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AGILE AND OPEN C4ISR SYSTEMS

Helping the Military Integrate, Innovate and Secure Networks across the Enterprise

The U.S. military is tasked with protecting our nation, putting the lives of warfighters and civilians on the line every day. The military must often use outdated systems to respond to enemies using technology to their full advantage. Agile and open C4ISR systems help the military respond quickly to technology changes. These state-of-the-art technology solutions also address key process, budgetary, operational and cultural concerns that impede rapid and effective implementation, upgrades, innovation, integration and situational awareness.

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> **"Too often with legacy C4ISR systems, military decision-makers and operators must use multiple devices, with separate displays, to get a unified picture of what is happening. And those in the field struggle to operate a variety of networks and communications protocols. Legacy C4ISR applications and systems lack secure interoperability with advanced technologies because current acquisition processes cannot keep pace with technological change."**
>
> TOM PFEIFER | *Booz Allen Hamilton senior vice president, leader of the firm's Air Force business*

Executive Summary

Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) systems comprise the backbone of military operations. Yet the legacy systems currently deployed function well below their potential capabilities. Stovepiped systems make it difficult — and sometimes impossible — to collect, analyze and disseminate critical threat and operations information or to obtain a complete, single view of the battlefield.

Current technology innovations and trends could, and should, be used in weapons systems. Yet in today's current acquisition and development environment it takes a minimum of two to three years, and often longer, to get new capabilities into the field — making those technologies obsolete by the time of deployment.

"Budgets continue to shrink, and the military is spending all their funds on sustaining legacy systems put in the field 20 years ago rather than responding to adversarial threats," says Dick Johnson, Booz Allen vice president and a leader in the firm's Air Force C4ISR business. "Not only are today's acquisition process and legacy systems barriers to innovation, there is simply no way many of these systems can be secure."

As a result, IT managers are hamstrung — they cannot respond to operational needs nor create new opportunities. This leaves warfighters and citizens at risk.

In a recent study looking at the military's top challenges working with traditional C4ISR systems, more than half of survey respondents saw interoperability across military organizations as a problem that cannot be solved without the true integration and networking of C4ISR. They also indicated an integrated approach to C4ISR would be beneficial to their organizations. Booz Allen Hamilton partnered with Market Connections, a leading government market research firm, to assess the challenges in C4ISR and identify solutions that provide the flexibility military decision makers need to respond to current and future warfighting in the context of ever-changing technologies.

Challenges With C4ISR

Legacy C4ISR systems were designed to meet specific mission requirements, but not to share information or interoperate seamlessly with systems outside of their mission space. As such, traditional acquisition processes were well suited to develop them. David Roberts, a principal in Digital Solutions/C4ISR within Booz Allen's Strategic Innovation Group, says that as opportunities and requirements for collaboration grew, the military expanded and modified systems already deployed — typically via the large original equipment manufacturers (OEMs) that built the systems and use proprietary technology. Today, this method of developing C4ISR systems is creating barriers to innovation and cost savings.

By far, survey respondents cited process and budget as the top challenges of working with legacy C4ISR systems. More than six in ten respondents (62%) specifically cite lack of funding and budgetary constraints, while 61% say a long and complicated acquisition process is a challenge. More than half of respondents also rate lifecycle sustainment costs (58%) and changing procurement rules and requirements (54%) among top challenges.

