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(This section must be signed)

Individuals **outside your company**, including the companies listed above and other third parties, potentially including your competitors and others in your industry, may receive and/or review award submissions. All information submitted should address the program's management, leadership, and processes in a manner that you are comfortable sharing with third parties freely and without restriction, and may not include any classified or proprietary information or materials. Do not include any materials marked Confidential or Proprietary or bearing any similar legend. All responses and other submissions, whether in whole or in part ("Submissions"), shall be deemed <u>not</u> to be confidential, proprietary, and/or nonpublic information of any sort for any purpose.

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Thank you for participating,

Gregory Hamilton
President
Aviation Week Network

Acknowledged, agreed, and submitted by

Reg Bush

July 15th, 2024

Nominee's Signature   Date

Nominee's Name (please print): Reg Bush_____

Title (please print): Senior Manager, Value Stream Management_____

Company (please print): Collins Aerospace_____

NOMINATION FORM

Name of Program: B-1B Avionics Upgrade Program_____

Name of Program Leader: Reg Bush_____

Phone Number: 972-705-3015 (O), 972-322-2874 (M)_____

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_____

☐ Customer Approved

    o   Date: _____

    o   Customer Contact (name/title/organization/phone): _____

☒ Supplier Approved (if named in this nomination form)

    o   Date: July 18th 2024_____

    o   Supplier Contact (name/title/organization/phone): Robert Madigan,
        robert.m.madigan-jr@boeing.com

**PLEASE REFER TO PROGRAM EXCELLENCE DIRECTIONS
AS YOU COMPLETE THIS FORM.**

SECTION 1: EXECUTIVE SUMMARY

Make the Case for Excellence
Value: 10 points
Use 12 pt. Times Roman typeface.

What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration?

Boeing Defense, Space & Security (BDS) and Collins envision ensuring that the B-1B platform is well sustained for its current and future missions. Together they have upgraded and modernized numerous avionics components to secure and maintain the B-1B Lancer as a strategic bomber for the United States Air Force, "Air Force". This type of forward thinking helps to ensure B-1B's operational position by aligning and integrating with the latest aviation technical improvements.

The B-1B Lancer – nicknamed "The Bone" – is a long-range, multi-mission, supersonic conventional bomber that has served the Air Force since 1985. Manufactured by Boeing and carrying the largest conventional payload of both guided and unguided weapons in the Air Force inventory, the multi-mission B-1B is the backbone of America's long-range bomber force. It can rapidly deliver massive quantities of precision and non-precision weapons against any adversary, anywhere in the world, at any time. As such, the B-1B is a key component for the Air Force in defending the nation and securing freedom for people around the globe.

Collins, an RTX company, is one of the world's largest suppliers of aerospace and defense products. The Avionics Strategic Business Unit within Collins provides communications, navigation, display and multisystem management avionics products that allow air platforms the capability to operate in both civil and military airspace.

The Collins team has been providing software and hardware solutions to keep "The Bone" updated with avionics technology since its inception, continuously achieving post-delivery goals for 39 years. Exemplifying program excellence in Supplier System Sustainment, Collins most recently ensured the B-1B platform maintains operational tempo through crypto and avionics upgrades.

Currently, the Collins team is improving the Operational Flight Program (OFP) for the Control Display Unit (CDU), which is part of the Communication and Navigation Management System (CNMS) for lab, ground, flight test and operational purposes. This program provides an innovative approach for system sustainment as the team identified a solution that enables reuse of existing components for cost control while ensuring uninterrupted reliable communications and compliance with the latest mandates.

B-1B Lancer nicknamed "The Bone"

SECTION 2: VALUE CREATION
Value: 15 points

Please respond to the following prompt:

➤ **Clearly define the value of this program/project for the corporation; quantify appropriately**

The B-1B is being updated to comply with Federal and Department of Defense (DoD) mandates specified in the Cryptographic Modernization Program regarding cryptographic and capability upgrades on the platform. To comply, Boeing requested an upgraded technical solution from Collins to support the Control Display Unit (CDU) integration with the Generation 6 (Gen 6) Airborne Radio Communications (ARC)-210 Receiver Transmitter (RT) -2036(C) radios. The Gen 6 ARC-210 radio provides modern encryption, Second Generation Anti-Jam Tactical UHF Radio for NATO (SATURN), and Mobile User Objective System (MUOS) capabilities to the platform.

