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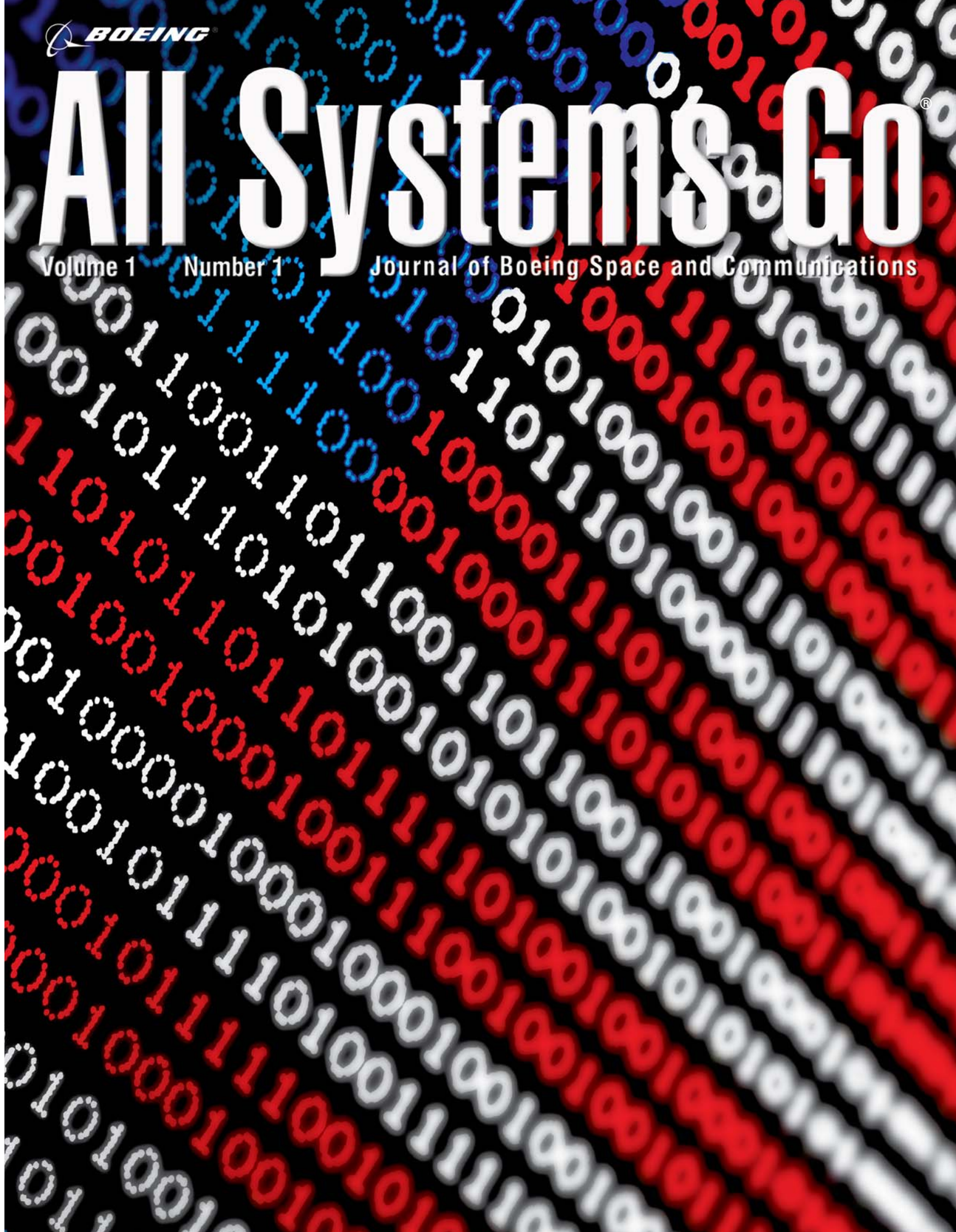

I'm excited to introduce the premiere issue of *All Systems Go*, a quarterly update of the latest developments at Boeing Space and Communications (S&C).

All Systems Go is intended to keep customers current on our efforts to provide them with best-in-class solutions, to understand their challenges and expectations, and to foster and maintain close working relationships characterized by honesty, integrity, innovation and a sense of shared destiny.

The publication also is intended to highlight continuous process improvements underway at S&C. Whether it's streamlining strategic business planning, implementing lean manufacturing or strengthening subcontract management – the Boeing team is continually striving to do business better today than we did yesterday, and even better tomorrow.

As the title suggests, *All Systems Go* describes Boeing's efforts in creating system-of-systems solutions for our customers – that is, taking disparate systems not designed to work together, and using our technology and experience in end-to-end systems integration to make them speak with a single voice.

The articles in this issue reflect our vision of an integrated battlespace of the future, where enhanced operational effectiveness comes from the integration of varied platforms into seamless networks. Networks that provide the information and situational awareness necessary to secure and maintain the competitive edge required in our new national security environment. S&C sees a similar network-centric future on the commercial side with significant growth potential.

As you thumb through the pages of *All Systems Go*, I hope you'll share my enthusiasm for our capabilities, my gratitude for the efforts of so many talented Boeing employees, and my excitement about our role in helping customers meet the challenges of tomorrow.

