

# Delivering Capabilities Through Partnerships

Chris D. Moore

Warner Robins-Air Logistics Center

*As public-private partnerships become more prevalent in the Department of Defense for providing logistics support for advanced weapon systems, integrated teams must look for unconventional opportunities to exploit the best capabilities of their combined resources to support many diverse program objectives. The challenge is figuring out how to evolve traditional customer-supplier relationships into truly integrated teams with common objectives at the forefront. Warner Robins-Air Logistics Center and the Northrop Grumman Corporation are pioneering a new path with their partnered E-8C Joint STARS software maintenance team.*

The 402d Software Maintenance Group (SMXG, formerly MAS) at Warner Robins-Air Logistics Center (WR-ALC), Robins Air Force Base (AFB), Ga., is soaring high in its partnership with Northrop Grumman Systems Corporation (NGSC) to maintain the complex E-8C Joint Surveillance Target Attack Radar System (Joint STARS) software through integrated teaming. As legislative support and expectation for government-private partnerships continue to grow, software organizations are finding more opportunities to leverage the best of each side's infrastructure to provide both government core capability and optimum support for fielded systems.

The challenge is figuring out how to optimize the new and unconventional government-private relationship. While many government-private partnerships cast the parties in traditional contractor-subcontractor roles, the 402 SMXG and NGSC partnership has taken the concept to a new level with a truly integrated team fielding war-winning capabilities through software maintenance.

The E-8C Joint STARS Systems Group (E8SG) is a long-range air-to-ground surveillance system designed to locate, classify, and track ground targets in all weather conditions. It is operated by the 116th Air Control Wing (ACW) based at Robins AFB. In 1998, the Air Force designated Joint STARS a core workload. The Department of Defense (DoD) services designate certain weapon systems, equipment, and components as mission-essential for support of scenarios approved by the Joint Chiefs of Staff. The DoD ensures that there is core depot maintenance capability to support these mission-essential weapon systems. Core exists to minimize operational risks and to guarantee required readiness for these weapon systems.

In November 2000, the 330 Intelligence Reconnaissance and Surveillance Group (330 IRSG), also at WR-ALC, awarded a Total System Support

Responsibility (TSSR) contract to NGSC, which was the Joint STARS system integrator operating out of its Airborne Ground Surveillance and Battle Management Systems Division in Melbourne, Fla. This contract made NGSC responsible for maintaining and providing logistics support for the entire fleet of 17 E-8C jets from nose to tail. In that Joint STARS is a core logistics workload, a partnership was required between WR-ALC and NGSC to enable WR-ALC to support NGSC's logistics responsibilities with government-furnished supplies and services (GFS/S). While this part-

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nership includes the support of many areas of logistics, this article focuses on Joint STARS software maintenance.

The fiscal year 1998 Defense Authorization Act provided statutory authority for DoD depots to enter into government-private cooperative arrangements (partnerships) for the performance of depot-level work. While the concept of partnering or teaming with industry was conceived initially as a strategy for depots to make skills, facilities, and equipment available to the private sector to perform government workload and to maximize the utilization of skills, facilities, and equipment that are required to support core workloads, it lent itself well to a somewhat different arrangement regarding Joint STARS software maintenance. In this case the contractor, NGSC, had a history of maintaining Joint STARS software almost exclusively. Further, the facilities and expertise existed at the contractor facility in

Melbourne, not at Robins AFB. In this case, the government is the novice and the contractor is the expert.

As an umbrella to the WR-ALC-NGSC partnership, a Long Range Memorandum of Agreement (LRMOA) was established between the three principle parties depicted in Figure 1. They are WR-ALC, specifically the 402d Maintenance Wing (MXW), formerly WR-ALC/Maintenance Directorate; the E8 Systems Group, formerly the Joint STARS System Program Office at Electronics System Command (ESC); and NGSC.

The agreement set the ground rules for partnering by acknowledging the existence of both common and unique individual objectives. While there are mutual objectives in government-private partnerships, there are many objectives that are unique to the parties and may have higher priorities to the respective parties.

Success hinges on the deliberate support of all objectives by all parties. The challenge is pioneering innovative methods for achieving these objectives that sometimes appear to be in complete conflict. The agreement recognized the new and unique roles of the parties as well as individual objectives, but most importantly set forth the agreement to pursue a set of common objectives.