Collins takes pride in our continued partnership with Boeing ensuring that the B-1B maintains its mission success by providing highly reliable avionics communications allowing "The Bone" to operate in any airspace. This alliance is strengthened by both companies' shared ambition to provide industry-leading avionics solutions for the Air Force. Collins has proven itself an industry leader and supplier through quality performance and maintains a strong relationship with Boeing. It is Collins' commitment to be a **trustworthy**, **innovative**, and **reliable** partner to our customers:

- **Trustworthy**: Ensure Customer (BDS) and End Customer (Air Force) Satisfaction and Preferred Partnership
- **Innovative**: Integration of upgraded CDU and Gen VI Radios with minimal cockpit modifications
- **Reliable**: Provide Aircrew Reliable Continuous Communications

B-1B Ordinance Loading

➤ **Clearly define the value of this program/project to your customer**

BDS' reliance upon Collins to perform the B-1B Radios Upgrade Program (RUP) is a testament to over 28 years of sustainment support for the aircraft. Improvements are being made to the CNMS OFP to allow for mandates and capability upgrades while simultaneously maintaining functions of navigation and guidance, flight management, and management of additional aircraft avionics functions. This concurrency will allow operators to use the CDU for accessing Gen VI radio features during the upgrades, ensuring uninterrupted, reliable communications.

This program adds modern capability to the existing CDU avionics architecture system while passing along significant cost savings to Boeing and Air Force customers. In most upgrade programs, transitioning to a newer CDU increases costs in the tens of millions of dollars due to hardware acquisition and non-recurring engineering (NRE) required to integrate the new hardware. This program negates the need to upgrade to a

more modern avionics hardware solution, while still allowing the B-1B platform to comply with the latest air space mandates ensuring operational readiness.

The current CDU has been in service for nearly 30 years making it older than many of the engineers currently working the program. The hardware required to compile new code is obsolete and cannot be repaired or replaced. Replacement of the CDU for a newer in production solution would be very costly and disruptive to the operational availability of the aircraft. The Collins teams innovative approach eliminated the need for a larger upgrade program.

Collins strives to continually improve our battle-ready military avionics. By combining our innovative technologies with existing designs, B-1B pilots receive unparalleled performance and reliability to complete their missions with maximum effectiveness.

➢ **Clearly define the value of this program/project to members of your team; quantify if possible**

The B-1B RUP program team values working on the avionics of a world-renowned strategic bomber. Its unique design for speed, payload, and variable-sweep wings is an aeronautical wonder. There is a strong sense of pride among the team members who have enhanced the bomber and further upgraded the overall capabilities.

Our team is welcomed to bring forth their ideas on potential improvements. There have been numerous employees who have shared their nostalgia while working on with "The Bone". Two examples are worthy of discussion.

1. The program has a B-1B engineer who once built a B-1A model in their youth. This person is still actively supporting and is considered a subject matter expert (SME) that works tirelessly for B-1B.
2. Millennial engineers marvel at incorporating leading edge capabilities on a bomber that is older than most of the B-1B RUP engineering team.

For many team members that did not serve in the military, they carry a lot of pride in supporting the B-1B operators that do by providing them with equipment that helps keep them safe and perform their mission of defending freedom across the globe.

➢ **Clearly define the contribution of this program/project to the greater good (society, security, etc.)**

The B-1B bomber is on track to continue flying operations out to the year 2040 and beyond. Boeing partners with the Air Force to keep the B-1B mission ready. Originally designed for nuclear capabilities, the platform transitioned to an exclusively conventional combat role in the mid-1990s. During Operation Allied Force in 1999, B-1Bs flew 2% of the strike missions, yet dropped 20% of the ordnance, and during Operation Enduring Freedom in 2001 the B-1B flew 2% of the sorties while dropping over 40% of the precision weapons.

