the enterprise.

USSTRATCOM, acting as the NetOps executive agent, is working with DISA to develop a NetOps Concept of Operations (CONOPS). It describes management, organizational and process procedures, such as the Joint Task Force for Global Network Operations, which will more efficiently and effectively support net-centricity and an information environment. The CONOPS calls for an integrated, tailorable situational status of GIG enterprise information for DoD decision makers and network administrators.

The US Joint Forces Command will develop Joint TTPs, Programs of Instruction and ensure that NetOps activities are an integral Part of Joint Exercises and Experiments. NetOps is the essential enabler for the GIG to achieve the net-centric warfare (NCW) goals.

NetOps is fully integrated into the Network-Centric Operations and Warfare Reference Model (NCOW-RM) and is also an essential capability of the GIG v2.0 architecture. ASD (NII) is preparing a NetOps DoD Instruction.

NetOps is the integrated approach to system and network operation and management. It is the enabler for the DoD enterprise, information environment and is essential for net-centricity.

9 DISA Computing Operations

Computing is an integral component of the GIG. DISA provides mainframe and server computer processing operations for the entire gamut of combat support functions, ranging from transportation to military personnel readiness. As an integral component of the GIG, these computing services provide global reachback and end-to-end control. DISA's facilities, like the nation's other warfighting resources, are under military ownership and control.

To evolve the computing infrastructure to support a joint, net-centric environment, DISA's strategies include: refining architectures to take advantage of increasing bandwidth and highly distributed computing and storage; providing standardized, content-rich computing environments; increasing system availability by expanding data replication and mirroring; enhancing the scalability of DISA computing services to better support GIG policy and NCES requirements; expanding processing support for C2 and intelligence functions; and continuing efforts to support mainframe and cross-component server applications and promote the use of common GIG assets for all applications as DoDD 8100.1 requires.

C. Information Interoperability

1. General

Network centric warfare is the transformational operating concept, and information interoperability is the essential enabler of network centric warfare. A robustly networked

force cannot realize the benefits of networking – robust information sharing and collaboration – if the systems and processes are not interoperable across the network. Information interoperability is essential to joint, combined and coalition forces working together seamlessly to enhance operational effectiveness. Achieving and sustaining interoperability is a DoD enterprise-wide responsibility that must be woven into organizational roles, responsibilities, processes, and resources. Moreover, future operations will also include other federal agencies and state organizations. The effectiveness of these operations will depend upon the ability of DoD to share information and collaborate externally as well as internally.

Experience shows that fixing systems after the fact to achieve interoperability is typically costly, often fails to satisfy mission requirements, and may create security problems. The better approach is to incorporate interoperability at the outset in designing new systems. However, the Department will continue its efforts, where cost effective, to bring its legacy systems up to interoperability standards.

Continued emphasis on gaining compliance with existing directives and policies for interoperability testing and certification (e.g., CJCSI 6212.01B and DODD 4630.5) and the use of standards are keys to achieving interoperability. The Joint Interoperability Test Center (JITC), managed by DISA, serves a vital DoD role by testing and evaluating systems to determine actual capabilities, limitations, and interoperability in realistic joint warfare scenarios and in performing realistic missions. The JITC tests and certifies joint and combined IT and national security system (NSS) interoperability for DoD. The DoD Joint Technical Architecture (JTA) provides the minimum set of standards for the acquisition of all DoD systems that produce, use, or exchange information. These include DoD sensors, processing and command centers, shooters, and support activities.

The JTA has played a key role in DoD's overall architecture strategy for ensuring systems can interoperate in a joint environment and can be born joint. To address DoD's transformation to a Net-centric environment, the DoD CIO has initiated a reformation of the JTA to an online database of IT standards and standards profile repository for development of technical views of integrated architectures. In support of DCIO IT Standards initiatives, DISA will continue to develop and maintain, with the DoD components, the DoD IT Standards management processes necessary to prescribe IT and NSS standards for DoD systems. DISA also performs standards conformance verification as part of overall interoperability verification testing of IT and NSS. Once completed, the improvements to the IT standards management processes will be more efficiently organized around Net-centric precepts to identify and promulgate appropriate technology standards to support DoD IT and NSS acquisitions and procurements.

A key concept in promoting interoperability “net-readiness”: the readiness of DOD IT/NSS to meet required information needs and timeliness requirements, achieve information assurance accreditation, and display the attributes required for both the technical exchange of information and the end-to-end operational effectiveness of that exchange. DOD IT/NSS that is Net-Ready enables warfighters and DOD business operators to exercise control over enterprise information and services through a loosely

coupled, distributed infrastructure that leverages service modularity, multimedia connectivity, metadata, and collaboration to provide an environment that promotes unifying actions among all participants. Net-readiness requires that IT/NSS operate in an environment where there exists a distributed information processing environment in which applications are integrated; applications and data independent of hardware are integrated; information transfer capabilities exist to ensure seamless communications within and across diverse media; information is in a common format with a common meaning; there exist common human-computer interfaces for users; and there exists effective means to protect the information. Net-Readiness is critical to achieving the envisioned objective of a cost-effective, seamlessly integrated environment.

Recent changes to the DoD 5000 series of acquisition directives, and to the CJCS 3170.01 directive establishing the JCIDS process, will promote joint information interoperability through the development of integrated architectures. In addition, the DoD CIO/ASD (NII) has developed the concept of a "net-ready" key performance parameter (NR-KPP) that will facilitate interoperability at the communications, networking, and enterprise service layers. The NR-KPP defines information needs, information timeliness, information assurance, and net-ready attributes required for both the technical exchange of information and the end-to-end operational effectiveness of that exchange. The NR-KPP consists of verifiable performance measures and associated metrics required to evaluate the timely, accurate, and complete exchange and use of information to satisfy information needs for a given capability. The NR-KPP is comprised of the following elements:

- Compliance with the Net-Centric Operations and Warfare (NCOW) Reference Model (RM).
- Compliance with applicable GIG Key Interface Profiles (KIPs).
- Verification of compliance with DOD information assurance requirements.
- Supporting integrated architecture products required to assess information exchange and use for a given capability.

Another interoperability initiative involves the concept of GIG Key Interface Profiles (KIPs), as part of the GIG architecture. The KIPs will define the functional and physical characteristics required at a specific interface to allow third parties to develop interoperable capabilities.

2. DoD Integrated Interoperability Plan

The DoD *Integrated Interoperability Plan (IIP)* has been recently developed to promote improved information interoperability throughout the Department. It provides the following guidance and direction:

- Endorses the objective Global Information Grid (GIG) architecture incorporating the initiatives described above, including greatly-expanded bandwidth, use of the next-generation Internet protocol throughout for data transfer, and implementation of net-centric enterprise services. A target date of FY08 is established for introduction of the enhanced capabilities.

- Endorses/implements recent and emerging OSD and CJCS policy and initiatives, including those on capability development, data management, GIG Enterprise Services, and Internet Protocol.
- Proposes USD(P) investigate a capability development governance process.
- Establishes operational validation of joint interoperability (similar to Y2K thread testing) in joint exercises and real world ops.
- Establishes family of systems assessment via the Joint Distributed Engineering Plant (JDEP) and similar venues.
- Provides for interoperability metrics development.
- Provides for DoD/Industry collaboration in standards development.
- Establishes measures to improve compliance with interoperability certification requirements.

In addition to the foregoing provisions designed to address systemic issues impeding joint/coalition interoperability, the *IIP* also directs specific actions to improve interoperability in six functional areas directed by the *TPG*:

- Standing Joint Force Headquarters
- Common Operational Picture
- Enhanced Intelligence, Surveillance, and Reconnaissance
- Joint Fires and Maneuver, including Sensor-to-Shooter links
- Reachback Capability
- Adaptive Mission Planning and Rehearsal

The *JTRM* complements the *IIP* and implements its provisions where applicable. The *JTRM* also provides a vehicle to update the *IIP* provisions annually as needed. Two interoperability initiatives addressed in the *IIP* of particular importance to transformation are the Joint Distributed Engineering Plant and allied/coalition interoperability.

3. Joint Distributed Engineering Plant (JDEP)

JDEP is an OSD and Service-funded initiative created to support interoperability. JDEP facilitates access, coordination, scheduling, and technical support to replicate joint operational environments through the reuse of existing hardware- and software in-the-loop capabilities across the DoD and industry. This allows for the creation of a distributed joint test environment for use in the development, integration, testing, and assessments of IT and NSS. When developed to its fullest, the JDEP will be a DoD-wide, distributed, interoperability tool for software design, support, test, and evaluation. It will be used to verify corrective actions in a controlled, repeatable environment, and to evaluate the interoperability of developing or newly fielded systems. DCEE and JDEP development efforts will be closely coordinated to enable efficient use of both networks and simulation products.

The JDEP Board of Directors (BOD) oversees investment and management of JDEP capability and infrastructure. The BOD is a high-level DoD oversight body that cuts across mission areas and broad FoS responsibilities. Senior membership includes

DISA, Joint Staff, USJFCOM, ASD (NII), Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)), Director, Operational Test and Evaluation (DOT&E), the combatant commands, and the Services.

Action: Recommend USD(AT&L) add USD(Intelligence) to the BOD.

4. Allied / Coalition Interoperability

As the United States and its partners continue to aggressively pursue terrorism across the globe and combine their military efforts in many other areas, the ability to efficiently exchange information with our allies is even more important, particularly as we seek to decisively attack and destroy terrorist networks. Using requirements specified in the JROC approved Capability Development Document/Capability Production Document, DISA (in collaboration with the National Security Agency and other members of intelligence community) will integrate the design, development, acquisition, and fielding of end-to-end capabilities that allow U.S. Joint Forces, and their Allied and Coalition partners, to securely share intelligence and operational information with a full range of services across multiple security levels. One example is the C4I for the Coalition Warrior Advanced Concept Technology Demonstration that provides a solution for messaging from a U.S. classified environment, such as the SIPRnet, to a coalition domain. The use of XML technologies, in addition to the traditional formats, provides a message format that can be used to create tailored reports for ease of security handling and comprehension. Foreign disclosure policy and other policy on sharing of intelligence and sensitive information must also be addressed.

Allied/coalition interoperability initiatives include the Combined Communications-Electronics Board, the Joint Staff/ASD NII-led Multinational Interoperability Council and the USJFCOM-led Multinational Information Sharing program, which are addressed in the following paragraphs.

Note: U.S. Forces operating as part of an alliance or coalition will consider use of the Land C2 Information Exchange Data Model to share and exchange information whenever possible, subject to guidance from alliance or coalition leadership.

The Combined Communications-Electronics Board (CCEB).

The CCEB is a military organization that addresses C4 issues to enhance interoperability between its member nations at the strategic, operational, and tactical levels of command. The CCEB member nations are: Australia, Canada, New Zealand, the United Kingdom and the United States.

As the only joint combined organization focused entirely on C4 matters, it is uniquely position to provide C4 leadership within the combined and joint environment. This capability was recognized in a Statement of Cooperation (SOC) signed in 2001, between the MIC and the CCEB principals. The SOC established the CCEB as primary multi-national organization focused entirely on C4 interoperability matters. Furthermore, the statement of cooperation recognizes the Warfighter's primacy in defining operational and user requirements and priorities for C4 systems.

The CCEB is seeking to deliver an environment that optimizes information sharing between coalition warfighters. Working to priorities agreed to with the MIC, the CCEB seeks to achieve interoperability by developing and agreeing to policies, procedures, and standards as well as coordinating national programs to deliver capabilities for the exchange of information in the combined or coalition environment.

The US plays a vital role in the CCEB, and it is in the nation's best interest to continue this relationship. The Director, Command, Control, Communications and Computer Systems, (J-6) on the Joint Chiefs of Staff, serves as the US CCEB Principal.

Multinational Interoperability Council (MIC). The purpose of the Multinational Interoperability Council (MIC) is to provide a multinational forum, complementing and going beyond the long-standing NATO forum, to address coalition operational coordination requirements. This council should identify coalition information interoperability issues and develop solutions that positively impact coalition interoperability policy, doctrine, and planning. Its goal is to provide for the exchange of relevant information across national boundaries in support of warfighter interoperability during coalition operations. In an era when U.S. military capabilities are being transformed, to a large extent via comprehensive, next generation networking, future interoperability efforts will inevitably necessitate that our international partners introduce some modicum of C2 transformation. It will be in the U.S. interest to use this organization for precisely this purpose in order to enhance the prospects for effective future coalition operations.

Member Nations in the Multinational Interoperability Council include Australia, Canada, France, Germany, United Kingdom, and the United States. The U.S. DoD senior MIC Principal is the Joint Staff, Director for Operations, DJ-3 supported by the DASD(S3/C3) as the MIC Executive Secretary).

Figure 7 depicts the organization of the MIC and its working groups.

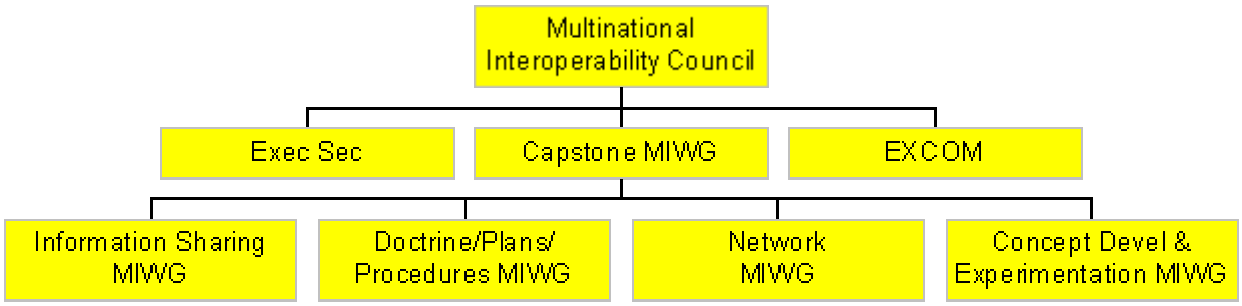

Figure 7: Multinational Interoperability Council Organization

Current MIC projects include the following:

- Lead Nation Concept
- Video-teleconferencing Capability
- Multinational Coalition Wide Area Network (CWAN) – "Griffin"
- Coalition Interoperability Lessons Learned – East Timor, Afghanistan, Iraq
- Participation in USJFCOM Multinational Limited Objective Exercises
- Multinational C3 Interoperability Conferences

CJCS and ASD(NII) are responsible to continue supporting the MIC and to exploit this forum to collaboratively and reciprocally improve policy, doctrine, procedures, and technology for information sharing with coalition partners and encourage coalition C2 transformation. U.S. actions to support the objectives of the MIC shall leverage the USJFCOM Joint C2 transformation efforts discussed in this section and the initiatives described in the paragraphs that follow.

Multinational Planning Augmentation Team (MPAT) Initiative. The Multinational Planning Augmentation Team is a multinational initiative sponsored by USPACOM to enhance multinational force readiness and interoperability for combined or coalition crisis responses. MPAT seeks to standardize basic concepts and procedures involved in combined/coalition operations at the operational level. The initiative's main focus of effort is on improving U.S. capabilities in the formation, establishment and planning functions of a Combined/Coalition Task Force (CTF) Headquarters. The primary method for achieving this goal has been the development of Multinational Force Standing Operating Procedures (MNF SOP) and the incorporation of foreign military planners into PACOM exercises and staff planning workshops. Current efforts are focused on missions at the post-conflict stability operations and low intensity end of the conflict spectrum and include, but are not limited to: Peace Operations (PO), Combating Terrorism (CT), Civil-military Operations (CMO), Humanitarian Assistance/Disaster Relief (HA/DR), military-assisted Non-combatant Evacuation Operations (NEO), and Search and Rescue (SAR).

Member Nations in the MPAT initiative include Australia, Bangladesh, Brunei, Canada, France, Fiji, Germany, India, Indonesia, Japan, Korea, Madagascar, Malaysia,

Maldives, Mauritius, Mongolia, Nepal, New Zealand, Papua New Guinea, Philippines, Russia, Singapore, the Solomon Islands, Sri Lanka, Thailand, Tonga, the United Kingdom, Vanuatu, and Vietnam.

Current MPAT projects include:

- Lead-nation Concept
- Multinational Force Standing Operating Procedures (MNF SOP) expansion and refinement
- Multinational Information Sharing (MNIS) support
- Multinational Exercise Support
- Multinational Staff Planning Workshops
- Coalition Communication Interoperability Guide (CCIG)

Multinational Information Sharing (MNIS) Initiative. Multinational Information Sharing is a USJFCOM initiative to create a single multinational sharing environment in which information is protected at its source and access control is based upon participants' authorizations. The Operational Concept for MNIS was delivered to the Joint Staff on 30 September 2002. It contains 12 overarching requirements and 73 functional requirements divided among seven specific application categories. The operational view of the MNIS architecture identifies current and future information flows, and links MNIS to the SJFHQ.

The following actions have been identified and agreed to for implementation by USJFCOM, the Joint Staff, and selected OSD organizations as means to transform information sharing in multinational operations:

a. Develop a common set of Unified Combatant Command requirements for multinational information sharing. (USJFCOM)
b. Update joint doctrine to address multinational information sharing. (CJCS)
c. Designate an Executive Agent and establish a program for development and support of MNIS technology solutions. (ASD (NII))
d. Include the MNIS program in the MID 912 JBMC2 portfolio. (USJFCOM)
e. Revise National Disclosure Policy to facilitate more rapid and robust sharing of intelligence and technical information with coalition partners within the bounds of current law. (Joint Staff lead working group to include DUSD Policy, NSA, DIA, USD(I), COCOM representatives) Identify a single office, as far as practical, to approve the release of non-intelligence technical information, and a single office to approve the release of intelligence information.
f. Pursue amendment to Chapter 6 of Title 10, U.S. Code, to authorize the Secretary of Defense to transfer non-lethal military goods and services to coalition partners, to include conventional and Internet-based education and training. (USD Policy)

Information sharing with less capable coalition partners, especially when advanced preparations have not been practical, may be facilitated by the temporary provision of U.S. equipment, liaison officers, and interpreters as required.

D. Information Operations (IO)

Information operations include operations to protect the information and information systems of friendly forces (information protection), to exploit or deny adversaries' use of information (information exploitation and information denial), and other measures to promote victory through the information domain. Information warfare is information operations conducted during wartime. The functional areas of IO are:

- Computer network defense, exploit, attack
- Electronic warfare (protect, exploit, attack)
- Psychological operations
- Military Deception
- Operations Security
- Public information

Information assurance consists of information protection measures plus measures to assure the availability and reliability of information support services. Information assurance is arguably the most important domain of information operations given the crucial reliance of network centric warfighting concepts on information sharing and collaboration. Information assurance is addressed in the following section.

Information operations are transformational because they are essential to achieve superiority in the critical information domain. In addition to the critical role of information assurance in enabling network centric warfare, information exploitation is a form of intelligence collection that can contribute substantially to the overall intelligence picture and which is necessary to support information attacks.

Information attack through computer network attack or electronic warfare offers another option for force application that has significant advantages over kinetic attack: stealth, lower risk and cost to friendly forces, elimination of the possibility of non-combatant casualties in most situations, and potentially widespread effects through a single attack. The disadvantages of information attack, especially computer network attack, are generally greater uncertainty in achieving the desired effects and generally greater difficulty in assessing whether the attack has been successful.

The roadmap for developing IO capabilities has been developed in the *DoD IO Roadmap*, which was signed in November 2003.

E. Information Assurance (IA)

1. Description

Information assurance (IA) is an essential enabler of decision/information superiority and interoperability. Given the pivotal role to be played by the ubiquitous, networked GIG in U.S. military transformation, reliable protection of information, secure information sharing, and defense of this network will be absolutely essential. Failure to provide adequate assurance for information services in a net-centric concept of operations could create an "Achilles heel" that an adversary could exploit.

DoD Directive 8500.1, October 24 2002, defines information assurance as "a set of measures that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality, and non-repudiation." This includes provisions for enabling the sharing of information across multiple levels of security and providing for restoration of information systems by incorporating protection, detection, and reaction capabilities. Information sharing and collaboration, the dual engines of net-centricity, are crippled without adequate information assurance. Therefore, information assurance must be embedded in the GIG architecture. An IA component of the GIG Architecture to address the end-to-end distribution of integrated and interoperable IA capabilities throughout the GIG is being developed

The DoD IA Strategic Plan provides the specific IA goals and objectives that are summarized below.

Goal 1: Protect information to ensure that all information has a level of trust commensurate with mission needs. Specific objectives are:

- Promulgate IA Architecture
- Define protection criteria for Net-centric operations
- Develop and deploy protection capabilities
- Transform the security management infrastructure (SMI).

Goal 2: Defend systems and networks to ensure that no access is uncontrolled and that all systems and are capable of self-defense. Specific objectives are:

- Establish GIG network defense architecture and to-be baseline
- Develop and enforce Computer Network Defense (CND) policies
- Evaluate and deploy CND tools and capabilities
- Establish vertical and horizontal defense mechanisms within CND response actions framework (RAF)

Goal 3: Provide integrated IA situational awareness/IA C2 to create a shared understanding among decision makers and the decision tools needed for coordinating actions. Specific objectives are:

- Establish timely intelligence and indications and warning (I&W) information to enterprise situational awareness (SA)
- Create SA visualization capabilities
- Coordination IA operations and decisions
- Harmonize NETOPS, IO, CNA, and CND relationships

Goal 4: Improve and integrate IA transformation processes to develop and deliver dynamic IA capabilities and to improve inter-and intra entity coordination to reduce risk and increase return on investment. Specific objectives are:

- Ensure IA is integrated and sustained in all programs throughout the lifecycle
- Improve strategic decision making
- Expedite dynamic IA capabilities through innovation
- Enable information sharing and collaboration

Goal 5: Create an IA-empowered workforce that is trained, highly skilled, knowledgeable, and aware of its role in assuring information. Specific objectives are:

- Standardize baseline IA certifications
- Provide trained/skilled personnel
- Enhance IA skill levels
- Infuse IA into other disciplines

2. Implementation Plan

Iterative IA deliverables, most taking advantage of the highly networked environment they seek to protect, shall focus on the following:

- Embedded high assurance net encryption for the convergence upon IP for all space, terrestrial, and wireless nets, to be delivered primarily through programs such as GIG Bandwidth Expansion (GIG BE) and Transformational Communications.

- Continued physical separation of computing resources into multiple security domains (e.g., public, sensitive or controlled unclassified, secret U.S. only, top secret, top secret/sensitive compartmented information, secret coalition). Enterprise storage and application services in each of these security domains as well as capabilities for Enterprise Services Management-NetOps is planned as part of a projected FY04 new start program, Net-Centric Enterprise Services.

- An enterprise service for exchange of information across established security domains according to data tags and/or labels (e.g., metadata-enabled guards), to be integrated into the enterprise through NCES.

- Use of the enterprise cross-domain exchange to synchronize global directories and data meta-card catalogs to provide end users and emerging core enterprise services such as discovery or messaging with a security-enabled, virtual view

across security domains. Integration of this capability into the enterprise is planned as part of NCES.

- An enterprise service for identity and access management that builds upon the DoD public key infrastructure (PKI) and biometrics programs and federates personal identity (e.g., name, biometric form factor), corporate identity (e.g., organizational position, job title, location, group membership(s), additional assigned roles and privileges), and consumer identity (e.g., net interaction, behavior, other demographic characteristics or reputation) to facilitate rapid account provisioning, single sign-on, and authorization or access decisions is planned as part of NCES.

- Enterprise auditing, monitoring, detection, alert and response capabilities that that are integrated with Enterprise Services Management-NetOps and other computer network defense support capabilities, to be integrated through NCES, other initiatives such as Attack, Sensing, and Warning (AS&W), and through USSTRATCOM-sponsored initiatives for the CND community of interest

- Key management Infrastructure that addresses all enterprise needs from the transformed network transport to emerging core enterprise services to domain and community of interest services and applications, to edge services delivered directly to end users and IT devices.

- The application of public key encryption to data at rest in conjunction with a policy based access scheme to segregate information in different foreign release categories in coalition nets, to be tested under the Content-Based Information Sharing Initiative.

The following paragraphs describe specific implementation initiatives.

Cryptographic Modernization. The DoD Cryptographic Modernization Initiative will provide IA solutions to enable the Global Information Grid to securely employ its enterprise services and its integrated C2, C4ISR, Information Technology, weapons and communications systems, as well as interoperate with allies and coalition partners, activities that are essential to the conduct of network centric operations, the very cornerstone of U.S. military transformation. Operational force components depend upon Cryptographic Modernization to directly apply 95% of its designated resources for research, development, and initial procurement of IA solutions, upon which net-centric warfare depends to achieve its envisioned potential.

Cryptographic Modernization is leveraging new and emerging technologies, as it partners with industry and military services to identify cryptographic solutions that can be applied – in all domains, enterprise-wide – throughout the remainder of the 21st Century. These solutions, as well as their sustaining management core, will ensure achievement of "power-to-the-edge," securely. Solutions being pursued will be iteratively developed, in conjunctions with leading-edge transformational communication systems, families-of-systems, and systems-of-systems. The IA capabilities that

Cryptographic Modernization is pursing will be crucial components of the transformational communications initiatives that are being identified to implement the GIG, its domains, and the cross-domain services that will be extended enterprise-wide and, as required, to transient communities of interest. These IA solutions will provide assurance for protecting critical information in warfighter domains for battlespace awareness, C2, force application, protection, and focused logistics.

The transformation of cryptographic solutions will ensure the security flexibility, transparency, agility, interoperability, and seamless interconnectivity demanded by all echelons of end users. Priority Cryptographic Modernization activities directly address programs that revolutionize today's provision of information management, communications and assurance services. Top priority Cryptographic Modernization development programs are pursuing end-to-end IA solutions that are integral to major information systems identified to enable the GIG vision of satellite-based communications programs and terrestrial systems designated to support horizontal fusion.

Cryptographic Modernization initiatives currently underway are comprised of families of functional IA solutions: High Assurance Internet Protocol Interoperability Specifications (HAIPIS), secure voice, link encryption, wired/wireless, end unit management, and key management. These systems, systems-of-systems, and families-of-systems are crucial to developing operational capabilities to meet the QDR critical operational goals, especially the one that calls for leveraging IT and innovative concepts to develop interoperable, joint C4ISR architecture capabilities. These transformational initiatives are being developed pursuant to the GIG integrated architecture and its complementary net-centric operations and warfare reference model. The Capstone Requirements Document for Cryptographic Modernization captures the strategic IA capabilities and performance parameters necessary to implement the GIG.

DOD Public Key Infrastructure (PKI) Roadmap. The Public Key Infrastructure (PKI) Roadmap establishes the enterprise-wide end-state for the Department of Defense (DoD) PKI effort and outlines the evolutionary strategy and timeline for fielding of the Department's improving PKI capabilities. Also, it identifies critical risk areas that must be addressed, summarizes measures that will be undertaken to mitigate those risks, and highlights the roles and responsibilities of organizations involved with its realization.

The DoD PKI strategy recognizes that capabilities must keep pace with commercial technologies and services; therefore, an incremental, evolutionary approach, using open standards is being embraced. Within that approach, DoD must maintain appropriate levels of security while providing interoperability both within the DoD and externally with Federal and international counterparts and with business partners.

The Department is establishing a PKI that provides the public key products and services needed to support the Department's diverse set of missions and operations. The DoD PKI will also enhance the Department's capability for unilateral, joint, and combined operations, as well as improved interoperability with civil agencies, and business partners. To ensure operational effectiveness, the DoD PKI will provide these products

and services in a series of phased upgrades that, for the most part, will be transparent to subscribers. In some cases, user devices and mission planning systems will require enhancements so they take full advantage of the features offered by the DoD PKI.

The DoD PKI will directly support the Department's objective to encourage the widespread use of public key (PK)-enabled applications. The DoD PKI will evolve as an essential element of the overall Key Management Infrastructure (KMI). The DoD KMI will enable the provisioning of cryptographic key products, symmetric and asymmetric (public) keys, and security services. The DoD KMI will be implemented through a phased evolution delivering capability increments every 18-24 months.

Computer Network Defense (CND). The Information Operations Roadmap provides recommendations on computer network defense, the operational component of Information Assurance. It recommends that DoD implement a "Defense in Depth" strategy. Given its responsibilities under UCP 02, STRATCOM is being tasked to develop the defense in strategy that will rely on the technical underpinning provided by information assurance. The strategy should be based on the premise that the Department will "fight the net" as it would a weapons system.

- The strategy must be carefully constructed and managed to give senior leaders high confidence that additional investments in network defense will ensure the graceful degradation of the network rather than its collapse. Like any strategy it should account for limited resources and balance them against known risks.
- The strategy also must embrace a concept of operation that self-consciously identifies and manages risk. The starting assumption should be one of attrition, i.e., that the networks will be degraded. However, the strategy should be engineered to sustain required capabilities across the range of military operations with the goal of ensuring:
    - Sufficient protection of the information architecture to initiate combat operations in all circumstance and on preferred timelines (harden)
    - Sufficient information architecture during conflict to defeat an adversary (battle management)
    - The ability to quickly reconstitute information architecture to pre-conflict levels in order to restore readiness for the next conflict
- The "Defense in Depth" strategy should include:
    - Robust network defensive infrastructure including demilitarized zones, insider threat protection and firewalls
    - Well-configured networks that slow down and channel the attacker
    - Vertical and horizontal situational awareness and configuration management to enable effective command and control of defensive operations
    - A CND concept of operations that allows for varied defensive postures consistent with minimum required functionality

- The ability to conduct reconstitution operations that enable the DoD infrastructure to absorb attacks, minimize degradation and maintain critical network functionality
- Well-integrated CNA/CND efforts that permit us to maximize opportunities for CNA and minimize vulnerabilities in our CND efforts
- Situational awareness and battle management tools to provide the capability for attack sensing and warning, event correlation, attribution and forensics

- Other near-term recommendations to implement the "Defense in Depth" strategy include:
  - Expand and standardize the DoD vulnerability management and reporting capabilities
  - Develop and implement a cyber-event attribution capability
  - Expand current, limited event correlation and analysis capability to achieve improved situational awareness of the cyber battlespace
  - Expand current detection capabilities to identify events and to respond in a coordinated manner that mitigates DoD-wide risk while providing continued support to the operational mission
    - These capabilities result in reduced response times associated with detection and response
    - These capabilities also support rapid reconstitution of affected portions of the enterprise

The *IO Roadmap* identifies a need for full time dedicated CND specialists. It recommends that the Department raise a dedicated force of network defenders separate from the system administrators.

IV. Joint Command and Control Roadmap

A. Definition and Scope

As defined in Joint Publication 0-2, Joint C2 is "the exercise of authority and direction by a properly designated joint force commander or component commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission."

Of the five functional concepts that define joint warfighting – Joint C2, Force Application, Protection, Battlespace Awareness, and Focused Logistics – Joint C2 is uniquely important in that it guides/directs and coordinates implementation of the other functions. Therefore, C2 is the pivotal function for transforming DoD operations and warfighting. Improving C2 directly supports Pillar 1 of the *TPG* – strengthening joint operations.

The future Joint C2 capability will also be transformational in the sense that it will comprise a coherent, integrated, net-centric capability, spanning all levels of command – national, strategic, operational, and tactical - with appropriate capabilities tailored to each level and to the commander's mission and forces. Transformational Joint C2 will:

- Ensure common shared situational awareness
- Ensure decision superiority through speed of command and self-synchronization of lower echelon forces, when appropriate
- Support coherent, distributed and dispersed operations, including the ability to rapidly defeat enemy anti-access or area-denial efforts
- Enable more dispersed, agile, and lethal joint operations with lower risk to friendly forces

Since the U.S. military will increasingly fight as a joint team, one that is dynamically reconfigurable to meet the demands of a wide spectrum of missions and unpredictable threats, *all C2 capabilities must be inherently joint.* While many C2 capabilities are domain-specific (such as air defense or ground maneuver C2), most are employed by more than one Service and thus must be "born joint" to enable cross-Service support. Even single-Service functions such as anti-submarine warfare must be joint-interoperable to enable cross-functional support.

Joint C2 enables and is intertwined with the other four primary warfighting functions: joint fires and maneuver, protection, ISR, and logistics. Each has a C2 aspect, which must be integrated with the other aspects of that function as well as with the cross-functional aspects of Joint C2. Joint C2 is, in turn, enabled by joint battlespace awareness and by the Global Information Grid. This section of the *JTRM* will address, in addition to core (cross-functional) Joint C2 capabilities, the C2 elements of joint fires and maneuver and of protection. The C2 aspects of ISR and logistics are addressed in Sections V and VI respectively.

The future C2 capabilities described in this roadmap build upon current capabilities, as represented in the Joint Global Command and Control System (GCCS-J), Service C2 systems, and current doctrine and training programs. While effective in recent operations, the current C2 capability lacks adequate agility, robustness, and information sharing/collaboration capability to meet future challenges. Failure to achieve the transformational C2 capabilities will put the success of future operations at risk.

B. Transformational Joint C2 Concept[28]

This section describes the transformational concept for Joint C2 and two critical enabling initiatives – the Unified Command Structure and the Global Information Grid. It also describes the core C2 capabilities, which serve as the organizing theme for the remainder of Section IV.

1. Basic C2 Process And Functions

As presented in the draft *Joint Command and Control Functional Concept*, the basic C2 process is the systematic execution of the functions that an individual commander is required to perform in order to recognize what needs to be done in a situation and to ensure that effective actions are taken. Each commander performs the same basic C2 process, regardless of his position in the chain of command. Figure 8 below depicts the basic Joint C2 functions and process:

[28] The section that follows draws substantially upon information provided in the draft *Joint Command and Control Functional Concept,* Version 1.0, 31December 2003.

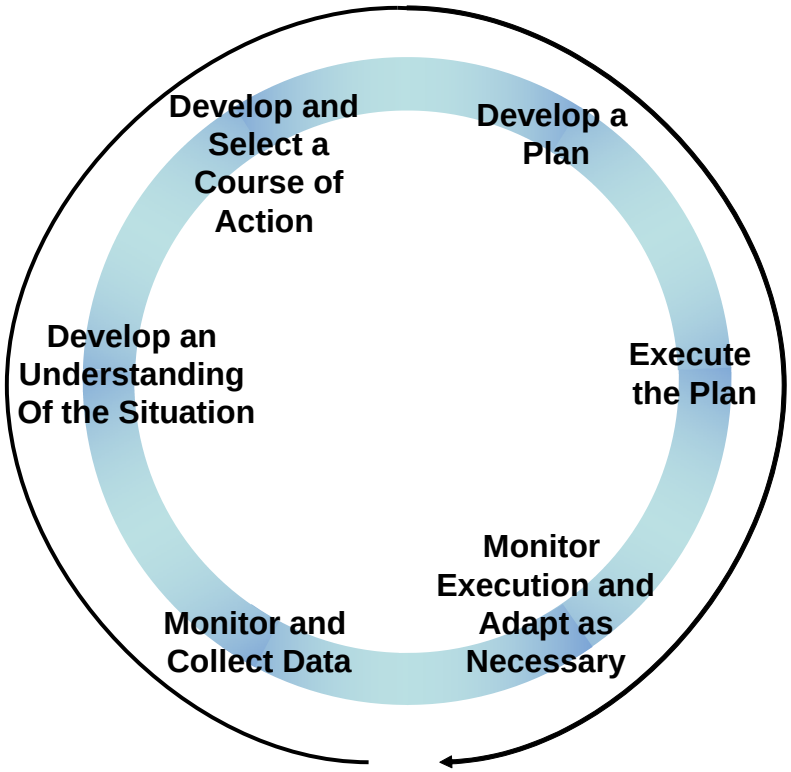

Figure 8: Basic C2 Functions and Process

Each commander in the battlespace is performing these functions to some degree and it is by performing these functions quickly and efficiently that commanders are able to make appropriate decisions and get in front of an adversary's decision cycle. The decisions of more senior commanders influence and frame the decisions made by subordinate commanders. The decisions of subordinate commanders, as they implement the decisions from their superiors and react to the adversary, constantly affect the operating environment. In a very real sense, multiple basic C2 process loops are turning at the same time at different speeds, all having a greater or lesser impact on the others. This requires that the C2 system possess an effective means to coordinate the multiple decisions being made to ensure congruent commander's intent and mission success. This basic process underpins the Joint C2 concept and capability breakdown that follows.

2. Overview of Concept

The paragraphs that follow describe the attributes of the transformational, (fully integrated, net-centric) Joint C2 concept that is applicable at all levels of command from strategic through tactical.

The future, transformational Joint C2 capability will be *agile, robust, resilient*, and *net-centric***.** Agility is the ability to make decisions and adapt quickly in the face of changing circumstances, while remaining faithful to mission objectives. Robustness is the ability

to exercise effective C2 in a wide variety of situations across the spectrum of conflict. Resilience is the ability to continue to operate effectively despite casualties and other setbacks. All three of these attributes are enabled by the extensive information sharing and collaboration that characterize net-centric operations. Net-centricity enables future C2 to be performed in a dynamic, decentralized, and distributed manner. The following paragraphs, excerpted from the 31 December 2003 draft of the Joint Command and Control Functional Concept, describe how the basic C2 functions will be performed in a collaborative, net-centric manner to provide future, transformational Joint C2 capabilities.