The system program director E8SG objectives are to implement U.S. Air Force (USAF) program management and acquisition techniques as necessary to provide the best possible support to the warfighter while ensuring that best value is achieved for the USAF. The focus of E8SG is on providing the user with superior combat capability by balancing program costs, schedule, and performance elements.

The WR-ALC objectives are, pursuant to law, to maintain the appropriate levels of core competencies in logistics management, engineering, supply chain management, and depot-level maintenance necessary to ensure efficient and cost-effective sustainment for all of its assigned weapon

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systems now and in the future. To achieve these objectives, the center must develop in-house expertise and transition software maintenance workload from the contractor to organic while mitigating risk to the user and to the overall program. Success in this endeavor satisfies the core directive.

An additional WR-ALC objective is to partner with the contractor to reduce the core capital investment through sharing of equipment and resources.

## Contracting Objectives

As the TSSR contractor, NGSC objectives are to fulfill an important role in assisting the USAF organizations in achieving their respective objectives. Consequently, NGSC's primary objective is to ensure the Joint STARS weapon system continues to provide the user with superior and reliable combat capability. This performance, in turn, allows NGSC to perform its TSSR contract obligations. By providing superior Joint STARS support, NGSC establishes a positive reputation for the Joint STARS weapon system, earns maximum performance incentives, and enhances its reputation as a leading provider of Joint STARS support.

When these individual objectives are superimposed, a set of common objectives comes into focus. The parties' intent is that through this LRMOA, and other subordinate agreements, the parties will successfully integrate their efforts to continuously improve total systems support of Joint STARS. Notwithstanding the unique roles and responsibilities of each independent party, the parties collectively agree that their overarching mutual objectives are to provide the following:

- Superior support to the warfighter.
- Best value to the USAF (balancing both program and broader objectives).
- The mechanisms necessary to meet the USAF core logistics competencies requirements.
- Support to future core and source-of-repair assignment analyses and decision-making to enable the USAF to balance objectives of the Joint STARS program with broader USAF imperatives such as the maintenance of core competencies.
- The creation of an integrated digital environment (IDE) as a key enabler in achieving the communication, coordination, insight, and responsiveness objectives outlined in this document (discussed later).
- The ability of NGSC to achieve reasonable profits and enhance its corporate reputation through demon-

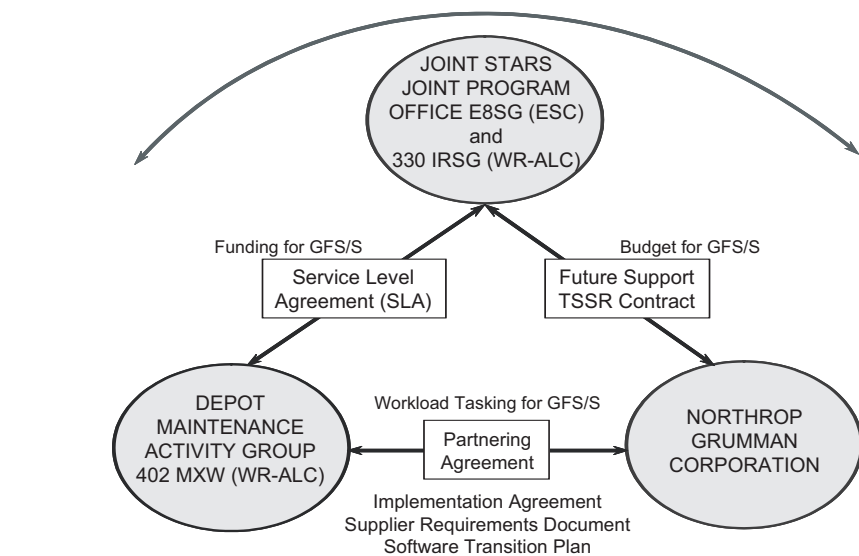


Figure 1: Long Range Memorandum of Agreement

strated performance in achieving the aforementioned common objectives as applicable to the TSSR contract.

Clearly there are many objectives ripe for competing interest. The TSSR contractor must balance maximizing corporate performance with supporting the Air Force in meeting its core capability requirements. The government partner must acquire laboratories, personnel, and training, and develop expertise and transition workload while mitigating program risks. It is a tough challenge, but major risk mitigators include early identification and optimization of individual strengths, practical integration of engineering and management processes and human resources, implementation and continued optimization of communication processes and procedures, and identification of weak areas followed by development of tactical plans to effectively fill those voids. Intense focus in these areas with little regard for organizational boundaries and contractor/government affiliations produces not only a partnered team, but also an integrated team postured to improve efficiency, performance, and quality – a win-win scenario. The bottom line: all objectives are met and, most importantly, superior warfighter support is provided.