There is no denying the Global Reliability – Domestic & Foreign of the B-1B Lancer. Collins' innovative and reliable avionics provide tip of the spear deterrents that are readily available for our customers. Our collaboration with Boeing to deliver requirements that meet Air Force expectations for the warfighter is paramount.

The B-1B RUP complies with Federal DoD Cryptographic Modernization mandates to implement cryptographic and capability upgrades on the platform. This allows "The Bone" to meet current and future communication needs as one component of a complex battle environment. A modern battlefield requires coordination across multiple platforms from multiple military service branches. These upgrades allow the B-1B to operate in that environment and perform its mission effectively. Collins provides cost-effective, quality solutions as a trusted industry leader and supplier.

SECTION 3: ORGANIZATIONAL BEST PRACTICES AND TEAM LEADERSHIP
Value: 35 points
Use 12 pt. Times Roman typeface

Please respond to the following prompts:

➢ *15 points:* **Describe the innovative tools and systems used by your team, how they contributed to performance and why**

To ensure Collins' vision for sustaining the B-1 platform, the RUP team has developed and leveraged tools to enhance their requirements, software, and test management environments. The following innovations were developed by the program team to overcome execution obstacles of the legacy program.

Legacy Code Management on Target Builds
Prior B-1B programs had software code base and software builds managed out of Rational APEX on older end of life SUN UltraSPARC machines running a sunset version of UNIX. This is due to the sheer age of the CDU utilized by the B-1B program. There were a few hurdles with using APEX for code management and Integrated Development Environment such as a cumbersome user interface, inefficient code development and compiling environments, and user training.

Collins found another method for compiling the CDU software by utilizing a SPARC20 virtual machine. Previously utilized hardware was long obsolete, and spare units no longer existed. This drove the need to develop a sustainable alternative. The build time to create a clean B-1B CDU OFP build was reduced from 8 to 2 hours. This significant improvement allows the team to produce multiple builds in a single day, greatly increasing development, unit testing, and debugging efficiency. This greatly aided the team in continuing to meet customer deadlines.

New Code Management/IDE and Rehost
The upgrade program transitioned the B-1B code from APEX's configuration management suite into the Subversion (SVN) rehost environment, a more modern code repository, allowing access to newer IDEs. This migration ensured developers could test and debug from a remote location via their desktop Personal Computers, allowing for more efficient development and debug conditions. As a result, on-target unit testing by software developers was reduced.

Virtual CDU and Remote Testing
The B-1B team created a virtual CDU application that allows engineers to connect onto a real CDU from a desktop. This allowed test development and testing to be done from remote locations on target hardware, permitting the team to be more flexible in terms of where engineers can be located and support the program. Given that the B-1B RUP team is spread out over several sites, this was crucial in allowing the team to be

successful in software development and testing. The virtual CDU also interfaces with Collins' existing test automation tools, greatly increasing testing efficiency over physically interacting with a real CDU.

DOORS Migration
The team moved the B-1B documents for requirements and test procedures that were maintained in an older enterprise documentation repository to the IBM® Engineering Requirements Management Dynamic Object-Oriented Requirements System (DOORS). Built-in linking functionality was the primary driver for the DOORs migration. Previously, all document traceability was done by hand, a system that was inefficient, hard to maintain, and error prone for identifying gaps in links from requirements to software and test procedures. By migrating the B-1B requirements and test procedures to DOORS, the team can now utilize built-in tools to identify linking gaps. This has increased the accuracy, reliability, and efficiency of showing traceability completeness.

Crew Familiarization (CrewFam)
The B-1B CNMS CrewFam tool is a self-contained system to familiarize crews with the use of the B-1B CDU. It includes a virtual CDU Graphical User Interface (GUI), that's used to control other aspects of the B-1B system and underlying processes. The CrewFam framework allows tasks to run virtually in a Windows PC system. CrewFam has not only been used for B-1B crew familiarization and the application is also used to familiarize new B-1B RUP engineers that are on-site and remote. The spawned tool helps engineers better understand system requirements while at their desk. Utilization of CrewFam has successfully reduced program onboarding for new engineers.

