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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>
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COST (\$ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
Total Program Element	-	262.452	237.332	500.575	0.000	500.575	815.046	951.369	721.619	711.021	Continuing	Continuing
640141: <i>Advanced Battle Management System (ABMS)</i>	-	262.452	237.332	500.575	0.000	500.575	815.046	951.369	721.619	711.021	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

ABMS is the primary program element funding architecture, digital infrastructure and software development for the Department of the Air Force's (DAF) primary contribution towards meeting the Joint All-Domain Command and Control (JADC2) warfighting concept. JADC2 requires individual military activities not simply be deconflicted, but integrated (i.e., activities in one domain must enhance the effectiveness of those in other domains and compensate for vulnerabilities). ABMS PE programs will therefore connect sensors, battle management C2 systems (BMC2), and weapons across both the U.S. Space Force (USSF) and U.S. Air Force (USAF) through the delivery of aligned infrastructure and secure data to enable global battle management for JADC2. The DAF formally refers to its integrated JADC2 deliverable as the "DAF BATTLE NETWORK."

On 24 Nov 2020, the DAF Rapid Capabilities Office (DAF RCO) became the ABMS Integrating Program Executive Office (PEO) in a deliberate transition to start acquiring enduring ABMS capability through focused acquisition efforts and investments in a robust DAF digital infrastructure. In September 2022, the Secretary of the Air Force (SecAF) directed the standup of the DAF Integrating Program Executive Office for Command, Control, Communication and Battle Management (DAF PEO C3BM). The construct emerged out of the Operational Imperatives (OI) analysis that identified a significant need for C3BM integration and a greater level of system-of-systems engineering and technical discipline across the enterprise to ensure the effectiveness of ABMS in supporting DAF operations. Notably, DAF PEO C3BM combines the previous efforts of the DAF Rapid Capabilities Office (RCO) ABMS program and the DAF Chief Architect Office (CAO). By bringing the ABMS and CAO portfolio of programs and authorities under a single PEO and then conferring unto that PEO the responsibility to integrate broader DAF battle management and C2 capabilities, one organization now has the architectural authorities to direct technical integration activities across the DAF while also having the acquisition authorities of a PEO to execute organic materiel solutions to field a survivable, distributable command and control capability into the integrated DAF BATTLE NETWORK. The C3BM construct will enable the DAF to provide a resilient decision advantage that will enable the joint force win against the pacing challenge.

The DAF PEO C3BM identified an initial set of 50 programs across the DAF that collectively comprise the core elements of the DAF BATTLE NETWORK. The DAF PEO C3BM will work in partnership with the PEOs of these core programs to ensure the technical and programmatic integration necessary to achieve the required operational decision advantage needed by the USAF, USSF, joint, and coalition forces to win against the pacing challenge. The DAF PEO C3BM will employ a range of integration and reporting activities with the PEOs for Command, Control, Communication, Intelligence and Networks; Digital; DAF Rapid Capabilities Office; Space Force PEO for Battle Management, Command, Control, and Communication; Space Development Agency; Space Rapid Capabilities Office; the National Reconnaissance Office; the Missile Defense Agency; and other PEOs across the DoD as needed to ensure the DAF BATTLE NETWORK delivers an integrated capability to build situational awareness, make operational decisions, and execute force direction at the scale and speed necessary to win against the pacing challenge. These activities may include technical and programmatic collaboration, reporting, and integration; leveraging the ABMS PE funding to accelerate critical capabilities or activities in

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another PEO to provide the needed DAF BATTLE NETWORK operational outcomes; accepting funding, manning, networks, or facilities from another PEO to design, build, or deliver DAF BATTLE NETWORK capabilities; or executing organic programs with the DAF PEO C3BM to meet DAF BATTLE NETWORK cost, schedule, or performance requirements. The DAF PEO C3BM will exercise technical architecture authorities across the DAF to ensure the Command and Control mission area is integrated technically and programmatically to meet DAF C2 mission requirements and provide the needed resilient decision advantage to the joint and coalition forces the USAF and USSF will fight alongside of.

For clarity in nomenclature, the end-to-end, system-of-systems needed to deliver resilient decision advantage is the DAF BATTLE NETWORK. The core of the DAF BATTLE NETWORK encompasses 50 programs across multiple PEOs collectively called the DAF C3BM Enterprise. The DAF PEO C3BM integrates across the DAF C3BM Enterprise core programs to ensure the DAF BATTLE NETWORK operates as needed to provide resilient decision advantage to the joint and coalition force. The ABMS portfolio of programs are the specific programs the DAF PEO C3BM maintains organic control over from a cost, schedule, and performance standpoint, and initially encompasses the programs formerly executed by the DAF RCO. The ABMS PE content described in this document funds the ABMS portfolio of programs and the architecture and systems engineering work required to execute technical direction across the rest of the DAF.

Relative to the broader DAF BATTLE NETWORK capability, ABMS is therefore not just a weapon system platform or sensor. It is the aggregate of materiel and non-materiel solutions to integrate the essential data network that connects and empowers current and future weapon system platforms and sensors to fight and win in the modern era as defined by the National Defense Strategy and Joint All-Domain Operations Department of Defense directives. Legacy and future sensors from a variety of air and space-based programs and sources will produce data that needs to be made available to operators or systems that need it. Multi-level secure processing occurs on global distributed clouds, tactical edge nodes, infrastructure, platforms, and end user devices where operators interface with the data and applications at the required classification level. For information to flow, the network must be enabled by a combination of government and commercial connectivity pathways to move data to and through a suite of cloud and local edge-based applications that make sense of the environment and apply advanced algorithms aided by artificial intelligence and machine learning. Strategic, operational, and tactical operators use these applications to manage and direct the desired effects using machine-to-machine connections.