There is also the concept of trust. Traditionally the government personnel have been perceived as the customer in all instances. The partnership scenario casts the government partner in an entirely different role: an insider, a colleague, and yes, in some forms even as a subordinate. Not only is this scenario foreign to the contractor, but extremely new and possibly uncomfortable for the government personnel. It takes deliberate attention and

actions to bridge this gap.

The contractor developed the E-8C and remains fiercely loyal to it, coveting it and its caretaking. In many cases, it is the lifeblood of the company or department and, to some extent, its surrounding community. Eradicating the culture of competition is essential to the success of the government-private partnership, but this cannot be mandated or accomplished externally. It can only come from within the integrated team through building the spirit of teamwork and shared goals as reported in the following section.

## Working Together

While many obstacles can be anticipated at the outset and contingencies devised, most lie in waiting just around the corner and can initially appear to be insurmountable. To name a few, there is geographical separation, differences in software laboratory setup and capability, different technical and management processes, risk to contractor performance due to the government's poor performance, competition versus teamwork, and the previously discussed core objectives versus best value.

The E-8C is essentially a spiral development system with continuous development of new system-level enhancements and functionality, and subsequent fielding of these new capabilities through integration into the software maintenance process. Concurrent with new development is ongoing identification of software change requirements to address deficiencies and defects, which is the customary software sustainment life cycle.

The first four years of the partnership took a natural course with respect to

software workload sharing and transition. The 402 SMXG team had experience in performing limited modifications to the Joint STARS software specifically in the area of ground support software tools. These tools varied from pre- and post-mission support tools to software development and test tools. At first, NGSC tasked the 402 SMXG to perform software change projects in these areas. As the system integrator prior to the partnership, NGSC integrated – for a fee – any organically produced software modifications, thereby limiting organic contributions to the software maintenance effort.

Under the TSSR contract and through the partnership, NGSC engineering management opened the doors to the NGSC software lab and invited the Robins software engineers to deliver and integrate their own software changes. This single activity laid the foundation for what would become the standard software integration process. The 402 SMXG engineers would become responsible for following NGSC software engineering processes for in-house software delivery, integration, and testing. It also was the first step toward building confidence by the TSSR contractor in the government software maintenance team.

Prior to the partnership and the TSSR contract, software requirements were flowed to NGSC in a very structured and formal process of requirements management by the operational user, the 116th ACW and the 330 IRSG. Under the TSSR contract, NGSC took on a more programmatic role and the responsibility for making capability- and value-based decisions with regard to requirements management. NGSC established several requirements working groups in specific functional areas of the software. These working groups consisted of representatives from all stakeholders, including the user, contractor, government team, and program office.

The working groups are responsible for evaluating software problems, alternative solutions, and ultimately recommending requirements. Involvement by the government software team in these forums is essential to establishing a core software maintenance capability and has proven invaluable to the government team. Final requirements are managed in Integrated Release System Engineering Management Teams (IR SEMT). While this forum is the official communication between the contractor and the program office for software requirements, the 402 SMXG is a participant as well.

Probably as significant as anything has been the inclusion of the 402 SMXG in day-to-day software maintenance team meetings. These vary in function, but are numerous, and all are critical to continuous and optimum performance by the integrated software maintenance team. There are weekly Administrative SEMT meetings where project status and risks are discussed and short-term direction is provided. The weekly Technical SEMT is chaired by the Joint STARS software chief architect. In these forums, engineering leads and subject-matter experts discuss current tasks and issues from a system perspective, and technical guidance is cultivated and provided. In the weekly software integrated product team (IPT) meetings, software change designs are reviewed by leads from each system area to determine correctness prior to approval at the weekly software configuration control board (CCB). In the CCB, completed work is approved for incorporation into the weekly software build, and new assignments are made based on mature requirements and software change requests.

As you can see, the integrated team's concept of operation for a particular software release is one of continuous problem analysis, software modification, integration, and test. Major requirements that

flow from the IR SEMT are developed and integrated simultaneously with the continuous correction of defects. Major requirements dictate the overall integrated release schedule and determine when significant modification curtails.