Top Challenges with Traditional C4ISR

BUDGETARY CHALLENGE
Lack of funding/budgetary constraints **62%**

PROCESS CHALLENGE
Long, complicated acquisition process **61%**

TECHNOLOGY CHALLENGE
Cybersecurity threats **55%**

OPERATIONAL CHALLENGE
Stovepiped or standalone systems **51%**

The technology challenges respondents face are primarily related to cybersecurity modernization and technology insertion concerns. For example, increasingly sophisticated cyber threats require the highest security protection for C4ISR systems, yet digital interfaces to integrate independent OEM systems can introduce security vulnerabilities. Nearly two-thirds of respondents (62%) indicate improving security to protect from cyber threats is a priority for implementation in the next 12 months, yet this will prove challenging if they don't have the budget or cannot procure the technology in a timely manner. From an operational perspective, half of respondents (51%) believe stovepiped or standalone systems are a challenge.
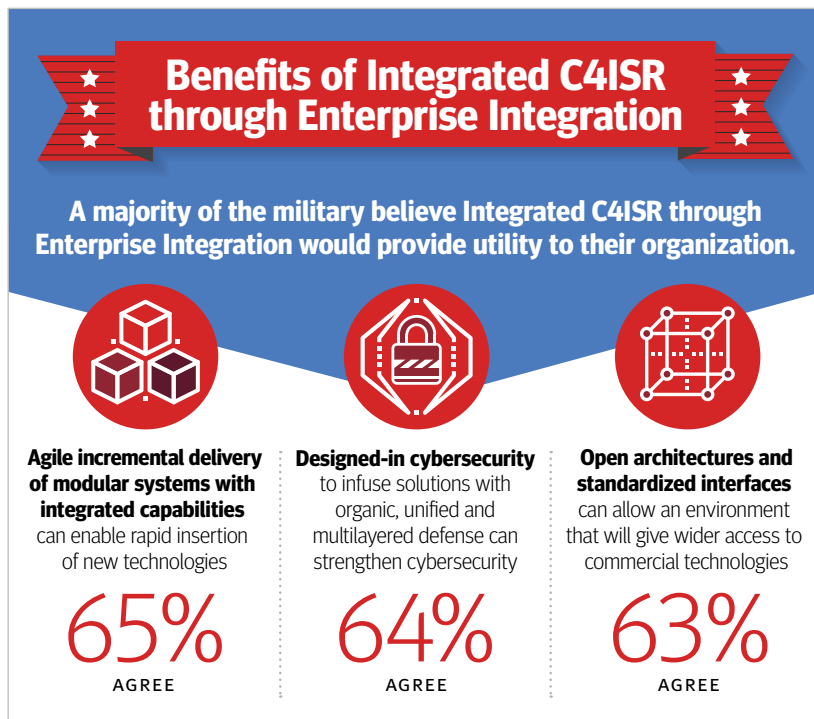
Clearly, the traditional approach to C4ISR integration does not meet today's mission challenges. Integrating independent, proprietary systems in a one-off fashion after they are in the field hampers interoperability, inhibits technology insertion, diminishes security and drives up costs with inefficiencies.

AIR FORCE

What if streamlining systems development could be simplified?
That, and other challenges the military faces, can occur with Integrated C4ISR through Enterprise Integration — a concept that especially resonates with the Air Force. Almost three quarters (73%) of Air Force survey respondents indicated Enterprise Integration would benefit them, versus 54% of total respondents. Top challenges the Air Force faces that Enterprise Integration could solve are:

- TECHNOLOGY: streamlining the acquisition process — 55%
- PROCESS: establishing and agreeing upon open common and standard architectures — 49%
- OPERATIONAL: ability to effectively serve warfighter needs — 39%

Benefits of Integrated C4ISR through Enterprise Integration

A majority of the military believe Integrated C4ISR through Enterprise Integration would provide utility to their organization.

Agile incremental delivery of modular systems with integrated capabilities can enable rapid insertion of new technologies

65%
AGREE

Designed-in cybersecurity to infuse solutions with organic, unified and multilayered defense can strengthen cybersecurity

64%
AGREE

Open architectures and standardized interfaces can allow an environment that will give wider access to commercial technologies

63%
AGREE

A New Concept: Integrated C4ISR Through Enterprise Integration

The military needs "integrated C4ISR," where the individual pieces are designed as part of an enterprise system from the start, says Tom Pfeifer, Booz Allen senior vice president and leader of the firm's Air Force C4ISR business. With Integrated C4ISR, the military will own the architecture, the system and the data, which reduces vendor lock-in and helps eliminate inefficiencies. In addition, the ability to create a modular architecture with open, interoperable and well-defined interfaces to plug in new technologies when they become available fosters innovation and reuse across the enterprise.

Acquiring Integrated C4ISR requires an Enterprise Integration approach, which brings together three major disciplines and their communities: engineering, operations and acquisition. The research shows that Enterprise Integration offers the types of benefits and flexibility the military needs and desires:

Two-thirds of respondents agree:

- **Agile incremental delivery of modular systems with integrated capabilities** can enable rapid insertion of new technologies (65%).
- **Designed-in cybersecurity** that infuses solutions with organic, unified and multi-layered defense can strengthen cybersecurity because interoperability will be designed into systems from the beginning (64%).
- **Government-owned, open architectures and standardized interfaces can allow a "plug and play"** environment that will give wider access to commercial technologies (63%).

Respondents also believe *collective forums* can help develop and field systems that improve situational awareness and decision-making to give warfighters unmatched superiority over current and future threats (62%). Additionally, *enterprise-oriented cultures* can strengthen collaboration among intelligence teams and warfighting units (66%).

Johnson says with agile and open C4ISR systems, the military does not need to adopt all of the new processes and systems at once. The key is to map current capabilities to the mission. With that information in hand, it is then possible to determine which systems are redundant and which systems are available for reuse, and find the best ways to architect systems going forward. He adds this flexibility is one of the greatest strengths of Integrated C4ISR.