Since the DAF BATTLE NETWORK is comprised of a DAF wide collection of acquisition efforts being executed by many different PEOs, the broader collection of "core" programs key to delivering the DAF BATTLE NETWORK must be well aligned. Investments in the ABMS portfolio of programs aligns USAF investment with USSF investment (e.g., Space Command and Control (C2) Program Element PE (1208248SF) and the MeshOne-T PE (1206760SF)) to eliminate duplication of effort while optimizing capability delivery to create the DAF BATTLE NETWORK deliverable.

Under the purview of the DAF PEO C3BM, ABMS will pursue multiple symbiotic investment strategies within PE 0604003F that will seek to optimally leverage "best of breed" capability from across the DAF to facilitate accelerated delivery of the DAF BATTLE NETWORK. The first thrust area is entitled: "Architecture and Systems Engineering (ASE)" and continues work previously conducted under PE 0604006F: Dept of the Air Force Tech Architecture. The ASE team combines DAF Chief Architect authorities with the Systems Engineering authorities needed for the design and fielding of the DAF BATTLE NETWORK. The ASE leads technical architectures for the entire DAF Air and Space portfolio to enable accelerated agile delivery of integrated warfighter capabilities in support of national security objectives. The second thrust area continues, and significantly scales, work from Fiscal Year 2023 and is entitled: "C3BM Software and Applications." The "Cloud-Based Command and Control (CBC2) program falls in the "C3BM Software and Applications" thrust area. The fourth thrust area continues work started in Fiscal Year 2023 and is entitled: "Airborne Edge Node (AEN) C3BM Aerial Networking." The Airborne Edge Node program falls under thrust area #4. In the Fiscal Year 2023 R-Doc for ABMS, CBC2 and AEN

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<p>were collectively captured under a thrust area entitled "Capability Release." In Fiscal Year 2024, these programs have been broken out to the aforementioned thrusts to provide greater insight and understanding to the work ABMS is pursuing in Fiscal Year 2024 and beyond.</p> <p>The purpose of the four C3BM thrust areas is to ensure a focused delivery of ABMS investments to enable the broader DAF BATTLE NETWORK. To do this, all ABMS investments will vector towards delivery of the following ABMS elements:</p> <ol style="list-style-type: none">1. Secure Processing: The hardware and software for processing and storage through multi-level security environments globally and at the edge enabling a full range of military operations.2. Connectivity: Maturation and integration of open software-defined radios and networks, government-owned waveform libraries, and wideband multi-function RF systems. This element also includes the integration and standards required to leverage advances in commercial technology such as Open Communications Standards (OCS), 5G networks, and connections through multi-orbit satellite communications.3. Data Management: Cloud-based data libraries, data feeds, data wrappers, software-defined data management, and content routing to improve data discoverability and information sharing across the joint force for legacy and future platforms and programs.4. Applications: Cloud-based applications to provide User Interface/User Experience (UI/UX) capabilities that will position warfighters "on the loop" to provide robust and dynamic battle management, command, and control (BMC2) functionality, improved timing, and enhanced decision advantage.5. Sensor Integration: ABMS will develop (as needed), codify, and mature government-owned standards, solidify interface specifications, and will provide open and reusable capabilities to ensure interoperability with the ABMS digital infrastructure* for existing and future military systems.6. Effects Integration: ABMS will develop (as needed), codify, and mature government-owned standards and interface specifications to ensure the successful integration of DAF and Joint effects capabilities into the ABMS digital infrastructure* for existing and future military systems. <p>To ensure effective delivery of capability across the four C3BM Thrust Areas in accordance with the aforementioned 6 ABMS elements, an ABMS Battle Lab will provide a critical digital experimentation environment to explore and vet new command and control technologies, as well as to develop C2 tactics, techniques, and procedures. The ABMS Battle Lab will allow warfighters direct interaction with software development teams and prototypes in development, speeding up the feedback loop and product maturity.</p> <p>Thrust Area 1: "Architecture and Systems Engineering (ASE)" encapsulates the following categories of activity in Fiscal Year 2024: 1) Digital Engineering, 2) Mission Domain Architectures, Mission Integration Team (MITs), and Enterprise Integration as it relates to the identification, capture, maturation, and codification of derived requirements, standards, interface specifications, and/or new technologies that enable delivery of an integrated DAF BATTLE NETWORK that will directly contribute to the joint fight in the face of a pacing challenge, and 3) an Operational Response Team (ORT) facilitating quick reaction prototyping and experimentation in response to</p>		