➢ *10 points:* **Define the unique practices and process you used to develop, lead and manage people?**

The Collins Management System (CMS) is a life cycle value stream-based decision-making framework used to run our businesses, enabled through empowerment, alignment, and accountability and aimed at maximizing customer value. This drives accountability and empowerment of our team members as well as being a consistent decision-making process that includes inputs across functions from the Integrated Product Team (IPT).

B-1B RUP utilizes the CMS life cycle devoted to design and development of programs. It implements Integrated Project Management (IPM) which is used to plan and manage projects throughout the life cycle. An IPT consists of a multifunctional team providing a systematic approach from concept from grave to rebirth for planning and managing work activities for program execution. The CMS was customized at the outset of the program to meet the specific development needs. This ensures time and energy are not wasted on processes that do not provide value to the program.

➢ *10 points:* **How did you leverage skills and technologies of your suppliers?**

The B-1B RUP utilizes the Belcan software company based out of Platteville, WI to develop an application known as the Mission Planning Ground Station (MPGS). The MPGS provides development engineers with a tool to populate data cards with the files necessary to test data loading features of CNMS. Both Collins and BDS utilize this application as part of our development, unit testing, and formal test events.

SECTION 4: DEALING WITH PROGRAM COMPLEXITY
(VOLATILITY, UNCERTAINTY, COMPLEXITY, AMBIGUITY, or VUCA)
Value: 25 points
Use 12 pt. Times Roman typeface

Please respond to the following prompts:

➢ *10 points:* **Describe UNIQUE areas of VUCA faced by your program and why. (Please avoid the issues surrounding Covid-19 pandemic, which was faced by all programs.)**

The obsolescence and age of the CDU created a number of execution obstacles that the team had to tackle in order to achieve the success of the upgrade program.

1. **Age of compiling equipment/software**
   The equipment that B-1B code resides on and is compiled with a Solaris solution that reached End of Life (EOL) 20+ years ago. There are not many people left across the company with the knowledge to support the older Solaris equipment and software. With the age of the equipment and software that is no longer supported by updates, it creates cybersecurity concerns with today's standards. Actions were taken to address the cybersecurity concerns, such as firewalling, which further limited the team's ability to utilize the older hardware.

2. **Testing is done in person, on-site**
   With legacy programs like B-1B the testing is very rudimentary manual (hands on) testing. The sims that B-1B uses are Windows 95 - Disk Operating System (DOS) based programs that require on-site testing. These machines are unreliable with limited supportability.

3. **Maintainability of the LRUs**
   SMEs that originally developed the CDU have retired. The CDU is long out of production, so spares in case of failure are not available to procure and very difficult to locate. Repairing failed units is more difficult and costly due to obsolescence of out of production components.

4. **New, Remote, and Hybrid Employees**
   Program work was relocated from Richardson, TX to a new facility in Huntsville, AL and a newer, less experienced organization. Additionally, Collins is a large, spread-out company with many engineering sites, remote employees, and hybrid employees. This ultimately led to the development team being spread out over the country. This creates challenges in communication and coordination amongst the development team and leadership. This also carries with it inefficiencies to on-boarding new engineers to the development team.

➢ *15 points:* **Explain how your team responded to these challenges. What changes did you make, what were the results?**

Given the age of the hardware, software and supporting infrastructure, the implementation of the below program improvements are a first for the CDU. If the team was not able to overcome and work around these issues it would have driven the need to migrate to a new in production CDU variant. Thus, resulting in a program that would have at least doubled or tripled the time and cost to achieve the same compliance to requirements. These improvements will also make future CDU modifications for sustainment easier to implement.

1. **Age of compiling equipment/software**
   The team collaborated with Collins' Information Technology to outline mitigation strategies and create the necessary redundancy to sustain the ability to compile executables for aging hardware. This resulted in moving compiled software to a virtual machine on more modern hardware that can be more easily replicated. Additionally, a rehost environment was developed, allowing for more efficient development and debug conditions that in turn reduces on target unit testing by software developers.

2. **Testing is done in person, on-site**
   Implementing the virtual CDU along with other prototype software provided the ability to have remote testers interact with a real CDU as if they were physically in the lab.

3. **Maintainability of the LRUs**
   Back up units have been sourced from the customer, other programs within Collins, and the few remaining internal company supplies. This has helped keep the development team stocked with the hardware it needs to continue development and testing.