The Benefits Of Enterprise Integration

With Enterprise Integration, individual pieces are integrated from the start — and then maintained throughout the lifecycle — as part of an enterprise system. It provides agile development, security features, and enhanced acquisition that address the military's top challenges in working with C4ISR systems.

Agile Development

Enterprise Integration provides agile and open systems that address one of the military's challenges: streamlining systems development. Nearly half of respondents (45%) found this challenging, while 65% agree that agile delivery of modular systems can enable rapid insertion of new technologies and more than half (55%) believe government-owned open architectures can prevent vendor lock-in.

"Agile, incremental delivery of modular systems with integrated capabilities is of particular importance to the military because it breaks down barriers between systems," says Roberts. "In this way government-owned, open architectures and standardized interfaces allow a 'plug and play' environment that gives wider access to commercial technologies."
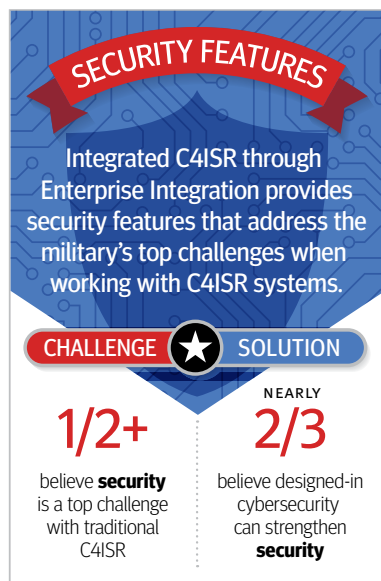
Johnson adds speed to repair systems as a benefit of agile development. In an open environment, multiple vendors can contribute to fixes, making systems operational much faster and ensuring the safety of the warfighter.

Another key benefit of agile development and open architecture ties directly to the security benefits of Integrated C4ISR: Johnson says when multiple people from different organizations look at the systems, they can better assess vulnerabilities. With proprietary systems, only "one set of eyes" is assessing vulnerabilities, thus increasing the liklihood of overlooking something.

Security

While nearly two-thirds of respondents say improved security is an implementation priority over the next 12 months, it is also cited as a top challenge with traditional C4ISR systems. Systems already fielded in particular have multiple security challenges. For example, Pfieffer says the complex interfaces required to integrate independent, proprietary C4ISR systems can introduce vulnerabilities and create security holes that increase the attack surface for malicious actors. An integrated C4ISR strategy can address those challenges.

About two-thirds of respondents (64%) agree designed-in cybersecurity — organic, unified, multi-layer defense designed into systems from the beginning — can strengthen security, and nearly 60% said this would provide utility to their organization. Designed-in cybersecurity is tested and, if necessary, improved with each modular phase of development. Testing and refining security early on and throughout the design process, rather than bolting it on after a system is built, infuses C4ISR solutions with unified, multilayered defense.

SECURITY FEATURES

Integrated C4ISR through Enterprise Integration provides security features that address the military's top challenges when working with C4ISR systems.

CHALLENGE ★ **SOLUTION**

1/2+	NEARLY 2/3
believe **security** is a top challenge with traditional C4ISR	believe designed-in cybersecurity can strengthen **security**

The Air Force is particularly interested in designed-in cybersecurity that infuses solutions with organic, unified and multi-layered defense. While two-thirds (64%) of respondents overall agree this feature would strengthen cybersecurity because interoperability is designed into systems from the beginning, almost three-quarters (72%) of Air Force respondents feel this way.

Roberts says these features are important not just in developing and fielding C4ISR systems, but also in sustaining them throughout their lifecycles. For example, future upgrades will be easier to integrate and keep secure using open architectures and standardized interfaces. Government labs and forums can also play a valuable role in sustaining deployed systems by bringing together the best technical experts, operators and other stakeholders to ensure enhanced security testing of planned upgrades. Given that a large number of legacy C4ISR systems will continue seeing service for the foreseeable future, improvements in automated testing and collaborative forums such as hackathons are essential to maintain security in C4ISR systems.

Enhanced Acquisition Process

Military leaders understand the mission value of integrated C4ISR through Enterprise Integration, but acquisition processes that produce systems and tools that either do not work or are obsolete by the time of deployment continue to frustate the military. Enterprise Integration addresses one of the primary challenges the military faces: this untenable acquisition process. Integrated C4ISR allows the military to buy and acquire technology in smaller pieces, which leads to faster procurement times and shorter development cycles.

Large, complicated procurements can easily become bogged down in the process, rather than focusing on the outcomes. Not only can this impede innovation, these large bids are prone to protests, which add even more time to the acquisition cycle. More, smaller targeted acquisitions streamline procurements, can work to reduce the instances of protests and ultimately get innovative technologies in the field faster to the warfighter, says Johnson.