Jim Albaugh
President and Chief Executive Officer
Boeing Space and Communications

All Systems Go®

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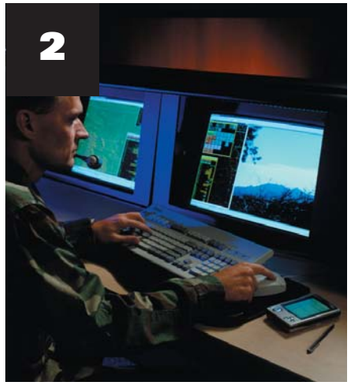
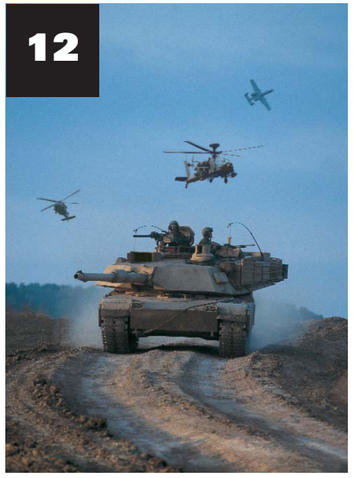


Future Combat Systems
Boeing is ready and able to partner with the United States Army to meet the challenges of Future Combat Systems integration.



Joint Tactical Radio Systems
As the Army consolidates service-unique radio acquisition programs, Boeing assembles a first-class team to maximize engineering talent and ensure successful implementation of a JTRS program.

Additional copies of *All Systems Go* can be obtained by contacting: Boeing Space and Communications
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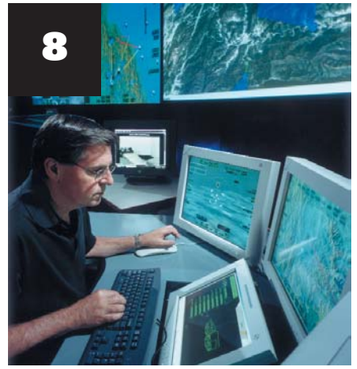
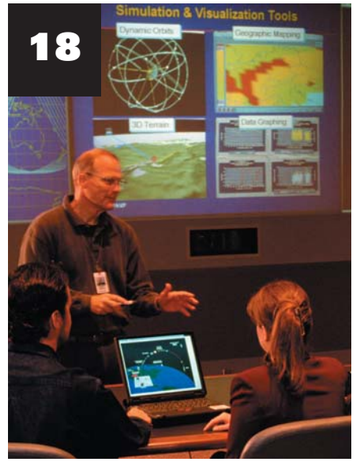


"Strategic Architecture" and the Boeing Integration Center
An informative interview with Carl O'Berry (Lt. Gen. U.S. Air Force, Ret. and Vice President of Strategic Architecture).



Integrated Battlespace of the Future
If recent events have taught us anything, it is that threats are asymmetric and surprise is likely; to combat that reality, Boeing S&C is formulating different architectures to improve situational awareness.

Changing Warfare

Long before the events of 9/11, the Army envisioned the need for a transformed fighting force to meet emerging threats and warfare unlike any the country had faced before. It laid out an aggressive plan for what became known as the "Objective Force." In light of current events, the Army's vision has turned out to be remarkably prescient.

FUTURE COMBAT SYSTEMS

The U.S. Army transforms to meet the challenges of today and tomorrow

When discussion turns to the modernization of America's armed services, the pundits are often less than kind in their comments. America, they say, is always preparing for the last war - not the next.

The United States Army has a vision – and a plan – that proves such critics wrong.

There is little doubt that the things that threaten the safety, security and serenity of our country have changed greatly over the course of our history. Threats, like the technologies that spawn them, have evolved.

From privateers to nuclear submarines. From muskets to cruise missiles. From massed forces on the ground to terrorists in the air.

Today the U.S. Army stands at the brink of a great change; its leaders have looked ahead and seen the need for an entirely different kind of fighting force.

Given the events of September 11, the Army's vision, first articulated by Army Chief of Staff General Erik Shinseki two years earlier, has turned out to be remarkably prescient.

In October 1999, when the nation was at peace and the U.S. economy prosperous, Army leadership correctly predicted the window of opportunity to begin transforming our nation's armed forces would grow narrower with each passing day. It wisely chose to begin transforming the military during a period of peace and prosperity, rather than waiting until "the eve of the next war, when the window has closed, our perspective has narrowed, and our potential limited by the press of time and the constraint of resources," according to Shinseki.

The transformation plan that Shinseki laid out in 1999 included some broadly defined goals for the Army. It would be responsive, deployable, agile, versatile, lethal, survivable, and sustainable. This so-called "objective force" was the goal of Army transformation. It was alternately described as the "art of the possible."

Reaching the full objective force is a multiyear process. It will take the Army from its current "legacy force" through an "interim force" to reach its goal.

Future Combat Systems (FCS) will be the primary system for the objective force. FCS is part of the vision to create a fighting force like nothing seen before.

This force will be lighter. More mobile. The Army Transformation deployment capability requires the ability to put a combat-capable Unit of Action anywhere in the world within 96 hours. A full division in 120 hours. And five divisions on the ground within 30 days.

Ready to fight, ready to win - in merely four days. Just 96 hours.

FCS is a networked system-of-systems – the backbone of the Objective Force – that will serve as the core building block within all maneuver Unit of Action echelons to develop the overmatching combat power, sustainability, agility and versatility necessary for full spectrum military operations.