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<p>warfighter-led efforts and new relevant technologies. Thrust Area 1 supports all 6 ABMS elements to ensure effective delivery of ABMS Thrust Areas 2, 3, and 4, as well as any activities considered to be C3BM core programs.</p> <p>Thrust Area 2: "C3BM Digital Infrastructure" encapsulates the following categories of activity in Fiscal Year 2024: 1) ABMS Digital Infrastructure (DI), 2) the ABMS Consortium, and 3) the ABMS Battle Lab. ABMS DI covers the ongoing work of Distributed Battle Management Node (DBMN), Software Defined Wide Area Network (SD-WAN), and several other digital infrastructure activities to include Deployable Digital Infrastructure (Deployable DI), Tactical and Enterprise Cross Domain Solutions (CDS), and ABMS-specific support for DAF enterprise solutions. Thrust Area 2 satisfies the ABMS Elements of secure processing, connectivity, and data management.</p> <p>Thrust Area 3: "C3BM Software and Applications" encapsulates the following categories of activity in Fiscal Year 2024: 1) Cloud-Based Command and Control (CBC2) and (2) Distributed Battle Management Applications. For Cloud-Based C2, efforts include LOE #1 for a SW Integrator, LOE #2 for Agile Software Development at scale, and LOE #3 for data transport, storage, and access, as well as platform investment. For Distributed Battle Management Applications, ABMS Thrust Area 3 will continue development and extension of CBC2 functionality, initially developed for NORAD & USNORTHCOM Battle Control Centers, to other DAF BATTLE NETWORK entities (e.g. the Tactical Operations Center Family of Systems, or TOC FoS) in line with Air Combat Command's (ACC) Common Battle Management Command and Control (BMC2) Interface (CBI) concept. Inherent to the C3BM Software and Applications Thrust Area is the requirement to align and/or integrate with multiple DAF software factories, artificial intelligence and machine learning centers of excellence, and DAF Data as a Service solutions to facilitate efficient deployment of critically needed software capabilities through development, staging, and production in support of joint operations. Thrust Area 3 contributes to ABMS element 4 (i.e. Applications) and leverages ABMS DI delivered capability (ABMS elements #1, #2, and #3) to achieve ABMS elements #4, #5, and #6.</p> <p>Thrust Area 4: "C3BM Aerial Networking" covers the ongoing work associated with the Airborne Edge Node (AEN), including Capability Release #1 (CR #1) and the effort to extend AEN capabilities to tactically relevant aircraft. AEN will connect select Tac Air assets and C2 functions to the ABMS cloud at the tactical edge, enhancing Situational Awareness and decision making at multiple echelons. CR #1 is the first prototype effort for AEN and will inform future design and fielding decisions for other platforms and C2 functions to connect to the ABMS DI. This work includes a Communications Subsystem, platform integration, and onboard tactical edge node capabilities for secure compute, and storage to host mission applications that increase aircrew situational awareness. The Airborne Edge Node work will include continued development and maturation of multi-function processors, multi-function arrays, edge node hardware and software to host mission applications, and platform integration options to ease implementation and scaling.</p> <p>To ensure delivery of ABMS projects in each ABMS Thrust Area, and to ensure alignment of the broader DAF from a battle management perspective, ABMS funding provides for program management support, operational concept development and demonstration, hardware development and integration, software development and integration, and other government costs.</p> <p>This program element may include necessary emergent or unanticipated civilian and National Guard/Reserve Duty pay expenses required to manage, execute, and deliver for emergent or unanticipated weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program element 0605831F and 0604858F.</p>		

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This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

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B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	268.849	231.408	556.108	0.000	556.108
Current President's Budget	262.452	237.332	500.575	0.000	500.575
Total Adjustments	-6.397	5.924	-55.533	0.000	-55.533
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-4.076			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	10.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-6.397	0.000			
• Other Adjustments	0.000	0.000	-55.533	0.000	-55.533

Change Summary Explanation

FY 2022: Program reduced -6.397M in total due to SBIR/STTR transfer in the year of execution.

FY 2023: The program received a +10.000M Congressional add and a FFRDC Reductions (Section 8026(e)) of -4.076M.

FY 2024: Reflects a -55.533 decrease to the overall program from previous President's Budget. This amount significantly ramps up funding from FY23 to FY24 in order to support execution of ongoing acquisition strategies and develop new efforts that are needed to deliver ABMS capability, SecAF directed initiatives for accelerated delivery of ABMS and JADC2 capability (consistent with the SecAF's Operational Imperatives (OI) efforts initiated in December 2021), and Architecture and Systems Engineering (ASE) work previously conducted under PEO 0604006F and evolved under DAF PEO C3BM. ABMS portfolio efforts in Fiscal Year 2024 support the DAF's migration toward resilient, distributable battle management by developing the ability to federate BMC2 tasks, functions, and execution, while providing the computational platform, data connectivity, and decision support tools to support these battle management nodes as dictated by the operational environment.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
Title: Architecture and Systems Engineering (ASE)	0.000	0.000	80.000

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
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Description: DAF PEO C3BM combined the roles of the Chief Architect and the Chief Engineer into a single office called the Architecture and Systems Engineering (ASE) office, which is responsible for the technical integrity of the DAF BATTLE NETWORK as we integrate ABMS capabilities, the rest of the DAF's C2 systems, and other Services's capabilities under JADC2.

Architecture integration in system-of-systems mission threads and environments is critical to deliberately advancing the DAF's technological edge by informing architecture design, acquisition investments, system requirements for future capabilities, and acquisition baseline updates for current systems.

FY 2023 Plans:

- These activities were previously conducted under PE 0604006F: Dept of the Air Force Tech Architecture.

FY 2024 Plans:

Digital Engineering (DE):

- Leverage, or create as necessary, a common DE approach and methodology for all the Mission Integration Teams to aggregate and analyze various cross-functional and cross-domain data products, and to then make them available to the C3BM Enterprise. Fund Model-Based Systems Engineering at the TS/SCI and SAP level for all ASE and DAF/OSD/Joint partners. This environment supports government sensitive C3BM and Joint partner planning and integration efforts. This DE environment is fully complementary to analogous contractor-led ABMS DE efforts.