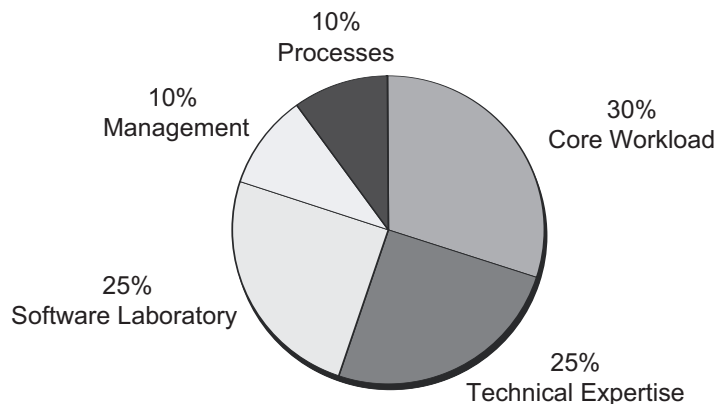
While NGSC has primary responsibility for conducting system-level testing on the E-8C, the 402 SMXG participates in this area as well to further the development of government expertise and capability. In this phase, NGSC must balance mentoring with meeting system requirements and schedule. The 402 SMXG has performed various roles ranging from mission planning using the ground software tools to actually flying on test aircraft and performing system-level tests.

The 402 SMXG possesses an extraordinary benefit in being co-located with the single Joint STARS operational wing, the 116th ACW. Not only does the 402 SMXG reside in the same building as the 116th Computer Systems Squadron that performs pre- and post-mission operations as well as software requirements management, but the 402 SMXG also operates and maintains the Joint STARS mission crew training systems in the same facility. Access to this critical resource enables the 402 SMXG to test the IR's weekly developmental builds on a target system. This can be done because Joint STARS incorporates the concept of a single software baseline. The same software that executes on the E-8C also executes on the trainers. Further, the 402 SMXG has the responsibility of ensuring the IR will operate according to specification on the training system once complete.

## Achieving Full Operational Capability

As stated before, the 402 SMXG has benefited immensely by partnering with the Joint STARS integrator and being allowed to perform as an integrated teammate rather than as a subcontractor. This natural teaming process has enabled processes and relationships to form from the ground up rather than be dictated from above. However, in the fourth year it became obvious that a quantitative structure was needed to evaluate when the 402 SMXG would be certified as capable of performing the software maintenance workload; in other words, achieving full operational capability (FOC). A Core Activation Plan (CAP) was established to provide the FOC plan and criteria. The FOC methodology consists of a scoring mechanism to evaluate the government software maintenance

Figure 2: FOC Critical Area Weighting Factors





capability against five critically weighted areas as depicted in Figure 2. Those areas include 1) core workload, 2) technical expertise, 3) software laboratory, 4) management, and 5) processes.

This status against this CAP is presented to WR-ALC, NGSC, SPO, and the 116th ACW senior leadership semiannually in the Joint STARS Partnership Review Committee briefing. Upon performing the initial FOC evaluation, we learned that the area needing the most attention was technical expertise. Mentoring would be required from the contractor to the government team in specific areas that are stable with minimal modification, and in specific areas where the government team lacked sufficient experience and had performed minimal or no software changes.

To complete the picture, deliberate steps were required. NGSC increased the level of software maintenance workload assigned to the 402 SMXG in these areas and increased the level and quality of mentoring of government engineers. This initiative ensures quality software is delivered on time in addition to transferring much needed knowledge to the 402 SMXG – again a win-win approach through partnering.

A final, and critically important common objective, was the establishment of an IDE. This goal was conceived at partnership inception, but has been the most illusive. The IDE, as depicted in Figure 3, was planned to be an electronic collaborative workspace to facilitate joint and simultaneous accomplishment of software engineering at geographically separated sites manned by separate teams. For it to become a reality, the IDE required software equipment laboratory upgrades on both ends, security approvals, integration and testing, and concepts of operation.

During the first four years of the partnership, we relied upon weekly overnight shipments between Robins AFB and Melbourne to facilitate the delivery of software products to and from the two sites. In January 2005, our IDE was completed with official operation of a network connection between the two sites. We will use the connection to transfer software files back and forth to facilitate integrated software maintenance teaming, and also to connect remotely to each site for day-to-day operations. We are one step closer to becoming a virtual integrated team via the completion of this connection.