In 2015, Joint C2 will be agile across the range of military operations. Joint forces, interagency, multinational partners, and non-governmental organizations will be able to rapidly respond and decisively execute the commander's intent in a complex, uncertain and dynamic operating environment. C2 processes will be performed collaboratively to improve the speed and quality of the individual decisions and allow for the rapid and continuous synchronization of multiple decisions to achieve unity of effort. Commanders will rapidly tailor their C2 capabilities to any situation and will be able to exploit the benefits of decentralization – initiative, adaptability and tempo – without sacrificing unity of command. This will be achieved through a collaborative information environment that enables cohesive teams, regardless of location, to develop a *shared understanding* of the commander's intent, and of the battlespace, enablin*g flexible synchronization* and *superior decision-making*.

The key aspects of Joint C2 in 2015 are:

- In 2015 commanders, staffs and other decision makers or experts, throughout the joint force and beyond, are networked together by a collaborative information environment. The network provides assured communications and connectivity in which any member of the organization located anywhere in the world is able to communicate directly with any other member, regardless of location, echelon or organization.
- Commanders will employ a suite of collaborative tools, which allow them, even when globally dispersed, to work together in a virtual problem space to understand a common problem and devise a solution to it.
- The ability to network through a collaborative environment provides maximum flexibility in organization, allowing the commander to assemble groups of any composition required—commanders, staff and others—to work together on a single task or mission and see the perspectives of others.
- Any participant in the collaborative information environment will have access to any piece of information collected or generated within the system—within policy and security restrictions. From this common information base, commanders and staffs will be able create unique operational pictures of the situation as it pertains to them.
- Potential courses of action will be created and assessed collectively. The commander has the opportunity to assess them quickly and within the context of the other decision processes that are going on at the same time.

- The execution of a course of action, either directly or by a subordinate, is performed in the context of the actions of all the other players involved in the mission. By synchronizing those actions with the actions of others, commanders will bring forces to bear more effectively at critical times and places.
- Joint C2 in 2015 will reap the benefits of decentralization—initiative, adaptability and tempo—without sacrificing the coordination and unity of effort typically associated with centralization. Subordinate commanders can seize initiative and exploit opportunities as they arise.
- Decision makers need not even be aware that they are cooperating with one another. The result is *implicit collaboration*, in which decision makers contribute jointly to a solution without any need for direct or centralized coordination.

Agility is a fundamental, overarching attribute of the transformational Joint C2 capability. Agile organizations will possess a number of important attributes critical to meeting the challenges of the future operating environment. These attributes provide a means to measure overall improvement in the execution of the basic and collaborative C2 processes with appropriate measures and metrics defined for each one. The nine attributes of Joint C2 are:

- Superior decision making
- Shared understanding
- Flexible synchronization
- Simultaneous C2 processes
- Dispersed command and control
- Responsive and tailorable organizations
- Full spectrum integration
- Shared quality information
- Robust networking

A fundamental enabler of Joint C2 in 2015 is the collaborative information environment (CIE). The CIE is a specified information environment that enables collaborative processes at will between a selected group of individuals or organizations. In addition to the CIE, there are nine supporting Joint C2 enablers:

- Leadership development
- Digitally assisted decision aids and tools
- User framed information flows
- Cohesive teams
- Decentralized support
- Multilateral integration
- Networked computing environment
- Collaborative Information Environment (CIE)
- Adaptive security

3. Unified Command Structure

Transformation to a new C2 framework must occur not only at the operational and tactical levels of war, but also up to the strategic level, including the Secretary of Defense and the President. The recently adopted Unified Command and Control Structure (UCS) concept addresses the management level functions (plan, organize, direct and monitor) of the President, the Secretary of Defense, and the combatant commanders in the execution of the new set of "strategic strike" missions identified in the 2001 Nuclear Posture Review. While the *systems* supporting Joint C2 and UCS may be the same, the *function*s are different. UCS must work in concert with Joint C2 to ensure mission success.

The goal of the UCS concept is to build a shared C2 process for the senior warfighters and national political leaders within a common information environment. While there are differences in information usage at the strategic, operational, and tactical levels, a common and shared C2 process, as established through UCS, will enable information flow across institutional and organization boundaries and lead to the overarching goal of superior decision-making for our nation's senior leadership. Migration from the traditional "stove-piped" systems to secure, survivable, robust, and ubiquitous strategic and national C2 capability requires an overarching operational concept and policy providing for net-centric architectures and "agile" C2.

To fully achieve agile C2, DoD must make the leap to a future framework for national and strategic level C2 from the President through the combatant commanders to the joint task force commanders. The new framework must assure C2 and business continuity across the complete threat spectrum. This framework must posses the agility to support both the concepts of supporting and supported C2 processes within a dynamic environment.

UCS is not a system-based architecture. It is not a plan to replace current independent C2 systems with another system. Rather, it is a capability-based approach for providing our senior leadership with a common set of C2 capabilities. It will establish overarching policies to integrate or migrate C2 systems into a net-centric environment that supports strategic-level command and control of military operations. The UCS will provide the policy, operational concept, architectural framework, and implementation strategies and guidance for acquiring capabilities and infrastructures required to enable net-centric C2 at the highest levels of the U.S. government.

4. C2 Core Capabilities

The core capabilities that will enable transformational Joint C2 and their functional relationships are shown below. (This list is derived from a variety of sources, including the draft Joint C2 Functional Concept and JBMC2 Roadmap discussions).

- Common "Operational Picture" (for all levels of war)
- Adaptive Mission Planning and Rehearsal (employment planning and execution control)

- Collaborative Information Environment (joint, interagency, multinational, including international and non-governmental organizations)
- Intelligence Support (interface with C2)
- Joint Fires and Maneuver C2
- Protection C2
- Deployment Planning and Execution Management
- Logistics Planning and Execution Management

The core Joint C2 capabilities and their functional relationships are depicted in Figure 9:

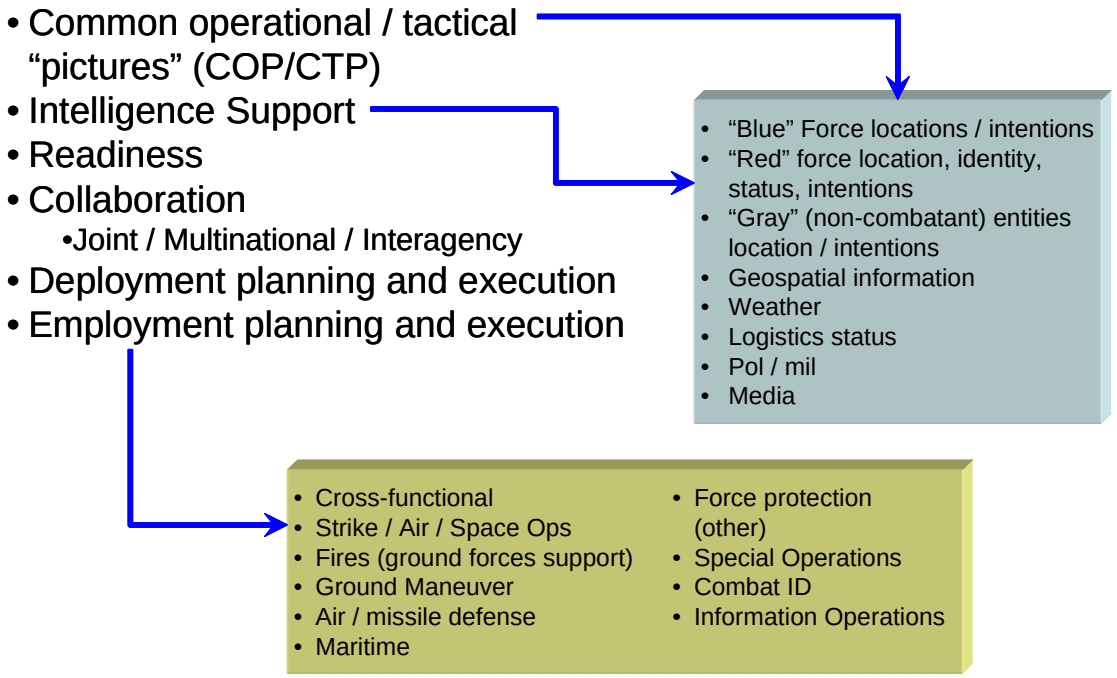

Figure 9: Core Joint C2 Capabilities

The sections that follow describe each of the core capabilities and the plan to achieve it. Intelligence support for Joint C2 is addressed in Section V. Logistics support and deployment planning & execution are addressed in Section VI. The section begins by addressing a key organizational and process initiative that will enable transformed planning and decisionmaking on a joint staff.

C. Standing Joint Force Headquarters

1. Description

The Standing Joint Force Headquarters (SJFHQ) is an organizational concept that will significantly increase the capability available to the joint force commander by addressing a number of shortcomings associated with the transition from regional combatant commander staff pre-crisis planning to operational execution. Historically, this transition has required the establishment of ad hoc joint task forces with staffs that were often ill prepared to immediately ramp up to plan and execute the operation.

These ad hoc organizations often lacked a full understanding of the strategic, political, and tactical situations and adversely impacted the JTF commander's ability to provide the regional combatant commander with adequate deterrence, preemption, or crisis response options. The SJFHQ resolves these deficiencies by providing a core theater capability that can be rapidly and seamlessly leveraged during the transition from crisis to the execution of operations, eliminating delays associated with providing these key capabilities in a standing joint force headquarters.

The SJFHQ is a uniquely structured organization that is further enhanced by its ability to leverage a number of transformational capabilities. These include collaborative information environment; operational net assessment (ONA); EBO; joint interagency coordination group (JIACG); joint ISR; and focused logistics. During Millennium Challenge 2002 (MC02), held in August 2002, each of these capabilities demonstrated their ability to aid the warfighter in conducting rapid decisive operations (RDO). Each of the attendant concepts' capabilities demonstrated value during MC02. Nevertheless, the transformational benefits of SJFHQ, which significantly increased joint force readiness and operational effectiveness, depend on a synergistic application of these concepts within the construct of the SJFHQ organization.

The SJFHQ will have the manning, equipment, training, and procedural enhancements needed to become a core around which the staff of a regional combatant commander or a joint task force commander can operate across the spectrum of operations--from daily routine, through pre-crisis, to crisis response. The SJFHQ will enable commanders to anticipate and respond to a national or regional security threat with a credible force that is directed by a highly flexible and robust command and control capability.

In its overall effect, the SJFHQ will serve as a "centerpiece" of joint C2 transformation. The SJFHQ will lead the way in:

- Changing how we think
- Transforming how we will command and fight
- Training the way we will command and fight; and
- Enabling decision superiority and rapid execution

The initial fielding of the SJFHQ in FY05 should not be considered an end state. The concept development and experimentation (CD&E) process will continue to refine SJFHQ enabling concepts (e.g. ONA) as well as produce new concepts that will advance SJFHQ capability well beyond that to be fielded in FY05.

The SJFHQ will be a *standing body of planners* who possess the full range of skills and training necessary to plan and conduct effects-based, joint operations. The SJFHQ personnel will work and train together on a daily basis. This standing body will assist in planning and executing the regional combatant commander's security cooperation program, and conduct continuous operational net assessment (explained below) and contingency planning for potential crises in the assigned theater of operations. Additionally, the SJFHQ must be fully integrated in the regional combatant commanders exercise program. Unlike the current "J-code" (typically J-1 through J-8) functional

structure of today's JTF headquarters, the SJFHQ will be organized around the operational functions of command--plans, operations, knowledge management, information superiority and support, performed by a warfighting headquarters. This structure will provide an effective, cross-functional context for the boards, centers, and cells operated by a JTF headquarters. The SJFHQ will be directed by a flag/general officer who is able to assume the role of an operational level joint commander of a contingency operation in the theater.

The SJFHQ will be *an adaptive command and control entity*. Its cross-functional structure coupled with experienced personnel will enable it to be configured for the specific requirements of a particular mission and the unique conditions of the theater of operations. The SJFHQ will feature improved interoperability through a high degree of standardization across the regional combatant commands (RCCs). This feature enables the rapid configuration of forces into a JTF, but remains sufficiently flexible in design and principles of operations to provide each regional combatant commander the ability to tailor the organization and skill sets for theater-specific missions.

The SJFHQ will plan for the conduct of effects-based operations. Planning and conducting future joint operations requires a firm grounding in this emerging concept of operations. EBO is a methodology for planning, executing, and assessing operations designed to attain a set of effects that achieve desired national security outcomes. These operations are oriented towards a desired strategic outcome or "effect" on the adversary through the synergistic effects achieved by applying the full range of national military and nonmilitary capabilities at the tactical, operational, and strategic levels. Achieving desired effects through the application of all elements of national power is the framework within which the military must plan and execute its operations.

2. Implementation Plan

USJFCOM was directed to provide the prototype SJFHQ during the past year, and to support fielding SJFHQs in designated RCCs in FY05. USJFCOM has determined that many actions must be taken in the FY 03 to FY 05 time frame in order to achieve these objectives. Outlined below are actions USJFCOM will undertake. These actions will synchronize SJFHQ development with a broad range of related activities including: CIE, EBO, JIACG, ONA, Blue JISR Database, Dynamic JISR Management, development of the Deployable Joint Command and Control (DJC2) capability and joint concept development and experimentation and training events from FY04 to FY05.

- USJFCOM, as lead, in coordination with RCCs and the Joint Staff, has developed "PAM 3 Doctrinal Implications of the SJFHQ," which addresses higher-level doctrinal issues relevant to the SJFHQ. This document presents a proposed plan to the Joint Staff for incorporation of these issues into joint doctrine, including a recommended schedule that synchronizes SJFHQ doctrinal development with the established doctrine review schedule.

- USJFCOM, in coordination with the RCCs and the Joint Staff, led a process to develop the organizational template for the SJFHQ in FY03. USJFCOM and the

Joint Staff and the RCCs will refine this template through FY 04-FY05, based on findings from joint concept development and experimentation and training. This same analysis will produce the recommended skill requirements for each SJFHQ billet and sourcing options for manning to include military (active and reserve; officer and enlisted) and civilian (civil service and contractor) personnel.

- USJFCOM will conceptualize, develop, and validate requirements and tactics, techniques, and procedures for optimizing intelligence capabilities (collection, exploitation, analysis, dissemination) against the time-critical information requirements of the SJFHQ. This focus will encompass systems, capabilities, and architectures in addition to the cultural aspects (i.e. non-material solutions) of transforming intelligence to support effects-based planning and operations.

- USJFCOM, as part of its SJFHQ strategy, will develop standardized SJFHQ training processes and procedures for delivery by December 2004. These procedures will serve USJFCOM and the RCCs throughout development of the SJFHQ. They will evolve and be examined within the Joint Training System four-phased methodology: 1) determine requirements, 2) initiate planning 3) conduct exercises and 4) assess results. As these processes and procedures evolve, joint training policy will require revision. USJFCOM will forward recommended changes, as required to the Joint Staff. Specific aspects of these training processes and procedures include:

  - Codifying the individual and collective tasks, conditions, and standards for the SJFHQ
  - Drafting a SJFHQ Master Training Guide; and
  - Continued development of the SJFHQ SOP[29]

- USJFCOM will lead, in coordination with the RCCs and Services, the development of initial infrastructure requirements in order to support each Regional Combatant Commander's fielding of a SJFHQ capability in FY05.

- DJC2 will provide the material component of the SJFHQ. DJC2 will be a deployable variant of GCCS-J and its successor, the Joint C2 Capability.[30]

- The Interoperability Technology Demonstration Center (ITDC) is being established within the Joint C4ISR Battle Center (JBC) at USJFCOM to demonstrate the interoperability, including compliance with GIG architecture and standards, of new systems and programs within the JC2 family of systems, early in the acquisition process. Consistent with this mission, the ITDC will demonstrate the interoperability of DJC2 prior to its being deployed to the SJFHQ. The ITDC will conduct joint interoperability demonstrations for selected systems and programs and provide

[29] USJFCOM will merge this product with the JTF HQ Common SOP (which is under development). The delivery of the SOP will coincide with SJFHQ fielding in FY 05.

[30] See Section K-2 below for a description of the DJC2 program.

independent results to program managers and the Commander, USJFCOM, the JCS Chairman's advocate for interoperability, to ensure joint interoperability requirements are satisfied. The ITDC will provide end-to-end analysis and validation of functional capabilities of operational, systems of systems, technical, software, and procedural interoperability for selected new systems and programs. For programs with USJFCOM oversight ITDC will coordinate with JITC to ensure that efforts to demonstrate and certify interoperability are carried out in a synergistic manner. Early implementation of the ITDC will focus on USJFCOM's SJFHQ, JBMC2 programs, and other programs as may be determined such as desired capabilities emerging from joint experiments. The JBC can provide interim joint C2 capabilities by prototyping and assessing timely solutions. The ITDC can demonstrate the interoperability of new systems or programs. When interoperability demonstrations are conducted for new capabilities provided by JBC, this will significantly contribute to USJFCOM's comprehensive C4ISR experimentation capability. ITDC demonstrations will be planned and executed in a manner that supports and complements the interoperability certification process outlined in the CJCSI 6212.01 and thus adheres to the overall JCIDS process for providing joint capabilities to warfighters.

- By FY05, individual SJFHQs will be fielded at USPACOM, USCENTCOM, USEUCOM, and USSOUTHCOM. Fielding of the SJFHQ in the other combatant commands is still under review.

Over the next two years, USJFCOM will employ a spiral development process, including major joint training events in FY03-FY05, to refine SJFHQ capabilities as needed to support the regional combatant commanders in establishing their SJFHQ capabilities by FY05. While the SJFHQ of 2005 will represent a significant change in operational planning and joint command and control, the potential of the SJFHQ will continue to improve with the development and implementation of SJFHQ-enabling concepts that will come on line well beyond 2005. The following SJFHQ-related DOTMLP-F packages are in various stages of development and JROC review: the Collaborative Information Environment, Joint en route Mission Planning Rehearsal System-Near Term (JEMPRS-NT), Effects-Based Operations, Operational Net Assessment, Blue ISR Database, Dynamic JISR Management, Joint Interagency Coordination Group, and the Joint Fires Initiative (supporting).

The SJFHQ and its attendant supporting concepts and capabilities will transform the ability of the regional combatant commander to influence, deter, and, if necessary, preempt and/or defeat the adversaries of tomorrow. Also, it will serve as a standing and cohesive planning organization that will embody the philosophy of "training in the manner in which we command and in which we fight."

D. Common Operational Picture

1. Description

Shared awareness of the operational and tactical situation is the key to net-centric operations, speed of command, and self-synchronization. The common operational picture (COP)[31] provides this shared awareness. The COP is a common, composite view of conditions, locations, and events in the battlespace. It is derived from an accurate, distributed database of operational and tactical data that is common to all users, with the form of presentation tailored to the user. Elements of the COP are: the order of battle, location, status, and assessed intentions of the opposing force; friendly force order of battle, location, status, and intentions; non-combatant units locations and intentions; status of friendly space assets; geo-spatial data; weather; logistics; political-military factors; and media reports.

The design of the COP display capability is driven by the need to be tailorable in content and area of regard, and selectable from a family of possible configurations and options for a selected mission area and function. It must be completely integrated for the selected mission area to ensure that no relevant information is omitted. It must be accurate and sufficiently close to real time to meet the needs of the user. Some users, particularly those involved in air/missile defense or strikes on ground or sub-surface moving targets, will require a real-time COP.

2. Implementation Plan

The COP will be provided by a cross-domain net service within the JC2 architecture, employing GIG ES, enabled by the GIG communications layer, enterprise-wide IPv6 and Mobile IPv6 networking, and commercial processors. The COP will be deployed as a capability within JC2/DJC2 and be fully compatible with tactical-level systems. This net service capability will consist of software and procedures for accessing, displaying, and using selected types of data. The GIG will provide timely access to the data required by the COP, including Blue Force Situational Awareness (BFSA) and intelligence inputs on opposing and other forces as well as non-combatants, through a publish/subscribe or query/response process, integral to the JC2 architecture.

The Joint C2 Functional Capability Board (FCB), under USJFCOM leadership, is responsible for guiding the development of the tailorable, objective COP, based on the JC2/GIG ES architecture, which will ultimately be utilized by all warfighters and support elements from the strategic to the lowest tactical levels. COP capability will first be provided at the operational level of command, consistent with the current GCCS COP

[31] The terms “COP” and “CROP” are considered interchangeable for the purposes of this plan. The COP is, by definition, relevant to the user. The terminology and concept of a COP apply to all levels of command from the strategic to the lowest tactical levels. Throughout this document, the term “COP” is used as the officially recognized term. The term “User Defined Operational Picture” (UDOP) has been proposed to distinguish the future Joint C2 net-centric operational picture from its COE-based predecessor. The term “Common Intelligence Picture” is not used in the plan. The intelligence picture is a key element of the COP

and the current JC2 ORD. Figure 10 depicts the key capability milestones associated with the objective COP.

The DoD Integrated Interoperability Plan establishes the following actions to enhance blue force situational awareness capability in the COP:

- The Battlespace Awareness FCB, in coordination with the Joint C2 FCB, shall manage the development of BFSA capability.

- The Army, Marine Corps, and SOCOM in coordination with USJFCOM and other stakeholders shall submit a plan and investment strategy to the SecDef by 30 June 2004 to migrate diverse surface BFSA systems to a common, secure, low-cost system that is interoperable with GCCS/JC2 and tactical C2 systems to equip all ground units with this common system by 30 September 2006.

- CJCS continue working with the Symbology Senior Management Committee to develop a common symbology and metadata for BFSA as part of the Mil Standard 2525 revision.

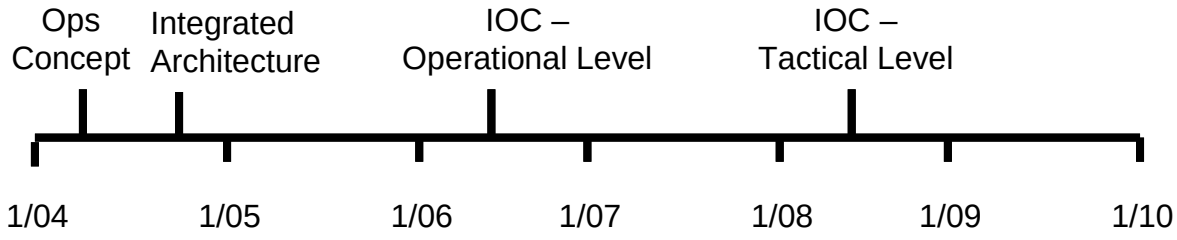

Figure 10: COP Capability Timeline

E. Adaptive Mission Planning and Rehearsal

1. Description

Attributes. Identified as one of the six interoperability priorities of the FY04-09 DoD Transformation Planning Guidance,[32] adaptive mission planning and rehearsal (AMP&R) is the capability to rapidly plan operations and continually adapt the plan to changing situations.[33] The accelerating pace and complexity of military operations make effective and adaptive joint planning necessary for the successful coordination and synchronization of effects-based operations. As such, it will be an important enabler of military transformation at the strategic, operational, and tactical levels of operation.

Desired attributes of the AMP&R capability are:

- Effectiveness across the full spectrum of operations, from non-combatant evacuations to full-scale hostilities against a peer adversary

[32] Joint Pub 5-00.2 Joint Task Force Plans and Policy, Chapter IX. P. IX-3.
[33] For the six interoperability priorities, see the *Transformation Planning Guidance*, p. 16

- Planning that is conducted in a distributed, collaborative, interactive manner, with echelons planning in parallel from the theater commander to the individual unit
- Planning capability that is available in garrison, deployed, and enroute to deployment
- Capability to generate and revise plans, incorporating all warfare domains (air, land, maritime, space, information, and military assistance to civil authorities) and all mission areas, while operating under a range of command environments (inter-agency, allied, coalition)
- Integration of planning and execution management
- Integration of strategic, operational and tactical planning
- Integration of a dynamic rehearsal capability into the planning process
- Integration of a staff training capability
- Capability to plan unconventional operations, such as SOF operations and information operations, and to integrate these activities with other elements of the joint plan.

2. Implementation Plan

Operational and tactical level AMP&R systems will constitute a family of applications integrated into the JC2 architecture. This integration will allow the AMP&R systems to draw information from JC2 databases and to use the User-Defined Operational Picture (UDOP) and other JC2 applications. AMP&R applications, like all JC2 applications, will leverage the GIG Enterprise Services / Net-centric Enterprise Services (GES/NCES) architecture and the Joint Command and Control Collaborative Information Environment (JC2 CIE). Individual systems will share services and information within a Shared Data Environment (SHADE).

The CIE will provide planners with the ability to improve planning quality and shorten planning timelines through information and idea sharing and the conduct of parallel activities. CIE capabilities will allow GIG users to task, collect, post, process, use, store, manage and protect information resources on demand.

The AMP&R capability will be achieved through an iterative process that leverages joint concept development and experimentation and prototyping. This process will encompass a series of initiatives and programs, each of which will facilitate the evaluation and integration of one or more capabilities, thus incrementally yielding an increasingly robust and effective AMP&R system from the strategic to the tactical level. The currently envisioned modules include:

- Adaptive Planning Study
- Secure Enroute Communications Package-I (SECOMP-I)
- Joint Mission Planning System (JMPS)
- SOF Planning and Rehearsal System (SOFPARS)

Adaptive Planning Study. Joint command and control begins with the system by which the strategic direction of the National Command Authority and the national military

strategy are converted into missions and tasks assigned to the combatant commanders. The combatant commanders' plans, in turn, are important bases for joint concepts and required capabilities, doctrine, and experimentation across the joint force. Transformation of the planning systems will begin immediately. By 15 February 2004, the Office of the Deputy Assistant Secretary of Defense (Resources and Plans) (OSD(R&P)) and the Office of the Director for Operational Plans and Joint Force Development (J-7) will complete a study of how DoD can change from current planning systems to the adaptive planning system that is required. The recommended system must include more responsive, flexible planning and execution processes and tools. It must produce war plans in a year or less; enable the rapid revision of plans according to changing circumstances; facilitate iterative senior leader dialogue that shapes plans as they develop; and provide up-to-date options for the President and the Secretary of Defense. The study will result in a recommended adaptive planning system and a concept of phased transition, including immediate actions and steps to be taken in FY04.

The concept of phased transition to a new planning system will include near-term (FY 04), mid-term (FY05-06) and long-term (FY06-11 and beyond) components that, with Secretary of Defense approval, can be converted swiftly into a more detailed implementation plan. In the near-term, new planning doctrine can be written while commands and headquarters experiment with new procedures and tools using guidance contained in the 2004 Contingency Planning Guidance. The mid-term component is likely to link planning systems and tools to readiness and force management systems to shared, collaborative, parallel planning. The long-term component will strive to exploit core enterprise services on the global information grid in order to link the entire JPEC in a virtual community capable of continuously creating, revising and retiring plans as strategic needs and military capabilities change.

SECOMP-I. The Secure Enroute Communications Package-Improved (SECOMP-I) program will help provide enroute mission planning and rehearsal capability to combatant command and Army elements on the move, with particular focus on supporting forced entry and early entry operations. The package is designed to receive and disseminate updated intelligence, support command and control planning by forces deploying to theater aboard USAF aircraft, and provide initial ground communications in the area of operations. U.S. Army CECOM is the executive agent. Key SECOMP-I capabilities include:[34]

- VHF/UHF Beyond Line of Sight (BLOS) communications interoperable with legacy C2 software: (Maneuver Control System (MCS), Force XXI Battle Command Brigade and Below (FBCB2)
- Flying Location Area Network (FLAN) for command and control while airborne (Block II objective)
- Air-to-air and air-to-ground communications from within the aircraft formation

[34] US Army CECOM Field Commanders Report, SECOMP-I. p. 1

- Wide band data transmission across the airborne formation
- Interoperability with Single Channel Tactical Satellite (SCATSAT), International Marine Satellites (INMARSAT) terminals, and/or VHF voice on non-frequency hopping channels simultaneously[35]

In FY02, SECOMP-I produced SECOMP-I (-) as part of a rapid procurement program. These systems were delivered to the XVIII Airborne Corps. The SECOMP-I (-) is now certified for use by Army warfighters on board C-17 and C-130 aircraft during all phases of flight and is currently supporting operations in Afghanistan.[36]

Initially slated for a block approach to procurement, SECOMP-I will go immediately to Block II fielding. Block II IOC in 1QFY07, will provide full AMP&R capabilities similar to the ground-based Tactical Operations Center (TOC) systems using advanced wideband commercial or DoD-provided radios, satellites and approved Army and joint command and control systems. The Army is pursuing with the USAF Special Projects Office the possibility of adding additional antennas. These antenna modifications will support both Joint and Army en route communications. Block II incorporates a Flying Local Area Network (FLAN), wideband high speed satellite communications, and an approved, automated C2 system to attain full AMP&R functionality in three packages tailored to support different levels of command: a fully capable AMP&R C2 node normally manned by corps and division staff; a less capable brigade/battalion package; and a company package.

The proponent school will provide TTPs for units being fielded SECOMP-I. The TTP will address changes in the units' doctrine and tactics because of the fielding of SECOMP-I.[37]

As of March 31, 2003, SECOMP-I is a full acquisition program. In FY04, SECOMP-I Program will absorb the USJFCOM J-8 JEMPERS-NT initiative for the development of interim Enroute Mission Planning capabilities.[38]

- First Unit Equipped Date (FUED): Q4 FY06
- Initial Operational Capability (IOC): Q1 FY07
- Full Operational Capability (FOC): TBD

JMPS. The Joint Mission Planning System (JMPS) is a co-development program that includes the Navy, Army, Air Force, and USSOCOM, which will use a scaleable, extensible and configurable open architecture to meet a full range of joint automated planning needs. The executive agent for JMPS is the U.S. Naval Air Warfare Center.

JMPS will provide the information, automated tools, and decision aids needed to rapidly plan for aircraft, weapon, or sensor missions as well as to support post-mission analysis

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[36] "New Communications Equipment Fielded by CECOM Team." Robert Bradley, Program Manager for WIN-T. CECOM.
[37] System Training Plan for SECOMP-I. US Army Signal Center. Ft. Gordon, GA. 18 July 2001. Pages 1-2
[38] Ameet Bhaat, SECOMP-I Subject Matter Expert, Eatontown, N.J., 3 September 2003.

of recorded data. As a key net-centric warfare enabler, JMPS will provide seamless interoperability, improved data availability and flexibility, an aggregate capability that will streamline and accelerate joint mission planning, thus speeding the tempo of joint operations. JMPS accomplishes these goals by establishing a standardized environment for mission planning systems.

JMPS has adopted an evolutionary acquisition approach, which will allow the warfighter to seamlessly perform basic, level flight planning with the JMPS Version 1 system. JMPS Version 1 will provide basic flight planning, route planning/editing, fuel calculations, mapping, 3-D visualization, Common Mission Data Load (CMDL), and an intelligence interface.

The JMPS Combat Version 1 system is a planned enhancement of JMPS Version 1. JMPS Combat 1 will provide unit level planning, Precision Targeting Workstation (PTW) imagery interface, GCCS-M interface, GPS crypto keys, precision guided munitions (PGM) planning capability, weather interface, GPS Prediction and Server Implementation. The JMPS Combat 1 will also serve as a common foundation to support mission planning for some legacy platforms.

JMPS will evolve architecturally, as needed, to support future platforms and weapons. The JMPS Follow-On Components system will be an enhanced version of JMPS Combat 1 that provides additional components and capabilities, including multi-level mission planning capability, Theater Battle Management Core System (TBMCS) interface, route deconfliction, storage of planning and weapon effectiveness information, and Littoral Mission Planning tools.

Table 9: JMPS Investment Plan

JMPS	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	25.300	18.759	14.782	8.736	8.894	9.042

The planned program for JMPS includes:

- FY04 JMPS Version1 and Combat 1 development efforts continue. Unique Planning Component (UPC) testing and system-of-systems testing began Q4 FY03 and will continue through Q1 FY04. The JMPS program provides collaboration support across platforms and weapons programs with the Services.

- FY04 and beyond will see the start of the JMPS Follow-On Components effort, coordinate and plan the development of additional mission planning components and capabilities, and continue JMPS Combat 1 fix builds for any discrepancies identified during testing.

- FY04 through FY05 will transition Science and Technology initiatives into JMPS Follow-On

- IOC JMPS Version 1. Q3 FY04

SOFPARS.[39] Special Operations Forces Planning and Rehearsal System (SOFPARS) improves and streamlines SOF mission planning and mission execution capabilities in support of the USSOCOM's core mission and tasks. This is being achieved by improving data flow and information management, accelerating planning folder preparation, collaborating and sharing mission data, and providing mission equipment data initialization and interfaces. The use of SOFPARS is expected to significantly improve SOF response times and increase opportunities for pre-mission rehearsal, joint forces coordination, and crew/team rest.

The SOFPARS is a software development program following evolutionary acquisition strategies for delivering automated mission planning applications and tools with automated interfaces to C4I systems. The initial version began to be fielded in FY02. Applications and tools include SOF enhancements to the Air Force Mission Support System's personal computer-based Portable Flight Planning Software (PFPS) and the emerging JMPS. The software enhancements tailor the baseline PFPS functions to support Joint Chiefs Pub series 3-05 that direct development of new, more rapid capabilities for the planning and execution of SOF missions. Additionally, the software improvements are developed to be tailorable for support of the component (Air, Ground, and Maritime) Service and unit-required training, tactics, and procedures, and the Theater Special Operations Command (TSOC).

Current funding supports continuing software development, force sustainment, operational support, and response to emergent requirements for the United States Army Special Operations Command, Air Force Special Operations Command, and the Naval Special Warfare Command. Future funding minimally supports the development of TSOC capabilities, and migration of the warfighter's capabilities to the JMPS.

Table 10: SOFPARS Investment Plan

SOFPARS	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	2.603	3.933	3.843	3.765	3.870	3.962

Planned project development for FY04 includes:

[39] USSOCOM RDT&E Budget Item Justification, SOFPARS. February 2003. p.85-91.

- Beginning development of SOC-level software development and integration, Including first-look migration and evaluation of the JMPS. Transition planning and software conversion to JMPS framework begins
- Developing and integrating aircraft weapons/electronics enhancements and interfaces with joint systems
- Continuing test and evaluation on core software, installable software modules, aircraft weapons/electronics, and flight performance models

Table 11: SOFPARS Schedule Profile

Fiscal Year	2004	2005	2006	2007	2008	2009
Mission Planning Environment Software Suite						
PFPS Releases						
4.0 Joint Build	4QFY03					
4.X	1-4Q					
4.X		1-4Q				
JMPS			2-4Q	1-4Q	1-4Q	1-4Q
Aircraft/Weapons & Electronics Software Modules						
Enhancements required to take advantage of new:						
PFPS Functionality	1-3Q	1-3Q	1-3Q	1-3Q	1-3Q	1-3Q
Route Analysis Tool	1-3Q	1-3Q	1-3Q	1-3Q	1-3Q	1-3Q
Mission Planning Module	1-3Q	1-3Q	1-3Q	1-3Q	1-3Q	1-3Q
Development of Automated Tools		2-3Q				

F. Collaborative Information Environment

1. Description

The CIE is the aggregation of hardware, software, and procedures that will enable sharing of information and collaboration within the joint force commander's staff and with other, similarly equipped staffs. It will also provide the interfaces with both DoD and commercial communications pathways to allow the JFC to receive and disseminate information.

The CIE will facilitate information and knowledge exchange among members of the joint force and its supporting and supported organizations. It will contribute to achieving decision superiority by providing warfighters the ability to share information and ideas, reduce planning times, and to enhance operational effectiveness. The CIE will allow the joint force to collaborate with supporting organizations, wherever they are located. Information brought into this environment will be available to everyone in the

environment. The CIE's critical enabler, the GIG, interconnects the processes and personnel for collecting, processing, storing, disseminating, and managing information on demand to warfighters, policy makers, and support personnel. The CIE toolset must be effective in all environments from tactical to strategic, including environments characterized by limited bandwidth and intermittent connectivity.

2. Implementation Plan

The DJC2 system will provide the materiel component of the CIE. Collaboration capability will be provided by a DoD-wide standard tool set that uses commercial, state-of-the-art capabilities, which are provided with multi-level, military-grade security capability.

An interim CIE capability will be deployed to meet current needs and to provide feedback from the COCOMs into the spiral development of a born joint CIE.

The Prototype Limited Objective Exercise (LOE) 03 will refine CIE system level requirements for input into DJC2. In concert with the formal test process, the DJC2's CIE capabilities will be operationally assessed by USJFCOM's Joint C4ISR Battle Center (JBC). The JBC will conduct spiral operational assessments (OAs) commensurate with DJC2 incrementally integrated CIE capability to evaluate the warfighting utility, maturity, and jointness of the system. Additionally, the JBC, through its Interoperability Technology Demonstration Center (ITDC), will conduct interoperability demonstrations of the DJC2 in the context of a Joint C2 environment to address and resolve holistic C2 interoperability issues.

Once the interim CIE is fielded to the COCOMs, USJFCOM will work with commands as they capture the results of exercises and operations to further tailor/prototype their CIEs for specific Joint Mission Essential Tasks, missions, and tasks (e.g., joint fires against time-sensitive targets) to synthesize the CIE requirements for JC2 "born-joint" CIE applications within NCES/GES.

The interim CIE will transition to the NCES collaboration capability in the next three years.

G. Joint Fires C2

1. Description

This section addresses future sensor-to-shooter and combat identification capabilities that contribute to the C2 of joint fires. [40] Joint fires provide the ability for joint forces to: locate, identify, and track objectives or targets; select, organize and employ the correct systems to attack these targets in order to generate desired effects; assess results; and finally, if needed, to reengage with decisive speed and overwhelming operational tempo. This capability will available for employment throughout the full range of military operations (*Joint Vision 2020*, June 2000).