4. **New, Remote and Hybrid Employees**
   The team created a virtual chat room (conference room) via Teams and ZOOM to help answer technical questions. Additionally, the team holds daily standups meetings per the Agile process. This allowed the team to come together from a far to discuss program topics and timely adjudicate issues. The platform lead took the initiative to travel to remote sites for collaboration and training ahead of execution. These actions helped prepare the team for upcoming work on the program. The creation of the virtual CDU allowed off-site employees to interact with lab assets that were previously limited to on-site personnel only. This provided the team with flexibility by allowing every team member to take on testing tasks. This increased the overall capacity of the team.

SECTION 5: METRICS
Value: 15 points
Use 12 pt. Times Roman typeface

Please respond to the following prompts, where predictive metrics indicate items that provide a view of how yesterday's actions and today's actions will affect the future timeline, cost or other requirement.

Provide charts/graphs that illustrate performance to these metrics:

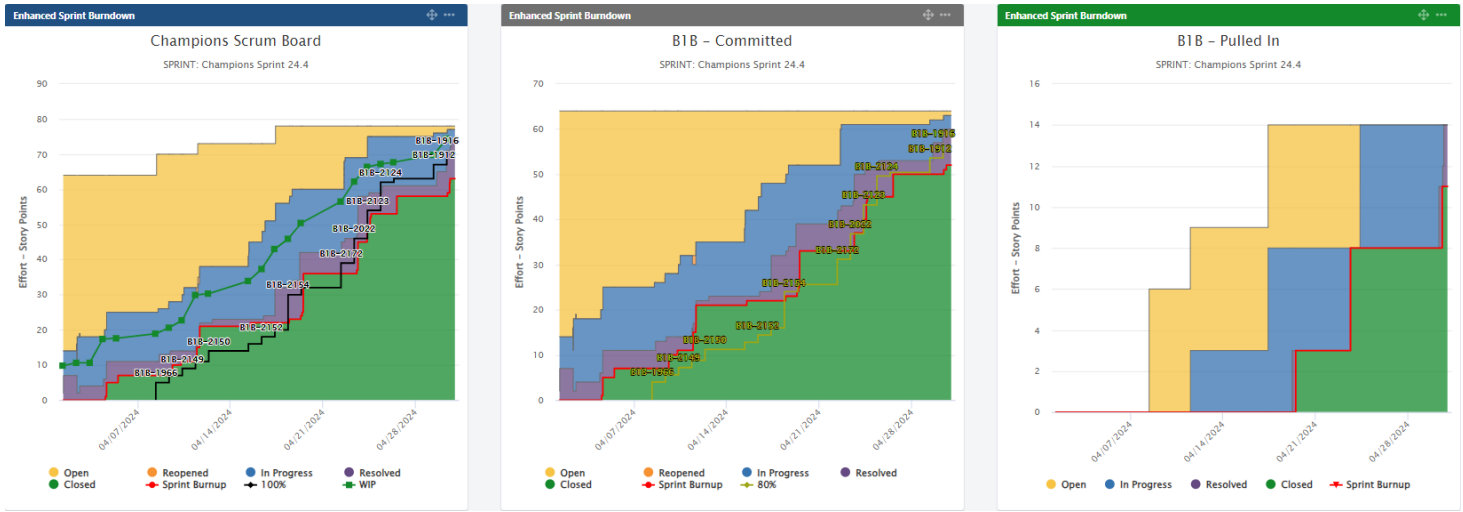➢ **What are your predictive metrics?**

The B-1B RUP team utilizes the Agile Development Process to organize and schedule tasks. A duration of time, known as a "sprint", is defined. Before every sprint, the team calculates its capacity for work that can be accomplished based on availability of personnel and the number of workdays in the sprint. The team is continually defining and sizing packets of work, known as "stories." In preparation for each sprint, planning is performed to identify which stories will be committed to within the sprint. As part of this, each story is evaluated for its need by date, any dependencies on other work, and any risks that might apply. Once the sprint is initiated, a program-unique planned burnup line is created to identify when work will be completed. This line gives the development team a consistent target to work towards, as well as provide leadership a plan to monitor progress.