## Conclusion

Having said this, let us take a look at our current status. We have integrated

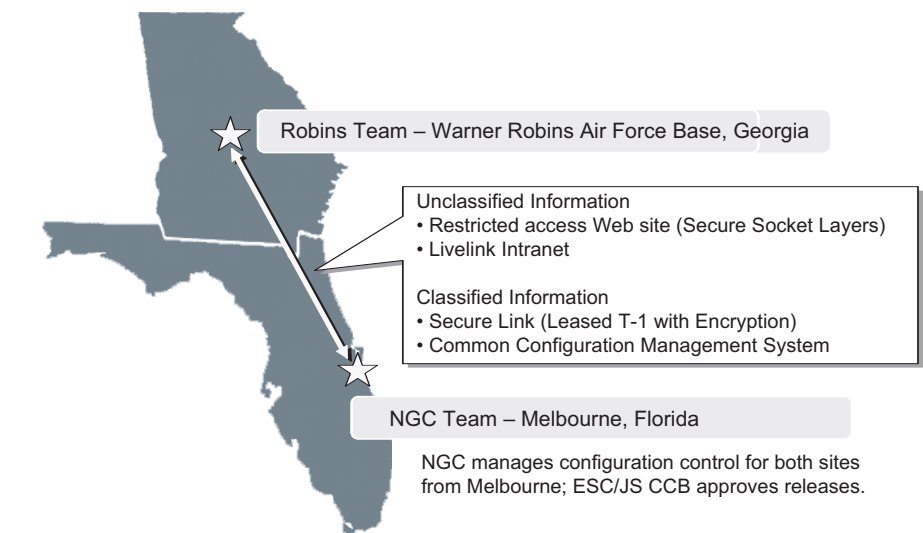


Figure 3: *The Robins AFB and NGC Team Initial IDE*

processes and project management, we have devised a method of sharing software workload, we have made plans to shore up the government's weak areas in system expertise, and we have completed the initial IDE. The 402 SMXG's current score against the FOC criteria established in the CAP is 95 percent out of a required 90 percent. Upon completion of the software release currently in development, the partners plan to declare the government capability fully operational.

Where do we go from here? While the initial period of the partnership has focused heavily on establishing organic software maintenance capability concurrently with satisfying user requirements, the future likely holds in store shrinking budgets and uncertainty. The partnered team will need to increase attention on value and optimization on both ends. With the next generation Joint STARS – the E-10 – on the distant horizon, the current platform will likely continue to undergo upgrades with the addition of new functionality to maintain pace with the demands of global conflict.

NGSC will be called upon to develop new capabilities that exploit the system for maximum operational effectiveness. The 402 SMXG will focus on increasing knowledge base and efficiency to keep up with the flow of software maintenance requirements. Both teams will look for opportunities to reduce costs and optimize processes. Exploiting the IDE will be a central focus for the near term. Joint efforts to strengthen and optimize interfaces with the user to improve software maintenance requirements management will also be a central focus of the partnership.

Sharing and applying lessons learned to other partnered programs within the Air Force Materiel Command will be a significant goal for the coming years. While the future was initially somewhat blurry, the Joint STARS software maintenance partners have exploited their new-found relationship to bring world-class war fighting capability and value for the warfighter into focus. ♦

## About the Author



**Chris D. Moore** is the director of the 402d Air Combat Operational Flight Program (OFP) Squadron at Warner Robins-Air Logistics Center,

Robins Air Force Base, Ga. He is responsible for sustainment of both the E-8C Joint Surveillance Tactical Airborne Radar System and the F-15 Eagle OFPs. He has 23 years experience in software engineering at Robins ranging from acquiring, developing, and sustaining software for automatic test equipment to sustaining OFP software. Moore has extensive experience with the Capability Maturity Model® Integration and in managing organizations steeped in software process improvement culture. He has a bachelor's degree in electrical engineering and a Master of Science in engineering management.

**420 Richard Ray BLVD STE 100**  
**Robins AFB, GA 31098**  
**Phone: (478) 926-2754**  
**Fax: (478) 926-3169**  
**E-mail: [chris.moore@robins.af.mil](mailto:chris.moore@robins.af.mil)**

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