[40] For the purposes of this plan, the term "Joint Fires" includes the concept of *Precision Engagement*.

The future joint force will integrate the joint fires capabilities of all Services, as well as coalition forces, in order to generate tailored lethal and non-lethal effects, wherever and whenever required in the battle space. The joint force will seek to orchestrate these effects in order to achieve operational objectives derived from the commander's intent.

The objective of joint fires is to precisely deliver attacks against positively identified, high value targets at the right moment with the most efficient means in order to create the desired effects. The key capabilities needed to accomplish this objective are time-sensitive target (TST) detection, [41] rapid sensor-to-shooter (STS) relay of the target location to a capable shooter, [42] and combat identification (Combat ID) of the target by or for the shooter.[43]

2. Implementation Plan

The development of common, tailorable, software systems will enable the building of a robust COP from which the human or automated controller can direct the establishment of a direct flow of tracking data from the sensor or multiple sensors to the shooter and other qualified joint fires control personnel. Through the specialized TST community of interest on the net, shooters will have access in real- or near-real time, as required, to all information on the track of their assigned target that is available from any surveillance sensor.

When carrying out Joint Close Air Support (JCAS), shooters will have real-time access to an automated target brief ("9-line brief") via netted communications with the Tactical Air Control Party (TACP). Airborne or ground-based controllers with access to real-time target tracking data from sensors on surveillance platforms will be able to facilitate the transfer of this data directly to ready shooters seeking to engage mobile missile launchers, surface-to-air missile launchers or other TSTs via the net.

The netting of all friendly forces and development of other Combat ID DOTMPLF capabilities will contribute to efforts to avoid fratricide by providing accurate tracking and identification of "blue" forces to "blue" shooters. Equipping all blue shooters with a joint-standard means of secure target interrogation will complement this information.

[41]Time-sensitive targets (TST) are targets of such high priority that the joint force commander designates them as requiring immediate engagement once detected because either they pose a particularly serious danger to friendly forces or they are highly lucrative targets, which will present only a fleeting opportunity for attack. Joint Publication 3-60, Joint Doctrine for Targeting, 17 January 2002, p. B-1.

[42]Sensor-to-shooter (STS) capability seeks to accelerate the detection-to-engagement cycle through near-real time dissemination of targeting-quality data from sensors directly to the appropriate shooter. The ultimate goal is to be able to deliver data from any sensor that detects and tracks the time-sensitive target to an appropriately armed, ready shooter, in some cases, directly to his weapon within a period of no more than several minutes. The STS concept includes Sensor-to-Weapon (STW) concepts and shooter organic sensors that can provide targeting-quality data

[43] Combat Identification (Combat ID) is the capability of shooters to positively identify a target as non-friendly prior to engagement.

The Joint Fires C2 capability will be achieved through an iterative process leveraging joint concept development and experimentation and prototyping. This process encompasses a series of initiatives and programs, each of which will facilitate the evaluation and integration of one or more capabilities yielding an increasingly robust and effective joint fires system. The currently envisioned modules, which are discussed below, include:

- Distributed Common Ground/Surface System (DCGS)
- Joint Fires Network (JFN)
- Advanced Field Artillery Tactical Data System (AFATDS)
- Digital Targeting Folders (DTFs)
- IP-Enabling of Shooters and Sensor Fields
- Tactical Data Link Integration
- Digital "9-line Brief" from TACP to Support Aircraft

DCGS/Air Force DCGS (AF-DCGS). The DoD Distributed Common Ground/Surface System (DCGS) is the Department's ISR network-centric enterprise that provides the TPED/TPPU capabilities for the JTF and below. It is the key component for providing fused ISR-based decision quality information for effective Joint C2. In addition, it contributes to the C2 of Joint ISR assets and to building the FIOP. USD/AT &L directed all Services to baseline their DCGS capability on the DCGS Integration Backbone (DIB), which is currently under development as part of the Air Force DCGS (AF-DCGS) Block 10.2 acquisition. The DIB is the key to joint interoperability across the DOD DCGS enterprise. All four Services agreed to the requirements that serve as the basis for the DIB.

The DCGS program is developing a family of systems capable of supporting all levels of conflict, interoperable (using the Common Data Link) with reconnaissance platforms and sensors, and integrated into the Joint Command, Control, Communication, Computer, and Intelligence (C4I) environment. The program integrates architectures and standards from the Common Imagery Ground/Surface Systems for Imagery Intelligence, the Joint Interoperable Operator Network for Signals Intelligence, and the Joint Airborne MASINT Architecture for MASINT. AF-DCGS provides ground/surface systems capable of tasking intelligence sensors, and receiving, processing, exploiting, and disseminating data from airborne and national reconnaissance platforms and commercial sources. AF-DCGS is a "system of systems" interconnected by a robust communications structure to provide data streams between intelligence collectors, exploiters, producers, disseminators, and users. AF-DCGS has four core locations, two CONUS-based and two OCONUS. Several other DCGS systems are distributed among Air Force operational units at numbered air force locations, to support the joint task force commander and the air operations center (AOC). The CONUS-based systems are deployable and capable of reachback operations via satellite.

AF-DCGS provides significant support to time-sensitive target (TST) operations. This support will be enhanced with the planned integration of software tools and closer integration to AOC tools. ISR management capability will provide the Joint Forces Air Component Commander (JFACC) the capability to:

1. Dynamically visualize and command ISR assets and the information in the AOC
2. Quickly and effectively synchronize AF-DCGS ISR operations, collection capabilities, and information with the AOC's combat objectives to improve the TST process

DCGS uses a spiral development program to field and upgrade the common ground system architecture. Systems and technology will be contracted for under a competitive Request for Proposal (RFP) process where possible. Activities for FY04-05 include:

- Continued evolution of DCGS architectures and standards for commonality and interoperability across intelligence disciplines to include NATO interoperability and management of DCGS Infrastructure Integrated Process Team (IPT) for ASD (NII)
- Continued ISR management capability development efforts to further integrate this functionality into DCGS
- Continued development of improved command and control of ISR platforms/sensors to enhance DCGS support to the commander, improve integration with the AOC, and to increase TST effectiveness

Table 12: AF-DCGS Investment Plan[44]

AF-DCGS	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	27.107	26.196	52.282	180.128	150.063	174.518

AF-DCGS will receive significant funding increases in FY 06 - FY 09 to support AF DCGS modernization. These funds will transform AF-DCGS from its existing architecture based on proprietary and legacy systems to an open architecture integrated into the Network Centric Warfare environment. However, the overall cost to complete DCGS is yet to be determined.

Joint Fires Network (JFN). The Joint Fires Network (JFN) (previously Naval Fires Network) is a Navy program developed through a partnership between the Naval Sea Systems Command's Program Executive Office for Integrated Warfare Systems, the Naval Air Systems Command, and the Space and Naval Warfare Systems Command. JFN leverages the Tactical Exploitation System (TES).

Each of the Services uses a portion of the TES middleware, but in its own unique way. While the Navy provides the system to each of the four Services, it does not provide central oversight among the Services. Furthermore, the Services have not agreed to be part of JFN, nor is JFN a JROC-approved program.

JFN provides intelligence correlation, sensor control and planning, target generation, precise target coordinates, moving target tracks and battle damage assessment

[44] FY 2004 Air Force RDT&E Budget Item Justification. AF-DCGS. February 2003. pp. 1-3.

capabilities to support more timely engagement of TSTs. This capability allows a platform with the full JFN suite to share a greatly improved battlespace picture very quickly with other platforms and C2 nodes in the area of operations.

The Air Force ISR Manager is not networked with any of the other Service systems that use the TES middleware, nor is there a Joint CONOPS for joint fires. The bottom line – Air Force DCGS does not equal JFN/TES, and JFN/TES does not equal ISR Manager.[45]

JFN development combines GOTS, COTS, and freeware technologies, along with a Multi-INT System Manager, to create the Common Software Baseline.

As of April 2003, TES middleware was installed at 60 sites. The Navy manages modifications to these and future systems with the four Services participating in a Joint Configuration Control Board (JCCB) and a Joint Commonality Board (JCB). The JCCB approves changes, and maintains system interoperability via a two-year development roadmap; the JCB is a council of O-6s from all four Services that helps to provide joint oversight and define the acquisition approach.

Current JFN operators report that the software is stable and the system is reliable. JFN training remains an issue, as do shortcomings with the GCCS Integrated Imagery and Intelligence (I3) segment that have been identified by the Marine Corps.[46]

JFN Implementation Plan:

- IOC for Build 6.1 routine upgrades of JFN is Q1 FY04
- Further builds of JFN are halted due to migration of capabilities toward the Distributed Common Ground/Surface System (DCGS)

JFN Build 7.0 was not based on requirements vetted and validated by the Services. Instead, they were developed by the TES JCB, which is an acquisition organization Recent changes to the Services Distributed Common Ground/Surface System (DCGS) acquisition program activities approved by USD/I and ASD/AT&L puts JFN build 7.0+ no longer on the acquisition pathway. While JFN/TES middleware provides for some interim solutions to joint fires, ISR integration with joint fires will require more than the materiel solution provided by JFN. The USD/I and ASD/AT&L decisions place development of such solutions with DCGS. [47]

Advanced Field Artillery Tactical Data System (AFATDS).[48] The Advanced Field Artillery Tactical Data System (AFATDS) is a US Army program to broaden and modernize the US Army fire support command, control and communications system. AFATDS will provide automated fire support, fire planning, and the coordination and employment of all Service/combined fire support assets to complement the

[45] Arthur Gunn, HQ USAF/XOIRY. Editorial Comments. 17 October 2003.
[46] Dr. Ronald A. Enlow. "Joint Fires Network Technical Assessment" Briefing. Institute for Defense Analyses.
[47] USJFCOM J-28 , Mr. Jackson. Editorial Comments. 17 October 2003.
[48] FY 2004 Army RDT&E Budget Item Justification. AFATDS. February 2003. pp. 135-145.

commander's plan. AFATDS accomplishes this by providing fully automated support for planning, coordination and control of all fire support assets (mortars, close air support, naval gunfire, attack helicopters, offensive electronic warfare, field artillery cannons, rockets, and guided missiles) in the execution of close support, counterfire, interdiction, suppression of enemy air defense and deep operations. AFATDS will automatically implement detailed commander's guidance in automation of operational planning, movement control, targeting, target value analysis and fire support planning. This project is a replacement system for the Initial Fire Support Automated System, Battery Computer System and Fire Direction System. The AFATDS supports the Legacy-to-Objective transition path of the Army Transformation Campaign Plan.

AFATDS will perform the fire support command, control, and coordination requirements at various levels of command. It will provide C2 relationships and full fire support functionality at all echelons of field artillery and maneuver, from Echelons Above Corps to battery or platoon in support of all levels of conflict. The system is composed of Common Hardware/Software (CHS) employed in varying configurations at different operational facilities (or nodes) and unique system software interconnected by tactical communications in the form of a software-driven, automated network.

The Marine Corps will also utilize AFATDS. AFTADS will interoperate with Navy and Air Force C2 weapon systems as well as the ADLER (Germany), ATLAS (France), BATES (UK), and SIT (Italy) fire support systems.

The acquisition strategy for AFATDS includes software development in incremental releases. AFATDS '96, released in Dec 1996, automated 51% of the required tasks including fire support planning, target nomination, order of fire, and meteorological/survey operations. The current version is AFATDS Version 6.3 and is deployed in the field with Force XXI units. Subsequent releases will add additional functions, providing automated capabilities for the required tasks, including fire support sensor planning and additional munitions. The AFATDS software will utilize the Defense Information Infrastructure (DII) Common Operating Environment (COE) and the Joint Technical Architecture.

Planned program activities for FY04 and FY05 include preparing and supporting AFATDS Version 7 test and material release, and continued AFATDS Version 6.3, AFTADS Version 7, and subsequent systems software development. Recent lessons learned during operations in Iraq from 3rd ID and V Corps also recommend "development of techniques that allow the tying in of ADOCS and AFATDS into a system such as TACSAT for mission processing on the move in a vehicle."[49]

Table 13: AFATDS Investment Plan[50]

AFATDS	FY04	FY05	FY06	FY07	FY08	FY09

[49] 3rd Infantry Division, Operation Iraqi Freedom DRAFT After Action Report. 12 May 2003. p. 112.
[50] FY 2004 Army RDT&E Budget Item Justification: AFATDS. February 2003. p. 135.

Dollars (Millions)	28.917	22.551	18.244	18.762	19.289	19.852

Digital Targeting Folders (DTFs). The Digital Targeting Folders program has been established as an effective means to capture, store and share relevant target data. This initiative develops a database that serves as a dynamic repository of targeting information residing in a web-based environment, accessible through COTS web browsers.

The objective of this initiative, led by USJFCOM, is to provide the user with a dynamically updated, near real-time targeting database that is based on most current threat data within the Joint Operations Area (JOA).

Key milestones include the following:

- Refinement and fielding of the Joint Targeting Toolbox (JTT) and Joint Automated Target Folder (JATF) functionalities. This combination has proven extremely effective in experimentation exercises and has recently been deployed by CENTCOM to support operations in Afghanistan.
- Planned integration of JTT/JATF into GCCS-M/GCCS-I3 and TBMCS by the Navy, Marines, and Air Force. There are, however, currently no corresponding plans to integrate JTT/JATF into the Army/Marines AFATDS/Army Battle Command System (ABCS).
- USJFCOM, in collaboration with the FIOP management team, will incorporate WebATF functional requirements in the FIOP overarching COP Joint Requirements by 31 December 2003.

IP-enabling of "Shooters" and Sensor Feeds. In accordance with DoD CIO Memorandum of 9 June 2003, "Internet Protocol Version 6 (IPv6)," all IT and NSS are to be IPv6-enabled by FY08. In addition, the DoD Integrated Interoperability Plan (IIP) tasks USD (AT&L) to provide oversight and amplifying guidance as necessary to ensure that all airborne, naval, and ground "shooters" are IPv6-enabled by the target date of FY08. USD (I) is to establish standards and support program realignment/resource requirements necessary to ensure that data derived from theater and tactical sensors is made available to all users as needed via IPv6. Further, USD (I) will seek to ensure that IPv6 requirements are incorporated into the format of data derived from national technical means.

Tactical Data Link (TDL) Integration. The DoD IIP tasks USJFCOM to investigate the use of Link 16 as an interim net for targeting ground targets. Tactical data links (TDLs) help provide interoperability, local and global connectivity, and situational awareness to the user operating under rapidly changing operational conditions. Air Force, Army, Navy, and the Marine Corps in theater C2 elements, weapons platforms, and sensors are using TDL terminals.

ASD (NII), in coordination with CJCS, DISA, and the Services, will update the Data Link Management Plan to show transition of legacy data links to the objective architecture, including demonstration of the viability of MIPv6 for near-real time tactical data. They will also investigate the interim measure of modifying Link 16 to include a MIPv6 capability, while retaining the secure Link 16 waveform and equipment.

Digital "9-line Brief" from the TACP to Support Aircraft. The objective of this effort is to ensure that the aircraft of any Service or SOCOM can receive an automated targeting "9-line brief" from the Tactical Air Control Party (TACP) of any Service or SOCOM. An additional capability for relaying the digital 9-line brief to aerial attack platforms via C2 aircraft requires continued development of the interim solution addressed in a DOTMLP-F package. This initiative is led by USJFCOM, in collaboration with the Services, the Joint Staff, and the COCOMs. Key milestones in these efforts include:

- Digital 9-line brief relay to airborne shooters via C2 aircraft was slated to complete testing by NAVAIR China Lake in September 2003.
- Operational testing will be conducted to validate viability of the airborne relay approach prior to initial fielding planned for December 2003**.**
- The Joint USMC-USAF TACP Modernization Program will update/enhance TACP field equipment (such as the TACTER-31), which will specifically enhance TACP capability to send digital link messages directly to attack aircraft.

Combat Identification (Combat ID). Current combat identification (Combat ID) capabilities are very limited, as was tragically demonstrated in Operation Iraqi Freedom. The U.S. Army and Marine Corps are pursuing vehicle and dismounted infantry target identification devices based on laser/radio frequency query/response technology, built to standards established for the systems interoperability among NATO allies. Furthermore, Radio-Based Combat Identification and other means of timely situational awareness at the shooter/platform level and critical C2 nodes are under development. However, in the interim, the Marine Corps and many Army units continue to rely on enhanced optics, thermal panels, and other recognition aids for ground Combat ID.

Airborne Combat ID requirements can be partially satisfied by secure IFF. However, the currently deployed version, Mk XII Mode 4 IFF system, is obsolete, and the Services have been slow to deploy its Mk XII Mode 5 successor. Furthermore, outstanding issues remain regarding the operational security impact of interrogative IFF systems like the Mk XII on force EMCON or on stealthy platforms.

The joint Combat ID initiative is being led by the CJCS. USJFCOM leads the Service management efforts. The objective of this initiative is to provide capability to all shooters to positively identify targets as non-friendly prior to engagement.

Key milestones include the following:

- CJCS was slated to finalize selection of an affordable objective Combat ID architecture for surface units and to confirm that Mk XII Mode 5 IFF is the solution for Combat ID of air targets by 31 October 2003.
- USD (P) will incorporate Combat ID investment guidance, consistent with Combat ID architecture, in DPG FY06-FY11; Services to provide funding in their POMs in accordance with DPG guidance.
- Services include funding in POM 06 to complete replacement of Mode 4 with Mode 5 IFF by FY08. Commander, USJFCOM shall synchronize Services management efforts.
- USJFCOM, in coordination with the Army, Marine Corps, and SOCOM, shall prepare a plan and investment strategy by 31 December 04 to equip all ground units with an interim Combat ID capability. Robust, dependable Blue Force Tracking embedded in the COP and the Single Integrated Air Picture (SIAP) (as described in section H that follows) should be able to play a larger role in IFF/Combat ID in the future, reducing the dependence upon Cold War-style interrogative IFF for Combat ID. However, there remains a need to secure interactive/responsive IFF systems from penetration/exploitation by hostile/potentially hostile states/actors. In an era of ad hoc coalitions, robust encryption with multiple keys that can be rapidly reset is essential to maintaining the operational security of the Combat ID system.

Balancing IFF/Combat ID needs with force protection/operational security needs is an on-going concern that needs to be recognized and incorporated into future planning. Interrogative IFF has inherent limitations for Combat ID of 21st century forces potentially facing electronically sophisticated adversaries seeking to exploit U.S. IFF/Combat ID for their own purposes.[51] IFF systems must provide reasonable security against exploitation by an adversary. In addition, the impact of cooperative Combat ID methods such as IFF on emission control capabilities must be considered in the development of CID architecture.

H. Protection C2

Transformational protection initiatives may be categorized under tactical air defense C2, theater air defense C2, and CBR defense C2.

1. Tactical Air Defense C2

Single Integrated Air Picture (SIAP). SIAP combines an engineering process with a supporting resource base to enhance air and missile defense C2 capabilities, primarily

[51] Mr. Steve Daskel, DIA/DTF-1, 17 October 2003.

at the tactical level, including provision of a Common Tactical Picture of the air space. This transformational battlespace awareness initiative, which will play a critical role in offensive and defensive air operations, is focused on integration of legacy systems as well as developing new applications that will leverage the objective GIG architecture. SIAP will develop common interoperability solutions for air picture participants, including a time reference, geodetic coordinate frame, data processing (track management and identification), and data exchange protocols (the mission application layer). Solutions are provided to platform managers as behavior models, which then require development of platform-unique solutions and subsequent integration and testing on each platform--aircraft, air defense site and naval surface combatant.

The SIAP will rely upon and leverage commercial data processing capability to the extent that this capability supports the deterministic, real-time performance requirements of tactical combat, weapon, and C2 systems. However, significant joint system engineering must be done to apply that commercial data processing capability to a war fighting system. SIAP funding supports joint system engineering as well as integration of this joint capability into sensors, tactical combat, weapon, and command and control systems, and weapons. This work directly supports near-term, horizontal, peer-to-peer data transfer and functionality. Additionally, SIAP functionality is expressed in terms of an object-oriented design, which can be a significant enabler of interoperability.

Table 14: SIAP Investment Plan

SIAP	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	119.1	125.4	161.4	175.0	92.9	21.1

2. Theater Air Defense C2

Joint Defensive Planner (JDP). In order for future U.S. joint forces to defeat enemy anti-access and area denial efforts, they must be able to mount effective active defenses against a variety of air, cruise missile, and ballistic missile attacks. The JDP program is developing a single, joint, theater air and missile defense planning application to support the Area Air Defense Commander and battle staff across all phases of air and missile defense operations to include deliberate and crisis action planning through execution monitoring and re-planning. It will be fielded as an application within GCCS-J and TBMCS. The current JDP program has evolved out of several Service and Missile Defense Agency efforts, such as the Joint Theater Missile Defense Planner, the Defensive Planning Module and the Defensive Planning and Execution program.[52]

JDP will support planning for joint, Service, and coalition forces active defense against aircraft (manned and unmanned), cruise missiles, and ballistic missiles in a theater of operations. The JDP is intended to provide assistance to a defensive planner

[52] JDP Program Manager Brief. Air Force Research Laboratory (AFRL). www.rl.af.mil.

responsible for planning, evaluating and implementing theater air and missile defense (TAMD). It is envisioned that the JDP will support in-garrison, long-term, deliberate planning and short-term contingency planning, as well as in-theater plan refinement and continuous update. JDP is not being designed to provide support of near real-time decision-making, track management, firing doctrine, or the method of fire. The intended users are the active TAMD planners on the staffs of the Commander, Combatant Command, Joint Force Commander (JFC), Area Air Defense Commander (AADC), and Regional Air Defense Commander (RADC) and their Component Commanders' staff counterparts. The JDP will provide planning detail consistent with that generated by the more detailed planners used by the planning staffs at the lower echelons that extend down to the weapons systems level, but will not duplicate it. The JDP will be used to develop an air defense plan and a prioritized defended assets list as an output of deliberate or crisis action planning, as well as TAMD mission objectives and tasks for the active defense commanders of the executing component.

The Joint Defensive Planner and the Army's Air and Missile Defense Workstation successfully demonstrated a collaborative planning interface by developing and prioritizing the Defended Asset List at an Advanced Technology Demonstration in December 1999. The JDP also supported exercises with early installations of hardware and JDP software at the Roving Sands exercise in 2001, which enabled distributed, collaborative planning between 32nd AAMDC and 8th AF.

Area Air Defense Commander (AADC) Capability. The Navy's Area Air Defense Commander (AADC) Capability provides the joint operational commander an advanced, rapid and robust Theater Air Defense (TAD) planning capability that can generate a TAD force laydown in minutes vice hours or days, and conduct dynamic rapid replanning as the battlespace evolves. Additionally, the capability provides a high-resolution, 3-D, near real-time view of the battlespace by fusing data from existing sensor sources such as tactical data links and theater sensors. The capability is fully capable of supporting management of joint air defense operations from shipboard or land-based installations. These capabilities make AADC capability a key automation tool for Theater Air and Ballistic Missile Defense Battle Management C4I.

Currently, five systems exist on the USS SHILOH, USS MOUNT WHITNEY, USS BLUE RIDGE, at the Joint National Integration Center (JNIC) at Schriever AFB in CO, and at the General Dynamics production facility in Greensboro, NC. The AADC Capability is slated for FY04 installation at the Deployable Joint Command and Control (DJC2) system facility in Panama City, FL. The DJC2 and JNIC installations will demonstrate the value of the capability to the joint community and its interoperability with joint C4I systems. Specifically, these two sites will assess the capability's contribution to TAMD and TBMD.

The authors of this roadmap suggest that the JDP and AADC capabilities should be merged into a common, JC2-compliant application for operational level air defense C2.

I. Interagency Collaboration

1. Joint Interagency Coordination Group (JIACG)

Organizational innovation, combined with advanced IT collaboration systems, are needed to support effects-based operations that emphasize the need to complement military actions with the orchestration of diplomatic, informational, and economic instruments of national power to deal with the wide range of future operations. Implementation of the JIACG concept, which establishes operational connections between civilian and military departments and agencies at the COCOM level, will improve the planning and coordination of multiple power initiatives within the U.S. government. Exercises and experimentation have identified the need for both a secure, virtual collaborative working environment and a staff element at the combatant command level to facilitate interagency collaboration. While recognizing that the focal point of staff coordination among key federal agencies could be located in Washington, D.C. or in the theaters of operation, USJFCOM has conducted initial experiments with an interagency element on a combatant commander's staff. JIACGs are already established and functioning at USCENTCOM, USEUCOM, and USPACOM.

The JIACG is a multi-functional, advisory element that can be attached to the joint force commander's staff that includes representatives of relevant civilian departments and agencies and facilitates information sharing across the interagency community. It is designed to foster regular, timely, and collaborative day-to-day working relationships between civilian and military operational planners at the combatant command headquarters.

Proposed JIACG functions include:

- Participate in combatant command staff crisis planning and assessment
- Advise the combatant command staff on civilian agency campaign planning
- Work civilian-military campaign planning issues
- Provide civilian agency perspectives during military operational planning activities and exercises
- Present unique civilian agency approaches, capabilities and limitations to the military campaign planners
- Provide vital links to civilian agency campaign planners in Washington, D.C.
- Arrange interfaces for interagency crisis planning activities
- Conduct outreach to key civilian international and regional contacts

In day-to-day planning activities at the combatant commander headquarters, the JIACG will support the COCOM staff and the SJFHQ planners by advising them regarding civilian agency operations and plans and providing perspective on civilian agency approaches, capabilities and limitations, thus helping to develop a coordinated plan for the coordinated use of all instruments of national power.

When a joint task force forms and deploys, the JIACG will extend this support to the JTF commander's staff. Additionally, the JIACG capability should not be tied to the SJFHQ. Commanders should have the latitude to employ the JIACG where it makes the greatest operational sense.

Implementation Plan. The JIACG will be implemented by each Combatant Commander, as needed, in conjunction with implementation of the SJFHQ. DoD personnel to man the JIACG will come from within COCOM resources, while key federal agencies will be encouraged to provide permanent representatives on the group. In the near-term, the DoD standard collaboration toolset (currently DCTS) will be used to enable virtual collaboration with participating agencies.

2. Inter-Agency Information Sharing

Anti-Drug Network (ADNET). The Anti-Drug Network (ADNET) is a counter-drug community of interest network using SECRET networks; SIPRNet, Diplomatic Telecommunications Service, and agency enclaves. It provides business processes and access control mechanisms that enable sharing of detection and monitoring, intelligence, and investigative data among:

- Department of Defense
- U.S. Coast Guard
- Department of Justice
- Department of State
- Department of Treasury
- Intelligence Community

The WebShare adjunct to ADNET provides a similar service at the Sensitive But Unclassified (SBU) level to a larger community of federal, state, regional, and local users plus private sector and foreign users. Users define their own membership and data sharing rules.

ADNET/WebShare represents a transformational capability in that it provides a significant capability for interagency collaboration and may provide a platform for expanded collaboration beyond the counter-drug arena to homeland security and other mission areas.

J. Personnel Recovery C2

Personnel Recovery is the aggregation of military, civil, and political efforts to recover captured, detained, evading, isolated or missing personnel from uncertain to hostile environments and denied areas (DoDD 2310.2, Personnel Recovery, 22 Dec00). Execution of the 5 Personnel Recovery tasks (report, locate, support, recover, and return) is critical to the effective recovery of personnel in those environments and across the range of military operations, including interagency and coalition operations. The timely notification of a Personnel Recovery event with accurate location information is

the key enabler in the effective command and control of Personnel Recovery operations.

Operations in Iraq highlighted the requirement for improved command and control preparation, training, and systems to support the joint force commander's capability to plan and execute Personnel Recovery operations through the Joint Search and Rescue Center (JSRC). Additional joint training courses and increased throughput is required to meet the Personnel Recovery command and control requirements of the regional COCOMs (RCCs). JSRCs now rely on an ad hoc arrangement of tools and systems derived from ACTDs and other initiatives to support personnel recovery command and control.

Current capabilities to locate and track personnel, who become isolated in the battlespace, do not meet DoD's requirements. This capability is currently provided to a portion of the joint force through a combination of legacy survival radio systems with limited capabilities and operational vulnerabilities that can be readily exploited by the adversary. The Combat Survivor Evader Locator System, which is just completing Multi-Service Operational Test and Evaluation (MOT&E), provides a significant improvement in capability, but fielding numbers fail to meet the total requirement of personnel operating at high risk of isolation and exploitation. Technologies to provide improved location and tracking capabilities that can exploit ISR as well as communications platforms have not been developed.

Combat identification (Combat ID) and Joint Blue Force Situational Awareness must play a more synergistic role in the rapid detection, location, identification, and successfully recovery of isolated personnel. Forces equipped with a Combat ID or Blue Force Tracking capability may not be able to gain access to the Personnel Recovery command and control architecture limiting the timely response by recovery forces.

Initiative Objective. Provide an improved capability to joint force commanders to provide command and control of Personnel Recovery operations and to report, locate, support, recover, and return isolated personnel across the full range of military operations.

Initiative Lead: USJFCOM/JPRA in coordination with Joint Staff, Services, and RCCs

Initiative Milestones:

- JFCOM develop a plan by 1 Dec 03, including a request for FY04 supplemental funds, to respond to command and control, location and tracking, and other critical Personnel Recovery shortfalls identified in USCENTCOM's Personnel Recovery Lessons Learned from OIF.

- JFCOM complete the Personnel Recovery Modernization Strategy recommended by the DoD 2003 Personnel Recovery Conference by 31 Dec 03 to address near term Personnel Recovery issues.

- JFCOM develop a transformation roadmap for Personnel Recovery by 1 Feb 04 with emphasis on migrating Service-centric Combat Search and Rescue (CSAR) to joint Personnel Recovery.

- JFCOM, in coordination with the Services and RCCs, improve scope and availability of joint training courses for isolated personnel, joint recovery forces, and commanders and staffs (Personnel Recovery C^2).

- JFCOM improve joint concept development and experimentation capability for Personnel Recovery beginning in FY04 to ensure effectiveness of future joint Personnel Recovery operations across the range of military operations.

- USD (P) incorporate investment guidance, consistent with OIF Lessons Learned, validated GCC Personnel Recovery requirements, and Personnel Recovery Executive Agent requirements, in DPG FY06-11; Services provide needed resources in their programs in accordance with DPG guidance.

K. Cross-Functional Joint C2 Programs and Initiatives

1. Global Command and Control System-Joint (GCCS-J)/Joint C2 (JC2) Capability

As the DoD joint command and control (C2) system of record, the Global Command and Control System–Joint (GCCS-J) fuses a suite of critical warfighting capabilities to present an integrated, world-wide joint C2 system. Operational at more than 600 locations worldwide, GCCS-J forms the C2 backbone for planning and execution of joint military and multinational operations. Built upon the Common Operating Environment infrastructure, GCCS-J integrates critical joint and Service/agency C2 mission capabilities, databases, web technology, and office automation tools. GCCS I3 provides a set of tools to integrate intelligence support with C2 functions. Theater variants of GCCS, such as GCCS-K (Korea), and GCCS (Japan), have also been developed. It is the responsibility of the developing COCOM to keep these variants current with the baseline version of GCCS-J.

Transforming the current system to a web-centric solution with continued migration to a common C2 architecture is a complex global effort, requiring careful orchestration of the technical interdependencies and the participation of all partners. GCCS-J will use a phased approach focusing on transforming to a lighter, more capable, Web services solution in the near term with long term evolution from its current state of joint and Service variants to a single joint C2 architecture, introducing a net-centric, capabilities-based implementation consisting of Mission Capability Packages (MCP**)** that are common across the Services. OSD and the Joint Staff are documenting the requirements and top-level operational architectures for the Joint C2 (JC2) capability and Net-Centric Enterprise Services (NCES) for a new generation of command and control capabilities. As the initial NCES services begin to emerge, many of the GCCS-J mission capabilities and JC2 transformational capabilities will begin the migration to the transformational architecture.

GCCS-J Block IV (FY02-FY04). GCCS-J Block IV is the precursor to modernizing joint C2 capabilities. Initial forays into web-enablement included renovation of key mission capabilities to support browser-based user interfaces. GCCS-J v3.6, fielded four months early in January 2003, featured significant enhancements to the Integrated Imagery and Intelligence (I3) suite of applications and provided key functionality specifically requested by USCENTCOM for use in OIF. It also provided a substantially improved web capability for the Common Intelligence Picture (CIP) as part of the overall Common Operational Picture (COP). GCCS-J Block IV culminates with GCCS-J v4.0, scheduled for global release in 2004. GCCS-J v4.0 is an essential prerequisite to implementing greatly expanded Web services solutions. It fields new, supportable hardware/software and eliminates significant end of life constraints. GCCS-J v4.0 provides significant enhancements to mission capabilities in the areas of Force Planning, Intelligence, Readiness, Situational Awareness, and Sustainment.

GCCS-J Block V (FY04-FY06). GCCS-J Block V will continue the migration to a net-centric solution, redefining the underlying core functions to implement a more sophisticated "n-tier" architecture, while accelerating GCCS-J capabilities in such areas as Air and Missile Defense, Theater Missile Defense Status Display, Air and Missile Defense Plan/Order Generator – the Blue Force Tracking improvements described in Program Decision Memorandum (PDM) 1. GCCS-J will also address Red Force Tracking capabilities; Intelligence and associated enterprise capabilities including acceleration of SIGINT analysis capability, ISR asset battle management; and embedded training. During this period, GCCS-J will also address joint command and control program improvements identified by the USJFCOM JI&I legacy system interoperability shortfall assessment of 2002, including Theater Ballistic Missile Defense (TBMD) integration of the COP, enhancement of the Joint Surveillance Target Attack Radar System interface, and modernization of the Joint Engineering Planning and Execution System and Weapons of Mass Destruction Materiel Assessment Tool.

Within the Block V timeframe, GCCS-J will also work closely with NCES to ensure early adoption of emerging and rapid transition to GIG Enterprise Services, and to ensure that those services adequately support the joint Command and Control Community of Interest. Early inclusion of high priority services including identity management via Public Key Infrastructure (PKI), directory services, portal framework, and "publish and subscribe" capability are essential to providing transformational net centric functionality. Block V Web Services development will validate the new web-based architecture and early NCES services.

Initial web-based application development will target high value capabilities to allow rapid transformation. One such high value capability is the COP, currently the centerpiece of situational awareness. Several initiatives are currently working toward establishing a web-based version of the current COP capabilities. Enhancement to this element of situational awareness will include enterprise scalability based on the Java 2 Enterprise Edition standards and the ability to receive, correlate, and fuse data from an increased number of information sources, also known as track amplification. The goal for transforming the COP is to establish a system-to-system data interchange mechanism based on "publish and subscribe" technology, XML, and data mediation.

These technologies will enable any external system to "publish" their data to the COP, with automatic correlation to a track, given conformance with the XML schema. Examples of key infrastructure services required to implement the transformed COP include robust enterprise messaging, web-based authentication, and an enterprise metadata repository. The end state of the COP transformation provides a standardized way for both red and blue force systems to present decision quality, trusted data to their user community. These transformational efforts will validate architectural definition for transactional information processing and refine application developer guidance.

JC2 Block I (FY06 - FY08). During Block I, GCCS-J and Service variants will begin the migration to a single capabilities-based implementation in accordance with the JC2 Operational Requirements Document (ORD).Integration and delivery of web-based mission applications will continue within the MCP constructs. MCPs will be fielded on the NCES services to address seven mission areas, including Situation Awareness, Intelligence, Readiness, Force Projection, Force Protection, Force Employment-Air/Space Operations, and Force Employment-Joint Fires/Maneuver. Software development, which will begin with MCP pilots during FY04, will be devoted entirely to new NCES services. However, infrastructure services on the legacy command and control capabilities must be continued until these functions have completely migrated to the JC2/NCES architecture.

While GCCS permitted the Services to develop GCCS Family of Systems variants in parallel with GCCS-J, with the COE being the common denominator, JC2 will require higher-level functional integration of the seven capability packages before Service-unique applications are added. Enabled by the new and significantly more powerful commercial web services components, new methods for rapid revision of functionality, and scalability and load balancing will be researched and implemented as warranted. Publish/subscribe and collaboration components in NCES will lead to redefinition of functions to support such new command and control techniques as locating and connecting to new data sources after deployment, locating alternate servers in the event of loss of a user's primary server, and conducting the planning and decision process in a collaborative applications environment across operations, logistics, and intelligence. JC2 requires the extension of its interoperability to support secure information exchange with allied, coalition, and non-DoD partners, including the participants in homeland security/defense operations. Finally, JC2 must work closely with the Navy as DJC2 Executive Agent and with USJFCOM during the development of a capability for the SJFHQ during the years prior to the initial fielding of the first JC2-based DJC2 capability in FY06.

JC2 Blocks II (FY08 – 09) and III (FY10-11). JC2 evolution will continue until all specified threshold requirements are met and well beyond the stage where GCCS legacy components have been phased out due to end-of-life supportability. JC2 will likely reside in a group of regional enclaves, with local services being provided at major nodes for improved performance, reduced bandwidth usage, and disconnected operations. Because of the increased user requirements, there may be components of JC2 on the SIPRNET, NIPRNET, TS Network(s), and multiple coalition and/or interagency networks. JC2 capabilities will be extended to wireless users using the

capabilities of NCES and a set of tailored presentations designed for smaller screens such as Personal Digital Assistants (PDA). Continued development of JC2 capabilities must be closely integrated across the Service Executive Agents and with USJFCOM both in the prototype evaluation integration phases as a result of their expanded mission of joint force integration oversight.