Air Force respondents see the benefits that Integrated C4ISR through Enterprise Integration can deliver. They agree signficantly more with the following statements than respondents from any other military organization.

- Open architectures can reduce vendor lock-in (68% Air Force vs. 55% overall respondents)
- Agile incremental delivery of modular systems with integrated capabilities can enable rapid insertion of new technologies (75% Air Force vs. 65% overall respondents)
- Designed-in cybersecurity that infuses solutions with organic, unified and multi-layered defense can strengthen cybersecurity (72% Air Force vs. 64% overall respondents)

The Air Force Recognizes Benefits of Integrated C4ISR through Enterprise Integration

Air Force respondents agree with the following feature statements significantly more so than other military organizations:

Open architectures can reduce vendor lock-in	Agile incremental delivery of modular systems with integrated capabilities can enable rapid insertion of new technologies	Designed-in cybersecurity infuses solutions with organic, unified and multilayered defense
68% 55%	75% 65%	72% 64%
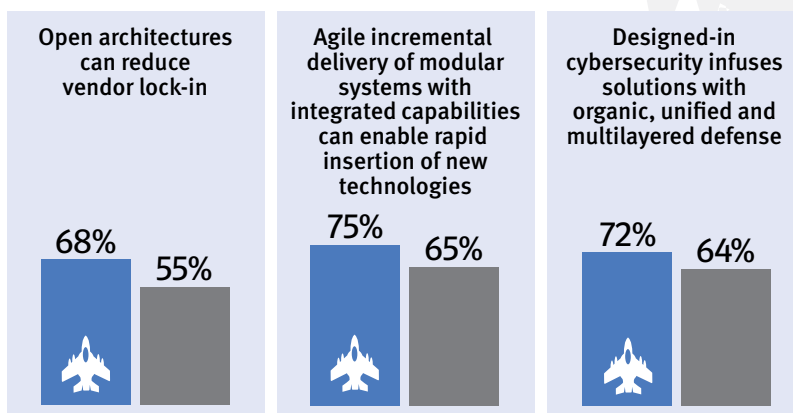
"The best way to protect our warfighters is to create and sustain C4ISR systems that are both interoperable and secure. Doing so will improve situational awareness and decision making, and this will give our warfighters a decisive advantage in all of their mission objectives. At the same time, the military will realize considerable fiscal savings at a time when budgets continue to shrink more and more."

TOM PFEIFER
Booz Allen Hamilton senior vice president and leader of the firm's Air Force C4ISR business

Conclusion

The traditional approach to C4ISR integration does not meet today's mission challenges. Enterprise Integration, on the other hand, is a holistic approach to innovation and fiscal responsibility. It provides a risk-based approach that lets the military prioritize where to focus spending and technology upgrades for enhanced situational awareness and real-time decision-making.

By moving to Enterprise Integration, the military can overcome the challenges of stovepiped legacy C4ISR systems, creating truly interoperable and secure C4ISR networks and systems.

About the Study

Booz Allen Hamilton partnered with Market Connections to assess the challenges the military faces with C4ISR and identify which defense commands and decision makers felt an Integrated C4ISR through Enterprise Integration approach would address their concerns and challenges. Of the 250 defense decision makers who participated in the blind, online survey, 35% were from the Department of the Army, 31% from the Department of the Air Force and 23% from the Department of the Navy (including the Marine Corps). The remaining 11% represented other Defense Department agencies, including OSD, DCAA, DLA, DTRA, JCS, NSA, DFAS DISA and DARPA. A variety of job roles are represented in the sample, with respondents most often describing their role as operations/administration. More than half (56%) develop operational requirements and 45% manage subcontractors/consultants on projects.

ABOUT BOOZ ALLEN HAMILTON

Booz Allen Hamilton has been at the forefront of strategy, technology and engineering for more than 100 years. Booz Allen partners with public and private sector clients across the globe to solve their most difficult challenges.

Booz Allen provides an agile and open set of situational awareness tools and transformative solutions to help federal agencies and departments integrate data, systems and people across the enterprise for mission success. Through deep and holistic expertise rooted in network-centric warfare, Booz Allen allows the government to meet their cross-organizational C4ISR needs and drive out inefficiencies while optimizing cost-effectiveness.

To learn more, visit www.boozallen.com/C4ISR.

ABOUT MARKET CONNECTIONS, INC.

Market Connections delivers actionable intelligence and insights that enable improved business performance and positioning for leading businesses, trade associations and the public sector. The custom market research firm is a sought-after authority on preferences, perceptions and trends among the public sector and the contractors who serve them, offering deep domain expertise in information technology and telecommunications, health care and education.

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