The following figures show the total sprint, committed story, and pulled-in story progress of an active sprint. Progress is monitored separately against committed work and pulled in work. This allows the team and leadership to evaluate the team's ability to plan and perform to what was originally committed to. It also allows the team to take credit for any extra work performed. Failing to adhere to the committed plan allows the team and leadership to identify issues with planning or discovery of unforeseen issues. Comparing the summation of committed and pulled-in work allows the team to assess the accuracy of the capacity calculations and the size of individual stories.
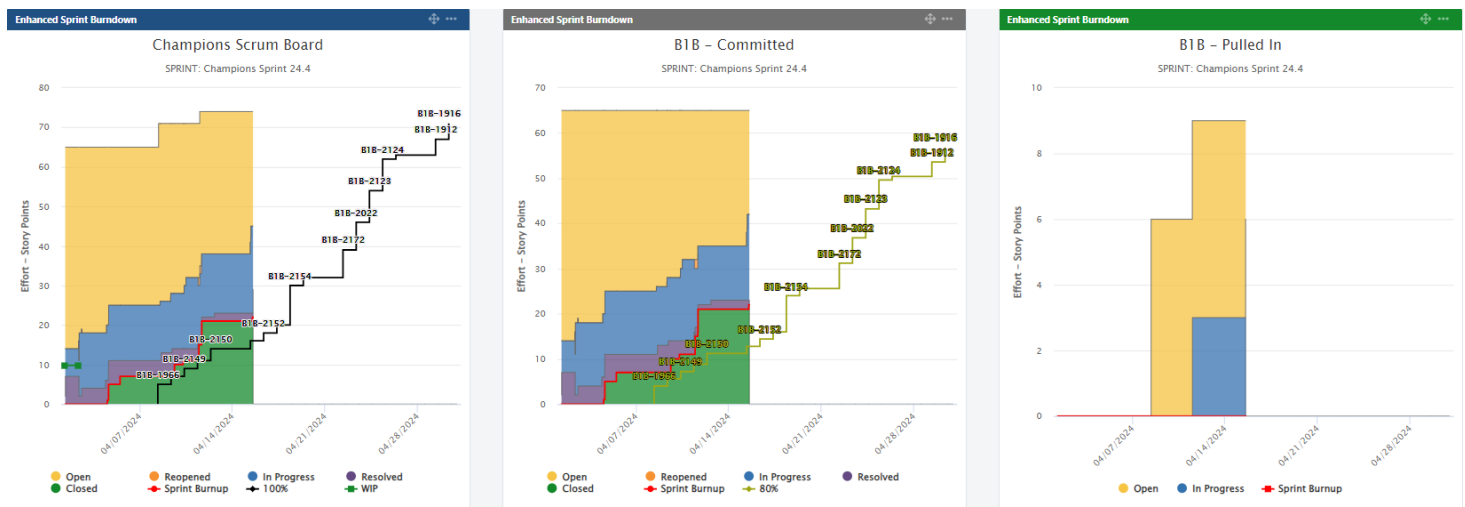
How did you perform against these metrics?

At the completion of each sprint, a review is held. The purpose of the review is to identify where the team was successful and any areas for improvement in the operation or planning of the team's work. The team will use this information to refine its capacity calculation for future sprints. The following figure shows the total sprint, committed story, and pulled-in story progress of the completed sprint. From the figures, we see that the B-1B RUP team met their sprint commitment in terms of story points completed. The team meets or exceeds that commitment sprint after sprint.

➢ **How do your predictive metrics drive action toward program excellence? Please provide examples.**

The program unique burn up line (black "100%" line) in the left figure provides a realistic deadline for each story to be completed. The completion date of each story is evaluated by its need-by date as well as any dependencies on the completion of other stories within the sprint. This creates a clear understanding between the development team and leadership on what the expectations are for each story. The line allows leadership to very quickly identify whether the team is ahead or behind schedule without the need to consult with the team.

Below we see an example from a sprint where the team fell behind due to story interdependencies that provided less linear progress than initially expected. Leadership and the team identified the issue and adjusted the approach to completion of stories. By the end of the sprint, the team managed to catch up to their original plan.