Table 15: GCCS-J/JC2 Planned Program*

GCCS-J/JC2	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	133.9	139.4	147.8	151.4	140.3	139.7

* Based on President's Budget (PB) 04

2. Deployable Joint Command and Control (DJC2)

DJC2 will provide joint force commanders (JFC) with a deployable, interoperable and scalable integrated C2 infrastructure supporting a common, standardized set of joint C2 capabilities, integrated applications, and hardware. It will be the material enabler for SJFHQ and will be the overall deployable command and control solution for the JFC. The core of the DJC2 command and control capability will be GCCS, including its way ahead from current implementation to GCCS-J and JC2.

DJC2 is intended to provide the JFC with a full range of interoperable, robust, standardized and scaleable systems and tools to support operations; it must be deployable and able support the commander enroute. It will include shelters, environmental control, power, and chemical/biological warfare protection.

The DJC2 ORD has been developed in close coordination with the JC2 ORD. IOC is envisioned for FY05, based on the GCCS-J 4.x release. Concurrent with the IOC of the JC2 capability in FY06, DJC2 will migrate from GCCS-J to JC2 as its core networking and transport capability, thereby providing the Joint Force Commander with a mobile version of the capability that he will use for day-to-day operations.

Initially building upon the joint GCCS-J applications, DJC2 will integrate JC2 Block I mission capability packages (MCPs) beginning in the FY06-07 timeframe. DJC2 will help provide improved warning of emerging crises, identify critical targets for effects-based campaigns, measure and monitor the progress of the campaign, and provide indicators of the effectiveness of operations. DJC2 reachback capabilities will exploit global expertise and information centers of excellence. DJC2 capability must support rapidly changing JFC missions; therefore, it will contain common modules for basic JFC functions. It will also be designed to allowable rapidly changing configurations.

As part of the DJC2 program, and in direct support of the fielding of the Standing Joint Force Headquarters (SJFHQ), the USJFCOM's Joint C4ISR Battle Center (JBC) will conduct operational assessments (OAs) of the DJC2. Further, the JBC will be prepared to conduct the interoperability demonstrations (IDs) of the DJC2 as directed by the JBMC2 Board of Directors. JBC OAs and IDs will use operational venues and will

support DJC2 JPO/OPTEVFOR developmental test (DT)and operational test (OT) activities in the context of evolutionary acquisition and spiral development. The DJC2 test strategy will leverage information and data gained in these assessments and demonstrations to augment the overall operational evaluation of DJC2 and resolution of deficiencies. JBC's OAs and IDs combined with the 46th Test Squadron's DT, COMOPTEVFOR's OT, and JITC's interoperability certification will result in a comprehensive system evaluation.

Table 16: DJC2 Investment Plan

DJC2	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	126.0	72.3	72.0	9.1	9.2	9.4

3. Family of Interoperable Operational Pictures (FIOP)

The FIOP initiative provides an engineering process with a supporting resource base for enhancing joint C2 capabilities, primarily at the tactical level, including provision of various Common Tactical Pictures. FIOP efforts are focused on integration of legacy systems as well as on developing applications that will leverage the objective GIG architecture. Sponsored by USD (AT&L), the intent of the FIOP program is to leverage information technologies and innovative concepts to develop and demonstrate C4ISR integration solutions in order to provide a series of integrated, net-centric pictures of the battlespace. FIOP is a set of high value warfighter-identified developments that are integrated into systems of record as well as a program for subsequent life cycle maintenance. Efforts currently underway are the web-enabling of joint fires execution management, developing a tactical workstation for the Common Operational Picture, and providing the capability to process Variable Message Formats on the Common Operating Environment.

Table 17: FIOP Investment Plan

FIOP	FY04	FY05	FY06	FY07	FY08	FY09
Dollars (Millions)	14.7	24.7	26.8	27.1	39.9	28.5

L. DISA JC2 Transformation Initiatives

DISA is a provider of joint C2 applications and tools. As stated in Section III, DISA is developing and providing advanced joint C2 warfighting capabilities to support network centric transformation. DISA is transforming DoD C2 information technologies and the manner in which they support the joint warfighter now and in the future. In its role as integrator for joint and coalition C2 and combat support capabilities, DISA is engaged in the following initiatives:

Joint C2. DISA serves as executive agent for core GCCS-J functionality and for the transition efforts that migrate current systems and new applications to GCCS-J. GCCS-

J and the COP it provides serve as a solid foundation for evolving C2 capabilities. According to the Joint C2 ORD, GCCS will evolve from its current joint (GCCS-J) and Service variants to a single Joint C2 architecture and capabilities-based implementation.

SJFHQ/DJC2. DISA is partnering with USJFCOM and Navy to provide next generation, deployable joint command and control. The SJFHQ being developed by USJFCOM must have interoperable joint C4ISR capabilities that provide a common operational picture of the battlespace for joint and combined forces. Future JTFs must also have a responsive integrated logistics system that provides easy warfighter access to essential support. The SJFHQ requires adaptive battlespace awareness, targeting, and mission planning tools that will enable U.S. forces to operate within the adversary's decision cycle. Further, these capabilities must be integrated into the Deployable Joint Command and Control center. GCCS-J provides the core software functionality for DJC2 Increment 1 and JC2 will provide the core software functionality for DJC2 Increment 2.

Global Information Grid Enterprise Services (GIG ES). GIG ES will provide infrastructure services used by communities of interest (COIs) to enable collaborative planning, collaboration, and situational awareness capabilities for the warfighter. GIG ES capabilities are more fully described in Section III.B of this document.

Combat Support Computing. DISA provides computer processing for combat support functions--transportation, logistics, maintenance, munitions management, engineering, acquisition, finance, medical support, and military personnel readiness. An integral component of the GIG, combat support computing provides global reachback, end-to-end control, and operational sensitivity for these support operations. The DISA-fielded Global Combat Support System (GCSS) provides commanders with web-based access to selected Service and Agency logistics and transportation databases, avoiding the need to transport and support a considerable information technology infrastructure in the forward area of operations. DISA leads work to transition existing combat support computing capabilities to net-centric capabilities using the Net-Centric Enterprise Services infrastructure (See Section III.)

Advanced Concept Technology Demonstrations (ACTDs). DISA is also involved in ACTDs working with the Combatant Commanders to pilot key capabilities essential to the ongoing transformation. These ACTDs respond to high-priority capability shortfalls involving complex conceptual or technical issues appropriately addressed early in a technology lifecycle.

M. Major Service C2 Transformation Initiatives

This section provides brief descriptions of the major Service initiatives relating to C2 transformation in order to facilitate planning for their integration. Failure to integrate emerging C2 system development efforts into a common architecture at all echelons and to develop corresponding common baseline doctrine/tactics, techniques and procedures (TTP) and training will result in another generation of Service C2 capabilities that are not interoperable, and thus will imperil the transformation of DoD military capabilities.

1. Air Force

C2 Constellation. The centerpiece of Air Force C2 transformation is the C2 Constellation, a net-centric concept that links sensors, decision-makers, and "shooters" in a robust information network. The planned Multi-mission C2 Aircraft (MC2A), now identified as the E-10, will be a key airborne surveillance and control node in the constellation. The C2 Constellation will play a central role in the full range of Air Force CONOPS: Global Mobility, Global Response, Global Strike, Homeland Security, Integration, Nuclear Response, and Space and C4ISR.

The C2 Constellation infrastructure and communications architecture will create an open, GIG-compliant network, capable of supporting all C2 mission applications. New C2 systems shall identify and use common standards for data and metadata presentation. These systems will also comply with applicable IT standards contained in the DOD JTA and the security standards of the DoD Intelligence Information System. All of the system's data that will be exchanged, or have the potential to be exchanged, shall be tagged in accordance with the current JTA standard for tagged data items XML, and tags will be registered in accordance with the appropriate registries. The network will be designed to interoperate with future C2 systems yet to be defined.

2. Army

Battle Command. The Army's future C2 concept is "Battle Command," defined as the art and science of applying leadership and decision making to achieve mission success (DRAFT Battle Command (C4ISR) Concept, 5 March 2003). Within the commander-centric, network-enabled Battle Command concept, decisionmaking will be enabled by:

- Creating a "Battle Command – Anytime, Anywhere" system to support the leadership function of joint and Army commanders creating "One Battle Command System (BCS)" that is inherently joint
- Designing to optimize teaming of commanders and leaders, capable of "on demand collaboration" in a net-centric environment

This Battle Command approach will be enabled primarily by the Future Force Intelligence System and by the Joint Battle Command Architecture and Network. The Army's future BCS will provide C2 capabilities at the operational level and below. It will be interoperable with the current ABCS. The next generation BCS will be integrated with the ground force applications of JC2. The JC2/BCS family of systems will also include Future Combat Systems (FCS) C2, DCGS-A, JTRS, and the Warfighter Information Network-Tactical (WIN-T).

Future Combat Systems C2. The Future Combat Systems (FCS) is a family-of-systems that will provide full-spectrum combat capabilities for a Unit of Action -- a tactical unit operating at the brigade level. FCS includes 17 advanced air- and ground-based maneuver, maneuver support, and sustainment systems, including both manned and unmanned systems, all networked via a single C4ISR architecture. The Future Force will operate as a networked family-of-systems, that will include existing systems,

FCS and other systems (The Comanche helicopter, WIN-T, and others) currently under development, and, ultimately, additional systems that have yet to be developed. The FCS network will enable:

- Improved ISR, battle command, real time sensor-shooter linkages, and increased synergy between echelons and within small units
- Capabilities available to Unit of Action (UA) small units that enable the UA to connect to the larger Unit of Employment, joint capabilities, and national assets
- Real time diagnosis and prognosis of critical maintenance and sustainment systems that will facilitate a reduced logistical footprint in the UA battlespace which will provide increased flexibility and freedom of maneuver to the UA commander.

FCS C2 will enable the networked Unit of Action to seize the initiative while operating from dispersed locations and to execute its basic CONOPS. This concept calls for the UA, when on the offensive, to develop the situation in and out of contact, set the conditions for battle, maneuver to positions of advantage, and then close with and destroy the enemy through a combination of stand-off attack and combat assault.

The key performance parameters for FCS include joint interoperability and networked battle command. The FCS & UA architectures contain the information exchange requirements and mission threads to link to joint integrated C2 architectures.

3. Navy/Marine Corps

FORCEnet. FORCEnet is a broad Navy/Marine Corps initiative to operationalize net-centric warfare by integrating Naval C2 systems, weapons, sensors, support systems, platforms, and warriors via a robust, ubiquitous information network. The initiative is co-led by the Naval Network Warfare Command (NAVNETWARCOM) and Marine Corps Combat Development Command (MCCDC), with guidance, oversight and resourcing support from the Chief of Naval Operations staff and Headquarters, Marine Corps. Fundamentally an integration initiative, FORCEnet is developing a Naval requirements process, architectures, a compliance matrix, and a test and experimentation environment to facilitate system-of-systems integration and industry outreach. The FORCEnet architecture and compliance matrix are designed to ensure full joint interoperability of FORCEnet-compliant systems. FORCEnet capabilities will be demonstrated in the Trident Warrior experiments in October 2004.

NAVNETWARCOM and MCCDC are collaborating with the Air Force C2ISR Center to synchronize development of FORCEnet and the Air Force C2 Constellation. They are undertaking collaboration projects that include development of an ISR Sensor strategy/CONOPS. NETWARCOM and MCCDC are also collaborating with USJFCOM on DJC2 development and the Joint Battle Management Command and Control (JBMC2) Roadmap. The FORCEnet architecture will comply with the Global Information Grid Capstone Requirements Document

4. Synchronization of Service and Joint Initiatives

The foregoing Service initiatives are developing the next generation of operational/tactical C2 capabilities, including the interface with strategic C2. As the above paragraphs indicate, there are some commendable, spontaneous efforts underway between the Services to coordinate development of next-generation C2 capabilities. To complement these and other Service cooperative initiatives, a common architecture and a structured synchronization process are needed to ensure that the transformational goal of truly joint-interoperable C2 at all levels of command will be realized. The recently created Joint C2 Functional Capabilities Board (FCB), led by the USJFCOM, in collaboration with all stakeholders and supported by the C2 Joint Warfighting Capabilities Assessment (JWCA), will be responsible for developing the integrated architecture (operational, system, and technical views) and baseline doctrine for Joint C2 at all levels that will guide Service C2 developments. To promote C2 interoperability at all levels, the FCB should give strong consideration to using the services-oriented JC2 capability as the foundation architecture for tactical and strategic as well as operational C2. USJFCOM, in its JBMC2 development role assigned by Management Initiative Directive 912, will be responsible for guiding and overseeing the development of operational and tactical level C2 capabilities, in coordination with the Joint C2 FCB and all stakeholders. The *JBMC2 Roadmap* currently under development will provide a valuable management tool in planning the migration of existing and emerging joint and Service systems to a common, interoperable architecture. The *JBMC2 Roadmap* should be expanded to include development of common baseline doctrine, TTP, and training.

Since the Service development efforts are already well underway, it is imperative that the C2 integrated architecture be provided as quickly as possible. *In developing the system view of the integrated architecture for C2 from the strategic to tactical level, USJFCOM recommends that the Joint C2 FCB use JC2/GIG ES as the single, common foundation.* This approach, modeled on the JTRS development strategy, will promote horizontal interoperability at all echelons, including the tactical level, as well as vertical interoperability between echelons. Since some next-generation Service developments, such as FCS, are ahead of the JC2/GIG ES development schedule, it is imperative that the Service development organizations and their contractors collaborate with DISA in the system design process. USJFCOM should facilitate this collaboration, with assistance from USD (AT&L) and ASD (NII).

V. Joint Intelligence

A. Scope

Through transformation, Joint Intelligence, Surveillance and Reconnaissance (JISR) will support the four initial joint operating concepts and six critical operational goals outlined in the 2001 Quadrennial Defense Review (QDR). JISR is an enabling function to achieve decision superiority and high quality battlespace awareness. Central to transforming ISR capabilities is the exploitation of U.S. intelligence advantages. The requirement to exploit U.S. intelligence advantages was outlined in the 2001 QDR Report. JISR is focused on the entire spectrum (strategic, operational and tactical) of ISR support to joint command and control, including the SJFHQ.

Enhanced JISR is a key component of JBMC2 and is embedded within the DJC2 system and other capabilities and architectures such as the Distributed Common Ground/Surface System (DCGS). As such, the processes and activities related to Joint ISR transformation will advance joint and service intelligence capabilities to maximize U.S. intelligence advantage across the full range of military operations.

B. Definition

JISR transformation will employ a net-centric approach to the management of intelligence, surveillance, and reconnaissance capabilities in order to better support the demands of the joint force commander and his staff, other commanders and their staffs, as well as combat and support elements engaged in a particular operation. The JISR concept integrates ISR capabilities into a coherent whole, leveraging emerging doctrinal, materiel, training, personnel and organizational transformation initiatives to provide near real time, integrated, relevant and responsive intelligence. The concept supports and relies on collaborative planning and execution across the full range of military operations among inter- and multi-national agencies, the intelligence community, and the JFC and his Service components.

DoD ISR VISION 21: *Integrated and responsive ISR capabilities operating in a collaborative enterprise assuring delivery of timely, relevant information for the President, Secretary of Defense, and joint/combined forces.*

C. The Enhanced JISR Concept and Associated Capabilities

As outlined in the *Transformation Planning Guidance*, the new security environment requires unprecedented intelligence capabilities to anticipate where, when and how adversaries might seek to harm the United States. To support the vision of a smaller, more lethal and nimble joint force that is capable of preemptive and preventive action as well as the ability to swiftly defeat any adversary throughout the depth of the global battlespace, next generation intelligence capabilities must:

- Provide timely, accurate warning of emerging crises and continuously monitor adversary intentions.

- Locate and identify critical targets for, measure and monitor progress of, and provide indicators of effectiveness for success of U.S. effects-based campaigns.
- Persistently collect and assess information across all domains and throughout the depth of the global battlespace by means of multiple collection assets, thus providing near-continuous access to our most important intelligence targets.
- Provide horizontally integrated intelligence information to the GIG, various shared awareness systems and transformed C2 systems.
- Create new organizational constructs that closely relate or merge operational and intelligence functions, as well as improved doctrinal, personnel, process, and training capabilities and means to support those constructs and the JISR concept and its activities and operations.

The ultimate objective for enhanced JISR activities is to achieve the capability to reliably deliver timely, accurate, actionable intelligence to warfighters and other intelligence consumers in a form that is easy to understand and use. To achieve this capability, the DoD ISR Capstone Strategic Plan outlined seven goals: the creation of a robust information infrastructure; an interactive collection management capability; operations/ISR integration; Intelligence-Surveillance-Reconnaissance integration; cross-platform integration; development of new collection capabilities; and multi-intelligence fusion.

Enhanced JISR Capability Objective. The enhanced Joint ISR capability objective will be achieved through the deployment of advanced sensors and sensor platforms combined with a net-centric strategy for the management of sensors as well as new processes for the timely posting, analysis, fusion and dissemination of intelligence information and assessment. The 2010 vision replaces existing stove-piped C2 and ISR processing, exploitation and dissemination with a net-centric concept that makes ISR data available to all appropriate users and distributed activities shortly after it is collected. “Horizontal Fusion” initiatives will provide the full range of consumers with new tools enabling easy posting of minimally processed data, ready access to needed intelligence data, and the ability to make effective use of the vast amount of data available on the net. Intelligence analysis that makes use of the posted data will be conducted concurrently with the exploitation of other “raw” data to provide finished intelligence assessments.

D. OSD/USD (I) Guidance

The *FY04-09 Defense Planning Guidance (DPG),* the *TPG* and the *IIP* outline guidance that drives JISR concepts and objectives for near term and long term JISR transformation.

In the near term, the Office of the Under Secretary of Defense for Intelligence, OUSD (I), is leading efforts to develop the Joint DCGS architectures and transition plan as well as to oversee the implementation of DoD strategy for ISR data. These two near-term activities will endeavor to shape the longer-term JISR objective domain by:

- Creating a seamless network of ISR capabilities encompassing all collection domains and supporting all levels and types of military operations
- Deploying net-ready nodes of sensors, assessment centers, operational staffs, platforms, weapons and forces with smooth interfaces between JISR and JC2 through the Joint DCGS via the GIG
- Creating an environment for implementing Horizontal Integration that employs new policies, processes and mechanisms to improve cross-domain and cross-discipline collaboration and the automated correlation of data and/or information from disparate sources to support decisions across all organizational levels
- Creating a new Task, Post, Process, Use (TPPU) approach in which data and information are posted before substantial processing, transforming the timeliness of intelligence products and information concepts[53]
- Migrating to Common Data Link (CDL)/Tactical Common Data Link (TCDL) apertures, which support IP/Web services/NCES-enabled architectures

E. The Battlespace Awareness Functional Concept[54]

The Joint Staff J2 Directorate and DIA are drafting the initial *Functional Concept for Battlespace Awareness*, as discussed in Section II. This concept will provide the basis for creating the "to-be" architecture that offers the framework for future battlespace awareness capability development and analysis, including the critical role played by timely ISR.

[53] While TPPU is clearly the direction in which we are heading, the Task, Process, Exploit, Disseminate (TPED) construct will remain valid and necessary, particularly with certain types of information and systems, over the short to medium term.

[54] The section that follows draws upon information provided in the draft *Functional Concept for Battlespace Awareness,* Version 2.1, 31 December 2003.

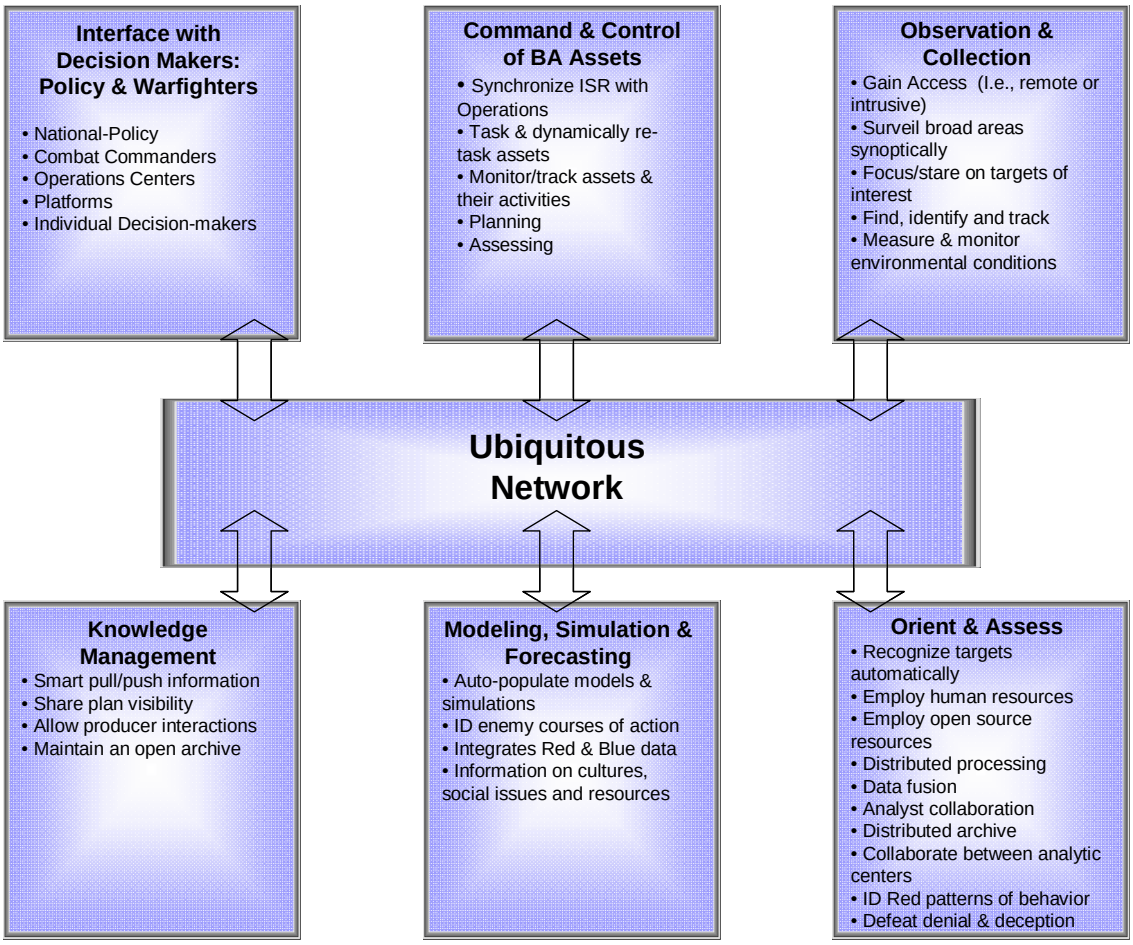


Figure 11: **The Joint Battlespace Awareness Functional Concept**

The Battlespace Awareness Functional Concept is designed to guide the network-enabled integration of a series of functional activities that is anticipated to produce transformational improvements in joint intelligence capabilities. These activities include:

- More effective **command and control of battlespace awareness collection assets** that allows more rapid and dynamic tasking of sensors. This will be made possible by support/decision tools that keep close track of the status and location of collection means and accurately model the potential utility of alternative collection configurations.

- More persistent **observation and collection** of data by a vastly expanded number of sensing platforms, government-owned and commercial, including satellite constellations, airborne, underwater and proximate surface sensors, human intelligence agents, unmanned vehicles, weapons delivery platforms, and weapons. These platforms will carry more capable sensors, all networked together in an elaborate sensor grid that provides tip-offs and cross-cueing among sensors and platforms.

- Improved **orientation and assessment** of collected data as the result of improved cross-correlation and data fusion capabilities, combined with unique and innovative methods of processing such as coherent change detection, which will often occur collaboratively in facilities well outside of the area of operations via reachback through the ubiquitous, GIG-enabled network.

- Enhanced **modeling, simulation, and forecasting** of possible adversary courses of action in the battlespace, often based upon behavioral and physical science-based algorithms embedded in the simulations. These efforts will be assisted by the use of more accurate models for terrain and weather effects and more attention devoted to the impact of cultural norms and custom on adversary behavior.

- This superior shared awareness will be enabled by the **advanced knowledge management capabilities** that will be provided by the enterprise services built into the **ubiquitous, GIG-based network,** which connects all the activities in the more rapid and effective tasking-to-use network centric intelligence cycle.

- More effective **interface** of timely joint intelligence information **with decision-makers—warfighters and policy makers**, as a result of their shared understanding based on access to tailorable operational pictures, which are derived from common, constantly refreshed data and information.

F. DoD Distributed Common Ground/Surface System (DoD DCGS)

DoD DCGS is the Department's ISR network-centric enterprise that provides the TPED/TPPU capabilities for the Joint Task Force and below. It is the key component for providing fused ISR-based decision quality information for effective Joint C2. In addition, it contributes to the C2 of Joint ISR assets and to building the FIOP. USD (AT &L) directed all Services to baseline their DCGS capability on the DCGS Integration Backbone (DIB), which is currently under development as part of the AF DCGS Block 10.2 acquisition. The DIB is the key to joint interoperability across the DOD DCGS enterprise. All four Services agreed to the requirements that serve as the basis for the DIB.

DoD DCGS provides the architectural construct to implement the TPPU concept in support of warfighters. DCGS is a family of systems that provides multi-INT processing and exploitation to the JTF and below. DCGS characteristics are:

- Net-centric
- Open systems, services-oriented architectures
- Modular and scaleable
- Common components (where applicable)
- Tailored to warfighter requirements
- Standards-based

DoD DCGS comprises part of the GIG "infostructure." It will be integrated with the future warfighting C2 system, JC2. Joint DCGS will:

- Improve the accuracy (through multiple sources) and timeliness (through better connectivity and more sources) of intelligence provided to the warfighter
- Promote ownership efficiencies, common investment opportunities, and a balanced, cost-effective system mix
- Promote a standards-based ISR infrastructure to increase inter-Service and agency collaboration and ISR platform management
- Mitigate integration risks associated with future ISR technologies and enhancement

Testing of the DoD DCGS is being integrated into Joint National Training Capability events. An initial event is tentatively scheduled as part of Combined Joint Task Force Exercise (CJTFEX) 04-02.

Figure 12 depicts the DoD DCGS concept:

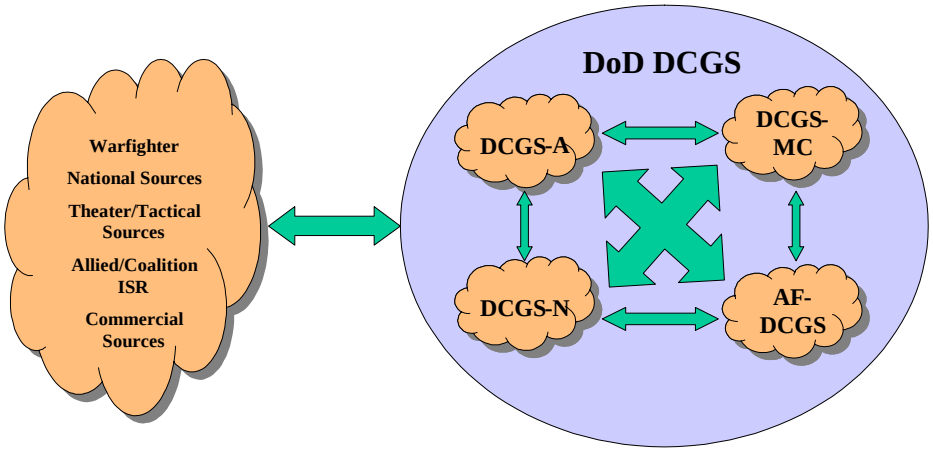


Figure 12: DoD DCGS Concept

Joint DCGS will rely primarily on GIG common-user communications, supplemented by specialized high-bandwidth line-of-sight links as needed for backhaul of large data files such as imagery. Service and DoD DCGS nodes will be on the same IP networks as the operational nodes they support. The Web-based GIG ES architecture addressed in Section III will serve as the foundation for developing DCGS applications. ISR data management will be guided by the *DoD Data Management Strategy.* The Air Force, as Internet Database Connector (IDC) for the Battlespace Awareness domain, will serve as the data manager.

The DoD Integrated Interoperability Plan directs the following action to migrate Service DCGS systems to the transformational DoD DCGS:

- In accordance with the Interoperability Senior Review Panel (ISRP) January 2003 Memo guidance, DoD DCGS Council under USD (I) supervision shall develop a roadmap and plan to migrate Service DCGS to the (Joint) DoD DCGS

based on an interoperable, net-centric architecture. The roadmap shall synchronize Service investments, training, and testing, including interoperability demonstration. In addition, the roadmap shall map materiel and non-materiel component development to the DoD DCGS CRD and joint operational concepts. Migration to DoD DCGS shall be complete by FY08.

- USD (I) has been directed to coordinate with CJCS, USJFCOM, ASD (NII)/DoD CIO, and the Services to finalize the Joint DCGS objective architecture; provide a transition plan and investment strategy, including integration of multi-intelligence support with NCES and JC2.

G. JISR Transformation at USJFCOM

In its role of shaping and integrating the military forces of the 21st Century, USJFCOM is developing innovative JISR concepts and experimenting with a robust series of JISR processes and activities in order to help create new and refined JISR capability requirements. These activities are conducted and supported by USJFCOM J2 as the Office of Primary Responsibility (OPR) for ISR-related activities within USJFCOM, and are synchronized into the USJFCOM J9 Experimentation Campaign Plan.

1. USJFCOM JISR Transformational Activities

JISR transformational activities within USJFCOM include the following:

- Dynamic JISR
- Blue ISR Forces Database (BISR)
- DCGS Joint Concept and Architecture
- ONA Concept
- Joint Operational Test Bed System (JOTBS)
- Joint Forces Intelligence Command (JFIC)

Dynamic JISR. The Dynamic JISR concept applies a net-centric approach to the management of intelligence, surveillance and reconnaissance capabilities to better support the knowledge demands of the Joint Force Commander and his staff, his components and multi-national coalition forces. Strategies will be developed to capitalize on levels of net-centric capabilities that allied and coalition partners have been able to achieve at the time of a training, military, or civilian operation and at the same time to ensure that their service levels are comparable to U.S. service levels during operational conditions. The concept integrates sensors and processing capabilities into a coherent whole, leveraging emerging doctrinal, materiel and organizational transformation initiatives to provide near-real-time, integrated, relevant and responsive intelligence. The Dynamic JISR concept supports and relies on collaborative planning and execution across the full range of military operations among inter- and multi-national agencies, the intelligence community and the Joint Force Commander and his Service components. It will efficiently and effectively meet the expanded requirements of the Standing Joint Force Headquarters for increased situational understanding and effects-based planning.

Dynamic JISR is a value-added extension to existing and future ISR organizations and capabilities. The concept should be thought of as a mechanism that orchestrates and synchronizes ISR operations across echelons, Services, agencies, and coalition partners, thus enhancing collaboration, adding new capabilities, and, in some cases, performing existing functions more efficiently and effectively.

Dynamic JISR will deliver a joint “all ISR” capability that reflects doctrine, tactics, techniques and procedures, training, materiel, and leadership and education elements. This concept will enhance overall warfighting battlespace situational awareness by delivering powerful ISR visualization, optimization and operations-intelligence synchronization capabilities to the ISR battle manager and collection manager. The ISR Battle Manager and Collection Manager use Dynamic JISR capabilities to update the common operational picture, thereby providing a more accurate and complete operations/intelligence view of the battlespace. Dynamic JISR transitions stovepipe collection management into a dynamic ISR battle management asset environment.

JFCOM will hold JISR Prototype Limited Objective Experiments (P-LOE) over the next few years to develop TTP for collaborative, effects-based ISR planning and management as a near-term delivery supporting the SJFHQ prototype, regional combatant commanders, components, and Services. Additionally, results of the JISR P-LOE events will be cycled to Intelligence Community programs of record to support optimization of ISR management tools against operational warfighting requirements. Finally, JISR P-LOE activities will be used to support spiral development of concepts and TTP for emerging capabilities such as new sensors and processing/exploitation assets (e.g., DCGS). There is no substitute for operational experience and the lessons learned from that experience to appropriately refine operational concepts. USJFCOM will continue to review and apply lessons learned from operations such as OEF and OIF to improve JISR and ensure those improvements are relevant to the warfighter.

Funding required to execute Dynamic JISR is estimated to be $9.775M over the FYDP (FY04-FY10); funding sources include programs of record and USJFCOM.

Blue ISR Forces Database (BISR). The Blue ISR Forces Database will support more effective ISR operations and enable collaborative collection management of ISR capabilities by providing rapid access to information on capabilities and availability of Blue Force ISR sensors and processors. A web-enabled, parametric database that contains information on all U.S., allied and coalition ("Blue") ISR platforms and associated sensors, BISR will provide timely, effective access to Blue ISR data through a scalable query and thematic search engine, which meets the Standing Joint Force Headquarters requirements for information dominance and support to early efforts to carry out effects-based planning and operations. The Blue ISR Database will also support requirements of joint concept development and experimentation by incorporating information on future ISR capabilities (in addition to currently fielded systems.) This support includes parametric data of quantity and fidelity to be able to drive modeling and simulation of ISR programs.

USJFCOM funding for the Blue ISR Forces Database is supported via the General Defense Intelligence Program (GDIP) at $3.778M over the FYDP (FY04-FY10).

DCGS Joint Operational Concept and Architecture. The DCGS operational concept provides both a strategy for achieving a family of interoperable JISR systems and the desired end state to support knowledge superiority and battlespace awareness. In its role of overseeing and directing joint Battle Management Command and Control (BMC2) capabilities for joint integration and interoperability, USJFCOM is developing the DCGS Joint Operational Concept to provide the Services and combatant commanders with the strategy and vision for a net-centric ISR enterprise and to provide the foundation document for development of the Joint DCGS Operational Architecture. The DCGS Joint Operational Concept and Architecture outline the path to achieve complete interoperability between military Service and defense agency ISR processing and exploitation elements within a globally networked environment. DCGS is an architectural model for modular, scaleable and interoperable, multiple ISR ground and surface systems designed to support a Joint Task Force and smaller force elements.

ONA Concept. The ONA concept is a product, a process and an organization, all focused upon understanding the operational environment as well as the effects of friendly actions. The main objective of the ONA process is to achieve decision superiority by rapidly converting ISR-enabled information to actionable knowledge. The ONA process will support our increased ability to conduct rapid and precise operations to achieve decisive results and to achieve decision superiority by taking advantage of superior information converted to superior knowledge. The ONA prototype is an integrated planning, operations and intelligence process, which synthesizes information available across the interagency community into a coherent understanding of:

- The system-of-systems nature of the operating environment
- The adversary as a complex adaptive entity

- Ourselves as a nationally networked set of capabilities, available across all elements of national power
- Ourselves as seen through the eyes of the enemy.

Joint Operational Test Bed System (JOTBS). Public Law 107-107 (2002 National Defense Authorization Act) directed Commander USJFCOM to establish a flight activity referred to as JOTBS to "…evaluate and ensure the interoperability of unmanned aerial vehicle (UAV) systems." The system completed development and testing and began operations in 2002. JOTBS currently consists of a UAV ground control station that operates two Navy owned Predator UAVs and their electro-optical/infrared payloads, a Joint Mission Support Module (JMSM) for command and controlling experimental missions and integrating new C2, C4I, and ISR capabilities, and a dedicated team of experts to conduct UAV experimentation.

In the near term, JOTBS will use its organic capabilities and integrate other technologies to experiment with current and emerging UAV and related systems to identify materiel and non-materiel enhancements that will improve the interoperability of UAVs across the battlespace for the joint warfighter. The products of JOTBS experiments are Transformation Change Package recommendations. In the long term, JOTBS will support command enterprises for Joint Force Integration, Joint Concept Development, and Joint Force Training and other command responsibilities (e.g., JBMC2, etc.), providing a key UAV and ISR component of those efforts.

USJFCOM OM&N funding for JOTBS is approximately $18M over the FYDP (FY04-FY10); this funding line does not include submitted Budget Change Requests (BCR) for both OM&N and RDT&E. If a pending BCR is approved, JOTBS funding will be $36.06M OM&N and $25.40M RDT&E over the FYDP.

Joint Forces Intelligence Command (JFIC). The Joint Forces Intelligence Command (JFIC), USJFCOM's Joint Intelligence Center (JIC), is a transformational joint intelligence organization that is playing a central role in USJFCOM's and Defense Intelligence ISR transformation work. The JFIC is developing and testing new ISR concepts, and processes, while also providing intelligence support to USJFCOM's many transformation-related workshops, war games and experiments.

The JFIC's pursuit of JISR transformation involves conducting JISR concept development and experimentation, carrying out selective beta/operational testing on joint operational and intelligence systems and deriving joint intelligence "lessons learned" from exercises, experiments, and actual operations. JFIC personnel are also working closely with counterparts at the JICs of the other COCOMs and with other parts of the defense intelligence community to develop new, more effective, network-enabled processes in the functional areas of strategic planning, analysis, production, exploitation of advanced information technology, joint concept development and experimentation, joint intelligence training, and project management.