One element of the building block concept, for example, is the development of an all new FCS vehicle. Compared to the

FCS

current Abrams tank, the FCS vehicle will be 70-percent lighter and 50-percent smaller, while maintaining equal (or even greater) "network-derived" lethality and survivability. The FCS vehicle will weigh no more than 20 tons with 300 to 400 cubic feet of internal volume. (The Abrams weighs 70 tons and has 650 cubic feet of internal volume.)

The Boeing Company's Phantom Works unit, working with Boeing Space and Communications, was one of four contractor teams awarded an FCS Phase One concept design contract last year.

Just recently, Boeing and Science Applications International Corporation (SAIC), one of the four Phase One competitors, announced that they would form a team for the next phase. By combining their teams, the two companies realized that they had a team that was doubly strong in both people and experience.

"We have merged our two independently developed concepts to come up with the best possible solution," said John Gully, SAIC corporate vice president.

As Boeing's FCS Phase One program manager, Bob Mitchell, sees it, "the FCS task, more than anything, is a lead systems integrator (LSI) task." Boeing's long-standing LSI experience on programs like the Apache helicopter, Ground-based Missile Defense and the International Space Station, and the company's customer-focused culture are both relevant to a discussion of FCS," he says.

"We're a non-traditional Ground Army contractor," he said. "Because we're not trapped in the same old paradigm – trying to P3I an old system – we can take a much more innovative look at the new challenges facing our customer today.

"It takes some pretty innovative thinking to find solutions to challenges like taking a 70-ton vehicle and making it lighter and faster – and more lethal." Mitchell said.

The Army, which is working collaboratively with the Defense Advanced Research Projects Agency (DARPA) on the multi-billion dollar procurement, just recently cranked up the heat on the FCS program – announcing that it was accelerating the development of the system with low rate production now set to start in FY '06 rather than FY '08.

It also announced that instead of awarding design study contracts to two or three teams, the FCS program will move directly to a single LSI contract, confirming Mitchell's assessment of the main challenge of the program.

Taking an LSI approach gives Army leadership what it's really looking for, according to Army LTG Johnny Riggs, head of the Objective Force Task Force: analytical capability and an ability to "cherry-pick the best technologies" across industry and government.

Riggs, during a magazine interview earlier this summer, provided some further insight on the Army's requirements for the objective force.

The objective force will result in an Army with a network-centric force that has absolute intelligence, surveillance and

"The FCS task, more than anything else, is a lead systems integrator task."

Bob Mitchell, Boeing FCS Phase One program manager

Boeing will focus on a knowledge-centric force. Its concept would provide troops with near-perfect knowledge of the locations of self, friends and enemy, as well as environmental data.

C4ISR - May well be the glue that holds the future force together.

FCS

The FCS force will be lighter and more mobile. The Army Transformation deployment capability requires the ability to put a combat-capable brigade anywhere in the world within 96 hours. A full division in 120 hours. And five divisions on the ground within 30 days.

reconnaissance, according to Riggs. It will also have the ability to be able to make decisions rapidly, on the move, with platforms that are, in fact, deployable but are also lethal and survivable once they get there.

In evaluating all the changes that will be a part of the Army's transformation, Riggs emphasized the importance of command, control, communications, computer, intelligence, surveillance and reconnaissance (C4ISR). He called C4ISR, "the glue that very well may hold the future force together."

Boeing's FCS concept dovetails neatly with what the Army has in mind, and even takes it a bit further, Mitchell says. "We want to go beyond 'network'," he says, "where much of the current talk is about just moving information around and not enough about quality, too."

Beyond a network-centric approach, Boeing is focusing on a knowledge-centric force, he says. The team's concept would provide troops with near-perfect knowledge of the locations of self, friends and enemy as well as environmental data. Information denial for the enemy would be another key element.

"We're really focusing on 'knowledge' as a key to the success of the FCS program," explains Al Boutilier, Boeing Phantom Works capture team leader for the next phase of the FCS program.

"We'll also be utilizing robotics, both on the ground and in the air, as part of our approach," he adds. "There's a tremendous potential for robotics in terms of sensors, as well as for tasks like mine clearing."

Recognizing the Army's requirements, the Boeing solution is based on a flexible force comprised of a modular system of platforms. This would include manned and unmanned ground vehicles, manned and unmanned air vehicles, and even satellites – all connected by a remote, distributed and non-dedicated architecture.

"This design concept would allow the Army to deploy smaller, highly mobile teams with great effectiveness," according to Tom Flynn, System Architecture IPT lead for FCS.

The Boeing team admits that some may see them as a "dark horse" in the race. Despite the company's extensive Army experience in such highly regarded programs as Apache, a reputation as the world's leading airplane manufacturer sometimes overshadows the defense side of the business.

"We're used to seeing some raised eyebrows when people hear that Boeing is one of the teams competing for an Army ground program like FCS," Boutilier said. "Not everyone is aware of the fact that the defense side of the house accounts for about 40 percent of the company's revenues.

"Really, when you look at Boeing's experience as the Lead Systems Integrator on National Missile Defense, Comanche, or even building the Space Shuttle, there is no other contractor with that level of experience. The Army wants this critical system of systems delivered on an accelerated schedule with best of breed solutions, I don't think they want their LSI doing on-the-job-training," he says.