- Develop Modeling & Simulation capabilities to enable evaluation of C3BM systems virtually via software digital twins.

Mission Domain Architectures (MDA) and Mission Integration Team (MITs):

Through MDA and MIT activities, ASE will perform the following functions in support of the broader success of the C3BM Enterprise.

- Operational Analysis: Build models and provide mission value metrics for C3BM decisions. Invest in longer-lead modeling to enable rapid responsiveness to Mission Integration Team priorities set annually in consultation with C3BM Enterprise stakeholders. Fiscal Year 2023 initiated the build out of MIT capabilities spanning the air, space and maritime domains. Fiscal Year 2024 will complete this work and will scale out capability for land and homeland defense.

- Architecture Modeling: Model interfaces and interactions for specified mission areas. Build team to support DAF programs, and OSD/Joint Staff on standards for integration.

- System Engineering: Build team to manage artifacts in the DE environment related to tracking interfaces, roadmaps and progress.

- Risk Reduction: Hold community-wide enterprise risk reviews yearly with different communities (operators, S&T, Tech Advisors, cyber) and manage enduring risk register and provide senior leader products.

- Test and Evaluation: Build team to analyze artifacts to test mission area architecture.

FY 2022	FY 2023	FY 2024

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
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Operational Response Team (ORT):

- Prototype Integration and Experimentation: Continue operational integration and experimentation of the initial Digital tactical edge connectivity prototype as it transitions to C3BM Digital Infrastructure for further development.
- Continue to prototype and experiment Deployable DI mobile solutions that provide multi-level security compute and storage able to host mission data, data management software, and mission applications at deployed C2 nodes. Support identification, orchestration, "shepherding" and potential investment in emergent C3BM technologies. Rapidly develop and execute experimentation and prototyping activities in support of ASE findings to mitigate risks or exploit opportunity identified during mission engineering or architecture development work.
- C3BM Vignette Analysis: Continue Counter-C5ISRT (Command and Control, Communications, Computers, Cyber, Intelligence, Surveillance, Reconnaissance, Targeting) numerical analysis, modeling, and simulation to assess impact of specific capabilities on the ability to protect US assets and achieve mission success to prioritize DAF investments and modernization.

FY 2023 to FY 2024 Increase/Decrease Statement:
Fiscal Year 2023 funding for Architecture and Systems Engineering (ASE) was executed under PE 0604006F: Dept of the Air Force Tech Architecture. Fiscal Year 2024 funding for ASE has been consolidated under PE 0604003F. The budget increased due to adding architecture development to ensure the technical integrity of the system of systems integration across air, space, maritime, land, and homeland defense domains to integrate the DAF BATTLE NETWORK. Furthermore, Fiscal Year 2024 funding will increase over Fiscal Year 2023 as investment in emergent commercial technologies, to accelerate operational adoption, are made.

Title: C3BM Digital Infrastructure (DI)	71.000	86.838	270.121
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Description: The C3BM DI effort, which incorporates Fiscal Year 2023 efforts referred to as ABMS DI, reflects a composite of activities to deliver ABMS Elements #1 (secure processing), #2 (connectivity), and #3 (data management). The ABMS DI orchestrates ongoing digital infrastructure activities to provide a multi-level security (i.e. unclassified to top secret) environment as a foundation for battle management C2 (BMC2) data and software across the space, airborne, and terrestrial domains. C3BM DI investments ensure the ability to connect the joint force and allow decision advantage at the tactical, operational, and strategic levels. In Fiscal Year 2024, C3BM DI will start the initial phase of physical infrastructure procurement. Investments focus on hybrid commercial and tactical edge multi-level security, multi-cloud environments resulting in secure compute and storage capability. Solutions will provide tactical edge secure processing environments and tools to enable both "remote operations" and "on the move" operations when disconnected from the broader network and global environment. These secure processing solutions will host critical services such as robust data management solutions, zero-trust multi-level security applications, Artificial Intelligence (AI) algorithms and Machine Learning (ML) capabilities.

FY 2023 Plans:

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
<ul style="list-style-type: none"> - Continue ABMS Consortium comprised of traditional and non-traditional companies to perform Operational Analysis, Mission Analysis, Systems Engineering, and Integration of the ABMS Digital Infrastructure. - Continue maturing CONUS and OCONUS clouds by adding more data types, data transfers across classification levels, establishing data and network management standards and tools, and developing and hosting cloud-native applications. - Continue maturing connections between CONUS, OCONUS, and existing clouds. - Continue data architecture, data tagging and data orchestration design solutions and prototypes that enable available data to be exposed, processed and transferred amongst multi-level security ABMS cloud environments. - Integrate with and expand Battle Lab connections to additional sites / C2 programs. - Integrate with and expand Battle Lab connections to Joint Partners, to include Project Convergence and Project Overmatch. - Begin deployment of ABMS Digital Infrastructure to the Battle Lab. - Integrate with Capability Release #1 Line of Effort #3 (Tactical Edge Node Situational Awareness and Edge Processing). <p>FY 2024 Plans: Beginning in FY 2024, there are 3 major efforts within Thrust Area #2 - "C3BM Digital Infrastructure":</p> <ol style="list-style-type: none"> 1. ABMS Digital Infrastructure (DI) 2. ABMS Consortium 3. ABMS Battle Lab <p>ABMS Digital Infrastructure (DI):</p> <ul style="list-style-type: none"> - ABMS DI invests in technologies and solutions to expose, transport, and host data and mission/infrastructure software through widely used commercial best practices and techniques such as Application Program Interfaces (APIs) and standardized data fabric solutions. This capability includes the capability for machine-assisted tagging of data across the DAF to enable rapid exploitation and processing. These techniques enable data to rapidly and securely move across multiple security levels and support decision making. High priority data management solutions include critical investments in zero-trust multi-level security applications, Cross Domain Solutions (CDS), as well as Artificial Intelligence and Machine Learning (AI/ML) capabilities. - ABMS DI connectivity-related focus areas include Software-Defined Wide Area Networking (SD-WAN) solutions, which will deliver capabilities to enable resilient, robust, communications and the transport of data globally, to the edge, and through space. This will include the software-defined networking and routing layer to enable content routing across connected nodes through both government and commercial communication paths. SD-WAN will integrate into existing and future connectivity solution efforts in order to bridge gaps across existing and future platforms. In partnership with ongoing USSF satellite communication efforts, ABMS will also leverage the rapidly advancing commercial satellite ecosystem to provide SD-WAN solutions that will ensure robust and resilient connectivity for the Joint Force. - ABMS will also develop Deployable DI solutions that provide a multi-level security compute and storage environment able to host mission data, data management software, and mission applications at deployed C2 nodes. Initial deployment locations include 				

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
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<p>Wing Operations Centers (WOC) and Tactical Operations Centers (TOC) supporting the Lead Wing concept for Agile Combat Employment (ACE). Deployable DI will include an interface to connect with ABMS SD-WAN and/or existing communications infrastructure, as needed.</p> <ul style="list-style-type: none"> - The ABMS DI portfolio includes the ABMS Distributable Battle Management Node (DBMN), an edge instance of ABMS DI, aligned to the Tactical Operations Center-Light concept for tactical C2. This effort provisions lightweight, scalable connectivity, data management, and edge compute/store for tactical edge battle management command and control (BMC2). - ABMS DI will fund efforts related to content delivery, datalink integration, and scalable transport is underway in partnership with operational MAJCOMs, Air Combat Command, the ABMS CFT, and C3BM ASE. As operational and technical requirements are refined, ABMS DI will look to accelerate development of acquisition strategies and propel additional efforts into execution. - ABMS DI will provide funding to the Space Systems Command MeshOne-T program and Space Data Fusion programs to provide resilient long-haul terrestrial data transport capacity for ABMS solutions delivered under the larger DAF PEO C3BM architecture and to facilitate the integration and processing of space data for the broader set of C3BM requirements. Space Data Fusion efforts are consistent with the scope of ABMS Consortium data related efforts (see below for more details) by exposing and processing key data sets as needed. <p>ABMS Consortium:</p> <ul style="list-style-type: none"> - Continue ABMS Consortium activity comprised of industry partners, federally funded research and development centers (FFRDC), and USG stakeholders performing operational analysis, mission analysis, Systems Engineering, and integration of ABMS Digital Infrastructure. - Continue data architecture, data tagging, and data orchestration design solutions and prototypes that enable available data to be exposed, processed, and transferred within multi-level security ABMS cloud environments. - Continue maturing the extension of the ABMS DI to the tactical edge based on operator and ABMS CFT input. - Continue maturing CONUS and OCONUS clouds by adding more data types, data transfers across classification levels, establishing data and network management standards and tools (e.g., SD-WAN), and developing and hosting cloud-native applications (e.g., Cloud-Based C2, advanced targeting tools, air base air defense applications, etc.). <p>ABMS Battle Lab:</p> <ul style="list-style-type: none"> - Support experimentation efforts within the Battle Lab construct to accelerate requirements development. - Integrate with and expand Battle Lab connections to Joint Partners. - Begin deployment of ABMS Digital Infrastructure to the Battle Lab. - Integrate with Airborne Edge Node (Tactical Edge Node Situational Awareness and Edge Processing) and Cloud-Based C2. 			
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FY 2023 to FY 2024 Increase/Decrease Statement:

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
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Fiscal Year 2024 increased significantly due to improved maturity of operational concepts, requirements, and architecture definition with corresponding increase in number of fully defined and approved acquisition efforts (e.g. SD-WAN, Deployable DI, Distributable Battle Management Node) in addition to the continuation of ongoing ABMS DI acquisition efforts (e.g. Battle Lab, tactical and enterprise Cross Domain Solution, content delivery network, datalink integration, and scalable transport).			
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Title: C3BM Software and Applications	81.770	84.648	85.200
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Description: Under Thrust Area #3, the C3BM Software and Applications effort encompasses ABMS portfolio activities that deliver ABMS Element #4 (applications) to facilitate Elements #5 and #6 (sensor and effects integration). These applications comprise front end (e.g., User Interface and User Experience, or UI/UX, Course of Action Recommendation tools, etc.) and back end microservices (data fusion, data brokering, track management, etc.). Where ABMS DI does not currently provide infrastructure services, C3BM Software and Applications leverages current DAF enterprise solutions (e.g. Cloud One, Platform One, etc.). C3BM Software and Applications develops C2 applications and integrates with DAF Software Factories (e.g. Kessel Run, Kobayashi Maru, etc.) to eliminate duplicative development. These software efforts are complementary and are working to facilitate sharing of data and products from multiple domains and echelons of command to provide decision advantage. C3BM Software development activities are executed with a continuous integration/continuous delivery (CI/CD) model that places operators as a critical member of the team and drives agile software development activities to generate user feedback and consistent product improvement.