A particularly important element of the JFIC transformation and experimentation intelligence efforts is the Joint Transformation and Experimentation Cell (J-TEC). A full-

service, all-source intelligence laboratory at the JFIC, J-TEC supports JISR transformation by using new or existing technologies and real-world data to address current and future JISR problems. Seeking to foster improved joint intelligence capabilities and to enhance interagency cooperation, J-TEC is incorporating advanced technologies in new analytical methodologies to address existing and future problem sets confronting the intelligence community. J-TEC actively promotes interagency exchanges to further the development of intelligence tool sets and applications, to develop collaborative data-sharing environments, and to test intelligence applications protocols, often in partnership with DIA's Joint Intelligence Virtual Architecture (JIVA). To assist USJFCOM's many transformation activities, the JFIC provides intelligence support to joint concept development, joint experimentation and prototyping, joint integration and interoperability and the DoD Intelligence Production Program)/DoD Intelligence Information System (DoDIPP/ DoDIIS) enterprise. The JFIC's J-TEC also supports intelligence missions in cooperation with the RCC JICs and SJFHQ. J-TEC support to USJFCOM experimentation efforts includes the testing of technologies to assist in ONA database development and assistance in validating candidate ONA tool suites. J-TEC has also conducted and supported DoD experiments focused on dealing with weapons of mass destruction. It is also being leveraged by USJFCOM in the upcoming JSIR Wargame.

2. Other Ongoing JISR Experimentation Activities

In addition to the JISR activities mentioned in the preceding paragraphs, USJFCOM is pursuing a number of JISR experimentation activities that support transformation, including the Adaptive Joint C4ISR Node (AJCN) ACTD and the Multi-Sensor Aerospace-Ground Joint ISR Interoperability Coalition (MAJIIC) ACTD.

Adaptive Joint C4ISR Node (AJCN) ACTD. The AJCN program is a FY03-07 ACTD. The ACTD will demonstrate and assess the military utility of modular scalable payloads capable of simultaneous multifunctional radio frequency (RF) mission support. Specifically, the system will support communications, signals intelligence (SIGINT), electronic warfare (EW), and information operations (IO) to enable the Joint Vision 2020 Information Superiority Concept. Throughout the demonstration and following a positive assessment, the ACTD will position the AJCN capability for transition to the warfighter. AJCN, via its revolutionary multi-mission capability, allows a number of missions, currently performed by multiple, specialized platforms to be combined in a single payload. It will provide the commander the flexible force-mix that can respond dynamically to changing mission requirements by reconfiguring assets through software to respond to the specific mission.

The system will establish horizontal and vertical interoperable connectivity between disparate narrow and wide band radios and networks. AJCN enables information dominance by supporting battlefield coordination and information dissemination while simultaneously degrading adversary C2 and ISR. The open system architecture and modular design is expected to streamline continued modernization and reduce total life cycle costs.

The demonstration phase for the ACTD, FY03-FY05, will build four prototype systems using Joint Tactical Radio System (JTRS) Joint Program Office (JPO)-developed waveforms. The U. S. Joint Forces Command will validate the warfighter requirements; develop an advanced concept of operations (CONOPS), and tactics, techniques and procedures (TTPs); recommend Transition Change Packages (TCPs); and assess the joint military utility during a series of modeling and simulation events and joint service exercises. The extended user evaluation (EUE), FY06-07, will follow the military utility assessment and will include further development of the CONOPS, TTPs, TCPs and refinement of the system.

Multi-Sensor Aerospace-ground Joint ISR Interoperability Coalition (MAJIIC) ACTD. The Multi-sensor Aerospace-ground Joint ISR Interoperability Coalition (MAJIIC) is a new FY04 ACTD. It envisions a net-centric ISR environment enabling warfighter access to recently gathered ISR data in support of collaborative targeting and time-sensitive operations. The approach will be to develop, test, and demonstrate an ISR information services capability that will have the following attributes:

- ISR sensor data links to operational command and control networks
- "Post before process" web services to enable unencumbered access to ISR data by the decision maker
- Common, interoperable data formats for utilization of multiple types of information from multiple sources
- Advanced concepts of operations embracing horizontal fusion methods of information management

USJFCOM is the User Sponsor and will provide both the Lead Technical Manager and the Operational Manager functions. USJFCOM will work with the coalition technical manager (Air Force/ESC) to ensure commonality in the development of the MAJIIC ACTD and multi-national applications of MAJIIC.

3. Future USJFCOM JISR Vectors

Future JISR activities and experimentation at USJFCOM will continue to explore defining intelligence capabilities to meet the Transformation Planning Guidance and support the four joint operating concepts. Future JISR activity vectors are envisioned in the areas of information sharing, human-centric analysis, optimizing JISR toward "human-centric" targets within the persistent and agile ISR domain and operationalizing the horizontal fusion concept.

USJFCOM J2/JFIC will also integrate joint operational intelligence transformation concepts and programs into the joint concept development and experimentation process. This entails three primary roles: 1) inserting IC transformation initiatives into experiments, war games, etc. in order to develop raw data to analyze concepts, 2) identifying future intelligence requirements as the new joint operating and functional concepts are developed and evaluated, and, 3) developing/identifying new intelligence concepts that result from integrating IC initiatives at the operational level. Concurrent to these activities, the J2/JFIC will participate in a process of discovery and hypothesis

formulation through the joint concept development process as a result of the Joint Mission Analysis (JMA) conducted by USJFCOM. The JMA resulted in three broad areas (Decision Superiority, Creating Coherent Effects, and Joint Deployment and Sustainment) of which each will have intelligence equities. A major part of the discovery process will be participation in co-sponsored experiments with the services and combat support agencies in which the "next generation" of transformational concepts will be explored. These "next" generation concepts include but are not limited to global net assessment, global command and control, and follow-on JISR capabilities. Finally, the USJFCOM J2/JFIC will perform this role in close coordination with DIA and the USD (I) in order to ensure the broadest possible array of IC transformation initiatives and concepts are integrated and evaluated in the joint concept development and experimentation process.

H. JISR Transformation at USSTRATCOM

UCP-2002, Change 2, tasks USSTRATCOM with planning, integrating, and coordinating ISR in support of strategic and global operations, as directed. In support of global operations, USSTRATCOM's responsibilities may extend from strategic, through operational, to tactical, especially in the area of ISR campaign development and execution. C4ISR systems and architecture provide supporting capabilities necessary for USSTRATCOM's global missions as well as USJFCOM's role in transforming and shaping present and future theater warfighting and smaller scale contingency operations capabilities. Three separate areas form the basis for decision-making superiority: C2 services, global network operations, and ISR activities. These capabilities provide the means to integrate, synchronize, coordinate, assess and convey information. USSTRATCOM leads the transformation and integration of the Armed Forces of the United States and the development of tactics, techniques, and procedures. USSTRATCOM and USJFCOM will coordinate closely so that their efforts are complementary.

I. JISR Transformation at DIA

DIA's JISR transformation strategy is focused on its core mission areas of collection, analysis, and information services and management. This strategy is designed to develop a significantly transformed JISR operating capability in an environment that meets future demands by incorporating state-of-the practice technology and major shifts in the collection-analysis-dissemination paradigms.

DIA's transformational collection strategy focuses on four co-equal and simultaneous approaches: implementing and instituting precision all-source collection planning and strategies; strengthening HUMINT; developing and employing a mix of multiple intelligence collection assets aimed at a variety of phenomenology; and shifting the weight of our collection capability from reconnaissance to surveillance, using a system-of-systems model to achieve targeted, intrusive, persistent and unwarned access to targets on-demand. Investments in MASINT capabilities will emphasize long-dwell sensors, while transforming the Defense Human Intelligence (HUMINT) service will ensure HUMINT plays a leading role in the future persistent surveillance environment.

DIA's transformational analysis strategy focuses on deepening analytic capabilities through work force planning and providing all-source analysts access to information and tools required to turn data into knowledge. Several initiatives are designed to strengthen the quality of all-source analysis by reducing uncertainty and surprise. DIA will increase its emphasis and investment in predictive analytic efforts, expand analysis of high-priority issues and field new means to harness the relevant expertise resident in the academic and commercial sectors.

DIA's transformational knowledge and information management initiatives will support the modernization and transformation of the intelligence information environment by implementing the DoD Net-Centric Data Strategy, developing and fielding standards, applications and processes that allow rapid horizontal and vertical integration of data from all levels of classification, at all times in the intelligence cycle. DIA's ability to operate in a transformed DoD will be directly tied to the agility and performance of its information processing capabilities. The transformed DIA information environment will be characterized by tagging and posting of all data, instant access to all sources of data and the ability to mine, manipulate, fuse, disseminate and display information and knowledge.

DIA is pursuing a number of specific Joint Intelligence and JISR activities focused on collection, analysis and information services and management.

1. JISR Transformational Activities at DIA.

The executive agent for JISR transformational activities within DIA is the Office of the Chief Operating Officer (DIA/OG). The key activities that DIA is pursuing include the following:

- Horizontal Fusion
- Hard and Deeply Buried Targets Intelligence Visualization
- Regional Service Centers
- MASINT and Technical Collection
- Human Intelligence
- Workforce Planning

Horizontal Fusion. DIA's has been actively involved in the OSD/NII Net-Centric Enterprise Services and Horizontal Fusion iniatives that combine leading edge concepts of data and network management to make tactical and intelligence data visible to the warfighter, and will participate in the FY04 Horizontal Fusion Enterprise Services (HFES) "proof-of-concept" pilot called QUANTUM LEAP.

OSD/NII designated DIA as the DoD Executive Agent for creating the "Shared Collateral Information Space" on the SIPRNet that will implement the Intelligence Community System for Information Sharing (ICSIS) and DoD Net-Centric enterprise architecture in conjunction with the Regional Service Centers (RSCs). During the Summer of 2004 HFES Pilot, DIA, in partnership with DISA and SPAWAR, will deliver the "Shared Collateral Information Space" and selected Core Enterprise Services (i.e. Knowledge-

Discovery, Security/Information Assurance, Applications and Mediation) to provide combined national views, alternate theater views, tactical forms, and live feeds to promote a cohesive battle space / situation awareness for decision superiority.

The Shared Collateral Information Space will be interoperable and consistent with the ICSIS architecture and will ensure the growing potential for converging views of the battle space, avoiding the perception of stove piping operational sensor information. The Shared Collateral Information Space will include registry/integration of SIPRNET publication/web services, metadata catalogs, PKI technology, and Web-based information transfers published across different security domains.

The following DIA-developed capabilities are part of the HFES Shared Collateral Information Space pilot:

- Military Language Understanding Search Refinement – The MLU Search Refinement capability recognizes constructs, abbreviations, acronyms and keywords from the military domain and refines user queries appropriately.
- Military Language Understanding Search Federation – The MLU Search Federation capability uses open standards and web services to provide a single access point to disparate data sources.
- Portlet Library – The Portlet (small web portal) Library provides portlet access to capabilities (MLU, Syndication/Subscription Suite, MIDB Area Search, MIDB Search, and Expert Collaboration)
- Federated Syndication/Subscription – The Federated Syndication and Subscription capability provides a single point of access for registration of and access to alerts, warnings and notifications.
- MIDB 2.1 Integration – Web service access to Modernized Integrated Database (MIDB) 2.1 and customized access portlets will be provided on SIPRNet.
- Expert Collaboration – The Expert Collaboration capability provides a single place to locate DIA experts and then collaborate with those experts.
- Secure Knowledge Sharing – The Secure Knowledge Sharing capability enhances the user's experience with the Virtual Knowledge Base (VKB) through the use of role-based access to provide a customized experience and single sign-on access.
- Document Annotation Server – The Document Annotation Server capability allows the user to add searchable annotations to remote html documents without needing ownership of those documents.
- Multimedia Archive Library – The Multimedia Archive Library supports the storage, indexing (based upon metadata, closed-captioning, and speech to text) and retrieval of video assets.

Other HF initiatives planned by DIA will provide the following capabilities:

- Smart Agents on the Net - Designed to structure and organize free-text or semi-structured information (i.e. USMTF messages) through intelligent agent technology to facilitate more relevant queries. Theses agents, referred to as Recognition Agents, can assist both the publisher (client-side) in creating

metadata corresponding to their document content as well as auto-creating metadata for an index on a server (Autonomy or Verity) to aid in precise query capabilities.

- Common Situational & Reporting Picture on a Wireless Device/Trusted Wisdom Project - The utility of integrating existing COTS/GOTS solutions into a scalable, Web services capability to rapidly fuse, and securely exchange intelligence information and situation reports. Operating on SIPRNet, the pilot effort will demonstrate collaborative, real-time intelligence information sharing, situational assessment, two-way "reach," and needs determination and prioritization between various Communities of Interest (COIs) to support time critical decision making, consequence management, and operational command and control to prevent, contain, or respond to a critical incident. Geographic information system (GIS) data will generate a common, shared situational picture, which can be securely "pushed" to the wireless PDA or laptop of a tactical commander.

Hard and Deeply Buried Target (HDBT) Intelligence Visualization. To support the requirement associated with effects-based operations, DIA, as executive agent for the Director of Central Intelligence (DCI) Underground Facility Analysis Center, is planning to produce HDBT facility intelligence in the form of 3D models that can be manipulated in a 3D viewer, as well as 4-D models that can be used in conjunction with the Integrated Munitions Effects Assessment (IMEA) 4D software. These models, based on all-source assessments and reverse engineering, will be stored in the MIDB and will be automatically updated. Customers with IMEA software will be able to estimate damage to specific HDBTs when they stipulate the weapon/munition used (including its accuracy) and the aimpoint for the strike. The program will provide customers a visual intelligence product with which they can rapidly understand the character of the HDBT target and calculate anticipated munition effects.

Regional Service Centers (RSC). Transforming the communications, handling and controlling of intelligence information technology into a net-centric core enterprise service will be accomplished through DIA's RSCs. RSCs support the transformation of the DoDIIS TS-SCI architecture from site-based applications to global, net-centric data and IT core enterprise services. The RSC concept supports horizontal fusion, allowing data to be globally available across the network and accessible through the enterprise, anytime, anywhere, connecting analysts with customers using JWICS, SIPRNET and NIPRNET.

RSCs represent a change in the way Defense Intelligence TS-SCI IT core enterprise services and access to data is delivered to the customer. The RSC concept constitutes a cultural shift from producers "owning" data and IT capabilities to one where data is globally available across the network enterprise connecting analysts and customers via the JWICS, SIPRNet and NIPRNet.

The DIA RSC Program Office has overall responsibility for planning, integration testing and fielding IT capabilities into the RSCs for the DoDIIS Community, the Regional Combatant Commands and the Services.

MASINT and Technical Collection. DIA has established a Directorate of MASINT and Technical Collection to address DoD and DCI transformation goals, to provide a strong operational focus in these areas and to ensure continued U.S. information superiority. The new directorate will improve precision collection planning, all-source integrated management of ISR and execution of technical intelligence collection operations against targets of value. The planned development and fielding of persistent surveillance capabilities will enable prediction of an adversary's behavior, as well as support U.S. deterrent or pre-emptive options while defeating foreign denial and deception efforts. To attain the transformed MASINT and Technical Collection capabilities described above, DIA will:

- Sustain and support sensor and collection programs and operations that continue to provide critical technical intelligence on foreign activities and actionable information supporting policymakers and military operations
- Where appropriate and cost effective, develop replacement technical collection sensor and platform combinations that are more agile, flexible, and stealthy, thus providing improved access, greater discrimination capabilities and substantially increased persistence
- Assure vertical and horizontal integration of all collection-related activities through fully integrated ISR command and control, improved data processing and exploitation, and data management/dissemination
- Develop new forms of technical collection (e.g. un-manned or robotic systems) that will circumvent adversary denial and deception efforts to achieve desired collection fidelity
- Support research on key enabling technologies that support sensor miniaturization
- Improve worldwide MASINT and technical collection access through technical co-developments and collection arrangements with selective allies
- Improve the collection management process by creating robust analyst-collector-exploiter partnerships, using all-source information as the basis of precision collection planning. Precision collection planning will focus the right sensors, in the right place and time and is essential for persistent surveillance and quality access

Human Intelligence. DIA's Directorate for HUMINT transformation initiative will provide more dynamic, global HUMINT operations. Its business process and supporting applications will be intuitive, adaptive, quicker, reliable and supportive of precision tasking as well as real-time collection reporting. DIA will shift its HUMINT operations to a TPPU construct and expand use of web-based applications and state-of-the-practice technologies in order to process and manage requirements and resultant data in an automated, efficient and flexible manner. The desired end-state is a transformed HUMINT process with:

- Streamlined, responsive HUMINT requirements process that validates and forwards requirements rapidly to field collectors via secure, mobile communications.

- Secure mobile computing platform(s) that provide real-time bi-directional connectivity and collaboration between field collectors and headquarters desk officers, analysts and collection managers.
- Secure HUMINT Enterprise Portal providing single sign-on access to COIs, with critical information, knowledge and expertise that will be accessible to field collectors.
- Tailored collection format(s) and tool(s) that provide automated report tagging at the time reports are created to support rapid dissemination to CIO's and analysts.
- Collaborative tools and image annotation allowing field HUMINT collectors to conduct first-phase exploitation and analysis in real time.

A key DIA HUMINT transformation program is the Trusted Wisdom program. Trusted Wisdom supports a global, net-centric HUMINT operating environment at the Secret level, accessible on SIPRNET. Trusted Wisdom components will provide the technology to transform DIA HUMINT field operations by providing secure, mobile, wireless computing devices, which integrate commercial hardware and software, augmented by accredited security devices and supported by flexible communication architectures. Trusted Wisdom wireless technologies are included among DIA's Horizontal Fusion Program initiatives proposed for FY04.

Workforce Planning. To meet the current and future demands of its customers, DIA will transform the way it collects, analyzes and manages information. To meet these objectives, DIA must build a workforce with the right knowledge, skills and abilities to enable transformation. DIA must create a partnership of highly skilled people and leading-edge technologies, providing warfighters, policymakers, and planners with assured access to required intelligence. The urgency of customer demands drove DIA to initiate an enterprise-wide Workforce Planning Initiative that will help the organization solve its current skill gaps, as well as position it for superior decision-making support in the future. In addition, DIA is exploring policies and procedures that expand partnering, collaboration, and interdependence among collection, analysis, and dissemination.

Realizing that the workforce is the key to successfully meeting the mission in the future, the DIA leadership has charged the DIA Workforce Planning Project team with developing a comprehensive actionable transition plan over the first 9 months of the effort. The transition planning effort will result in a transition plan that provides the DIA with short, mid- and long-term activities to manage its human capital, driving toward achieving the workforce that DIA requires to meet the future mission. The 9-month transition planning period is further divided into four phases:

- Phase 1 – Project Future Requirements
- Phase 2 – Capture Current Skills
- Phase 3 – Conduct Gap Analysis, and
- Phase 4 – Develop a Transition Plan

Through this activity, DIA is working toward a flexible, well-skilled workforce that is able to adjust rapidly to new customer requirements with a rapid translation of large amounts of information into needed warfighting intelligence. To do this, the project team will craft

a plan that involves a series of logical activities that support the continuous growth in capability of the workforce in response to changing mission requirements. Once the transition plan is approved, the team will begin to implement changes over the next 5 years.

2. Ongoing JISR Experimentation Activities at DIA

In addition to the JISR activities mentioned in the preceding paragraphs, DIA is participating with USJFCOM in the development of several joint warfighting experimentation initiatives, intended to support the transformation of military intelligence capabilities sustaining Network Centric Warfare through Operational Net Assessment and Effects-based Operations. DIA initiatives related to JISR, Mission Execution/Adaptive Mission Planning, Rehearsal, and Joint Training linked with C4ISR include:

- Development of an engineering modeling capability enabling a better understanding of physical infrastructure systems
- Visually intuitive intelligence support to Urban Operations
- Development of a methodology to link adversary physical and non-physical infrastructure to gain a better understanding of an adversary as a system of systems
- The development of a DIA Intelligence Support Center to facilitate the integration, visualization and dissemination of actionable intelligence, as well as provide near real time intelligence in support of strategic decision makers
- The Joint Research Analysis and Assessment Center (JRAAC) is providing integrated weapon system simulations, hardware/software-in-the-loop analysis, high fidelity threat models and Integrated Air Defense Systems analysis for advanced threat representation techniques supporting operational training and planning processes

J. JISR Transformation at NSA

The central point of contact for JISR transformational activities within NSA is the Corporate Planning, Requirements and Performance Office (NSA/DC-4). The key transformational ISR activity that NSA is pursuing relates to the Distributed Common Ground/Surface System (DCGS) SIGINT Support Activities (SSA) program.

DCGS SIGINT Support Activities (SSA) Program. NSA's future SIGINT JISR capabilities are focused on the DCGS SSA program. DCGS addresses the broader issue of multi-INT interoperability, connectivity, modernization and security (ICMS) between each Service DCGS element within the context of DoD's overall DCGS vision. Under USD (I)'s DCGS multi-INT strategy, NSA was requested to develop a migration path for the evolution of operator workstations and ground stations. The DoD DCGS Charter calls on NSA to address airborne, maritime and ground SIGINT elements of the DCGS. The end result will be a fully connected and interoperable "intra-network" utilizing the JTA, Unified Cryptologic Architecture (UCA), Joint Airborne SIGINT Architecture (JASA) and Service cryptologic architectures to enable the SIGINT portion

of the joint, multi-INT seamless network envisioned by the Distributed Common Ground/Surface System strategy.

Service implementation of DCGS SSA concepts will result in a mix of tactical SIGINT sensors, ground/surface stations and associated collection communications to link local and distant SIGINT assets into a distributed SIGINT architecture. This enterprise facilitates the system functions of collection tasking, collection management, collection processing, exploitation, and timely SIGINT results dissemination focused on the Joint Task Force and below. DCGS SSA will contribute the fundamental foundation that enables the key thrusts of Joint Vision 2010/2020, the DoD ISR Vision 21 Seven Vectors and the UCA.

NSA activities related to integrating SIGINT capabilities into DCGS SSA are:

- Multi-level data standards
- TPPU Information Acquisition
- GIG BE
- Participation in DoD and IC Tactical ISR Transformation efforts
- Information Assurance/Security Working Groups
- Net-centric DCGS

Multi-Level Data Standards. To support USD (I)'s goal of TPPU, NSA's support to the DCGS community will focus on identifying standards for addressing multi-level data which allows for greater data sharing for multi-INT collaboration. To achieve standardization for multi-level data, NSA plans to leverage existing NSA participation in the ICCIO working group, coordinate Service program efforts with NSA's Enterprise Standards Program and coordinate with DIA through the Information Systems Security Group (ISSG) Military Intelligence Board to achieve cross community agreement.

Standards are also needed for SIGINT metadata. NSA plans to work with operational and acquisition program elements at NSA, within the Intelligence Community, DoD and the Services to establish and maintain a metadata standards program that applies to the national and tactical community. The end result of achieving agreement for multi-level data standards will be a process which enables end-users to access and locate SIGINT information crucial to their mission in a more timely manner.

TPPU Information Acquisition. The TPPU process is envisioned to rapidly post the right information to the user at the right time. To ensure the user acquires SIGINT information from TPPU in a usable form, NSA plans to work with the Services, Regional Combatant Commands and other Defense Support Agencies to identify potential technologies and approaches to support the Knowledge Agents and portals needed to satisfy TPPU SIGINT end user requirements. DCGS SSA will resource, monitor and guide NSA's TPPU support effort and will work with the ICSIS and the Intelligence Community Multi-Int Applications Program (ICMAP) development teams to incorporate DCGS goals and requirements.

GIG BE. A key aspect to the network centric approach to DCGS is its integration into the GIG BE program so that communications bandwidth limitations are removed. NSA will work with the GIG BE team and the Intelligence Community (IC) Community Communications Board (ICCB) to ensure ISR requirements are being met, identify ISR areas that are not being serviced by GIG BE and develop a plan for ensuring those areas are connected to the ISR network. NSA plans to expand the efforts of the Transformational Communications Study to address communications to mobile platforms and expand on existing Service DCGS connectivity programs to establish worldwide access to assets such as the Airborne Wideband Terminal, the Airborne Information Transfer Program, Network Centric Collaborative Targeting, ADNS and Joint Fires Network.

Participation in DoD and IC Tactical ISR Transformation Efforts. NSA plans to monitor, assist and influence future DCGS efforts by participating in and leveraging other major DoD and IC tactical ISR transformation programs. Programs of interest for DCGS SSA include the UCA, TRAILBLAZER, the Intelligence Community System for Information Sharing (ICSIS), Cryptologic Mission Management (CMM), Rebuilding Analysis (ReBA), Knowledge System Prototype (KSP) and the ICMAP. NSA also plans to expand the Airborne Overhead Cooperation Office (AOCO) proof of concept to incorporate across the DCGS domain, bringing new sources of information to DCGS. Central to NSA's effort is the desire to leverage the above existing programs to ensure an interoperable and seamless network for SIGINT supporting DCGS.

Information Assurance/Security Working Groups. For DCGS, NSA assists the Services and National Agency's in identifying security issues and impediments involved in connecting national systems to tactical systems, connecting different intelligence domains and addressing security issues unique to tactical producers. NSA works with various developers and accrediting authorities to develop mitigation plans and, where appropriate, security architectures for DCGS. By leveraging exiting programs within NSA's Information Assurance Division, NSA is supporting a future bi-lateral, NATO and coalition data sharing and data protection capability for DCGS.

Net-centric DCGS. The DCGS SSA partners with each Service as Service DCGS solutions are developed to ensure that DCGS is network centric.

K. JISR-Related Transformation at National Geospatial-Intelligence Agency (NGA)

NGA's core competency is observation and analysis of remotely sensed activity and data. NGA's transformation strategy and overriding objective is to leap ahead to an all-digital, data-centric, electronic business environment that, in the long term, will provide a "ubiquitous" knowledge map of the earth. It is NGA's intention to transform from a provider of legacy geospatial information products to a data-centric information service provider. To do this, NGA and the National System for Geospatial Intelligence (NSGI) will migrate to an all-digital environment to enable collaboration among geographically dispersed users from various intelligence disciplines. In support of this objective, NGA is pursuing an aggressive program to develop its workforce (both government and contractor) and is developing, implementing, and enhancing a variety of systems, tools,

and business processes. JISR-related transformation at NGA will include seamless, web-enabled libraries, collaborative exploitation, automated generation of information, a robust communications infrastructure, and community collection and information management in a multi-intelligence environment that supports the complete intelligence cycle. *The overall result of this effort is to leverage technology, policy, and procedures to enhance the effectiveness, relevance, and accuracy of analysis as analysts convert raw data and information into geospatial and all-source intelligence in support of national, civil, theater, and tactical decision making and operations.*

To support Joint ISR and mission execution, NGA's national system for geospatial intelligence (GI) will capitalize on all forms of traditional or non-traditional data, including that derived form National Technical Means, airborne, commercial and other sources. This capability will greatly enhance NGA's ability to significantly reduce the time required to derive the precise geo-location of fleeting time-sensitive targets to support dynamic targeting and re-targeting efforts. The GI architecture will also support a data-centric view of the enterprise and its data holdings. The combination of the new modernized infrastructure, as well as new analytic and business processes will enable more effective exploitation of an increased number of commercial and national sources that span the electromagnetic spectrum, as well as airborne and multi-INT information. The use of all of these sources will allow the GI Community to improve substantially its ability to produce actionable intelligence and to enhance overall geo-spatial readiness and responsiveness.

The NGA customer set ranges from national-level civilian and military decision-makers, military leadership at the theater and joint task force echelons of command, coalition forces and their leadership, the military services, civil leadership, Federal, state and local government agencies, foreign/allied nations, and commercial partners. Each requires that NGA's Geospatial Intelligence be provided with the timeliness and accuracy specifications sufficient to support their decision, planning, operational, and execution cycles, relative to the projected threat/crises environments. The projected threat environments include every circumstance from strategic and conventional deterrence and warfare, peacekeeping, counterterrorism and counterproliferation planning and operations, to natural disaster relief, to cite a few.

Geospatial Intelligence provides *unique knowledge not available by other means,* unprecedented precision, three-dimensional, temporal and spatial measurement, an integrated digital environment, and a geo-referenced visual presentation of the mission space. It provides the foundation for the COP, situational awareness, information and decision superiority and indications and warning analysis pursuant to diplomatic and military interests, such as weapons systems proliferation by hostile nations and/or non-state entities. Geospatial Intelligence gives warfighting commanders and their staffs a critical understanding of an adversary's strategic infrastructure and vulnerabilities, permitting precision strikes against strategic and tactical targets in all weather.

Geospatial Intelligence has the following attributes:

- Characterizes the location of an activity above, on, and under the surface of the earth
- Includes the source of the data and provides related accuracy, currency and potential utility of that information for further analysis (Geospatial Assurance)
- Ensures, through the development of standards, that the information content is consistent, easily accessible, viewable using common tools, and can be further updated by customers and collaborators located at disparate sites. The importance of establishing, maintaining, and evolving data, and database standards and models cannot be overstated
- Is context-based intelligence analysis, expertise, technical services and solutions that provide answers to questions such as:
    - What does this mean?
    - What is the impact?
    - What it is or isn't?
    - Why is it or isn't it important?

It is crucial to deliberate planning and execution, for target acquisition and weapons delivery platforms, to ensure the precise and accurate placement of weapons on target (see Figure 13).

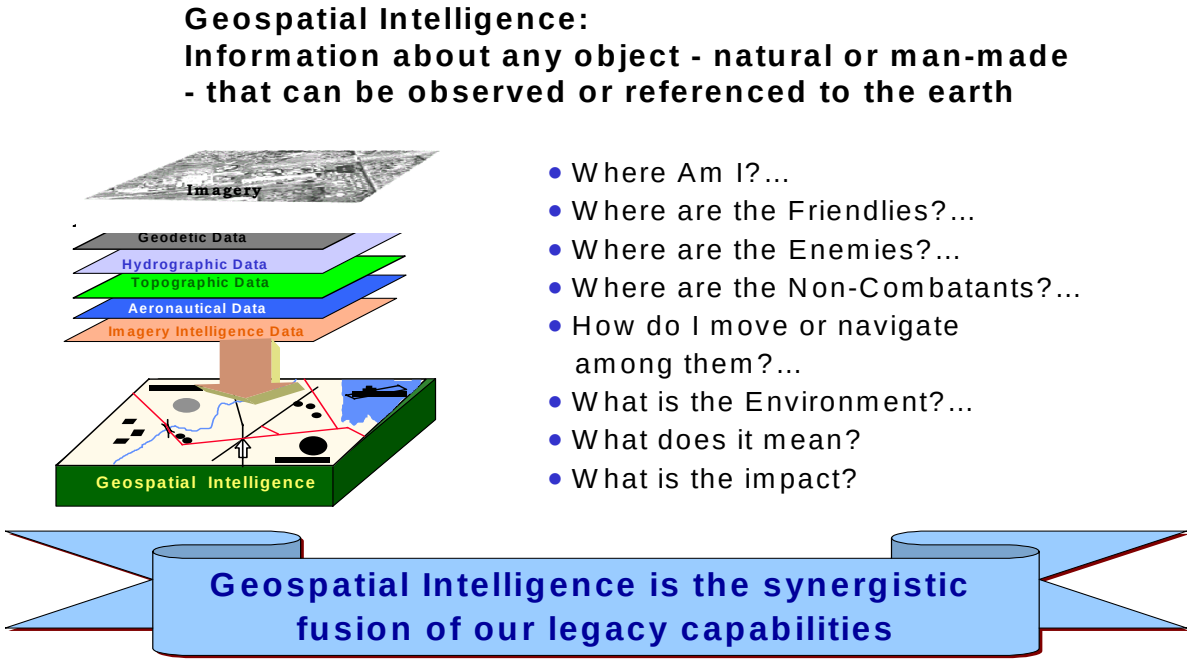


Figure 13: A Unifying Element For Decision Superiority

Figure 14 is a depiction of the central theme of Geospatial Intelligence: foundation data, mission specific data, and multi-source intelligence. This Geospatial Intelligence analytical environment provides Intelligence Community analysts and national, civil, theater, and tactical decision-makers with precise location information in four dimensions (longitude, latitude, elevation and time), upon which all-source intelligence and other operational information of activities of national security interest can be

overlaid. These intelligence products factor prominently in all aspects national decision-makers' planning, decision and execution cycles and are integrated into the guidance components of precision weapons systems and munitions, as well as satisfy NGA's legal responsibilities for ensuring safe navigation in the air, on the land, and on and under the sea.

Currently provided in paper, CD-ROM, and on-line formats, NGA is transforming its analytic and production capability to support future warfare, intelligence and command and control programs. This support uses an end-to-end digital flow process directly from analysis and production via live-feeds, through their IP addresses to their C2, visualization, and fire control, navigation, and mission planning components from globally accessible databases. These requirements place a premium on the direct collaboration across the Intelligence Community, Services and the civil sector to ensure alignment of common standards and the coordinated introduction of hardware, software, and analytic processes and techniques. Meta-data tagging *and DoD-compliant XML/GML markup* of data, smart-agent protocols for data/information storage, access, display, and integration are also key to ensuring systems interoperability and data/information/ integrity, regardless of source, process, or application. These warfare and Intelligence programs include: the Army FCS, the Navy CVN (21) and Littoral Combat Ship (LCS), the Air Force Small Diameter Bomb (SDB), F/A-22 and Joint Strike Fighter (JSF), the DoD Joint Mission Planning System, and the Integrated Exploitation Capability. Beyond the military, federal, state and local governments and agencies require precise location data to employ resources in anticipation and avoidance of and in response to natural disasters, and terrorist attacks. In all cases, precise geospatial location information along with the associated analysis of what is and why it is or isn't important is crucial to determining where an activity of interest is occurring, and where emphasis or a weapon must be placed.

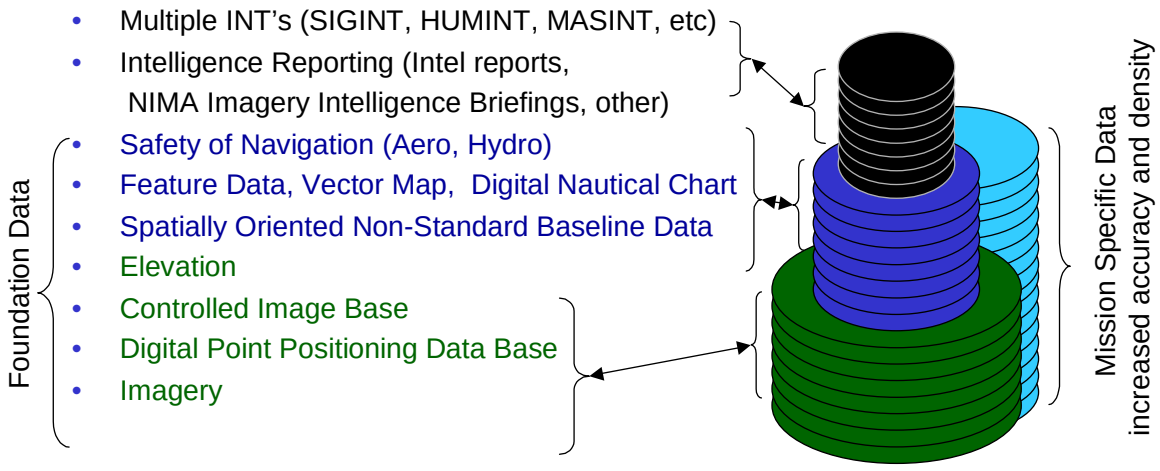


Figure 14: Geospatial Intelligence Analytical Environment

Geospatial Framework. Precise geopositioning is key throughout all analytic and planning activities. Precise geopositioning forms the basis of six of the 12 core C2 capabilities (Common Operational Picture, Adaptive Mission Planning and Rehearsal,

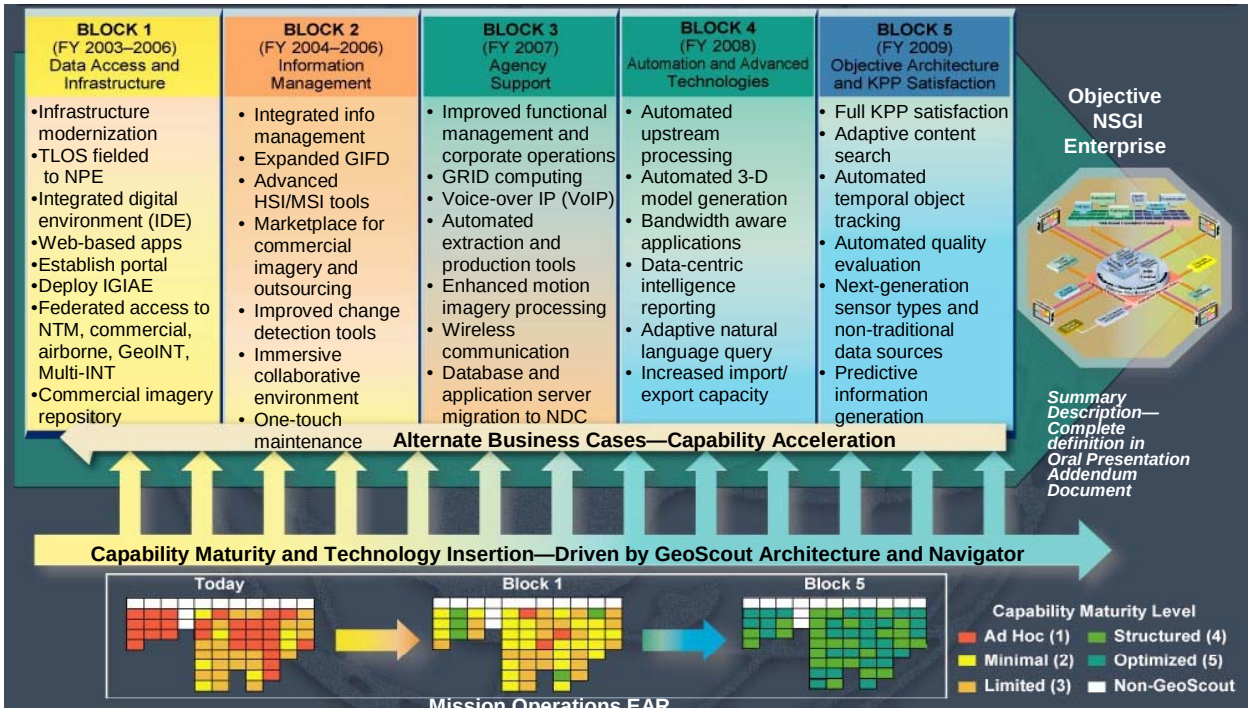
Collaborative Information Environment, Intelligence Support, Joint Fires and Maneuver C2, and Force Protection) discussed earlier in section IV, Joint Command and Control. As depicted in Figure 14, foundation data, mission specific data, and multi-source intelligence comprise the geospatial framework upon which all-source intelligence and other operationally relevant information is overlaid. They provide all-source intelligence analysts and national, civil, theater, and tactical decision-makers with precise location information in four dimensions (longitude, latitude, elevation and time), upon which all-source intelligence and other operational information of activities of national security interest can be overlaid. These intelligence products factor prominently in all aspects of national decision-makers' planning, decision and execution cycles and are integrated into the guidance components of precision weapons systems and munitions, as well as satisfy NGA's legal responsibilities. NGA and the Geospatial Intelligence Community incorporate a readiness and responsiveness strategy for generating Geospatial Intelligence to satisfy deliberate planning and crisis requirements. The strategy also supports the operational concepts and information superiority requirements, as described in *Chairman, Joint Chiefs of Staff Joint Vision 2020* (*JV2020*). NGA intends to use all sources of data to satisfy deliberate planning and crisis requirements. Under this strategy, NGA will improve the community's readiness posture for rapid response and crisis operations by taking advantage of advancements in imagery sources, commercial services, and advanced geospatial processing software that will allow NGA and relevant Geospatial Intelligence Community members to build geospatial databases with global coverage using the best available data. NGA will continue to provide the intensification of this data to support theater, operational, and tactical missions through the use of higher-resolution controlled imagery, elevation and/or depth information, and features needed to meet defined mission requirements, as well as data derived from non-imagery sources to include magnetic, bathymetric, acoustic, gravimetric, etc. The resulting geospatial framework will provide the basis on which a common operational picture of the mission space can be built.