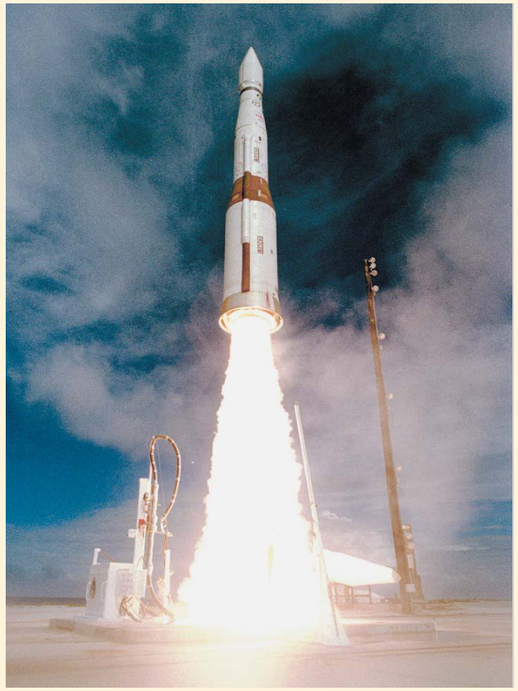
The FCS program will help transform the Army to meet the challenges of a world that has changed greatly since the end of the Cold War. Boeing stands ready to help. ■

Boeing-led missile defense team scores another "hit"; successful system test includes intercept over Pacific

The Ground-based Midcourse Defense (GMD) program's most recent Integrated Flight Test was again a success – resulting in an intercept and complete destruction of the incoming target. The test, referred to as Integrated Flight Test – 7 (IFT-7), was the third system-level test of the program, incorporating all major elements into the test scenario.

The intercept occurred over the Pacific Ocean at approximately 10:30 pm EST on December 3.

The flight-test sequence began with a target vehicle launch from Vandenberg Air Force Base, Calif. The Defense Support Program satellites detected the target booster, equipped with a mock reentry vehicle and decoy, and the GMD Battle Management, Command, Control and Communications (BMC3) was alerted. BMC3 cued ground-based radars that tracked the target complex and provided more accurate target information to the BMC3. The BMC3 provided a weapon-tasking plan to the interceptor and gave the commands leading to the launch of the interceptor vehicle from the Regan Test Site in the central Pacific Ocean approximately 20 minutes later.



Following booster separation, the BMC3 provided final target tracking information to the kill vehicle through the In-Flight Interceptor Communication System (IFICS). The kill vehicle intercepted and destroyed the target by hitting body-to-body at an altitude of approximately 140 miles and a closing speed in excess of 15,000 miles per hour.

The GMD program involves the development, testing and potential deployment of a system to detect, track and destroy hostile intercontinental ballistic missiles before they can reach any of the 50 states.

Boeing, as prime contractor, is responsible for the development and integration of the GMD elements, including the Ground-Based Interceptor, X-Band Radar, Battle Management, Command, Control and Communication systems, Upgraded Early Warning Radars and interfaces to the Space-Based Infrared System Satellites. Major team members include Raytheon Company (kill vehicle, radars); TRW (BMC2); and Lockheed Martin Missiles & Space (Payload Launch Vehicle).

The Joint Program Office of the Department of Defense Missle Defense Agency directs the Ground-based Midcourse Defense program. ■

THE BIC

"Strategic Architecture" and the Boeing Integration Center

When Lt. Gen. Carl O'Berry retired from the Air Force in 1995, he took with him a vision that he had nurtured for many years - an idea that really grew during his stint as deputy chief of staff for Command, Control, Communications and Computers (C4) at the U.S. Air Force headquarters in Washington D.C.

What O'Berry took with him into retirement was a concept of a completely seamless and interoperable architecture that would link together all communication elements - from PDAs to AWACS. It is a far-reaching and exciting vision, one that the retired Air Force officer found hard to walk away from.

After leaving the Air Force he worked for a short time for another communications and technology company, but soon opted to return to retirement.

He was lured out of retirement a second time when he discovered Jim Albaugh, president and CEO of Boeing Space and Communications, shared his vision for a strategic communications architecture that might one day revolutionize the world's concept of connectivity.

"My wife told me I flunked retirement twice," O'Berry said with a grin during a recent interview with *All Systems Go* (ASG), "But I couldn't resist the opportunity that Boeing offered."

In O'Berry's vision, future intelligence, warfighter and government systems will interoperate in a seamless manner that creates almost unprecedented situational awareness.

These days Carl O'Berry, in his capacity as vice president of the Boeing Strategic Architecture organization, is responsible for directing the development and application of a Boeing-wide strategic communication and information architecture designed to ensure and certify interoperability of all Boeing programs.

At the heart of the organization is the Boeing Integration Center (BIC), a modeling and simulation center that supports global architecture and systems-of-systems design and development work.

O'Berry sat recently to answer some questions about strategic architecture, the BIC, and what they mean to The Boeing Company and its customers.

The Boeing Integration Center is a modeling and simulation center that supports global architecture and system-of-systems design and development.

ASG: *Please define "strategic architecture" and explain the focus of the new Strategic Architecture (SA) organization under your direction.*

O'Berry: *I define architecture as a set of concepts, views and technical rules that enable effective application of information technology to satisfy individual and institutional requirements for situational awareness, decision support, and planning and execution of operations.*

Strategic architecture denotes our focus on efforts to enable all of Boeing's platforms, systems and programs with a single, common communication and information environment. Our objective is to build a working model of a digital global information environment through the leveraging of information technology and thus reduce the cost of owning and operating battle management command, control, communications, computers and intelligence (BMC4I) systems while simultaneously increasing their capabilities.