Cloud-Based C2 (CBC2):

- CBC2 modernizes battle management and command and control functions by replacing four existing C2 systems with modern Cloud-Based applications, enhanced by AI/ML, to create a common operating picture. Initial development efforts are focused on delivery to Air Defense Sectors (ADS) in NORAD and USNORTHCOM (N&NC) as well as Pacific Air Defense Sector (PADS); however, CBC2 is also working to provide hardware and software solutions that are extensible to additional Combatant Commands (COCOMs). This software suite equips operators executing tactical C2 in CONUS and OCONUS Air Defense Sectors (ADS) with modernized applications to ingest data from civilian and military sensors, fuse it with additional sources of data, conduct mission planning with machine-to-machine ingest of higher echelon tasking products, apply force accountability and risk assessments to a dynamic air picture with thousands of tracks, facilitate real time computing and scoring of Courses of Action (CoA) in order to speed F2T2EA timelines, and provide a UI/UX for battlespace awareness. CBC2 development follows commercial best practices for agile software development with an industry software integrator driving warfighter delivery across several independently contracted microservice developers.

Distributed Battle Management Apps:

- The extensibility of CBC2 aligns to Operational Imperative #2 initiatives associated with distributed battle management and Air Combat Command's Common BMC2 Interface (CBI). Additional software development teams will be established to increase

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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>
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C. Accomplishments/Planned Programs (\$ in Millions)

the number of C2 services that the core CBC2 applications for N&NC provide. Requirements currently under development for joint tactical integrated fire control and long range kill chains will trigger development activities for applications and advanced targeting tools development for maturing operational concepts including that are needed at the Tactical Operations Center Family of Systems (TOC FoS) and other maturing operational concepts.

FY 2023 Plans:

Cloud-Based C2 (CBC2):

- Continue design development activities focused on developing a scalable and extensible data-cloud architecture that leverages artificial intelligence/machine learning (AI/ML) applications and produces a common operating picture.
- Continue developing shared visualization of multiple sources: automated & fused 2D/3D representation of air domain.
- Ingest, fuse, and analyze data from military, government, and commercial sources to multi-classification cloud environments.
- Continue to develop automated and operator-selectable tasking of assets, voice, data and C2.
- Continue integrating new and existing development teams with ABMS Software Integrator to create a micro-services Cloud-Based C2 system for N&NC that is fully government owned.
- Continue building micro-services based software applications that will enable Cloud-Based C2.
- Continue efforts to design and build infrastructure pieces to support Cloud-Based C2 to include but not limited to: platform, cloud, cloud outposts, data transport, tactical data bus, identity management, zero trust network, cyber defense and data storage solutions.
- Continue Quarterly minimum viable product (MVP) releases, iteratively building out the Cloud-Based C2 application/software baseline, targeting minimum viable capability release (MVCR) to N&NC by the end of FY23.
- The Cloud-Based C2 application/software baseline is the starting point of Air Combat Command's (ACC) Common Battle Management Interface (CBI), which is the foundation of ACC's Battle Management Command & Control (BMC2) Roadmap.

FY 2024 Plans:

Cloud-Based C2 (CBC2):

- Continue design /development activities focused on developing a scalable and extensible data-cloud architecture that leverages artificial intelligence/machine learning (AI/ML) applications and produces a common operating picture.
- Continue developing shared visualization of multiple sources, automated and fused representation of air domain.
- Ingest, fuse, and analyze data from military, government, and commercial sources to multi-classification cloud environments.
- Continue to develop automated and operator-selectable tasking of assets, voice, data and C2.
- Continue integrating new and existing development teams with ABMS Software Integrator to create a micro-services CBC2 system that is fully government owned.
- Continue building micro-services-based software applications that will enable distributed battle management.

FY 2022	FY 2023	FY 2024

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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force		Date: March 2023		
Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>		R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>		
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
<ul style="list-style-type: none"> - Continue efforts to design and build infrastructure to support CBC2 to include but not limited to: platform, cloud, cloud outposts, data transport, tactical data bus, identity management, zero trust network, cyber defense and data storage solutions. - Continue quarterly minimum viable product (MVP) releases, iteratively building out the Cloud-Based C2 application/software baseline and addressing product backlogs associated with N&NC deliveries in pursuit of full operational capability (FOC). <p>Distributed Battle Management Apps:</p> <ul style="list-style-type: none"> - Continue development based on core CBC2 tactical C2 software suite to extend microservices functionality to support distributed BMC2 operational concepts and CBI requirements and associated capability needs. - Build microservices consistent with CBC2 development approach and in response to capability needs associated with joint tactical integrated fire control, long range kill chains, and other BMC2 functions. - Continue developing shared visualization consistent with CBC2 with automated and fused representation of multiple domains. - Continue integrating new and existing development teams with ABMS Software Integrator to create a microservices CBC2 system that is fully government owned. - Continue quarterly minimum viable product (MVP) releases, iteratively building out extensibility to additional distributed battle management operational concepts (e.g. Tactical Operations Center Family of Systems). - Facilitate transition of advanced targeting tools (e.g. developed under the Hawkeye program) by ensuring compatibility with ABMS digital infrastructure and battle management software. <p>FY 2023 to FY 2024 Increase/Decrease Statement: Fiscal Year 2024 increased due to additional software teams supporting distributed battle management operational concepts and ACC's CBI.</p>				
<p>Title: C3BM Aerial Networking</p> <p>Description: Under Thrust Area #4, the C3BM Aerial Networking efforts encompass ABMS portfolio activities that deliver ABMS Element #1 and 2 (secure processing and connectivity) to facilitate Elements #5 and #6 (sensor and effects integration). AEN leverages government reference architecture and the ongoing ABMS DI investments to connect select Tac Air assets and C2 functions to the ABMS cloud at the tactical edge, enhancing Situational Awareness and decision making at multiple echelons. AEN's first implementation, known as Capability Release #1, includes a communications subsystem, platform integration, and a tactical edge node, CR #1 will be on a KC-46. Onboard secure compute/storage infrastructure will host mission-relevant applications and be developed as a roll-on/roll-off capability using commercial solutions. Further, C3BM Aerial Networking includes an effort, known as Phalanx Griffon, to extend AEN capabilities to tactically relevant aircraft based on maturing operational concepts and aerial network road mapping activities. This effort will initially be based on the F-15E/EX which can be traced back to Operational Imperative #2 operational analysis and ACC input. AEN prototype efforts will inform future design and fielding activities for platforms and C2 functions.</p>		109.682	65.846	65.254

