

# Decision Superiority for the Joint Warfighter

*Vision: PEO C4I and Space, whose mission is to acquire, field and support C4I and ground-based space systems, ultimately produces “decision superiority” for the joint warfighter. In the words of its Program Executive Officer, Dennis M. Bauman, “Our job is to implement and to field capability. We turn resources — that is, money and people — into capabilities for the warfighter.”*

PEO C4I and Space was established in November 2002 and works closely with its organizational partner, the Space and Naval Warfare Systems Command, to dramatically enhance current and future C4I systems. SPAWAR’s Office of the Chief Engineer develops the architecture and standards for FORCENet, the Navy’s vision for network-centric warfare. “We in PEO C4I and Space,” explains Bauman, “apply these architectures by acquiring, aligning and fielding systems to make this vision a reality.”

Bauman, and the 12 program offices he oversees, manage more than 100 acquisition programs and projects that cover all C4I disciplines — applications, networks, communications, intelligence and electronic surveillance systems for both afloat platforms and shore commands. These systems support the Global Information Grid (GIG) development strategy and strengthen operational interoperability with allied and coalition partners.

*In a recent interview with CHIPS Magazine, Bauman discussed how his organization delivers “holistic, interoperable C4I solutions across the Navy” and is transforming the Navy’s approach to network-centric warfare.*

*CHIPS: I understand that FORCENet is an architectural framework, it’s not a program of record, and there are no milestones involved. I’ve heard you talk about the iterations of FORCENet. Can you explain that?*

**Bauman:** As you said, FORCENet is an architectural framework. It’s how the Navy is going to increase its network-centric warfare capabilities, serving as a forcing function for organizing, planning and investing in the Navy’s tactical information architecture and C4I in general.

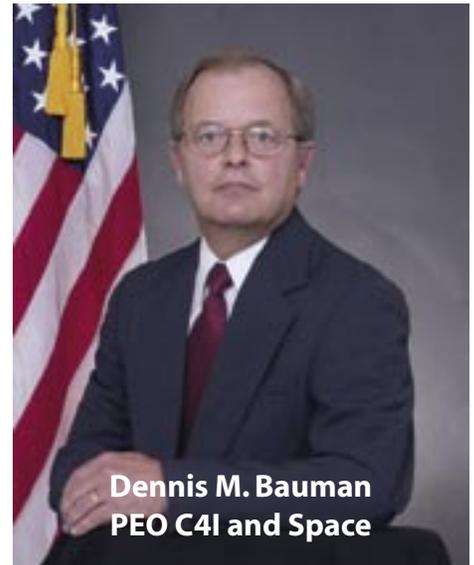
To reiterate what Rear Admiral Ken Slaght, SPAWAR Commander, has often said — it’s an ongoing process rather than a program of record, and it doesn’t have a definitive set of milestones. The architecture is built around the Office of the Secretary

of Defense’s GIG precepts for network-centric warfare. In PEO C4I and Space, we’re charged with implementing both the precepts of the GIG architecture and the architectural framework of FORCENet, defined by SPAWAR’s Office of the Chief Engineer. We acquire, align and field the systems that increase the net-centric readiness of our naval platforms.

*CHIPS: So could we say that warfighters are using the concept of FORCENet right now?*

**Bauman:** Absolutely. There are things that happened in Operation Iraqi Freedom (OIF) that I would characterize as early FORCENet capabilities. C4I used to be considered a combat support system. It’s now becoming a weapons system based on how it was used in OIF and Operation Enduring Freedom (OEF).

As an example, a very high percentage of strike planning in OIF was done in chat rooms. Five years ago in a command center you would hear a lot of voice circuits while watch officers planned strikes and



**Dennis M. Bauman**  
PEO C4I and Space

## A Snapshot of Dennis Bauman’s Service Career

- ⇒ U.S. Navy weapons officer and qualified surface warfare officer aboard an amphibious ship
- ⇒ Head of NOSC Submarine Communications and C4I Systems Division (1992-1997)
- ⇒ SPAWAR Program Director for Information Warfare (1997-2000)
- ⇒ SPAWAR Program Director for Command, Control and Intelligence and Combat Support Applications (2000-2002)
- ⇒ Program Executive Officer for C4I and Space (2002 - present)
- ⇒ University of California at San Diego faculty member, Computer Science and Engineering Department (1980-2000)
- ⇒ Member of the Senior Executive Service and the Navy’s Acquisitions Professional Community for Program Management

coordinated fires. If you went into one of those spaces during OIF you would hear almost no voices. What you would hear is the clattering of keyboards engaged in chat rooms. The implication is an overall increase in the speed in which we can synthesize information about the battlespace, coordinate quickly and act on that information to achieve decision superiority.