The Strategic Architecture organization is composed of approximately 30 people and will concentrate on mission effectiveness, modeling, simulation and demonstration - followed by development and deployment of systems, platforms and processes adhering to the

Lt. Gen. Carl O'Berry served as deputy chief of staff for Command, Control, Communications and Computers (C4) at the U.S. Air Force headquarters in Washington D.C. Retired since 1995, he serves as vice president of the Strategic Architecture organization for Boeing Space and Communications.

BIC

architecture and principals of a global information environment. The objective is to bring the true power of information technology to bear on the requirements of customers both internal to Boeing and in other government, industry and civil venues.

ASG: *What is the BIC and how does it tie into your vision for the SA organization?*

O'Berry: *Simply stated, the BIC is a world-class modeling and simulation, design, development and demonstration facility for the global information environment. Its immediate purpose is to demonstrate the viability and utility of architectures in addressing customer requirements and operational challenges.*

The BIC was specifically designed as a proving ground for demonstrating the increased combat power achieved through network-centric operations, consistent with Joint Vision 2020.

The BIC can rapidly model and demonstrate BMC4I solutions using real systems and software; design, develop and analyze integration schemes; certify architectural consistency of systems; evaluate new technologies and products; and above all, demonstrate to the customer increased mission effectiveness.

ASG: *What is the significance of the BIC?*

O'Berry: *The BIC is the bridge between traditional BMC4I and military systems and operations of the future. The real significance of this facility is the demonstrated and focused commitment by Boeing Space and Communications to adhere to a philosophy that guarantees to our customers the farthest-reaching concepts are integrated with the best technology the world can provide. Boeing will no longer just provide the best hardware -- we now provide the best integrated solutions to meet the customer mission needs.*

ASG: *You previously alluded to the benefits of linking together platforms across the battlespace. Why is this important to the Department of Defense?*

O'Berry: *Today's technology is causing revolutionary changes in the way the nation's military conducts military operations. The Department of Defense (DoD) has developed an Information Superiority vision that recognizes and responds to those changes and enables new operational concepts. The key issue is how to ensure that the right people have access to the right information at the right times and in the right form, whether that refers to a national command authority decision maker in Washington D.C. or a platoon commander in the heat of battle.*

Timely, relevant, reliable and secure information and its application to the operational decision process provides the crucial edge for leaders to make decisions that win battles and save lives.

In order to meet these goals requires that the platforms, each with its unique role, participate with other platforms so that the whole is greater than the sum of its parts. This integrated approach is called "systems-of-systems." For the military, an information superiority-enabled force will generate increased combat power by networking sensors, decision makers and shooters to achieve situational awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability and a high degree of operational synchronization. In essence, the challenge in leveraging information technology for improved combat power is the effective linking of knowledge entities in the battlespace.

ASG: *What does the BIC offer?*

O'Berry: *As stated earlier, the solution to DoD's quest for Information Superiority is a systems-of-systems approach. Boeing is the logical choice to lead this effort as we have many platforms in the battlespace.*

Boeing provides 60 percent of the world's military airplanes and 80 percent of the military satellite communications assets, for example, and we are the world's premier large-scale system integrator. When we make all Boeing platforms integral to a global digital information environment - that is, consistent with a global-scale integrated communication and information architecture - we will have created a compelling case for the value of such a strategy. The BIC is the place where that value will be demonstrated.

ASG: *Of what benefit is this capability to government customers?*

O'Berry: *The charter of the SA organization is to provide Information Superiority solutions to our customers by developing an architecture that implements the Global Information Grid (GIG) concept, such that there is seamless access to information anytime, anywhere. The BIC serves as a notional command and control center where new technologies can be applied and their effectiveness demonstrated to customers without disrupting existing programs or operations, allowing them to see first hand the value inherent in the integrating of platforms and systems across the battlespace. Customers who visit the center can then see for themselves how systems are going to work even before they are built.*

ASG: *Can you describe a typical scenario?*

O'Berry: *The BIC can easily assume numerous important roles. It can be a notional command and control center, where a battlefield commander is able to see in near real-time what is taking place within a sphere of operations and can make timely, knowledgeable decisions based on the information he (or she) is presented.*

We present this in such a manner that the customer can "see" a major difference in decision capabilities. We use a combination of 3-D visualization tools; integration of multiple Boeing platforms, such as Airborne Warning and Control System (AWACS) aircraft, fighters, unmanned vehicles; and systems like the Combat Survivor Evader Locator system to create, in essence, the look and feel of a real battlefield. Scenarios can be modified to depict the variety and unpredictability of challenges a commander faces when conducting operations in the battlespace environment, including identification and tracking of threats, search and rescue missions and time critical targeting. The best analogy that can be made is one where you look at a room with a flashlight one time and then turn on overhead lighting. Quite a difference.