Future Imagery Architecture (FIA). See Annex B (classified)

Achieving the Transformed Analytic Environment. NGA's successful transformation is tied to creating a collaborative environment where both NGA and customer analysts work together using an array of new tools and processes to produce GI. These tools and processes will enable analysts *of all disciplines* to exploit new sources, collaborate with their colleagues *and customers*, and create and manage Geospatial Intelligence. These requirements place a premium on the direct collaboration across the Intelligence Community, Services and the civil sector to ensure alignment of common standards and the coordinated introduction of hardware, software, and analytic processes and techniques. Meta-data tagging of data, smart-agent protocols for data/information storage, access, display, and integration are also key to ensure systems interoperability and data/information/integrity, regardless of source, process, or application. Policy decisions will be an important factor throughout all phases of analysis as our interagency, Service, and coalition partners are increasing their contributions to the overall Geospatial Intelligence database. This analytic environment will cut across several analytical skills including Aeronautical, Cartographic, Imagery, Geospatial, Geodetic, Marine and Regional experts.

Transformation Program. Within NGA, GeoScout is the principal vehicle for delivering transformed mission capabilities (see Annex B (classified). It stems from a NGA Commission recommendation and a Congressionally-directed modernization study initiated in September 2000 to determine the architecture, acquisition strategy, costs and transition plan for meeting emerging Geospatial Intelligence challenges. Simply put, GeoScout is the key program for transforming NGA and will integrate new technologies, sources, and capabilities into the Geospatial Intelligence baseline architecture. GeoScout's scope is broad, focusing not only on the infrastructure, architecture, and systems, but also on the technology-insertion process. GeoScout program numbers are shown in Annex A. GeoScout will be implemented in a series of "Blocks" (Figure 15):

- **Block 1** – (FY2003-2006): Data Access and Infrastructure
- **Block 2** – (FY2004-2006): Information Management
- **Block 3** – (FY2007): Agency Support
- **Block 4** – (FY2008): Automation and Advanced Technologies
- **Block 5** – (FY2009): Objective Architecture and Key Performance Parameters



Phased migration strategy reduces risk while optimizing stakeholder satisfaction

Figure 15: NSGI System Transition Roadmap

VI. Joint Deployment, Employment and Sustainment

The JDES effort at USJFCOM is pursuing a two-path approach to improve and then transform joint deployment, employment and sustainment activities by combining them into a single, coherently joint, continuum of activity. The JDES plan calls for rapid prototyping of capabilities to improve the current joint warfighting processes for deployment and sustainment in the context of new modes of force employment, as captured in the JOpsC and the new joint operating concepts. It will also provide senior leaders with actionable recommendations, derived from experimentation, concerning options for future force investments to transform joint deployment and sustainment capabilities.

The lead organization for this effort is the JDES Department of USJFCOM's Joint Concept Development and Experimentation Directorate, J9. This department consists of two elements: the Joint Logistics Transformation Center (JLTC) and the Joint Deployment Process Owner (JDPO). These elements are partnered with offices within OSD, the Joint Staff, the regional and functional combatant commanders, the Services, selected defense agencies, industry and academia to achieve a transformational, seamless capability across the JDES continuum. They are also working closely with their J9 colleagues, who are drafting the new joint operating concepts for major combat operations and stability operations.

A. Joint Logistics Transformation Center (JLTC)

The Joint Logistics Transformation Center (JLTC) is developing the vision, future concept and strategy for the JDES concept effort. The JLTC mission, broad in scope and transformational in its implications, is to "develop a concept for a single, coherently joint deployment, employment and sustainment process that enables the seamless projection and indefinite sustainment of the joint force."

The iterative development and specification of an integrated JDES process by the JLTC will facilitate the employment of coherently joint forces in a dispersed, distributed environment. The challenge includes addressing a battlespace that is increasingly global in scope and multi-dimensional, non-contiguous and non-linear in character. Moreover, the integration of deployment, employment, and sustainment must accommodate simultaneous operations occurring in multiple theaters, in multiple locations within these theaters, and involving multiple combat, support and humanitarian assistance operations in those locations. The JDES concept will focus at this operational level of warfare but impact on the strategic and tactical levels as well.

JDES Concept Definition. JDES is an operational level concept that merges planning and execution of deployment, employment and sustainment of military forces within a single construct. It consists of the assembly, configuration, movement, positioning, support and maintenance of tailored joint operational capabilities. Empowered by knowledge-centric planning and operations, JDES applies to global action (including CONUS) throughout the range of operations in a complex strategic environment.

JDES Relationship to Other Concepts. JDES reaches across the range of military operations and applies to each joint operating and functional concept. JDES will provide for the deployment of forces across global distances. As the Joint Commander employs multiple large force capability packages that may include multinational forces, inter-agency organizations and special operations forces, JDES must be able to provide the required support in a large theater for months at a time.

Post Cold War experience has demonstrated that Stability operations will require a JDES supporting rotational movement over a period of years. It is clear the Strategic Deterrence and Homeland Security Joint Operating Concepts will present new challenges for a JDES concept.

The Focused Logistics and Force Application Functional Concepts will be enhanced by the complementary attributes of the JDES concept. At the same time JDES will share strong linkages to the Protection, Joint Battlespace Awareness and Joint Command and Control Functional Concepts.

The JLTC will refine the JDES construct through experimentation, as outlined in the USJFCOM experimentation strategy for FY03-05, and will develop change recommendations based on this experimentation. As the concept and the process evolve, the JLTC will also continue to link it to the evolving JOpsC, the joint operating concepts, functional concepts, and enabling concepts. Figure 16 provides the timeline and events supporting this experimentation strategy.

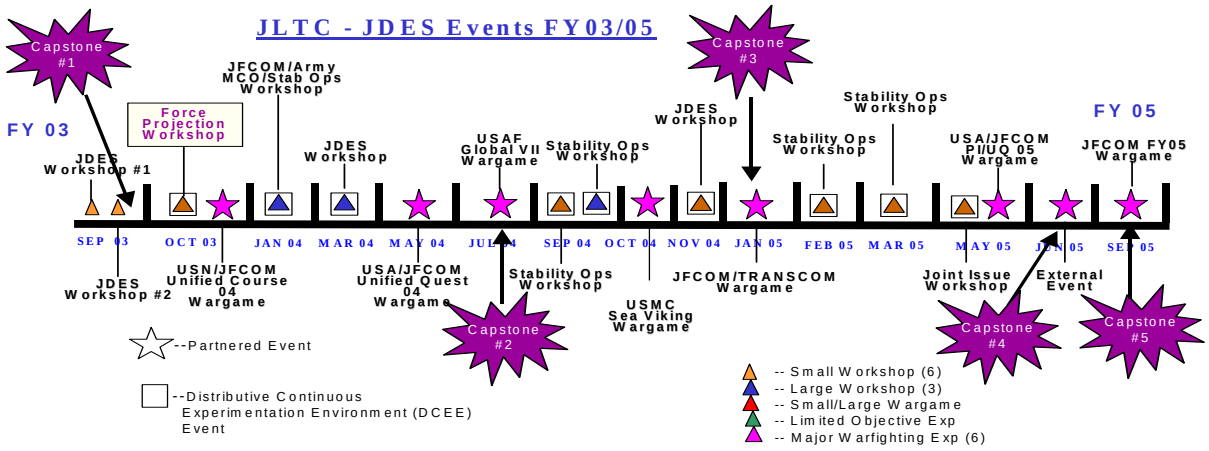


Figure 16: JDES Events FY03 – FY05

B. Joint Deployment Process Owner (JPDO)

USJFCOM's Joint Deployment Process Owner (JPDO) is currently leading a DoD-wide effort to improve and transform the joint deployment process that supports joint, multinational, and interagency operations. In accordance with its baseline charter, the JDPO is leading DoD collaborative efforts to improve and transform joint deployment planning and execution. It is doing so through the development of strategic direction and vision, coordination of initiatives and improvements related to the joint deployment

process and system, and investigation and promotion of technological solutions to produce a seamless joint deployment process.

The value of joint deployment transformation and the role of JDES in leading the process may be traced to lessons learned from Desert Storm. In the wake of Desert Storm, the Joint Staff determined that, in order to coordinate all the actions and organizations engaged in joint deployment, a single stakeholder needed to be identified as the DoD-wide process owner for joint deployment. This recommendation was made to OSD and USJFCOM (then USACOM) was subsequently designated by the Secretary of Defense in 1998 as the JDPO. The responsibilities associated with this designation were codified in DoD Directive 5158.5, 12 Nov 2001. It identifies USJFCOM as the single DoD Executive Agent for the end-to-end, joint deployment and redeployment process.

The baseline charter of JDPO establishes the enduring framework for JDPO activity, while more recent directives highlight the ongoing engagement of DoD senior leaders in the developing work of joint deployment process improvement. Recent operations have highlighted, once again, the necessity of possessing an agile, responsive, effective, and efficient joint force projection capability.

The major responsibilities of the JDPO, in support of joint deployment transformation, are to:

- "Ensure proper *coordination* among the DoD components during deployment and redeployment process improvement initiatives;"
- "*Provide recommendations to the Secretary of Defense*, through the CJCS, regarding deployment and redeployment process improvements, including the manner and timing of these improvements;"
- "*Maintain the current effectiveness* of the joint deployment process while leading actions to provide substantial improvements in the overall efficiency of deployment and redeployment processes, including prioritization of process improvement efforts;""*Issue directives* to other DoD Components and *take action* on behalf of the Secretary of Defense concerning deployment and redeployment process improvement initiatives, as specifically authorized by the Secretary of Defense through the CJCS."

Additional directives from the Secretary and the Chairman were cited in the Unified Command Plan 2002; "USJFCOM's functional responsibilities…in *transforming U.S. military forces*…include…*Serving as the JDPO for DoD*, responsible for maintaining the global capacity for rapid and decisive military force power projection;" and in CJCS Memorandum (CM-907-03, 23 April 2003), which directs USJFCOM to streamline the deployment process, in that the JDPO should "separate the short and long-term efforts."

The goal of the JDPO in deployment transformation is "to help bring about a simple, seamless, knowledge-based joint deployment process, supported by distributed, concurrent collaborative planning processes and tools, using real time, accurate and reliable information, enabling supported and supporting commanders to execute

effective and efficient joint deployment operations in support of the National Military Strategy and U.S. vital interests*."*

Specific actions that the JDPO is taking to advance deployment transformation include recommending and coordinating joint deployments, which outline proposals to transform joint deployment capabilities through changes in doctrine, organization, training and education, materiel, leader development, personnel, and facilities (DOTMLPF), as well as recommending changes in the joint deployment process and system to the Joint Planning and Execution Community (JPEC). These packages will also be associated with Deployment Process "Quick Wins" and with Deployment Business Process Re-engineering and Prototyping.

Through the use of these use of these tools, the JDPO is pursuing a rapid, iterative, and practical approach to advancing transformation in the area of deployment. Quick Wins, for example, are changes that are to occur in three month cycles and are designed to provide solutions to existing process challenges and that demonstrate commitment and gain support from the warfighter. This effort will focus on the disciplined use of a common collaborative process and procedures, the consistent association of movement requirements to a given order, and sustainment and in-transit visibility. The re-engineering and prototype work of the JDPO will look at the redesign of existing processes, identifying enabling information technology, conducting prototyping activities, developing processes, preparing for implementation and transition, and implementing new processes and technologies.

The JDPO approach also includes spiral prototyping. Through spiral prototyping conducted in coordination with the Joint Force Commanders, the JDPO will develop system level requirements for prototype capabilities. These prototypes will then be deployed to the Joint Force Commanders, who will provide assessments and feedback related to utility and maturity of the concepts as indicated in exercises and simulations. The JDPO approach also includes interoperability demonstrations that will seek to "find and fix" interoperability gaps, employing the "80% interoperability solution" needed for an interim capability. Interoperability demonstrations will also help to provide recommendations for interim or spiral capabilities.

JDPO initiatives in support of deployment transformation over the near and mid-term include the following:

Quick Wins for the Warfighter. Quick Wins for the Warfighter is a near-term program being pursued within the JDES effort that is designed to advance transformation through joint forces technology collaboration. The goal of this program is to deliver near-term, joint process and technical solutions to critical operational issues that are blocking transformation in the JDES area. Quick Wins focuses on developing the capabilities needed by the stakeholders and the target users and why these needs exist. The Quick Wins program uses feedback from the joint warfighters as a collection of "lessons learned" on critical operational issues from real-world operations and then captures these challenges in a joint Quick Win team, which executes each project within a 90-day development cycle.

JDPO Experimentation. In the near- and mid-term, JDPO will streamline existing processes and activities to create greater speed, accuracy, visibility, and agility in joint deployment process planning and execution. To do so, it will make use of industry best practices and benchmarks, tailored to the unique requirements of the military environment at the strategic, operational, and tactical levels. The reengineered joint deployment process will continue to place operational effectiveness as paramount, while seeking to improve the overall efficiency of moving and sustaining forces through the use of industry best practices.

Joint Deployment Integrated Architectures. JDPO is developing Joint Deployment Integrated Architectures in order to provide a detailed understanding of the current joint deployment process, the systems that support it, and the data elements that must be exchanged in order to carry out deployments. The completed architecture will help JDPO to examine a number of tradeoffs for achieving significant improvements in the process, including which information exchange requirements (IERs) may be effectively supported by automation, vice those that are best left to manual processes within the limits of foreseeable technology advances. Such understanding, in turn, will support the effort to reengineer the entire joint deployment process.

Systems Requirements Management. JDPO will continue to pursue transformational advances in deployment capabilities through its involvement in the requirements definition process for deployment systems. JDPO has, for example, developed and received JROC approval of a Joint Deployment Systems (JDS) Capstone Requirements Document (CRD). The JDS CRD contributes to deployment transformation by identifying and describing the overarching integration and interoperability requirements for joint deployment systems. These requirements will serve as the baseline criteria for developing Initial Capabilities Documents (ICD) (formerly Mission Needs Statements (MNS)) and Capabilities Development Documents (CDD)/Capabilities Production Documents (CPD) (formerly Operational Requirements Documents (ORD)) for the future and legacy deployment systems within the family-of-systems (FoS) that support the joint deployment process.

JDPO has also formed a new partnership with the Executive Agent for the Transportation Coordinators' - Automated Information for Movement System II (TC-AIMS II) to assist in managing the requirements for the ongoing development of this joint deployment system. One aspect of this partnership is JDPO's new role as Co-Chair of the TC-AIMS II Joint Requirements Board (JRB). Ultimately, JDPO activities in systems requirements management will support deployment transformation by advancing the integration of joint deployment systems at the tactical and operational levels with systems and applications supporting joint deployment and force projection at the operational and strategic levels, including the Global Command and Control System (GCCS), and the Global Combat Support System (GCSS).

Systems Integration, Interoperability, and Experimentation. USJFCOM has established a JDES Lab, which will support transformation in deployment by objectively assessing current and emerging JDES systems and processes, supporting the JDPO quick-win and reengineering strategies to improve the joint deployment process. The

lab will not only provide an objective assessment of competing systems capabilities to most effectively examine the deployment transformation tradespace, but will also integrate end-users into the process, facilitate collaboration, provide a joint perspective, enable improved vertical and horizontal integration of deployment systems and processes, and maximize systems integration. Overall, the JDES lab will create an environment that facilitates near-, mid- and long-term interoperable prototype solutions, integrating the best of the assessed functional capabilities and processes to meet the needs of Regional Combatant Commands (RCCs), Services, and DoD Agencies.

Multi-National Integration and Interoperability. US military operations are often conducted with the armed forces of other nations to achieve common objectives. Alliance or coalition partners often provide support to deployment operations in the Supported Commander's AOR through treaties and other agreements or commercially contracted support. This effort will consider issues relating to multinational, coalition, and interagency partners in deployment / redeployment operational planning and execution. The JDPO transformation strategy of Quick Wins for the Warfighter and Experimentation (Reengineering) will explore new and innovative approaches in supporting joint, multinational, and interagency operations

Command and Control. Command and Control systems related to joint deployment are addressed in the Command and Control section of this document.

The path to transformation for joint deployment is clear, but will require continuous support and coordination from all appropriate DoD organizations in order to carry out this vision.

VII. Joint Concept Development, Experimentation and Prototyping

A. The Role of JCIDS

Joint concept development and experimentation play an essential role in developing and delivering transformational capabilities to the warfighter as part of the JCIDS process. The continuous development and refinement of innovative concepts that harness advanced technologies and spawn new organizational configurations lie at the very heart of military transformation. Experimentation not only helps to test and refine the joint operating concepts and the joint and Service operational concepts, but also provides the warfighter with a rapid and effective tool for evaluating new capabilities and incorporating the most promising elements into acquisition processes on an accelerated timeline.

Joint concepts and joint experimentation play complementary roles in the development of transformational joint capabilities. Joint concepts identify the manner in which key functions will be integrated to provide the capabilities needed to carry out the full range of military operations. These new concepts serve as the basis for various types of experimentation. Thus, the new joint functional and enabling concepts are being articulated in the measurable detail needed to support the experimentation and analysis needed to allow decision makers to compare and select among alternatives. At the same time, experimentation, such as USJFCOM's Pinnacle Impact 03 seminar wargame, the USJFCOM and the Army co-sponsored Unified Quest 03 war games, the USJFCOM and Marine Corps co-sponsored Joint Urban Operations war games, and other Service and COCOM–sponsored limited objective experiments and war games are used to assist in the development of the new joint and Service concepts.

Operational prototyping plays an important role in the experimentation process. Prototypes are employed to test and refine new concepts by providing military personnel, the warfighter, with tangible new processes and capabilities to evaluate. In addition, promising concepts identified and refined through first order experimentation may be prototyped to provide a basis for more detailed evaluation and refinement of both the capability and the underlying concept, and to accelerate the fielding of an initial version of the capability. Another important benefit of prototyping is that the testing of prototypes generally broadens the numbers of line personnel involved in the experimentation process. These future warfighters provide valuable insights regarding the many practical adjustments needed to employ the new capability. At the same time, this direct experience helps foster innovative mind-sets and support for continuous adaptation among these participants in the transformation process.

To ensure that the joint concept development and experimentation and prototyping of information technology capabilities are successful and transferable to existing capabilities without having to be completely reengineered, the capabilities developing any prototyping initiative must be designed using methods that support an open environment and be easily assimilated into warfighter and business domains.

Considering the recent initiation of the JCIDS process, it has yet to be applied to joint concept development and experimentation. There is an obvious connection between these two areas, however, the details of the proper alignment between the two have yet to be developed. This is a challenge that must be addressed to ensure that joint concept development and experimentation ultimately results in the fielding of successful prototypes that become institutionalized.

B. USJFCOM's Concept Development and Experimentation Campaign Plan

The Unified Command Plan designates U.S. Joint Forces Command as the single combatant command for joint concept development and experimentation. This mission is to be carried out in partnership with the Services, combatant commanders, defense agencies, the interagency, and multinational community.

The JOpsC and the various supporting concepts will be developed and refined through the joint concept development and experimentation (JCDE) process as described in CJCSI 3010.02A, Joint Vision Implementation Master Plan. USJFCOM will ensure overall integration of joint concepts. The Joint Requirements Oversight Council approves proposed concepts, experiments and recommends approval of DOTMLPF changes.

Joint experimentation (JE) and assessment is designed to evaluate concepts, compare alternatives and provide observations, insights and actionable recommendations to senior decision-makers.

The Joint Staff and USJFCOM efforts will establish appropriate objectives, goals, scenarios, metrics and tasks to focus evaluation efforts. The Chairman's JE Guidance provides a common pathway for JCDE to facilitate concept development and experimentation. The key goals of JE and of the new family of joint concepts (JOpsC, JOCs, joint function and enabling concepts) include:

- Gain insights and understanding of what concepts and capabilities are feasible given the current state of technology, potential developments, and integrated effects with other technologies.

- Establish measures of effectiveness associated with achieving the desired capabilities outlined in the new concepts. Permit the exploration and co-evolution of new concepts, processes, capabilities, doctrine and technologies for the future joint environment.

- Provide a cohesive JCDE environment through the integration of Service, joint, multinational and interagency experiments.

The Joint Staff and USJFCOM will identify the critical measures of effectiveness and establish models to demonstrate changes from current to future capabilities to validate emerging concepts.

C. USJFCOM's Experimentation Strategy

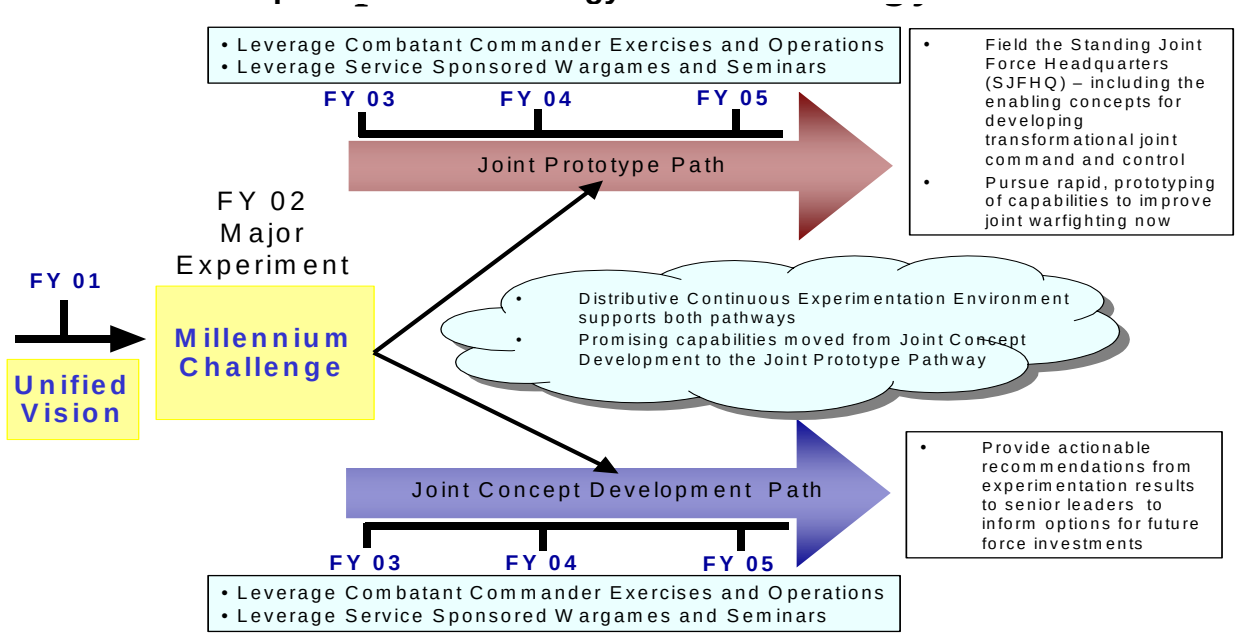


Figure 17: Experimentation Strategy

As depicted in Figure 17, the current Experimentation Campaign Plan establishes a two-path experimentation strategy to achieve the goals of the plan. The Joint Prototype Path is designed to facilitate the development of prototype capabilities that can be honed rapidly and provided quickly to combatant commanders. The focus of this path is on improving capabilities through the refinement of promising new concepts. The Joint Concept Development Path is designed to conduct experiments that produce actionable recommendations on longer term capability development efforts to assist senior DoD leaders in making informed decisions about future force investments, with a focus on developing next generation capabilities.

USJFCOM seeks to include the widest possible array of partners in its wide-ranging experimentation activities. For example, USJFCOM plans to embed future joint concepts and prototypes in Service experiments and war games as well as the experiments and exercises of the combatant commanders. USJFCOM will also invite wider and more varied participation in joint experiments and will partner with the Services, combatant commanders, multinational partners, and agencies to design and conduct events that will inform new joint concepts and lead to actionable recommendations for future joint capabilities. This expansion of the "experimentation space" will provide a means to set the joint context, achieve more effective concept and prototype development, and provide better solutions for joint warfighting, in the near-term and far into the future.

USJFCOM plans to employ a range of experiments and experimentation venues in implementing its FY04 experimentation strategy. Discovery experiments will dominate the Joint Concept Development Path, providing the means to discover and compare alternative approaches for achieving desired capabilities. Hypothesis testing

experiments will be used to determine whether concepts should be moved to prototyping. Demonstration events will be used to display promising capabilities. The venues will range from small workshops to large field exercises and experiments.

1. Joint Prototype Path

The Joint Prototype Path is predicated on delivering capabilities to improve joint warfighting in the very near term. Prototype capabilities are being embedded in joint exercises and real world operations to provide multiple data collection opportunities and feedback to concept and prototype development.

All current prototypes are directly associated with the development of the Standing Joint Force Headquarters, including its enabling concepts. The capabilities associated with these concepts are targeted for fielding in 2004-2005. The following capabilities are currently being pursued through the Joint Prototype Path:

- Standing Joint Force Headquarters (SJFHQ)
- Collaborative Information Environment (CIE)
- Operational Net Assessment (ONA)
- Effects-Based Operations (EBO)
- Joint Interagency Coordination Group (JIACG)
- Joint Fires Initiative (JFI)
- Joint Logistics Common Relevant Operational Picture (Log CROP)
- Joint Intelligence, Surveillance and Reconnaissance (JISR)

SJFHQ. The SJFHQ will be a full-time, joint, C2 element within the RCC's staff. It has the potential to dramatically improve joint command and control by maintaining a daily focus on warfighting readiness as a fully integrated participant in the RCC staff's deliberate and crisis planning and operations. The SJFHQ will provide each RCC with a trained and equipped standing, joint C2 capability specifically organized to conduct ONA and EBO and to enhance situational understanding within an RCC-designated focus area.

CIE. The CIE has the potential to substantially improve command and control and warfighting effectiveness by providing widely shared, common situational awareness and understanding regarding adversary and friendly forces to decision-makers across strategic to tactical levels of the battlespace, without today's time and space limitations. It will provide a means to effectively tailor and rapidly update individual information requirements to significantly increase the pace and quality of planning, coordination, direction and assessment of RCC and JTF operations.

ONA. The ONA process has the potential to serve as a key enabler of effects-based operations by providing a continuous, dynamic, system-of-systems analysis of the enemy's total war-making capability. The ONA will provide the joint force a comprehensive analysis of the extended battlespace. It will be conducted through reach-back to a national network of centers of excellence, giving the combatant commander access to the full capabilities of U.S. interagency community, non-

governmental organizations, and possibly, to allied and coalition partners. Moreover, an ONA will identify those capabilities, assets, connections, loyalties, networks, and other assets, both physical and non-physical, that are most valuable to the adversary. In support of integrated joint and coalition operations, the ONA process will also provide analysis of the capabilities available to the entire combined force, including all of the elements of national power that can be leveraged from outside the government to include industry, academia, and private organizations. The ONA process will assist the joint force commander in developing and executing effects-based courses of action to successfully carry out his mission.

EBO. EBO is a methodology that alters the way we view the adversary and ourselves and changes what we include and emphasize in planning and operations. EBO views the adversary and the battlespace "holistically" – as a series of integrated "systems-of-systems." It leverages networked knowledge and understanding of the adversary and battle space environment developed via the ONA process to translate policy guidance into actions to create desired effects that lead to the desired end state. Additionally, it seeks to match, coordinate, and synchronize the best combination of joint military actions with the non-military actions of interagency and international partners to generate the effects necessary to achieve our national aims.

JIACG. The JIACG is a multi-functional, advisory element on the combatant commander's staff that facilitates information sharing across the interagency community. It is a means designed to foster habitual collaboration among interagency representatives that helps integrate campaign planning efforts between the strategic and operational levels across all U.S. government agencies. The JIACG helps oversee theater strategic engagement and participates in deliberate, crisis action, and transition planning, informing the combatant commander and JTF commander of civilian agency campaign planning efforts, sensitivities, support requirements, capabilities, and limitations.

JFI. The JFI encompasses processes and products that will support jointly integrated and interoperable fires and fire support prosecution capability that will be available to the joint force across the full spectrum of military operations from the strategic to the tactical level. The capabilities provided by the JFI will integrate the various DoD fires and fire support processes from the operational to tactical levels into a single, jointly interoperable set of functionalities and processes. It is also designed to establish full interoperability between JISR and command and control architectures, thus creating a singular joint fires prosecution mechanism.

Log CROP. The Joint Log CROP is a tool used to manage large volumes of logistical information and to develop a shared understanding of the logistics dimension of the battlespace among commands. This virtual warehouse of relevant logistics information with multiple display means is not a single application or system, but rather a composite capability that will provide integrated "pictures" customizable, and tailored to the needs of the user. It will facilitate collaborative planning and assist all echelons to achieve and maintain logistical situational awareness. The Log CROP will include top-to-bottom information access, decision support tools to help convert information into knowledge,

and widely shared, common situational awareness. It will help consolidate large volumes of information into a usable form and to expedite the decision-making process by facilitating more effective collaboration.

JISR. The Dynamic JISR concept applies a net-centric approach to the management of intelligence, surveillance and reconnaissance capabilities to better support the knowledge demands of the Joint Force Commander and his staff, his components and multi-national coalition forces. Strategies will be developed to capitalize on levels of net-centric capabilities that allied and coalition partners have been able to achieve at the time of a training, military, or civilian operation and at the same time to ensure that their service levels are comparable to U.S. service levels during operational conditions. The concept integrates sensors and processing capabilities into a coherent whole, leveraging emerging doctrinal, materiel and organizational transformation initiatives to provide near-real-time, integrated, relevant and responsive intelligence. The Dynamic JISR concept supports and relies on collaborative planning and execution across the full range of military operations among inter- and multi-national agencies, the intelligence community and the Joint Force Commander and his Service components. It will efficiently and effectively meet the expanded requirements of the Standing Joint Force Headquarters for increased situational understanding and effects-based planning.

2. Joint Concept Development Path

The Joint Concept Development Path develops warfighting capabilities for the more distant future. The path relies on an iterative experimentation program that includes frequent workshops, limited-objective experiments focusing on specific warfighting issues in the context of common scenarios, as well as large-scale war games and experimental exercises. This type of experimentation stimulates innovation by evaluating alternative approaches tied to the development of the new joint operating concepts. These experiments will produce observations and insights that lead to the development of actionable recommendations for senior leadership to develop future program, budget, and experimentation guidance.

The development of experimentation efforts on the Joint Concept Development Path is driven by warfighting needs identified by the combatant commanders and by the joint operating concepts, which depict the manner in which U.S. joint forces will conduct future joint operations.

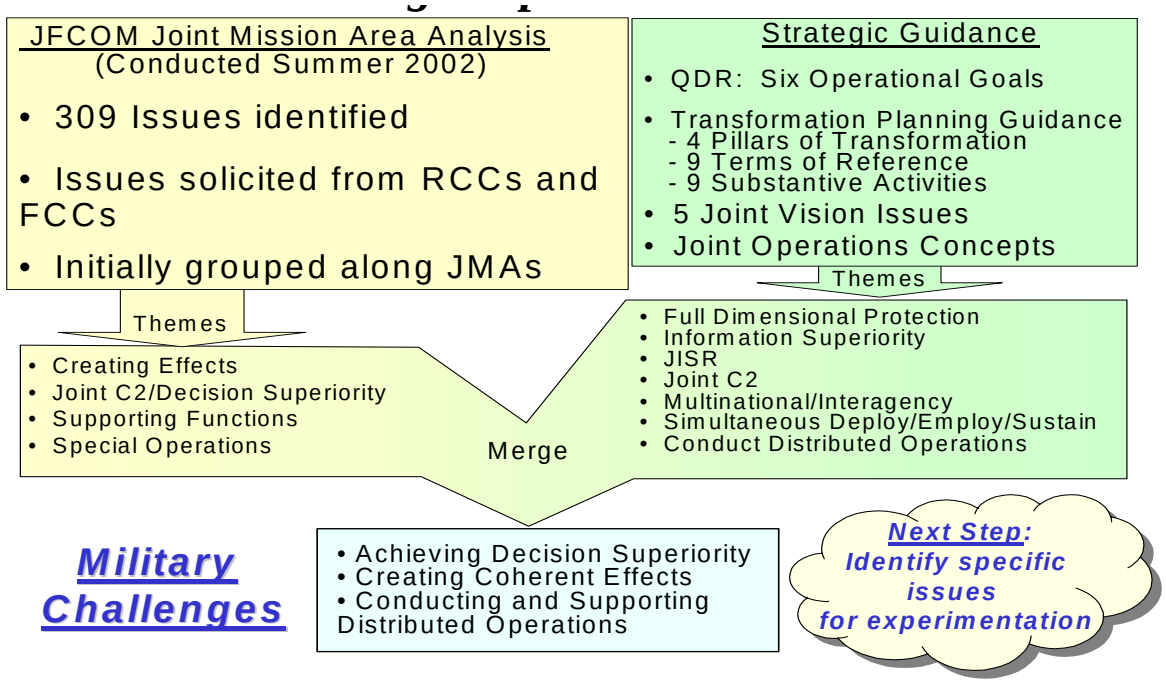


Figure 18: Selecting Experimental Focus

The entry point into the process of creating experiments on this path is the Joint Mission Area Analysis, in which important warfighting issues are identified for potential consideration through this type of experimentation. For example, during the summer of 2002, USJFCOM solicited a Joint Mission Area Analysis from the combatant commanders on current and future threats out to 2015 to ensure that experimentation efforts would reflect the geopolitical and military realities. USJFCOM coupled these inputs with strategic guidance (as represented in Figure 18) to identify three comprehensive "joint military challenges" based on the strategic guidance and combatant commanders' inputs and in collaboration with USJFCOM's many partners. Future Joint Mission Area Analysis will guide future issues for experimentation. The timeline for these recurring future analyses has not yet been determined.

Experimental focus is also shaped by strategic guidance, such as the six operational goals from the quadrennial defense review, as well as real-world operations, such as lessons learned from OIF.

Themes are extracted from the Joint Mission Area Analysis and other inputs. The three joint military challenges that emerged from the JMA and combatant commanders' input during the most recent period are:

- Achieving Decision Superiority
- Creating Coherent Effects
- Conducting and Supporting Distributed Operations

These challenges are then further decomposed into precise sets of joint concept development and experimentation issues. Figure 19 depicts the 18 issues currently providing the focus for the JCD Path experimentation. Issues in red are considered to

be priority issues. These issues, along with their priority are the result of synthesis of combatant commander-identified issues and strategic guidance.