In support of a common operational tactical picture and ballistic missile defense in OIF, we fielded a capability on the USS Higgins that was able to take cueing information from its Spy-1 radar and send it near instantaneously to Army Patriot batteries in Kuwait. They used that information to engage inbound Scud missiles.

Let me give you another example. We are fielding a coalition networking capability called CENTRIXS (Combined Enterprise Regional Information Exchange System). Our Navy warfighters often collaborate in network-centric fashion using SIPRNET, but our allies cannot access SIPRNET for security reasons. When we've interoperated with our coalition partners and allies in the past, we weren't able to collaborate via SIPRNET. Therefore, we've produced a separate set of bilateral and multilateral networks called CENTRIXS, and we've rolled them out into the fleet over the past year and a half.

CENTRIXS allows us to network with individual groups, coalition partners and allies, which had a huge impact in OIF and OEF. For the first time, CENTRIXS allowed our coalition partners and allies to leverage some of the same network-centric capabilities that we benefit from.

*CHIPS: You mentioned the GIG and how that fits into the FORCENet concept. Could you expand on that?*

Bauman: It's actually the reverse. I would say that FORCENet fits into the GIG concept. I say that because the GIG is the OSD architecture and vision for the entire Department of Defense for joint network-centric warfare. There are maritime components of that capability that the Navy needs to address. FORCENet encompasses what the GIG defines and extends it into the maritime realm because Naval forces have unique operational and environmental challenges.

At the strategic level, there are a number of pillars that support GIG development. They are designed to provide a global architecture that is joint in nature. The Navy, through what we're doing in FORCENet and what we're doing through PEO C4I and Space, is very much involved with developing these strategic pillars. Let me explain the GIG strategic pillars because I

think it's important to understand what the GIG is from one level of detail down.

The first one is the Transformational Communications Architecture or TCA, which is a space-based communication architecture to support the high bandwidth Internet Protocol traffic of the future.

The second part is the Bandwidth Expansion part of the GIG, known as the GIG-BE, which brings high data rate connectivity to worldwide bases and facilities.

The third pillar is the Teleports that connect current and future satellite communications architectures with the terrestrial GIG networks.

The fourth pillar, the Joint Tactical Radio System (JTRS), is a very important element. JTRS will provide a family of completely joint and interoperable radios to enable joint tactical voice, data and video communications for mobile military users in the air, on the ground and at sea for the digital battlefield. It is a software programmable and modular radio system with a set of different form factors for the Army, Navy, Marine Corps and Air Force.

JTRS also does routing to enable ad hoc networking in-theater. Let me further explain this ad hoc networking capability. Currently, to get into a Link 16 network, a fighter aircraft has to be part of the planning that set up that architecture days ahead of it being used. With JTRS routing and ad hoc networking capability, a fighter aircraft will be able to fly into an area of operation, and by virtue of the JTRS architecture, be able to come online dynamically. That's a huge advantage, making JTRS much more than just a next generation radio.

The fifth pillar is GIG Enterprise Services (GIG-ES), which is also called Network Centric Enterprise Services. This brings an enterprise perspective to the applications and processes through which information is handled through the architecture. It is an Internet-like, smart-pull services architecture that is provided for application across the GIG.

Another key pillar that becomes more and more important every day is Information Assurance, which protects the network

that we're building. We want to be sure we fully protect ourselves as we rely more and more upon this C4I weapons system.

Finally, the DoD push for increased network-centric capability will be Internet Protocol Version 6. It will add security and quality of service for our communications, which vastly increases the addressing architecture and allows us nearly unlimited expansion of our networks.