ASG: *This sounds similar to other facilities I've read about. What special features distinguish the BIC from other modeling and simulation facilities of this kind?*

O'Berry: *One of the most noteworthy features of the BIC is a series of embedded communications links that enable us to bring the power of Boeing facilities such as the Virtual Warfare Center in St. Louis into our solution. Additional features include bandwidth on demand, secure breakout rooms and a demonstration theater with three six-foot video displays, surround-sound system and state-of-the-art multi-media capability.*

ASG: *What does the government customer ultimately gain from this experience?*

O'Berry: *By integrating space, air and ground platforms across the battlespace, the customer can see the effectiveness of a networked force. It's easy to see the functional value of a hardware platform; but very difficult to envision the effects of integrating platforms and electronic systems into what is, in effect, a single combat objective force object. Difficult, that is, until one employs the Boeing Integration Center for that purpose.*

ASG: *What is the next step for the BIC?*

O'Berry: *First, we need to continue the process. Although we've taken a good first step it is only phase one in a long, continuous process.*

Integrating the defense customer base is in its early stages. Boeing is in the process of creating the Integrated Battlespace today. This unprecedented capability will provide a real-time visual map of the battlespace to include space, air, surface and assets and their status related to the specific mission environment. The ability to communicate between and among assets will ultimately enable integration of tailored missions as diverse as Air Traffic Management, precision military engagement and immigration agents screening border arrivals.

The bottom line is that the BIC will continue to evolve and grow in its capability for addressing the information age needs of our customers.

Boeing's "Working Together" philosophy is necessary to continue this effort and we look forward to working with all Boeing teams to ensure that our government customers get the best of the best from The Boeing Company. ■

Systems of Systems

Timely, relevant, reliable and secure information and its application to the operational decision process provides the crucial edge for leaders to make decisions that win battles and save lives. Platforms, each with its unique role, must be able to participate with other platforms -- this integrated approach is called "systems-of-systems."

Boeing and Joint Tactical Radio Systems

JTRS

JTRS is often called the backbone of the next-generation tactical internet, because it is intended to standardize communications across all branches of the U.S. military.

JTRS

Picture this. A soldier's hunkered down on the ground, combat going on all around him. He desperately needs to call Air Support, but . . .

inter-service radio communications are so poor that the only way he can get through to them is by using his personal calling card and a local pay phone. Not exactly high-tech, military communications.

That is not a "worst case scenario" – it actually happened during the Grenada invasion. The scenario was repeated, over and over, during Operation Desert Storm. And it didn't happen to the soldiers of a small island in the Caribbean or to ill-prepared Kuwaiti troops. It happened to American soldiers.

This was when the need for a Joint Tactical Radio System (JTRS) first became painfully apparent.

It's not that the U.S. armed services don't have a radio system, they do. Scores of them, in fact. And therein lies the problem – they can't talk to one another. And even when they do talk, their bandwidth is usually too small to accommodate the type of data that needs to be transmitted.

To really understand the challenge, you have to take a step back and look at the big picture. For nearly a decade the Army has been working on an effort to "digitize" combat units.

It's no secret that knowledge is power - especially on the battlefield.

What would happen if you could take the lower-echelon forces (which by their very nature are constantly on the move and therefore difficult to connect) and hook them up via a digital network? What if you could provide information (be it data, voice or video) rapidly and reliably to individual soldiers, vehicles, airborne platforms and headquarters – simultaneously, if needed?

The Army has done just that in its quest to move towards a network-centric force; they call it the "tactical internet."

Like the familiar Internet to which most people connect via their personal computers, the tactical internet has grown and evolved during its life.

Communication technologies continue to morph at the speed of light; the next-generation tactical internet stands poised to take advantage of them.

JTRS is often called the backbone of that next-generation tactical internet, because it is intended to standardize communications across all branches of the U.S. military.

The program vision, as outlined in the JTRS Mission Need Statement and the JTRS Joint Operational Requirements Document, is to develop a family of affordable, high-capacity tactical radios to provide both line-of-sight and beyond-line-of-sight Command, Control, Communications, Computers and Intelligence (C4I) capabilities to the warfighters.

This family of radios will cover an operating spectrum from 2 to 2000 MHz initially and will be capable of transmitting voice, video and data.

However, JTRS is not a one-size-fits-all system. Rather, it is a family of radios that are interoperable, affordable and scaleable. By building upon a common, open architecture, JTRS will improve interoperability by providing the ability to share waveform software between radios, even radios in different physical domains.

"Interoperability is a critical need in today's joint digital battlespace," says Jerry McElwee, director, Boeing Integrated Government Systems in Anaheim, Calif. "A soldier who can't talk to his buddy – or a platoon commander, who can't call in air support – is isolated and ineffective on the battlefield.

"This has become particularly critical in today's changing political climate - where commanders and their troops need instant access to timely, relevant information in order to make decisions that will save lives and win battles," McElwee adds.

The open architecture will help ensure that JTRS can take advantage of continuously evolving communications technologies - always a nightmare in the traditional military acquisition cycle, which often results in technologies that are outdated just as they reach the fielding stage.

JTRS helps to overcome this by being the first "software-defined" radio.

A software-defined radio is similar to a personal computer in that it is able to perform a variety of functions depending on what software is loaded. This means that a software-defined radio, with one set of hardware and a variety of software applications, can operate in a variety of modes and across the frequency spectrum from 2 megahertz to 2 gigahertz.

The JTRS program is a multi-phased effort, managed by the JTRS Joint Program Office for the joint services, that represents a significant departure from "business as usual" for the DoD.

The Pentagon plans to consolidate various service-unique radio acquisition programs into the JTRS in an effort to achieve cost savings, improve performance and provide an interoperable communications system that will enable joint, combined and coalition forces to communicate across platforms, services and continents.