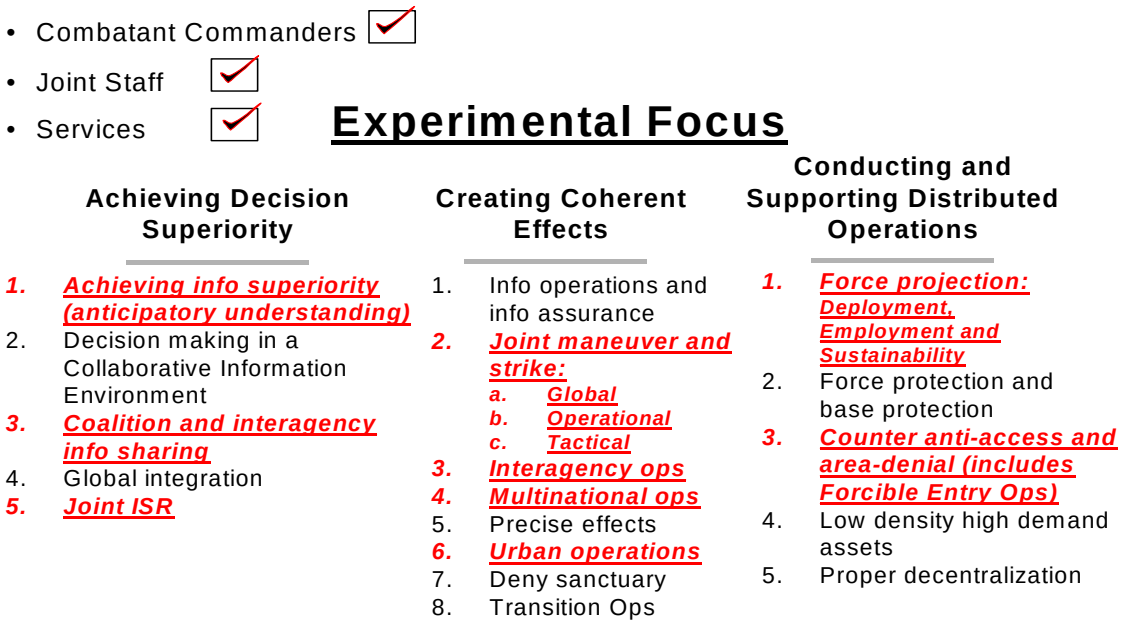


Figure 19: Issues for Experimentation

Given the established focus for joint concept development and experimentation, the USJFCOM Joint Concept Development and Experimentation Campaign Plan establishes a battle rhythm for experimentation that allows USJFCOM and Service, Combatant Commander, agency, and multinational partners to derive observations and insights from events enabling the development of actionable recommendations for future joint force investment. USJFCOM sets the joint context for events along the joint concept development path using the backdrop of the Joint Operations Concepts and the Joint Operating Concepts. Alternative approaches to the joint military challenges and specific issues are compared in different experimentation scenarios. Analysis of these events provides potential solutions to combatant commander, defense agency, and multinational partners to derive observations and insights from events that will enable the development of actionable recommendations for future joint force investment. USJFCOM sets the context for experimentation events along the joint concept development path, refining the approach to future joint operations set forth in the Joint Operations Concepts. JFCOM-led experimentation will include efforts to explore new concepts to provide the key capabilities identified as needed by the new joint operating concepts, once they have been initially drafted and approved.

In JFCOM experiments, alternative approaches to meeting the joint military challenges and specific capability needs are compared in different experimentation scenarios. Analysis of these events provides potential solutions in the form of observations and insights to issues raised by the combatant commander. From these, recommendations are developed to inform senior leader decisions on programs, budget, and further concept development and experimentation. The figure below depicts this process.

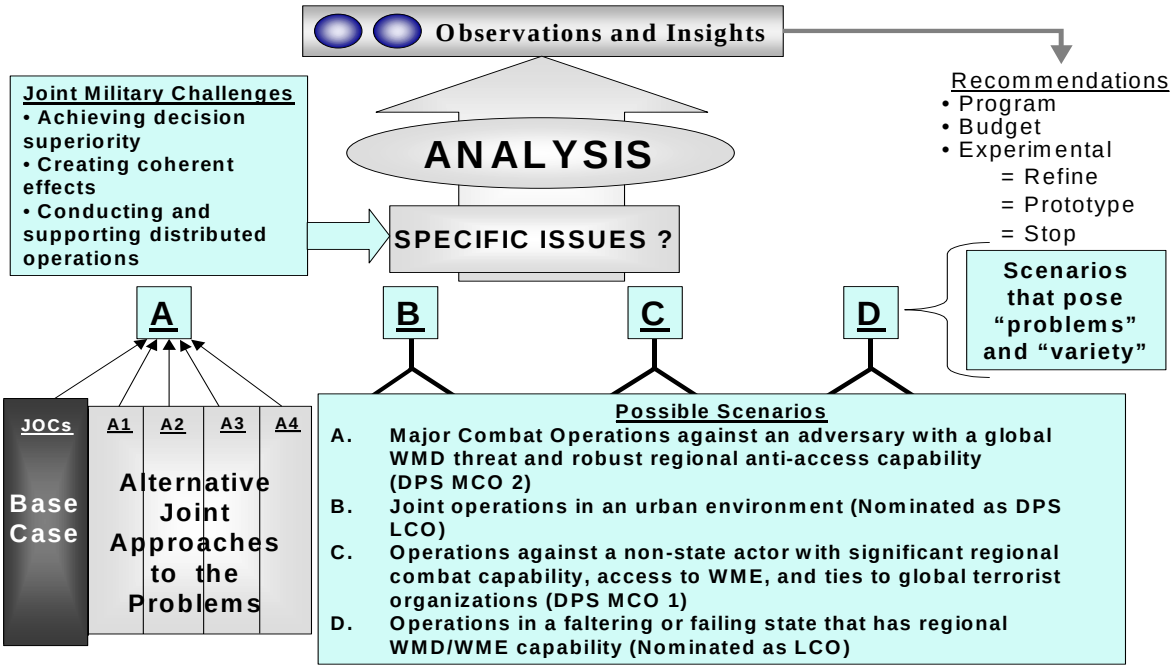


Figure 20: Experimentation Battle Rhythm

The battle rhythm established by the USJFCOM Joint Concept Development and Experimentation Campaign Plan provides an opportunity for partnership with Services, combatant commanders, agencies, and the interagency and multinational communities. The plan aims to reduce operational tempo and duplicative efforts by leveraging scheduled events and utilizing joint context as a mechanism for synchronizing efforts. The near-term plan is to conduct three to four wargames or exercises each year, alternating with Service and Combatant Commander partners. The following table highlights events currently targeted for use in pursuing joint concept development path experimentation.

Table 18: Joint Concept Development & Experimentation Events

Dates	Event	Sponsor
Feb 04	Thor's Hammer (Decision Superiority Wargame)	USSTRATCOM, USSOCOM, USJFCOM, NRO
Feb 04	USJFCOM MN Experiment 3	USJFCOM
Mar 04	Joint Urban Operations Wargame 4	USJFCOM, USMC
May 04	MCO and Stability Operations Wargame	USJFCOM, Army
Jul 04	Global Engagement VII (Creating Coherent Effects) Wargame	USJFCOM, USAF
Oct 04	Sea Viking (Creating Coherent Effects)	USJFCOM, USMC
Jan 05	Force Protection Wargame	USJFCOM, TRANSCOM

Mar-Apr 05	Joint Urban Operations Wargame 5	USJFCOM, USMC
Jul 05	USJFCOM MN Experiment 4	USJFCOM
Sep 05	Stability Operations Wargame	USJFCOM

D. New Paths from Experimentation to Joint Capability Development

At the same time that the joint community is leveraging its experimentation infrastructure to accelerate the evaluation, development, and fielding of new capabilities, it is also pursuing a number of alternative paths to more completely and effectively capture the range of promising concepts and technologies identified through experimentation activities and rapidly mature them into transformational capabilities.

E. Experimentation Infrastructure

The joint community leverages a broad range of human and technical capability to support its experimentation. This infrastructure includes the following:

- Simulation Infrastructure
- Modeling and Simulation
- Distributed Continuous Experimentation Environment (DCEE)
- Joint National Training Capability

USJFCOM uses a Human-in-the-Loop simulation federation to simulate both combat in a virtual battlespace and command and control, including the ability to provide the information to the players in an experiment. USJFCOM has been expanding its base simulation federation to include a number of Service models and simulation federates.

USJFCOM is pursuing a composite or modular approach to its simulation architecture. This allows models to be easily inserted and removed as required, and enables the simulation to be easily extended and optimized for specific applications. The Defense Modeling and Simulation Office (DMSO) built the High Level Architecture (HLA) to provide universal interoperability between all simulations. The HLA allows simulations to be linked together to produce composite simulations called federations. Once a federation is defined, experimenters can develop plug and play simulations for that particular federation.

USJFCOM has established the Distributed Continuous Experimentation Environment as a joint laboratory for the continuous evolution of simulation capabilities while simultaneously supporting real experiments. The DCEE includes a set of facilities, capabilities, hardware, simulation, and dedicated support staff that allow for continuous, rather than episodic, experimentation. As concepts grow to maturity in the DCEE with combatant command and Service participation and concurrence, they are provided as prototype capabilities to the combatant commanders. Combatant commanders refine capabilities through their own experimentation venues. Ultimately, these capabilities

are migrated into joint training exercises hosted by the Joint National Training Capability (JNTC). The JNTC is a global network of joint training facilitators composed of live, virtual and constructive components. Through the JNTC, existing operational and strategic facets of the exercises may be melded with live forces, creating a more robust and realistic exercise. The goal is to create an environment where every level of training is orchestrated through a joint context. The JNTC will incorporate Service, combatant commander, DoD agencies, Federal interagency, and multinational coalition partners.

F. Metrics for Experimentation

USJFCOM employs a number of qualitative and quantitative metrics to inform its decisions in each phase of the experimentation and prototyping process: deciding which concepts to develop through experimentation, identifying when the concept has attained a sufficient level of maturity, deciding when it is appropriate to move a concept to prototyping, and determining when to institutionalize the prototype.

In evaluating concepts for suitability for experimentation, USJFCOM is guided by the following criteria:

- Potential contribution to joint force transformation, including:
  - The degree to which concepts solve problems identified and incorporate lessons learned by the Combatant Commanders
  - The degree to which concepts improve joint warfighting
  - The degree to which combatant commanders accept the concept as a solution to the identified warfighting challenge
- Conformity of concepts with strategic guidance
- Senior leadership approval for concept development and experimentation

In evaluating concepts for maturity, USJFCOM is guided by the following criteria:

- Degree of completion of planned products
- Evaluation and validation of concept through experimentation
- Achievement of planned-end state
- Endorsement of concept by senior leadership

In evaluating concepts for suitability for prototyping, USJFCOM is guided by the following criteria:

- Extent to which a prototype is implemented in operations or during exercises
- The degree to which the concept's capabilities are needed by combatant commanders
- The willingness of senior leadership to invest in the prototype

In evaluating prototypes for maturity, USJFCOM is guided by the following criteria:

- Evaluation and validation of prototype in the field

- Incorporation of feedback from combatant commanders into successive versions of the prototype
- Improvement realized from changes to prototype
- Validation by combatant commanders of improvement to joint warfighting as a result of the prototype

In evaluating the degree to which efforts to implement a prototype have been successful, USJFCOM is guided by the following criteria:

- Prototype implementation recommended to senior leadership
- Appropriate changes to DOTMLP-F recommended
- Implementation of DOTMLP-F changes assigned by senior leadership
- Transition funds, POM funds, or Program of Record insertion identified to support lifecycle

Key metrics supporting the qualitative and quantitative discussion of experimentation suitability, evaluation and results discussed above are:

- Number of concepts solving Combatant Command issues evaluated in experimentation
- Number of concepts incorporating Combatant Command lessons learned evaluated in experimentation
- Ratios of attendees at co-sponsored experimentation events
- Percentage of prototype recommendations accepted by the JROC
- Number of prototypes developed
- Extent to which a prototype is used or accepted determined by the types and number of operations, environments or exercises prototype was implemented
- Number of prototypes transitioned with POM funds or insertion in POR
- Percentage of recommendations accepted by the Joint Requirements Oversight Council

Experimentation metrics serve both as focusing tools for program decisions and as a reflection of analytic rigor, making data integrity a critical factor in ensuring accurate performance measurement. Supported in greater detail by experimentation goals and objectives, performance is evaluated during concept development and prototype events.

1. Transformation Initiatives Program

As a complement to other ongoing joint concept development and experimentation activities, the Transformation Initiatives Program (TIP) is a new program to be developed and managed by the Office of Force Transformation (OFT) to support combatant commander's efforts to implement transformation initiatives and opportunities. This program will augment the ability of combatant commanders to pursue unforeseen, but potentially high-payoff joint transformation initiatives during the current fiscal year. TIP initiatives will be time-critical by nature, and present themselves

as opportunities to co-evolve operating concepts and technologies in contingencies, joint operations, exercises, or experiments.[55]

2. Joint Rapid Acquisition Program (RAP)

The joint Rapid Acquisition Program (RAP) is also a new program under development, which will seek to accelerate the implementation and fielding of projects employing newly matured technologies to meet the immediate needs of the warfighter. Such initiatives are expected to emerge as a result of the co-evolution of joint operating concepts and technologies during exercises and formal experimentation and may arise from ACTDs and Service Advanced Technology Demonstrations as well, RAP will support a more rapid acquisition of promising systems by using bridge funds to initiate development in the current fiscal year. Joint RAP will be targeted on joint initiatives of the COCOMs, Services and defense agencies, and be led by USJFCOM.

[55] Adapted from the *Transformation Planning Guidance*. April 2003. p. 20.

VIII. Joint Science and Technology

A. Support for Transformation

Science and technology (S&T) investment has historically been and will continue to be a key enabler of transformation in warfighting. The creation of significantly enhanced, "born joint" warfighting capabilities depends on technology investment that is driven by joint warfighting requirements. While the DoD S&T program has historically been aligned with, and continues to support transformation, the rapid evolution in both technologies and warfighting requirements that is currently taking place requires that those linkages be strengthened. This section addresses ways in which the current DoD S&T program is advancing transformational objectives, while also highlighting opportunities to improve that process to accommodate emerging realities and warfighting needs.

The high degree to which the current DoD S&T program supports transformation is reflected in the fact that that approximately 80% of S&T investment specified in the FY04 Program Objective Memorandum can be linked directly to the six transformation operational goals, as specified in the QDR, while other areas such as basic research and cross-cutting enabling technologies, can be shown to support transformation indirectly.[56] Long-term transformational capability advances supported by S&T investment include progress in hypersonic flight, persistent staring surveillance sensors, net-centric light ground forces, directed energy weapons systems, beyond line-of-sight precision missiles, and many other capabilities. While maintaining a broad base of investment, the DoD S&T community has also identified and focused on a number of initiatives with transformational benefits across multiple military domains. These include the National Aerospace Initiative (NAI), Energy and Power Technologies (E&PT), Surveillance and Knowledge Systems (S&KS), Future Combat Systems (Army), Sea Power 21 and Marine Corps Strategy 21 (Navy and Marine Corps), and Air and Space Superiority (Air Force). These projects offer significant benefits to each of the Services, and will deliver improved capabilities in five measurable attribute areas that support military transformation: lethality, speed, agility, knowledge, and survivability.[57]

Even while DoD S&T investment is providing the foundation for the development of transformational joint warfighting capabilities, that approach is itself undergoing significant change to better support an increasingly joint, complex, warfighter-driven capability development process. While these changes are still in their initial phases, the transition is creating significant near-term opportunities to provide the joint community a more effective voice in S&T decisions.

To understand the future direction in which the DoD S&T process must evolve to continue supporting transformational change, it is important to understand that the process by which the joint community provides inputs into science and technology

[56] From *Linking Science and Technology to Transformation. Department of Defense. Director, Defense Research and Engineering. September 2002. p. 9.*
[57] *Linking Science & Technology to Transformation, p. 9.*

programs has not, historically, provided a direct path for translating specific joint warfighting requirements into S&T investment decisions.

B. DoD S&T Processes

Since 1997, the principle vehicle for reviewing and managing joint S&T requirements has been a series of "roadmap" documents written by the Office of the Director, Defense Research & Engineering (DDR&E) under the Under Secretary of Defense for Acquisition, Technology & Logistics. The three such documents are the Basic Research Plan, the Defense Technology Area Plan and the Joint Warfighting Science & Technology Plan.

The Basic Research Plan (BRP) is generated bi-annually, and uses six "strategic research objectives" to review the range of 6.1 basic research programs, which largely consist of the activities of universities, industry, and the service labs in each of twelve technical disciplines. The document is compiled by the multi-disciplinary "Basic Research Panel" within DDR&E, under the supervision of the Defense Science and Technology Advisory Group (DSTAG), working for the Deputy Undersecretary of Defense for Science and Technology (DUSD-S&T). At the end of each document creation cycle, the BRP is staffed out to a multidisciplinary panel of DoD specialists for technical area reviews and assessments (TARA), followed by a DSTAG review.

The Defense Technology Area Plan (DTAP) reviews 6.2 and 6.3 programs, binned according to 12 "technology areas." The specific activities analyzed in the DTAP are the approximately 200 "Defense Technology Objectives (DTOs), including ACTDs, advanced technology demonstrations (ATDs), and other technology demonstrations (TDs). For the DTAP, the use of the 12 technology areas for binning provides a horizontal perspective into all activities occurring across the Services and defense agencies within a given area. Within DDR&E, the DTOs are split out and assigned to 12 "technology area panels" for the drafting of the document. As with the BRP, the integrated draft document is staffed out for review through the TARA process, and, ultimately is reviewed by the DSTAG. The DTAP ultimately may be used as a means to try to influence S&T decisions in the Planning, Programming, Budgeting, and Execution process.

The Joint Warfighting Science & Technology Plan (JWSTP) is the primary vehicle for providing a "joint perspective" to ensure that DoD technology development efforts are linked to potential uses in underwriting innovative concepts that address critical capability challenges associated with future joint and coalition military operations. The JWSTP analyzes the same 6.2 and 6.3 programs as the DTAP, but uses a different categorization scheme, and covers only those DTOs associated with ACTDs and ATDs. From 1997 through 2003, the JWSTP binned the ACTDs and ATDs according to Joint Warfighting Capability Objectives (JWCOs), which loosely paralleled the organization of the JWCA teams. In the wake of the recent reorganization of Joint Staff J8 and the JWCAs and the implementation of the new JCIDS process described earlier, this process has been changed. The next version of the JWSTP will bin the ACTD and ATD DTOs according to the five recently created functional capability boards (FCBs) and

functional concepts, which were discussed in Section II (above), and that which track with the recast JWCA structure as well. The primary external review of the JWSTP will still be done by the five JWCAs and their oversight FCBs, albeit in accordance with the new categories of force application, protection, battlespace awareness, joint command and control and focused logistics.

The current Joint S&T process is summarized in Figure 21 (below). The graphics in black depict key documents and programs, while the graphics in blue depict key meetings and organizations. The review and feedback process is depicted in green.

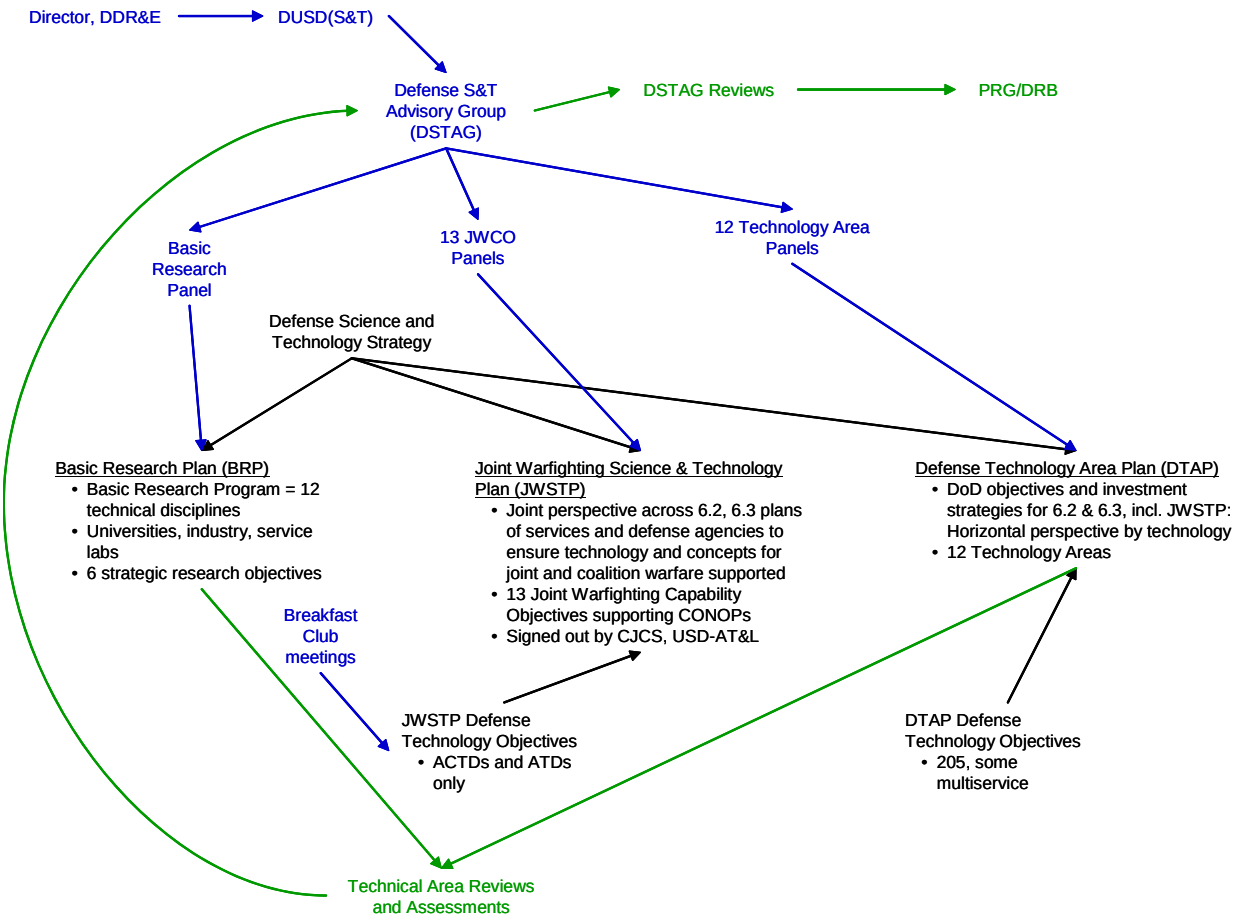


Figure 21: Joint S&T Processes and Organizations

Joint S&T is the vehicle by which technologies with transformational potential can be explored and developed as they show promise. In this manner, Joint S&T is an important avenue for avoiding "regrets" that could stem from failing to fully appreciate the possibilities or implications of harnessing advanced technologies that are still in their infancy, or whose potential is not yet well recognized through innovative operational concepts and new organizational constructs. Such technologies include, but are not limited to, directed energy, robotic systems, new sensing technologies, technologies enabling vertical movement on the battlefield, new means of power generation, and effective modeling of the future, non-contiguous operations.

Although the Joint S&T process is evolving in parallel with the new DoD emphasis on a "capabilities-based approach," a number of opportunities exist for strengthening the relationship between future joint warfighting requirements and S&T efforts.

First, no effective criteria exist for evaluating S&T programs in terms of their potential contribution to fulfilling future joint warfighting requirements. Technically, the DDR&E authors of the JWSTP use the Joint Warfighting Capability Objectives (JWCOs) to evaluate the Defense Technology Objectives (DTOs), and will now employ the functional area concepts to do the same. However, the original JWCO definitions were actually drafted by DDR&E, and only staffed out to the JWCA teams and the JWCOs were never sufficiently specific to provide a meaningful basis for aligning specific DTOs with specific military capability needs. Moreover, the actual process for selecting the ACTD and ATD DTOs has had no direct connection to the Joint Warfighting S&T plan.

Traditionally, ACTD and ATD decisions have been made through the "breakfast club" process. This group includes the acquisition-oriented principal deputies (sometimes their assistants) on the OSD side, and the number two or number three person connected with system acquisition from each of the Service secretariats. Proposals for ACTDs and ATDs are included in a Breakfast Club meeting through an informal process whereby one or more of these organizations agreed to "sponsor" a proposal for consideration. The Breakfast Club then narrows the list down to approximately 15 to take forward to be signed off by the JROC, and subsequently the USD (AT&L), before being submitted to Congress. Thus the only manner in which the JWSTP could influence ACTD and ATD choices is through one or more of the Breakfast Club principals having read or having been briefed on the (lengthy) document. Creating a meaningful channel for influence will require more than the shift from JWCOs to functional concepts as a construct for binning the defense technology objectives.

At the same time, no effective working relationship exists between the joint community's new concept development activities and S&T programs. Although the JWSTP contains a brief section written by USJFCOM describing the joint concept development and experimentation process, there is no direct, formal process by which promising or mature S&T programs can be nominated for joint experimentation. Reciprocally, there is also no direct means by which lessons from joint experimentation can be used to influence S&T programs, defining new needs or providing a basis for accelerating promising new technologies.

Because "born joint" transformational warfighting capabilities require S&T investments that are directly driven by joint warfighting needs, strengthening the relationship between new operational concepts to meet these needs and S&T investment in promising advanced technologies would be a very useful addition to the joint force transformation process. Given the recently adopted changes in the capabilities-based needs identification process via JCIDs and the adoption of new spiral development and evolutionary acquisition approaches, it would appear appropriate to create a new group to address this shortcoming. This group, composed of senior officials representing the Under Secretary of Defense (AT&L), the Vice Chairman of the JCS, the Director of Defense Research and Engineering, the Assistant Secretary of Defense (NII), the

Commander, USJFCOM, the Principal Deputy Under Secretary of Defense (P), and the Director, Force Transformation, should work together to create a new, more effective process for ensuring that DoD S&T efforts are much more effectively linked to the development of new, net-centric, joint warfighting concepts and capabilities.

IX. Joint Training and Professional Military Education

Joint training and professional military education play complementary, yet distinct and separable roles in enabling the development of joint warfighting capabilities. *Education* conveys general bodies of knowledge and/or develops habits of mind applicable to a broad spectrum of endeavors. It fosters breadth of view, diverse perspectives, critical analysis, abstract reasoning, innovative thinking, and comfort with ambiguity and uncertainty--all in particular reference to complex, non-linear problems. *Training* delivers the discrete, well-defined knowledge and skill sets essential to performance of specific tasks/jobs. Training focuses on preparing for the known, while education focuses on preparing for the unknown. Virtually every military school or exercise includes some element of both; however, maintaining a clear distinction when discussing institutional intent, whether education or training, is essential to successful transformation of professional military education and military training. The Transformation Planning Guidance recognizes this distinction by providing separate tasking for education and training.

The dramatic combination of advances in technology and organizational research and changes in operational concepts and constructs requires and allows the joint community to adopt new approaches to training and education within a significantly strengthened joint context. The force transformation process will lead to "born joint" forces, including a new joint culture. At the same time, it will be highly desirable to maintain Service cultures and perspectives, albeit, not at the expense of a clear, primary commitment to true jointness. Service cultures remain a valuable means to encourage diversity of ideas and approaches and convey the valuable combat ethos and traditions of the individual Services.

The Strategic Plan for Transforming DoD Training (SPTDT), completed in March 1, 2002, outlines the vision, strategic goals, and major tasks for transforming training, which includes training, education and job-performance aids. Its vision is "to provide dynamic, capabilities-based training for DoD in support of national security requirements across the full spectrum of Service, joint, interagency, intergovernmental, and multinational operations." The approach emphasizes "outputs," or training needed, to support the capabilities needed for combatant commander's mission accomplishment, while preserving the ability of the Services to train on their core competencies. The focus of the Training Transformation initiative is to better enable joint operations. The supporting strategic goals are:

- Provide comprehensive and systematic "joint" training focused on the operational requirements of the combatant commanders and linked to readiness assessment.
- Develop a robust, networked, live, virtual and constructive (LVC) training and mission rehearsal environment that enables the DoD to build unparalleled military capabilities, which are knowledge-superior, adaptable and lethal, and predicated upon Service, interoperability, and combatant commander training requirements.
- Revise acquisition and other supporting processes to identify interfaces between training systems and acquisition, logistics, personnel, military education, and

command and control processes, and ensure that these processes and systems are integrated.

A. Joint Training

Within the domain of training, the Training Transformation Implementation Plan (TTIP) captures the processes and key initiatives for supporting transformation. This plan reflects the transition from a threat-based, requirements-driven, force development process to a capabilities-based force planning process, and is directly linked to the TPG tasking on training and education and the Strategic Plan for Transforming DoD Training goals.[58] In addition, it recognizes a broader, more inclusive definition of "joint," to include Federal agencies, international coalitions, international organizations, and state, local, and nongovernmental organizations. The current version of the TTIP was published 10 June 2003 by the Undersecretary of Defense for Personnel and Readiness, and continues to be updated as part of an ongoing, iterative process.

Appendix 1 of the TTIP addresses the actions identified in the SPTDT and provides specific details and milestones for outlining how and when actions are to be accomplished and specifies organizational responsibility for these actions.[59] The following lays out the major components of the TTIP. Training Transformation is a continuous process designed to ensure all individuals, units, and organizations, both military and civilian, receive the joint education and training necessary to accomplish the joint tasks that support the operational needs of the combatant commanders.

Training Transformation will accomplish the following objectives:

- Strengthen joint operations by preparing forces for new warfighting concepts.
- Continuously improve joint force readiness by aligning joint education and training capabilities and resources with combatant command needs.
- Develop individuals and organizations that intuitively think jointly.
- Develop individuals and organizations that improvise and adapt to emerging crises.
- Achieve unity of effort from a diversity of means[60].

Achievement of these objectives will require the creation and storage of new knowledge for future military operations, imparting this knowledge to individuals through education and applying it to individuals and collectives (units and staffs) in an integrated joint knowledge management architecture. The Joint Training System (JTS) will provide an integrated framework that prioritizes, plans and executes and assesses training requirements. The following initiatives, depicted in Figure 22, will contribute to achieving this capability:

[58] The TTIP is the roadmap for Training Transformation. It is available at the DoD Training Transformation website: www.t2net.org/implementation_plan.htm.
[59] The Resource Management Process for the TTIP will not be added until December 2003.
[60] Diversity of means are drawn from Active and Reserve components of the Services; Federal agencies; international coalitions; international organizations; and state, local, and nongovernmental organizations.

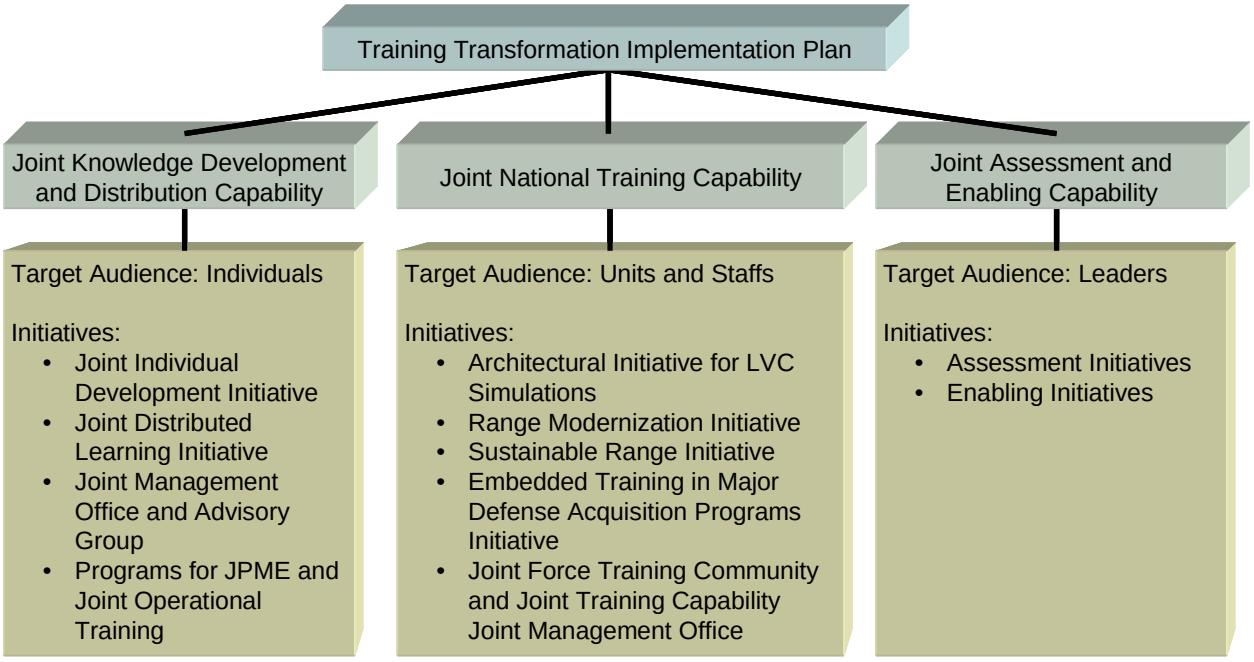


Figure 22: Joint Training Way Ahead

1. Joint National Training Capability (JNTC).

The JNTC will serve as the foundation for advances in training and professional military education underpinning the transformation of our military forces. The JNTC will support the creation, storage, imparting, and application of knowledge in improved ways to units and staffs. It will also prepare forces by providing command staffs and units with an integrated live, virtual, and constructive training environment with appropriate joint context that allows accurate, timely, and relevant training and mission rehearsal in support of specific operational needs.

The lead for JNTC is USJFCOM. The target audience for the JNTC is units and staffs. IOC is currently slated for October 2004. Current JNTC initiatives include the following:[61]

- Architecture Initiative for LVC simulations
- Range Modernization Initiative
- Sustainable Range Initiative
- Embedded Training in Major Defense Acquisition Programs Initiative

[61] Timelines and metrics for each of these initiatives are covered under each Capability Component Action in appendix 1 of the *Training Transformation Implementation Plan*.

- Joint Force Trainer Community and Joint National Training Capability Joint Management Office (JNTC JMO)

Architecture Initiative for LVC simulations. This initiative, led by OUSD (P&R) and USJFCOM, will develop and adopt common operational, technical, and systems architectures to allow integrated live, virtual, and constructive simulations to interoperate regardless of the Service providing the simulation. **Range Modernization Initiative.** Service capabilities form the current baseline range infrastructure. Investments will selectively expand and connect Service training ranges and instrumentation systems as part of the development of the Joint National Training Capability. ODUSD (R) will lead this effort.

Sustainable Range Initiative. Military ranges and operating areas are fundamental enablers of unit training, be it basic or advanced, Service or joint. Encroachment pressures such as private development adjacent to ranges, restrictions imposed by environmental regulation, or growing competition for airspace and frequency spectrum are increasingly impeding the ability to conduct unit training in realistic environments. Under the lead of ODUSD (R), ODUSD (I&E), and DOT&E, DoD is pursuing a comprehensive solution to encroachment pressures through this initiative which includes policy, organization and leadership, programming, outreach, legislative clarification, and a suite of internal changes to foster range sustainment.

Embedded Training in Major Defense Acquisition Programs Initiative. Under the lead of OUSD (P&R), existing defense acquisition and training policies that influence Major Defense Acquisition Programs will be reviewed and assessed, and changes to policies and procedures will be made as needed. The new or revised policies will provide an embedded training capability in targeted Major Defense Acquisition Programs that includes human performance-aiding capabilities within operational systems will be consistent with joint operational and joint training architectures, and will be achieved using real-world command and control systems.

Joint Force Trainer Community and Joint National Training Capability Joint Management Office (JNTC JMO). In late 2002, the Joint Force Trainer Community was established as a comprehensive network of joint force training-associated activities, whose core is the Joint Warfighting Center (JWFC). The JWFC now complements current capability development with aggressive assessment of joint training-based activity to identify, develop, and integrate near-term joint force capability improvement. Under the lead of USJFCOM, the JWFC will leverage joint training as an integrating environment for the improvement of joint force capabilities. This includes prototype capabilities from the Joint Prototype Path as well as incorporation of Joint Test and Evaluation teams and Advanced Concept Technology Demonstrations. Results of joint training event analysis will support assessment of joint force capabilities. The results of assessment are captured for integration into the Joint Training System and are managed through the DOTMLP-F process for implementation. The JNTC JMO will be a fully integrated responsibility of USJFCOM Joint Force Trainer Community that will leverage existing Joint Force Trainer capabilities, and resource the development of additional Joint Force Trainer capabilities to meet specific JNTC requirements.

2. Joint Knowledge Development and Distribution Capability

This capability will support transformation by creating, storing, imparting, and applying knowledge to enhance the individual's ability to think intuitively in joint terms. It will prepare future decision-makers and leaders to employ joint operational art, understand the common relevant operational picture, and respond innovatively to adversaries. It will develop and distribute joint knowledge via a dynamic, global-knowledge network that provides immediate access to joint education and training resources.

The target audience for the Joint Knowledge Development and Distribution capability is individuals. Initiatives currently occurring as part of the development of this capability include:

- Joint Individual Development Initiative
- Joint Distributed Learning Initiative
- Joint Management Office and Advisory Group
- Joint Knowledge Development and Distribution Capability Programs

Joint Individual Development Initiative. This initiative, led by CJCS, creates a career-long continuum of knowledge that integrates individual functional career knowledge with individual joint and service specialties. The continuum implements knowledge management processes within a framework of capabilities based on combatant commander needs. The methodology for this initiative is based on joint individual tasks required to perform joint operations. These tasks are then organized to form joint core competencies and analyzed to identify and select the best knowledge delivery methodology.