That is the framework of the GIG and the vision of OSD. FORCENet uses those same pillars and applies them to the maritime environment. We in PEO C4I and Space apply these architectures by acquiring, aligning and fielding systems to make this vision a reality.

*CHIPS: What are the decision-making factors that guide you in buying, building and fielding network-centric warfare systems?*

Bauman: Our job is to implement and to field capability. We turn resources — money and people — into capabilities for the warfighter. A few months ago, we put some of our best and brightest together to look at those architectures, to examine where we are today and where we're going in the Program Objective Memorandum for C4I systems. They built what we call our PEO C4I Integrated Roadmap.

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They mapped the operational goals of our warfighters, the DoD attributes that I've mentioned as we've talked about the GIG, and they identified three basic characteristics that our Naval platforms need to have in the future. The three characteristics build on each other and are very much interdependent.

The first one is *bandwidth enabled*, which

provides access to the entire network with the ability to rapidly access information with minimal latency. Bandwidth enabled doesn't mean all the bandwidth you want. What it really means is to eliminate bandwidth as a constraint of capability.

The second characteristic is a *service-oriented network architecture*, which allows

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the ability, flexibility and capacity to access information on the network. It has to be service-oriented, but not stovepiped, as most networks are today.

The third characteristic is *user-centric information systems*. By this we mean systems designed to put the user in the center and allow that user access across disparate applications at various security levels. It allows the user to synthesize information as the user deems appropriate, having consistent data quality from the radar to the common operational picture.

Using this model, we look at each program or effort that's been planned in the past and programmed in the POM to determine if they contribute to one or more of these three characteristics. To what extent does it contribute? Does it follow the architectural precepts of the GIG and FORCEnet? Then we compare the programs based on that lens and determine where we should spend the money in conjunction with the warfighter and the resource sponsor.

That's how we look at programming decisions, with the strategic goals of effectively and efficiently increasing the net-centric warfare capabilities of our Naval platform.

*CHIPS: When you're looking at C4I acquisitions, how much do you confer with the other PEOs in the Navy?*

Bauman: There is something interesting about PEO C4I and Space that makes us a little different than most other PEOs: The capabilities we implement and field are used across the products that the other PEOs produce. PEO Information Technology and PEO Integrated Warfare are exceptions, but most of the other PEOs are platform centric – subs, ships, carriers, etc.

We work very closely with the other PEOs because we provide interoperable C4I solutions that fit on the platform, scaled to what the platform needs and seamlessly interoperable across all the platforms. That presents particular challenges and requires us to work very closely with the other PEOs.



One reason why Mr. John Young, the Assistant Secretary of the Navy, Research, Development and Acquisition (ASN (RDA)), formed PEO C4I and Space a year and a half ago was to better align us at a peer level with these other platform PEOs so we could give them more holistic, interoperable C4I solutions across the Navy.

*CHIPS: How will the new PEO Space Systems affect your acquisition of C4I capabilities?*

Bauman: I'd like to provide clarity about the difference between PEO C4I and Space and the new PEO Space Systems that was recently established (May 2004). The last thing we want to do is create confusion as to why there are two PEOs with "space" in their names. There's a very easy interface between what we do and what PEO Space Systems does. We field the ship- and ground-based terminals that communicate with our space-based systems.

PEO Space Systems produces the on-orbit capability and the ground monitoring and control capability to maneuver and control satellites. So the interface between the two PEOs is between the earth-based terminals, leveraging information from space-based satellites and the space-based satellites themselves. That's where the seam is.

Mr. Young, Rear Admiral Rand Fisher, Program Executive Officer for Space Systems, and I discussed where we should draw the line. Should it be in that gap between space-based systems and the terminals on the ground or should the terminals be included in Space Systems?

We decided that the interface was a lot cleaner between the terminals and the spacecraft than it would be between the terminals and the remainder of the C4I systems. The rationale has to do with a complex interface between satellite terminals and ground stations and the networks that they connect with.

PEO Space Systems represents the Navy's efforts to streamline space acquisitions management. It is the PD 14/PMW 146 (Navy Communications Satellite Program Office) part of SPAWAR that has now been realigned into a PEO. The difference is that the program manager reports directly to the PEO, who, in turn, reports directly to ASN RDA without anyone in between.