The government has solicited help from industry to come up with a systems solution to provide seamless information anytime, anywhere.

It has created the role of systems integrator to make the JTRS work in accordance with user requirements and to

Seamless Communications

JTRS is not a one-size-fits-all system; it is a family of radios that are interoperable, affordable and scaleable. By building upon a common, open architecture, JTRS will improve interoperability.

The Army is moving towards a network-centric force they call the "tactical internet." As communication technologies continue to morph at the speed of light, the next-generation tactical internet stands poised to take advantage of them.

JTRS

select team members in such a way that government interests are protected and supported.

As the program enters the engineering manufacturing design and development phase, Boeing, an industry leader in system-of-systems integration, has teamed with several industry leaders in airborne, space and ground platform.

Boeing assembled a team comprised of TRW of Carson, Calif., Rockwell Collins of Cedar Rapids, Iowa, and BAE Systems, of Wayne, N.J., who is partnered with Harris Corporation, of Rochester, N.Y., to pursue a two-year U.S. Army Cluster 1 design and development contract.

The winning team will have responsibility for the design of the JTRS architecture, the development of JTRS-compliant waveforms and the development of two qualified hardware production sources for more than 100,000 ground vehicular and airborne systems. The Army's Communications-Electronics Command (CECOM) is expected to announce the contract award in March 2002.

Boeing team members were selected based on the operational, technical and management skills needed to achieve the goals and objectives of the Army cluster 1 program, according to Jim Olivo, Boeing JTRS capture team lead.

"We approached the JTRS solution in a unique way," Olivo says. "We formed a team with common goals and objectives to ensure success in the implementation of the JTRS program."

In order to accomplish that objective, he added, Boeing created a four-way teaming agreement that allows all members of the team to be a part of the decision-making process throughout the entire implementation of the program. More traditional teaming approaches, by contrast, involve a one-way teaming agreement with each respective company, which in turn limits dialogue and information sharing among the parties involved.

"Those traditional arrangements can result in problems and delays," Olivo notes. "Every time one team member does something, for example, the other ones have to agree," he says. "There are some unique agreements, however, within the overarching teaming agreement to ensure the team has common objectives, every member knows their role and therefore you truly do have a team."

The Boeing team is committed to making sure that the next time a U.S. soldier calls for Air Support he won't need his credit card to do it - no matter which branch of the service is on the other end of the line. ■

Joint Battlespace

Interoperability is a critical need in today's joint digital battlespace; a soldier who can't talk to his buddy – or a platoon commander, who can't call in air support – is isolated and ineffective on the battlefield.

Integrated Battlespace – "Connect and Protect"

excerpted from a November 2001 speech
by Jim Albaugh
President and Chief Executive Officer, Boeing Space and Communications

In the past, government and industry have designed their products and services, technologies and strategies in response to recognized or perceived threats. Certainly during the Cold War, that was easy to do - it understood the threat was the Soviet Union.

Today, however, as we design for the future, we must operate on the premise that surprise is possible and likely. That threats can come from places internal and external to our country. And those threats may well be asymmetric, as we've witnessed so vividly in recent months.

Accordingly, at Boeing, we need to structure our strategies, products and technologies not around threats, but rather, around capabilities; and to do so in anticipation of - rather than in response to - new and evolving threats.

Now, more than ever, the key issue is how we ensure that the right people have access to the right information at the right times and in the right form.

Boeing's view of the future battlespace - what we call the "Integrated Battlespace" – is reflective of where we think the Department of Defense wants to go, as laid out in Joint Vision 2010 and updated in Joint Vision 2020.

Our vision of the future is capabilities-driven. It includes a network-centric approach to warfare; based on creating a true digital battlespace; with integrated command, control and communications across all of the different resources that are out there; and a digital view of where all our assets are. But also a digital view of where our foes' assets are.

This vision requires integration of platforms that were not designed to work together. It will require integrating common operating standards on new platforms that are being built and integrating a common operating architecture into existing platforms as they come in for upgrades.

Take for example the surveillance systems we have today - and how they must operate in the future.

Today, our current space overhead assets were designed to be national reconnaissance systems. Tomorrow, they must be that; as well as space intelligence, surveillance and reconnaissance assets for providing real-time situational awareness

Today, our overhead reconnaissance systems offer revisit rates in terms of days or hours and days. Tomorrow, we must have real-time, near-continuous overhead surveillance.

Today, in the mountains of Afghanistan, our airborne Moving Target Indicator (MTI) surveillance is limited by the terrain. Tomorrow, integrated air and space MTI surveillance systems must be able to continuously track targets in deep valleys and denied areas.

Boeing, like other companies, is analyzing different architectures of space and airborne assets that are part of an overall integrated battlespace network, designed to provide a common operating picture and complete situational awareness.

If we do this right, just imagine the possibilities.

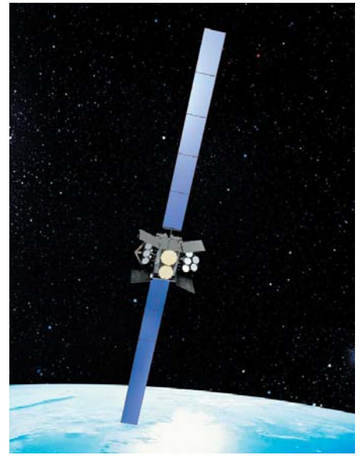
Imagine the capabilities theater commanders would enjoy if they had tailored, real-time overhead surveillance derived from an integrated battlespace network.