Joint Distributed Learning Initiative. This CJCS-led initiative will ensure ready access to high-quality "learning" for joint education and training, performance aiding, and decision-aiding that is tailored to the needs and capabilities of any individual or group and available anytime, anywhere. It builds upon previous work with the Services and industry to create an interoperable learning environment.

Joint Management Office and Advisory Group. The Chairman, Joint Chiefs of Staff, will establish a Joint Management Office to manage and oversee the rapid spiral development of joint individual education and training and will establish a Joint Knowledge Development and Distribution Capability Advisory Group to guide the development, distribution, and management of Joint Knowledge Development and Distribution Capability applications.

Joint Knowledge Development and Distribution Capability Programs. The Chairman, Joint Chiefs of Staff, will appoint managers to oversee development, distribution, and lifecycle management of the Joint Professional Military Education (JPME) and Joint Operational Training programs. The program managers will draw upon program resources for the analysis, design, development, implementation, and revision of instructional content associated with these programs and will coordinate requirements for the expansion of Joint Knowledge Development and Distribution

Capability applications to support the joint education and training needs of interagency, intergovernmental, and multinational partners.

3. Joint Assessment and Enabling Capability

This capability will assist leaders in assessing the results of transformational training initiatives on individuals, organizations, and processes by evaluating the level of joint force readiness to meet validated combatant commander requirements. It will also provide essential support tools and processes to enable and enhance the two aforementioned capabilities.

The target audience for the Joint Assessment and Enabling Capability is leaders. Key initiatives associated with the development of this capability include:

- Enhanced Joint Training System
- Performance Assessment Architecture
- Joint Performance Measures
- Linking of Training to Readiness Through a Joint Assessment and Enabling Capability

Enhanced Joint Training System. This will serve as the architectural framework for Training Transformation by systematically identifying and updating joint operational requirements for specific mission planning, mission-rehearsal, experimentation, education, and training needs that will be supported by the Joint Knowledge Development and Distribution Capability and the Joint National Training Capability.

Performance Assessment Architecture. This will complement Joint Knowledge Development and Distribution Capability and the Joint National Training Capability architecture efforts, and incorporate common assessment tools and metrics in its operational software and global information environment.

Joint Performance Measures. The quality and sophistication of metrics and assessment tools will evolve as a result of the rapid spiral transformation process. Feedback of performance information will be used to guide the evolution of the Joint Knowledge Development and Distribution Capability and the Joint National Training Capability.

Link Training to Readiness Through Joint Assessment and Enabling Capability. Future joint force training readiness reporting through the Defense Readiness Reporting System (DRRS) will be based on the process established in the Joint Training System. This initiative, led by OUSD (P&R), OUSD (P) and CJCS, will use the Joint Assessment and Enabling Capability to provide more robust reporting on DOTMLP-F issues.

4. Other Enablers

Training Transformation is enabled by relevant guidance and policy, as well as the improved capabilities for the tracking of the joint education, training, and experience of DoD personnel.

Guidance and Policy. Training Transformation initiatives must be codified in DoD policy to ensure initiatives are institutionalized with DoD, to provide guidance for planning and execution of Training Transformation programs, and to provide procedures and assign responsibilities for the training and management of military and civilian DoD personnel and military units.

Track Joint Education, Training, and Experience of DoD Personnel. This tracking encompasses accurately describing joint billet and leadership requirements, developing appropriate standards and certification processes, and ensuring that personnel systems assign the right individuals to the right billets at the right time.

- Lead agent: OUSD (P&R), CJCS
- Timelines/Metrics: Covered under each Capability Component Action in Appendix 1 of the TTIP

B. Joint Professional Military Education

Joint professional military education (JPME), in coordination with joint training, is a key enabler of joint military transformation. While training provides the knowledge and skills to perform well-defined jobs in known conditions, education prepares individuals to meet what the Training Transformation initiative sets as one of its principal objectives: the ability to improvise and adapt to emerging crises. It is also crucial in developing the capability to have a self-aligning joint force.

The Goldwater-Nichols Defense Re-organization Act of 1986 establishes joint officer management (JOM) and JPME as components of a single, interwoven system to improve joint warfighting and foster a joint culture within the Armed Forces. Therefore, significant change of JOM/JPME requires legislative change, which, in turn, requires comprehensive analysis of the full impact of such changes on the Goldwater-Nichols reforms themselves.

In March 2003, an, independent study of JOM/JPME, mandated by Congress, reported that JOM/JPME requires updates in practice, policy, and law to meet the demands of a new era more effectively. The report noted that JOM/JPME could be substantially improved as part of a more comprehensive, strategic approach to officer development for joint warfare that aims to reconcile legally mandated aspects of JOM/JPME with evolving joint requirements and the goals of joint military transformation. Responding to that report and the TPG, DoD, under the direction of the CJCS, is developing a strategic approach to JOM/JPME to ensure that more officers receive joint education at the appropriate points in their careers and that Senior NCOs, Reserve Component officers and civilians who play increasingly important roles in joint matters have access to joint education and training. The CJCS' guidance for the "JPME Way Ahead" includes the following imperatives:

- Develop trust
- Ensure Service integration

- Develop transformational leaders, capable of working with other agencies and the Services Incorporate observations from recent operations and Educate and train the right person for the right task at the right timeThe Joint Professional Military Education Transformation "Way Ahead" includes three paths, which are depicted in Figure 23:

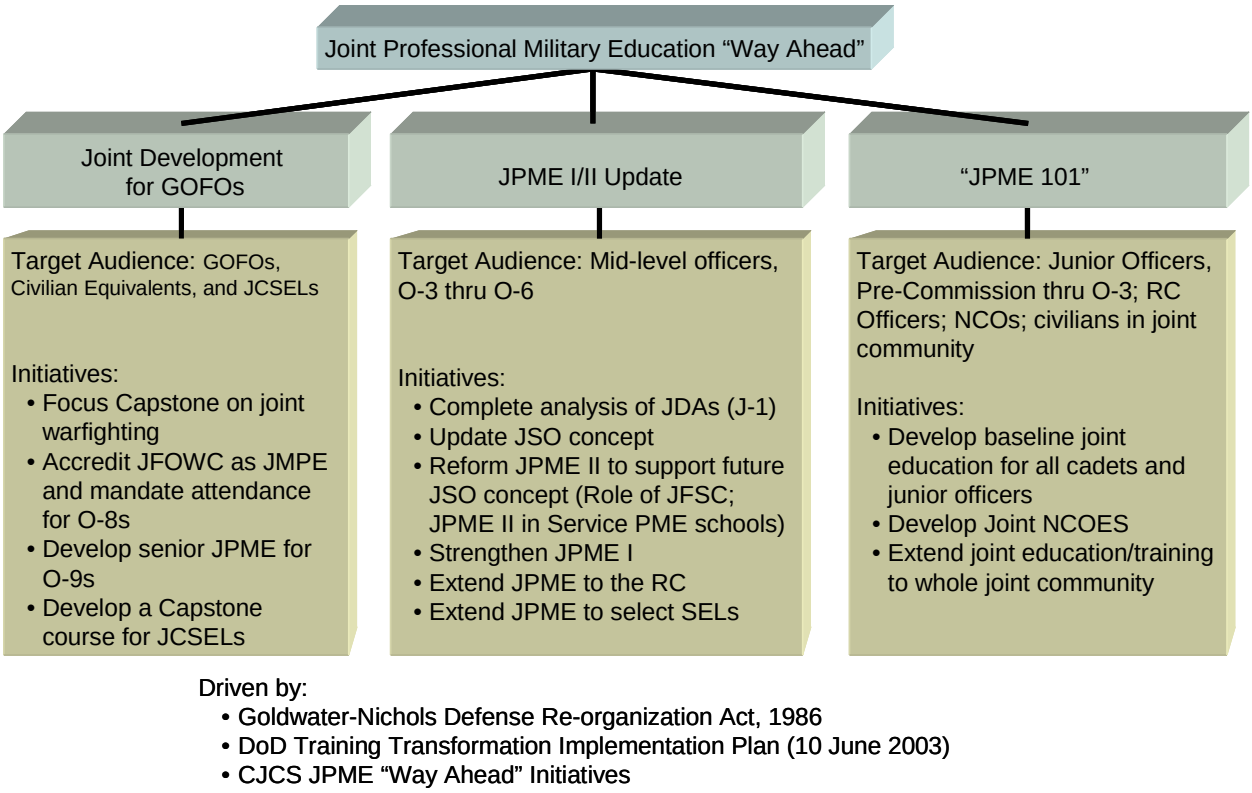


Figure 23: Joint Professional Military Education Way Ahead

1. Joint Development for Senior-level Leadership

The target audience for this component consists of general and flag officers, civilian equivalents, and Joint Command Senior Enlisted Leaders (JCSEL). Initiatives under Joint Development include the following:

Increased Focus of the Capstone Course on Joint Warfighting. This recently completed initiative revised the new general/flag officer capstone course to sharpen the focus on the joint operational fight. Changes included the elimination of Service capability demonstrations, the expansion of discussions with combatant commanders, and the lengthening and refinement of the joint operations module to emphasize more joint force execution and less joint process. The revised course also includes visits to Joint Task Force(s), as well as an interagency wargame with a homeland security emphasis. The lead agent for this effort is JCS J-7/National Defense University (NDU).

Review of the Joint Flag Officer Warfighting Course (JFOWC). This course prepares Joint Force Commanders. The review will seek ways to increase course

attendance by O-8s and improve content by more effectively linking course content to important activities at USJFCOM (i.e. Joint Lessons Learned and Joint Experimentation).

Development of a Senior JPME Course for O-9s. This effort focuses on developing a short, small group course with CJCS and VCJCS participation. The course will highlight the process of synchronizing Service component capabilities, integrating joint forces, working in the interagency environment, diplomacy, dealing with Congress, addressing resources from a joint perspective, and joint information operations. The lead agents for this activity are J7 and NDU. The timelines and metrics for this program are covered under each capability component action in Appendix 1 of the TTIP.

Development of a Capstone Course for Senior Enlisted Advisors. The development of this course will ensure that Senior Enlisted Advisors have an adequate level of joint education to support their general officer / flag officer when assigned to a joint billet. The lead agent for this initiative is USJFCOM J7. The course should be in place by February 2004.

Development of a Capstone Course for Joint Command Senior Enlisted Leaders. The development of this course will ensure that JCSELs have the higher level of joint education required to support their GOFO. While JCSELs are encouraged to attend selected portions of the GOFO Capstone course with their GOFO, a separate JPME course, focused specifically on operational level joint issues and a JCSEL's roles in support of their GOFO, is necessary. The lead agent for this initiative is USJFCOM J7. The course is scheduled to commence in February 2004.

2. JPME I/II Update for mid-level officers (O-3 thru O-6). Initiatives to update the curriculum include:

JOM "Strategic Approach" Study. This study, led by USD (P&R) with J-1 as OCR, includes a complete review of the Joint Duty Assignment List (JDAL).

Update JSO concept. This effort will be led by J-1 and J-7.

Update JPME II to support future JSO concept. This effort, led by J-1 and J-7, will examine the length and role of JFSC as well as seeking legislative change to permit JPME II in Service PME schools. However, in order to preserve the cross-culture aspects, JPME II currently provides a prospective JSO, Service PME enrollment quotas will likely require adjustment.

Strengthen JPME I. This effort, led by J-7, is part of the regular, biennial review of Officer Professional Military Education Policy (OPMEP), as set forth in CJCSI 1800.1A. The first step involves the sending of a letter from CJCS to each Service chief summarizing PAJE inspection trends over the last 10 years and recommending improvements. Suspense: 1 Oct 03. The anticipated date of completion is March 2004.

Extend JPME to the Reserve Component. This effort, led by JFSC, is an Advanced JPME (AJPME) course for Reserve Component officers that blends distance and

resident learning has been successfully tested and will begin pilot seminars in September 2003. Full fielding, to be achieved in FY04, will allow an annual throughput of 500 officers.

Extend JPME to Senior Enlisted Leaders (SELs). This effort, led by the National Defense University and the Joint Staff J7 is in its formative stages. This course, for SEL and taught by SELs, is envisioned to be a combination classroom and distance-learning course. The course is expected to be available during 2004.

3. "JPME 101"

The creation of this curriculum, led by NDU, encompasses both distance learning options and augmentation of resident courses. It targets junior officers (pre-commissioned thru O-3); Reserve Component Officers; NCOs; and civilians in the joint community. This initiative is expected to be similar and complementary to, but a vertical and horizontal expansion of, the current Joint Planning and Operations Course taught by the Joint Forces Staff College and attended by many of target audience. Activities associated with this process include:

- Development of a baseline joint education for all cadets and junior officers. This activity is led by NDU.
- Development of Joint NCOES. This activity is led by JCS J7 and NDU.
- Extension of joint education/training to the entire joint community. This activity is being led by JCS J-7, NDU, and USJFCOM.

As transformation drives these and other innovations and changes in military educational institutions and procedures, DoD will seek to nurture the particular environment and principles in which they flourish best. This environment will include a core of resident programs and a sizable base of high-quality faculty who are highly educated with a demonstrated capacity for expanding the boundaries of knowledge. The faculty will be continue to be highly experienced both in higher education and the strategic and operational worlds, and will have long-term institutional affiliation to balance the turnover of the rotating military faculty. The curriculum will continue to emphasize open-ended critical inquiry with an emphasis on critical reading across the spectrum of perspectives and interpretations of the material. It will also include a balance of classroom, lecture, and study time to foster intellectual reflection, integration and synthesis. The approach will rely on active learning methods, with particular emphasis on the small seminar and the Socratic method.

X. Conclusion

A. Summary

Dramatic improvement in joint military capabilities and processes is a cornerstone of military transformation. As reflected in the new Joint Capabilities Integration and Development System, the development of transformational military capabilities begins with the articulation of a series of new joint concepts. These joint operating, functional, and enabling concepts, currently being formulated, will guide the development of next generation capabilities that help realize the full potential of the future joint force.

Within each domain of capability development, the joint community and the defense agencies are playing a variety of roles in leading, developing, and enabling transformational military capabilities. The joint community is playing a lead role in the development and ongoing elaboration of the JOpsC, each of the four initial JOCs, and the five joint functional along with their associated enabling concepts that provide the bases for the identification and development of enhanced future joint capabilities. It is playing a central role in constructing the GIG, which will serve as the key enabler of joint force transformation by providing the information connectivity throughout the fully networked joint force, facilitating collaboration, and enabling the development and sharing of relevant battlefield knowledge and the commander's intent to allow our forces to achieve decision superiority in support of the goals of the joint commander. The joint community is also actively involved in the development of transformational joint command and control capabilities, which will integrate the capabilities brought to bear by the force providers and serve as the enabler for net-centric warfare.

The joint community is also actively involved in channeling previously stove-piped Service ISR capabilities into an integrated collection of complementary, truly joint systems that will provide transformational intelligence support for fast-paced, agile, effects-based operations throughout the duration of the military campaign.

In the area of deployment and logistics support, the joint community is working closely with OSD to actively coordinate the transition from a complex set of functions performed quite independently by each of the Services and by the Defense Logistics Agency to a seamless system of joint deployment, employment and sustainment. This new approach will support more rapid deployments of flexible, agile forces accompanied by significantly reduced deployed logistics "tail" will be highly effective in the chaotic, multi-dimensional, geographically extensive battlespace of the future.

The joint community is involved in all dimensions of the development of these future transformational capabilities, including not only joint programs, but also joint concept development, experimentation and operational prototyping, all of which play key roles in developing and refining innovative joint concepts and capabilities, and in accelerating the fielding of promising transformational capabilities in the forces. Similarly, the joint community participates in the oversight and coordination of science and technology development activities to ensure an appropriate mix of investment across the range of promising advanced technology areas that will support the creation of joint warfighting

capabilities with transformational potential. Finally, the joint community is actively engaged in all dimensions of the DOTMLP-F process, including the adaptation and strengthening of joint training and professional military education, to ensure that the men and women of the future U.S. Armed Forces are able to fully leverage the potential provided by new technology and organizations.

B. Key Recommendations

This roadmap describes a wide range of ongoing and planned activities in the joint arena that will be undertaken to advance force transformation. Where appropriate, it has also identified additional actions that need to be taken in order to ensure that force transformation objectives are achieved. The following is a summary of some of the key recommendations contained in this roadmap:

General. Joint and Service transformation roadmaps are most useful when treated as living documents. The security environment and the military challenges that it presents is in a constant state of change, as are the technologies, operational, and organizational concepts that create potential configurations for meeting those challenges. Because concepts and activities must adapt to meet such changing threats and opportunities, joint and service roadmaps must also change in order to reflect these realities, and to help structure the response to them. Moreover, because the roadmaps play an important role in the JCIDS process and PPBE cycle, joint and service roadmaps must be sequenced so that each can be effectively coordinated with the other, and so that both can inform program and budget decisions in a timely fashion. This roadmap thus recommends sequencing joint and service roadmaps in a staggered fashion so that each can be coordinated with the other. It also recommends that the roadmap due dates be early enough in the PPBE cycle so that they can contribute to key budget decisions.

Joint Concept Development. In order to derive meaningful solutions for needed capabilities identified in the joint operating and functional concepts, as suggested by the JCIDS process, additional concepts must be elaborated at a greater level of specificity. While it is possible for this role to be fulfilled in part by the specification of detailed enabling concepts, currently only a handful of these concepts have been developed. For the concept-driven capability development process to produce useful results, the functional concepts must be made far more specific, in most cases through the identification of subcategories, components and cases, each of which describe identifiable categories of assets with identifiable capabilities used to achieve specific recognizable military objectives as part of a larger campaign.

Global Information Grid. Successful fielding of the GIG is widely recognized as fundamental to gaining and maintaining information superiority. In order to ensure that it is both useful and relevant to future joint operations, however, the GIG should include a time-phased specification of future capabilities linked to current investments, including both the network architecture and associated utilities. Moreover, this specification should include plans and architectures agreed to by each of the Services, showing how separate Service network development efforts will contribute to and will be compatible

with the broader GIG architecture. It should also include a gap analysis to identify capabilities needed to support the specified JOCs and functional concepts, but not encompassed by known Service contributions to the architecture.

The terrestrial segment of the transformational communications architecture will be based upon fiber optics, including the GIG BE; however the DoD still needs to develop strategies to provide a bridge from installation-level telecommunications to the expanded GIG.

Because the GIG will depend, in part, on the use of commercially available technologies, reasonable and specific projections of the direction of advances in these technologies need to be factored into a gap analysis used to identify where needed networking and communication capabilities may not be available in the timeframe implied by the new operational concepts, where the direction of progress is dependent on government investment, and where additional investment may be needed.

Joint Command and Control. To fully achieve agile joint C2, the DoD must leap to a future framework that possesses the agility to support both the concepts of supporting and supported C2 processes within a dynamic environment. The UCS concept addresses the management function and the goal of building a shared C2 process for senior warfighters and national political leaders, but there is little information yet on the methods to be employed to support the concept.

Necessary activities in the Joint Command and Control arena include a number of actions with respect to specific future capabilities, including the Standing Joint Force Headquarters, Joint Fires C2, the SIAP, multinational operations, cross-functional C2, and Service C2 initiatives.

Although the SJFHQ will represent a significant change in operational planning and Joint C2, the full potential of this process will not be realized without the continued development and implementation of SJFHQ enabling concepts that will not be put into place until well after FY05.

Continued development and testing of next generation LAN protocols is required to incorporate programs such as GCCS-M, NTCSS, etc. into the shipboard LAN architecture. Studies are also being performed to find ways to increase network availability and survivability, to design better developmental testing, and to design and conduct operational testing of Block I and Block II architecture.

With respect to Joint Fires and Maneuver C2, the development of common, tailorable, software systems that can utilize the capabilities of Time-Sensitive Target (TST) detection, rapid TST relay, and combat identification of the target will be necessary to enable the building of a robust common operational picture from which human or automated controllers can direct activity. Moreover, in order for the Joint Fires Network to be fully implemented, problems with training must be corrected and shortcoming with the GCCS I3 corrected.

The Single Integrated Air Picture, which will play a critical role in offensive and defensive air operations, will require not only integration of legacy systems, but will be dependent upon developing new applications that will leverage the objective GIG architecture.

With respect to multinational operations, future interoperability efforts for the MIC will necessitate that the international members introduce some modicum of C2 transformation.

With respect to cross-functional joint C2 programs and initiatives, the Family of Interoperable Pictures will require the web-enabling of joint fires execution management, developing a tactical workstation for the COP, and providing the capability to process Variable Message Formats on the COP.

In the domain of Service C2 transformation initiatives, since Service development efforts are already underway, it is imperative that the C2 integrated architecture be provided as quickly as possible, for which USJFCOM recommends the use of JC2/GIG ES. Failure to successfully integrate the emerging C2 systems will imperil the transformation of DoD military capabilities.

Joint Intelligence, Surveillance, and Reconnaissance. A series of disparate JISR modernization and transformation initiatives are currently underway in key intelligence organizations. There is not, however, a single overarching vision for transforming Joint ISR, nor a single organization charged with developing and overseeing such a vision. Although the currently ongoing service and defense agency initiatives are complimentary in nature, and are being coordinated to varying degrees, the specification of a Joint ISR transformational roadmap as a living document, and the designation of an organization or coordinating body to oversee the implementation of that roadmap, would help to identify synergies between activities, directing limited resources where the were most beneficial, and leveraging emerging technologies, new and legacy systems, and ongoing initiatives to achieve transformational results in JISR in the most expeditious manner possible.

Joint Science & Technology. Because “born joint” transformational warfighting capabilities require S&T development investments that are directly responsive to joint warfighting needs, strengthening the relationship between these needs and S&T investment is a necessary step for more effective joint force transformation. Given the recently adopted changes in the capabilities-based needs identification process a la JCIDs and the adoption of new spiral development and evolutionary acquisition approaches, it would seem appropriate to have representatives of the Under Secretary of Defense (AT&L), the Vice Chairman of the JCS, the Director of Defense Research and Engineering, the Assistant Secretary of Defense (NII), the Commander, USJFCOM, the Principal Deputy Under Secretary of Defense (P), and the Director, Force Transformation work together to create a new, more effective process for ensuring that DoD S&T efforts are much more effectively linked to the development of new, net-centric, joint warfighting concepts and capabilities.

Appendix A – Acronym List

Acronym	Definition
AADC	Area Air Defense Commander
ABIT	Airborne Image Transmission
ABCS	Army Battle Command System
ACAT	Acquisition Category
ACTD	Advanced Concept Technology Demonstration
ADNS	Automated Digital Networking System
ADNET	Anti-Drug Network
AFATDS	Advanced Field Artillery Tactical Data System
AJCN	Adaptive Joint C4ISR Node
AJMPE	Advanced Joint Military Professional Education
ASD (NII)	Assistant Secretary of Defense for Networks and Information Integration
AMDWS	Air and Missile Defense WorkStation
AMP&R	Adaptive Mission Planning & Rehearsal
ATD	Advanced Technology Demonstrations
ATDLS	Advanced Tactical Data Link System
BCS	Battery Computer System
BE	Bandwidth Expansion
BFSA	Blue Force Situational Awareness
BISR	Blue Intelligence, Surveillance, and Reconnaissance
BLOS	Beyond Line of Sight
BMC2	Battle Management Command and Control
BOD	Board of Directors
BRP	Basic Research Plan
C2	Command & Control
C4	Command, Control, Communications, and Computers
C4I	Command, Control, Communications, Computers, and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAPS	Compressed, Adaptive Planning System
CBR	Chemical, Biological, Radiological
CBM+	Condition-Based Maintenance+
CBRNE	Chemical, Biological, Radiological, Nuclear and Enhanced conventional weapons
CDD	Capability Development Document
CD&E	Concept Development and Experimentation
CDL	Common Data Link
CENTCOM	US Central Command
CHS	Common Hardware/Software
CJCS	Chairman of the Joint Chiefs of Staff

CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CID	Combat Identification
CIE	Collaborative Information Environment
CINC	Commander in Chief
CIO	Chief Information Officer
CIO/ASD (NII)	Chief Information Officer/Assistant Secretary of Defense for Networks and Information Integration
CMDL	Common Mission Data Load
CMM	Cryptologic Mission Management
CND	Computer Network Defense
COA	Course of Action
COCOM	Combatant Command
COE	Common Operating Environment
COG	Continuity of Government
COI	Community of Interest
COOP	Continuity of Operations
CONOPS	Concept of Operations
COP	Common Operational Picture
CORSOM	Coalition Reception, Staging, and Onward Movement
COTS	Commercial Off-the-Shelf
CPD	Capability Production Document
CRD	Capstone Requirements Document
CS	Civil Support
CTL	Coalition Theater Logistics
CTP	Common Tactical Picture
CWAN	Coalition Wide Area Network
CWT	Customer Wait Time
DAB	Defense Acquisition Board
DCEE	Distributed Continuous Experimentation Environment
DCGS	Distributed Common Ground/Surface System
DCI	Director of Central Intelligence
DCTS	Defense Collaboration Tool Suite
DDR&E	Director, Defense Research & Engineering
DJC2	Deployable Joint Command and Control
DIA	Defense Intelligence Agency
DII	Defense Information Infrastructure
DMS	Defense Messaging System
DoD	Department of Defense
DoDIIS	Department of Defense Intelligence Information System
DoDIPP	Department of Defense Intelligence Production Program
DOT&E	Director, Operator Test and Evaluation
DOTMLP-F	Doctrine, Organization, Training, Materiel,

	Leadership, and Education, Personnel and Facilities
DISA	Defense Information Systems Agency
DMR	Digital Modular Radio
DMSO	Defense Modeling and Simulation Office
DPE	Defensive Planning and Execution
DPG	Defense Planning Guidance
DPM	Defensive Planning Module
DSTAG	Defense Science and Technology Advisory Group
DTAP	Defense Technology Area Plan
DTF	Digital Targeting Folders
DTIP	Disruptive Technology Innovations Partnership
DTO	Defense Technology Objectives
DUS-S&T	Deputy Undersecretary of Defense for Science and Technology
DWTS	Digital Wideband Transmission System
EA	Executive Agents
EBO	Effects-Based Operations
EBP	Effects-Based Planning
EFH SATCOM	Extremely High Frequency Satellite Communication
EI	Enterprise Integration
EM	Electromagnetic
EMSS	Enhanced Mobile Satellite Services
EP	Emergency Preparedness
FAA	Functional Area Analysis
FBCB2	Force XXI Battle Command Brigade and Below
FCB	Functional Capability Board
FCS	Future Combat Systems
FDS	Fire Direction System
FIOP	Family of Interoperable Operational Pictures
FLAN	Flying Local Area Network
FLE	Future Logistics Enterprise
FLE	Force-centric Logistics Enterprise
FNA	Functional Needs Analysis
FOC	Full Operational Capability
FoS	Family of Systems
FSA	Functional Solutions Analysis
FUED	First Unit Equipped Date
GBS	Global Broadcast System
GCC	Global Command and Control
GCCS	Global Command and Control System
GCCS-A	GCCS Army
GCCS-AF	GCCS Air Force
GCCS-M	GCCS Maritime
GCSS	Global Combat Support System
GES/NCES	GIG Enterprise Services/Net-Centric Enterprise

	Services
GI	Geospatial Intelligence
GIG	Global Information Grid
GIG BE	GIG Bandwidth Expansion
GIG ES	GIG Enterprise Services
GNA	Goldwater-Nichols Defense Re- organization Act
GOTS	Government Off-the-Shelf
HDBT	Hard and Deeply Buried Target
HFES	Horizontal Fusion Enterprise Services
HLA	High Level Architecture
HLD	Homeland Defense
HLS	Homeland Security
HUMINT	Human Intelligence
IA	Information Assurance
IC	Intelligence Community
ICCB	Intelligence Community Communications Board
ICD	Initial Capabilities Document
ICMS	Interoperability, Connectivity, Modernization and Security
ICSIS	Intelligence Community System for Information Sharing
IER	Information Exchange Requirements
IIP	Interoperability and Integration Plan
IMEA	Integrated Munitions Effects Assessment
INFOSEC	Information Security
INMARSAT	International Marine Satellites
IOC	Initial Operational Capability
IP	Internet Protocol
IPB	Intelligence Preparation of the Battlespace
IPv6	Internet Protocol version 6
ISSG	Information Systems Security Group
ISR	Intelligence, Surveillance, and Reconnaissance
ISR M	ISR Manager
ISNS	Integrated Shipboard Network System
I3	Integrated Imagery and Intelligence
IT	Information Technology
ITAB	Information Technology Acquisition Board
ITDC	Interoperability Technology Demonstration Center
I&W	Indications and Warning
JATF	Joint Automated Target Folder
JC2	Joint Command and Control
JC2I	Joint Command and Control Interoperability
JC2 CIE	Joint Command and Control Collaborative Information Environment
J6	Directorate for Command, Control, Communications,

	and Computer Systems
J7	Directorate for Joint Force Development
JASA	Joint Airborne SIGINT Architecture
JASSM	Joint Air-to-Surface Standoff Missile
JBMC2	Joint Battle Management Command and Control
JBC	Joint Battle Center
JCARS	Joint Battle Management Command & Control Concepts, Architectures and Requirements System
JCAS	Joint Close Air Support
JCB	Joint Capability Board
JCCB	Joint Configuration Control Board
JCD	Joint Capability Description
JCIDS	Joint Capabilities Integration and Development System
JCS	Joint Chiefs of Staff
JDAL	Joint Duty Assignment List
JDEP	Joint Distributed Engineering Plant
JDES	Joint Deployment, Employment, and Sustainment
JDP	Joint Defensive Planner
JDPO	Joint Deployment Process Owner
JDS	Joint Deployment Systems
JEMPRS-NT	Joint En Route Mission Planning Rehearsal System-Near Term
JFC	Joint Force Commander
JFCOM	Joint Forces Command
JFI	Joint Fires Initiative
JFIC	Joint Forces Intelligence Command
JFN	Joint Fires Network
JFOWC	Joint Flag Officer Warfighting Course
JIACG	Joint Interagency Coordination Group
JIC	Joint Intelligence Center
JIPB	Joint Intelligence Preparation of the Battlespace
JISR	Joint Intelligence, Surveillance and Reconnaissance
JITC	Joint Interoperability Testing Command
JITF-CT	Joint Intelligence Task Force Combating Terrorism
JIVA	Joint Intelligence Virtual Architecture
JLTC	Joint Logistics Transformation Center
JMA	Joint Military Assessment
JMO	Joint Management Office
JMPE	Joint Mission Processing Environment
JMPS	Joint Mission Planning System
JNTC	Joint National Training Capability
JNTC JMO	Joint National Training Capability Joint Management Office
JOA	Joint Operations Area

JOC	Joint Operating Concept
JOpsC	Joint Operations Concepts
JOM	Joint Officer Management
JOTBS	Joint Operational Test Bed System
JPEC	Joint Planning and Execution Community
JPME	Joint Professional Military Education
JRACC	Joint Research Analysis and Assessment Center
JRB	Joint Requirements Board
JRIES	Joint Regional Information Exchange System
JROC	Joint Requirements Oversight Council
JSF	Joint Strike Fighter
JTA	Joint Technical Architecture
J-TEC	Joint Transformation and Experimentation Cell
JTF	Joint Task Force
JTF/GNO	JTF/Global Network Operations
JTIDS	Joint Tactical Information Distribution System
JTMDP	Joint Theater Missile Defense Planner
JTRM	Joint Transformation Roadmap
JTRS	Joint Tactical Radio System
JTS	Joint Training System
JTT	Joint Targeting Toolbox
JTTF	Joint Terrorism Task Force
JWCA	Joint Warfighting Capabilities Assessment
JWCO	Joint Warfighting Capability Objectives
JWFC	Joint Warfighting Center
JWICS	Joint Worldwide Intelligence Communications System
JWSTP	Joint Warfighting Science & Technology Plan
KDT	Knowledge Discovery Toolkit
KMI	Key Management Infrastructure
LAN	Local Area Network
LOE	Limited Objective Experiment
Log CROP	Joint Logistics Common Relevant Operational Picture
LSS	Littoral Surveillance System
LVC	Live, Virtual, and Constructive
MACA	Military Assistance to Civil Authorities
MACDIS	Military Assistance for Dealing with Civil Disturbances
MAJIIC	Multi-Sensor Aerospace/Ground Joint ISR Interoperability Coalition
MASINT	Measurement and Signature Intelligence
MCA	Mission Capability Area
MC02	Millennium Challenge 2002
MC2A	Multi- mission Command and Control Aircraft

MCCDC	Marine Corps Combat Development Command
MCO JOC	Major Combat Operations Joint Operating Concept
MCS	Maneuver Control System
MDDS	Multi-Domain Dissemination System
MIC	Multinational Interoperability Council
MIDB	Modernized Integrated Database
MIDS	Multifunction Information Distribution System
MIDS-LVT	MIDS Low Volume Terminal
MLS	Multi-Level Security
MNIS	Multinational Information Sharing
MNS	Mission Needs Statement
MPAT	Multinational Planning Augmentation Team
MS-C	Milestone C
MSCLEA	Military Support to Civilian Law Enforcement Agencies
NAVNETWARCOM	Navy Network Warfare Command
NGO	Non- Governmental Organization
NetOps	Network Operations
NCCT	Network Centric Collaborative Targeting
NCES	Network Centric Enterprise Services
NDU	National Defense University
NGA	National Geospatial-Intelligence Agency
NJTTF	National Joint Terrorism Task Force
NORAD	North American Aerospace Defense
NSA	National Security Agency
NSGI	National System for Geospatial Intelligence
NSS	National Security System
NSIPS	Navy Standard Integrated Personnel System
NTCSS	Navy Tactical Command Support System
OEF	Operation Enduring Freedom
OIF	Operations Iraqi Freedom
ONA	Operational Net Assessment
OODA	Observe, Orient, Decide, Act
OPMEP	Officer Professional Military Education Policy
OPTEVFOR	Operational Test & Evaluation Force
ORD	Operational Requirements Document
OSD(R&P)	Office of the Secretary of Defense (Resources and Plans)
OUSD(I)	Office of the Under Secretary of Defense for Intelligence
MCO	Major Combat Operation
MCP	Mission Capability Package
OPR	Office of Primary Responsibility
P3T	Processes, Products, People, and Tools
PDAL	Prioritized Defended Assets List

PFPS	Portable Flight Planning Software
PGM	Precision Guided Munition
PKI	Public Key Infrastructure
PME	Professional Military Education
PSYOPS	Psychological Operations
PTW	Precision Targeting Workstation
QDR	Quadrennial Defense Review
RADC	Regional Air Defense Commander
RBCI	Radio-Based Combat Identification
RCC	Regional Combatant Command
RDO	Rapid Decisive Operations
ReBA	Rebuilding Analysis
RF	Radio Frequency
RID	Requirements Identification Document
ROMO	Range of Military Operations
RSC	Regional Support Center
SA	Situational Awareness
SBU	Sensitive But Unclassified
SCATSAT	Single Channel Tactical Satellite
SD JOC	Strategic Deterrence Joint Operating Concept
SECOMP-I	Secure Enroute Communications Package - Improved
SHADE	Shared Data Environment
SHF SATCOM	Super High Frequency Satellite Communication
SIAP	Single Integrated Air Picture
SJFHQ	Standing Joint Force Headquarters
SOA	Service-Oriented Architecture
SOCOM	Special Operations Command
SOF	Special Operations Forces
SOFPARS	SOF Planning and Rehearsal System
SPAWAR	Space and Naval Warfare Systems Command
SPTDT	Strategic Plan for Transforming DoD Training
SSA	SIGINT Support Activities
STS	Sensor-to-Shooter
TAMD	Theater Air and Missile Defense
TARA	Technical Area Reviews and Assessments
TAV	Total Asset Visibility
TBMCS	Theater Battle Management Core System
TC	Transformational Communications
TC-AIMS II	Transportation Coordinators' Automated Information for Movement System II
TCDL	Tactical Common Data Link
TCAP	Tactical Air Control Party
TCP	Transformation Campaign Plan
TCP	Transformation Change Proposals

TCPED	Tasking, Collection, Processing, Exploitation, and Dissemination
TD	Technology Demonstrations
TDD	Time Definite Delivery
TDL	Tactical Data Links
TEG	Tactical Exploitation Group
TES-A	Tactical Exploitation System-Army
TES-N	Tactical Exploitation System-Navy
TMIP-M	Theater Medical Information Program-Maritime
TOC	Tactical Operations Center
TPED	Tasking, Processing, Exploiting, and Dissemination
TPG	Transformation Planning Guidance
TPPU	Task, Post, Process, Use
TST	Time Sensitive Target
TTIC	Terrorists Threat Integration Center
TTIP	Training Transformation Implementation Plan
TTP	Tactics, Techniques, and Procedures
UA	Unit of Action
UCS	Unified Command and Control Structure
UDOP	User-Defined Operational Picture
UPC	Unique Planning Component
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USD-P&R	Undersecretary of Defense for Personnel and Readiness
USJFCOM	United States Joint Forces Command
USNORTHCOM	United States Northern Command
USSTRATCOM	United States Strategic Command
WAN	Wide Area Network
WIN-T	Warfighter Information Network-Tactical
VIXS	Video Information Exchange System
VTC	Video Teleconferencing
WMD	Weapons of Mass Destruction
XML	Extensible Markup Language

Appendix B – Classified Programs and Data (Contained in a Separate Document)