I share spaces with PMW 146 in San Diego — I'm actually collocated with them in our SPAWAR facility — and we will continue the close interface we had when it was PD 14.

*CHIPS: It's easier to interoperate when systems are "born joint." How do you further that goal?*

Bauman: We're involved with the other Services in some transformational examples of born joint. We've talked about JTRS, which is a great example. JTRS has clusters. The Navy used to have Cluster 3, which was maritime fixed, both afloat and ashore. There was a Cluster 4, which was airborne and developed by the Air Force. We recently combined those to form JTRS AMF, which stands for airborne, maritime, fixed. We now have a programmatic partnership between the Navy and the Air Force with the respective clusters.

It's a common acquisition approach with one contract to develop both the maritime-fixed and the airborne aspects. The program management structure is unique. An Air Force colonel is the current program manager, I am the program executive officer, and the Service acquisition executive is from the Air Force.

We're going to rotate this structure over time, so here's an example of how we are building JTRS with software waveform supplied by a joint program office. We're also joining with the Air Force to make sure that we are even more interoperable in the tactical and the maritime fixed environments.

Another example is the Common Link Integration Processing capability. It provides a tactical networking and gateway capability between JTRS waveforms and legacy tactical data links, including Link 16, Link 11, Link 22, Enhanced Position Location and Reporting System, and Joint Range Extension.

This program is also a joint Air Force and Navy program between PEO C4I and Space and the Air Force Electronic Systems Center (ESC) Hanscom, with PEO C4I and Space providing acquisition and contracting lead. The Army is monitoring the effort and may soon join as a full member.

We have another effort underway with the Air Force called NESI, or Net-centric Enterprise Solutions for Interoperability. It's a joint initiative to further interoperability and commonality. This collaboration is aimed at defining software application development standards to be followed, at a minimum, by Navy and Air Force command and control and C4I programs.

The present work by PEO C4I and Space, ESC Hanscom and SPAWAR to implement NESI are consistent with the GIG-ES. We are also engaging the Army to ensure consistency of effort across the Services. So, we have many efforts underway to make sure that programs are born joint, and we're using a lot of these standards when we make significant upgrades to existing legacy systems to make them more joint.

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*CHIPS: The "plug and play" or "plug and fight" concept is supposed to shorten the decision cycle for the battle force commander. What are some of the capabilities using this concept?*

Bauman: This concept is centered on how warfighters are going to access needed information quickly and efficiently to obtain decision superiority. It is intended to span the entire tactical spectrum from the strike group commander down to the unit ships and Marine battalions in the field.

Netcentricity greatly increases the availability of information, and it recognizes that users best define their information sources and determine what they need operationally and when they need it.

Tactical information under this concept is pulled off the network instead of having the warfighter sift through myriad data sources. We call that concept smart pull, which means that information is gathered in a way defined by the warfighter. The cycle time of information gathering is in seconds, the infrastructure is interoperable, the networks are robust, the bandwidth is available and secure, and information security and support protection are in place.

The result is a warrior, out on the tip of the spear, who is able to access critical information at the right time with an accept-

able latency. OIF and OEF gave the warfighter just a taste of this network-centric capability. Naval forces, in particular C4I systems in those conflicts, catalyzed a faster and more efficient planning mechanism that helped us deliver the chat room-planned lethal fires that I explained previously. It was at a pace unmatched compared with any other conflict.

We're seeing that our C4I systems now are

recognized not just as combat support systems but as weapons systems in and of themselves. C4I is fundamentally part of how the warfighter fights. It's integrated into virtually every weapon we use — our command and control systems, our precision guided munitions, our unmanned aerial vehicles — and it really gives us the ability to marshal assets on the fly to get the job done.

It's not the weapons or the platforms but the C4I systems that are the common connection points. C4I systems are transforming the way we approach warfare, and that's what network-centric warfare is all about.



*For more information about the Program Executive Officer C4I and Space, go to the SPAWAR Web site at <http://www.spawar.navy.mil>, and click on the PEO C4I and Space seal.*

*Editor's Note: For more information on the FORCENet concept, go to page 28 for an article on the Composable FORCENet by SPAWAR Systems Center San Diego.* 