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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 4: <i>Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>
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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
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<p>FY 2023 Plans: Capability Release #1: - Complete integration of capability on the KC-46 and conduct flights for test, military utility assessments, and Concept of Operations experimentation. - Complete development of a palletized compute and store enclave with local cloud storage, cloud synchronization, and network Management functions. - Complete build of additional podded systems to meet quantities in the requirement. - Maximize use of digital engineering, modern software development practices, and open architecture principles; develop Technical Data Package to enable potential follow-on development and integration activities.</p> <p>FY 2024 Plans: Capability Release #1: - Continue development and test activities associated with the CR #1 communications subsystem, including test and demonstration of skill development (e.g. MADL, DLOS, etc.) and preparations for security certifications. - Complete integration of Tactical Edge Node capability on the KC-46 and conduct planning for flights for test, military utility assessments, and Concept of Operations experimentation. - Complete development of a palletized compute and store enclave with local cloud storage, cloud synchronization, and network management functions. - Maximize use of digital engineering, modern software development practices, and open architecture principles; develop Technical Data Package to enable potential follow-on development and integration activities. - Demonstrate fieldable KC-46 capability in FY24 via Tactical Edge Node hardware and organic KC-46A communications capabilities.</p> <p>Phalanx Griffon: - Complete study for F-15E/EX platform integration options and develop mission architecture for acquisition planning activities. - Leverage CR#1 capabilities as applicable (e.g. security cryptographic module, or SCM) to continue development of open architecture multi-function processor tailored for hosting on tactical aircraft (i.e. F-15E/EX). - Continue development of content routing and communications software. - Conduct planning for test and demonstration activities associated with Phalanx Griffon. - Maximize use of digital engineering, modern software development practices, and open architecture principles; develop Technical Data Package to enable potential follow-on development and integration activities.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement:</p>			
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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>
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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
Work remains consistent from Fiscal Year 2023 to Fiscal Year 2024 as the team will finish out deployment of KC-46 Tactical Edge Node hardware and communication capabilities and will continue work for hosting capability on the F-15E/EX.			
Accomplishments/Planned Programs Subtotals	262.452	237.332	500.575

D. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

E. Acquisition Strategy

ABMS is building a portfolio of acquisition efforts and should not be viewed as a monolithic program. The first acquisition effort, formerly named Capability Release #1 (CR #1) and now referred to as AEN CR#1 under the C3BM Ariel Networking Thrust Area, is an ACAT II effort. The CR#1 acquisition strategy was approved by the Service Acquisition Executive (SAE) on 15 Jun 21. Cloud-Based C2 (CBC2) is Software Pathway program formerly captured under CR#1 and its acquisition strategy was approved by the SAE in May 2022. Aside from AEN and CBC2, the ABMS Digital Infrastructure project acquisition strategy was approved by the SAE in Nov 21 in order to initiate development of the ABMS Consortium. Follow-on Digital Infrastructure (DI) acquisition plans for Distributable Battle Management Node (DBMN), Software Defined Wide Area Networking (SD-WAN), and Deployable Digital Infrastructure leveraged the Middle Tier of Acquisition Rapid Prototyping Acquisition Pathway and were approved by DAF PEO C3BM in October 2022 and January 2023. Additional acquisition strategies will be developed and approved during the remainder of FY23.

The ABMS agile acquisition strategy and development approach is modeled after the path of commercial innovation and internet of things technology practices. The acquisition strategy breaks capabilities - that might traditionally be developed as a monolith in the government - up into modular components and then integrates them through open standards and an open architecture derived from ASE driven analysis. Modularity and openness enable increased competition and continuous innovation, as well as more rapid upgrade of product capabilities. Software development and hardware development can both follow this path—a proven, successful model that is employed in the commercial world as well as in agile government entities.

The iterative nature of technology and speed of technical obsolescence in the 21st century digital age mandate an agile approach to capability development, integration, and delivery that is both rapid and continuous. DAF PEO C3BM will make targeted investments in select areas and technologies to stabilize and integrate core operational capabilities, expedite the delivery of warfighter capability, and close operational gaps. This model is maturing FY2023 and FY2024, as is a number of digital infrastructure and software development efforts are in execution deploying minimum viable products across the DAF in keeping with a continuous integration/continuous delivery mindset where operators involved in regular feedback loops and a variety of traditional and non-traditional defense contractors involved in delivery.