Imagine the force-multiplier effect of a direct downlink of imagery and ground-based MTI and airborne MTI.

Imagine being able to communicate a real-time common operating picture to all units in the theater.

We can – and must – achieve this vision.

We can do it through hybrid communications networks that involve terrestrial, airborne and space capabilities; through increased space communications capability; through the deployment of unmanned aerial vehicles (UAVs) and tankers that are nodes in a global, mobile information network; and through the ability to process data into information within seconds and minutes and provide it to the warfighters.



From our perspective, where a given platform operates – whether it's on the ground, in the air, or on orbit – is less important than the effects and capabilities it produces.

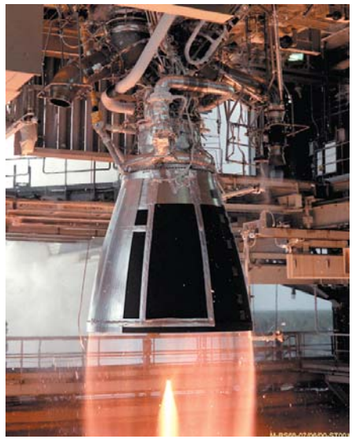
And just as most folks with cell phones don't care if they're getting their information from a space-based system, a wireless system, or a terrestrial system – all they care about is getting the packets of information when they need it, wherever they are, in the format they want. That's just as true in the battlespace. Whether it's weapons, communications or information, warriors don't care where it comes from as long as it does the job.

In the digital battlespace the way to protect is to connect. It's up to us – working as a team with our customers – to figure out what mix of assets will maximize our operational effectiveness and give the warfighters the edge they need. ■

Future Battle

Where a given platform operates -- whether it's on the ground, in the air, or on orbit -- is less important than the effects and capabilities it produces.

Elsewhere at Space and Communications



RS-68 engine completed ▲

The development and certification of the RS-68 engine for the Boeing Delta IV vehicle was recently completed, with the second of two certification engines wrapping up its test series and the Delta IV Design Certification Review in late 2001. As the development effort came to a successful conclusion, the focus shifted toward full-up production. Three production engines were delivered in 2001 and eight are slated for delivery in 2002.

Rocketdyne team works on Space Launch Initiative

A Rocketdyne team continues work under the Space Launch Initiative (SLI) contract begun in June 2001. SLI is a NASA program aimed at reducing the risk associated with developing a second-generation reusable launch vehicle by defining, developing and testing technologies needed for safe, reliable and affordable access to space. Rocketdyne received funding for main propulsion and upper stage research and is currently in the midst of the initial 10-month base period that could lead to a 14-month follow-on option. The design and risk mitigation efforts are running on budget and schedule.

Space Shuttle receives ongoing upgrades ▲

Destined to fly for the next two decades, the Space Shuttle will be continually upgraded in many areas, including modifications to the Space Shuttle Main Engine. One of those modifications will be advanced health-monitoring system. Phase 1 of the improvements, which is valued at $40 million, is already under way, and this fall Phase 2 of the planned changes will commence. That additional work will bring in another $115 million by the conclusion of the contract.

Expendable Launch Systems signs for more rocket engines

An inter-work authorization (IWA) with Boeing Expendable Launch Systems was signed this fall for 13 more RS-27As, powerplant for the Delta II and Delta III, presumably bringing to a conclusion the long history of one of the most successful rocket engine systems ever built.

The new buy is in addition to the existing order for 50 engines. Seven engines from the prior order have already powered launches, with the remaining 43 now either in stock or under construction.

Launch table makes grand entrance ▲

Space Launch Complex (SLC)-6 launch table arrived at Vandenberg Air Force Base (VAFB), Calif. on Oct. 19. Once planned as the West Coast launch site for Space Shuttle, SLC-6 is being renovated by Boeing for use by the company's Delta IV family of launch vehicles.

Hundreds of tons of steel were removed as the former launch table was demolished to the concrete level in preparation for installation of the new launch table and Fixed Pad Erector. First-launch capability from VAFB SLC-6 is currently targeted for late 2002.

Boeing launches its 200th commercial satellite ▶

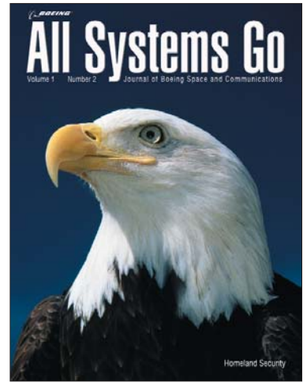
On Nov. 26, Boeing Satellite Systems launched its 200th commercial, DIRECTV-4S. The Boeing 601HP satellite will carry the first triple-junction solar cells.

QuickBird 2 mission launched on Delta II ▲

Boeing launched DigitalGlobe's QuickBird earth-imaging satellite on Oct. 18 from Vandenberg Air Force Base on a Delta II launch vehicle.

Airborne laser weapon system ▲

Team ABL - composed of Boeing, TRW and Lockheed Martin - continues to make substantial progress on the Airborne Laser weapon system for the U.S. Air Force in Wichita, Kansas. This system will, for the first time, provide an early defense against such missile as Scuds by destroying them in the boost phase.



All Systems Go, Volume 1, Issue 2 , due for publication in March, 2002, will feature Boeing's contribution to Homeland Security.

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