To enable the speed and agility required by this acquisition strategy, the ABMS acquisition efforts have developed a contracting strategy that is highly flexible. Though the program employs the full range of contracting authorities, ABMS is currently utilizing, but not limited to, the following contracting vehicles to execute requirements: 1) JADC2 Multiple-Award, Multi-Level Security (MA-MLS) Indefinite Delivery/Indefinite Quantity (ID/IQ) vehicle; 2) JADC2 Broad Agency Announcement with Calls to

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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3600: <i>Research, Development, Test & Evaluation, Air Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>

include a Call soliciting sources to participate in Cooperative Research and Development Agreements (CRADAs); 3) JADC2 Commercial Solutions Opening; 4) Small Business Innovation Research Phase III efforts; and 5) already existing contract vehicles where ABMS acquisition efforts are within scope. Additional vehicles will be considered on an as-needed basis.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>	Project (Number/Name) 640141 / <i>Advanced Battle Management System (ABMS)</i>
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Product Development (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ASE: Digital Engineering	Various	DAF PEO C3BM: Multiple : TBD	-	0.000	Oct 2021	0.000	Oct 2022	7.000	Oct 2023	0.000		7.000	Continuing	Continuing	-
ASE: Mission Domain Architecture & Mission Integration Team	Various	DAF PEO C3BM: Multiple : TBD	-	0.000	Oct 2021	0.000	Oct 2022	64.000	Oct 2023	0.000		64.000	Continuing	Continuing	-
ASE: Operational Response Team	Various	DAF PEO C3BM: Multiple : TBD	-	0.000	Oct 2021	0.000	Oct 2022	9.000	Oct 2023	0.000		9.000	Continuing	Continuing	-
ABMS Digital Infrastructure (ABMS DI)	Various	DAF PEO C3BM: Multiple : TBD	-	41.347	Jun 2022	58.848	Jun 2023	226.801	Jun 2024	0.000		226.801	Continuing	Continuing	-
ABMS Consortium	C/FP	DAF PEO C3BM: Multiple : TBD	-	23.403	Jun 2022	24.100	Jun 2023	24.820	Jun 2024	0.000		24.820	Continuing	Continuing	-
ABMS Battle Lab	Various	DAF PEO C3BM: Various : TBD	-	0.000	Jun 2022	0.000	Jun 2023	10.000	Jun 2024	0.000		10.000	Continuing	Continuing	-
Cloud-Based Command and Control (CBC2)	Various	DAF PEO C3BM: Multiple : TBD	-	80.435	Sep 2022	82.283	Sep 2023	78.200	Sep 2024	0.000		78.200	Continuing	Continuing	-
Distributed Battle Management Applications (DBMA)	Various	DAF PEO C3BM: Multiple : TBD	-	0.000	Sep 2022	0.000	Sep 2023	6.000	Sep 2024	0.000		6.000	Continuing	Continuing	-
Airborne Edge Node (AEN) CR#1	Various	DAF PEO C3BM: Multiple : TBD	-	84.830	Sep 2022	39.959	Sep 2023	23.475	Sep 2024	0.000		23.475	Continuing	Continuing	-
Phalanx Griffon	Various	DAF PEO C3BM: Multiple : TBD	-	0.000	Sep 2022	0.000	Sep 2023	4.000	Sep 2024	0.000		4.000	Continuing	Continuing	-
SBIR/STTR	TBD	TBD : TBD : TBD	-	0.000	Oct 2021	7.490	Oct 2022	18.321	Oct 2023	0.000		18.321	Continuing	Continuing	-
Subtotal			-	230.015		212.680		471.617		0.000		471.617	Continuing	Continuing	N/A

Test and Evaluation (\$ in Millions)				FY 2022		FY 2023		FY 2024 Base		FY 2024 OCO		FY 2024 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
ABMS DI: Test	Various	Various : TBD	-	6.250	Jan 2022	3.891	Jan 2023	8.500	Jan 2024	-		8.500	Continuing	Continuing	-
CBC2: Test	Various	Various : TBD	-	1.335	Jan 2022	2.365	Jan 2023	1.000	Jan 2024	-		1.000	Continuing	Continuing	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>	Project (Number/Name) 640141 / <i>Advanced Battle Management System (ABMS)</i>

FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027				FY 2028			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

ABMS	
Architecture and Systems Engineering (ASE)	
ASE: Digital Engineering	
ASE: Mission Domain Architecture and Mission Integration Team	
ASE: Operational Response Team	
ABMS Digital Infrastructure (ABMS DI)	
ABMS Consortium	
ABMS Battle Lab	
ABMS DI: Test	
Cloud-Based Command and Control (CBC2)	
Distributed Battle Management Applications (DBMA)	
CBC2 Test	
Airborne Edge Node (AEN) CR#1	
Phalanx Griffon	
AEN CR#1: Test	
OGC-Test	
FFRDC	
A&AS	
Other Support	

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Exhibit R-4A, RDT&E Schedule Details: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 4	R-1 Program Element (Number/Name) PE 0604003F / <i>Advanced Battle Management System (ABMS)</i>	Project (Number/Name) 640141 / <i>Advanced Battle Management System (ABMS)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
ABMS				
Architecture and Systems Engineering (ASE)	1	2024	4	2028
ASE: Digital Engineering	1	2024	4	2028
ASE: Mission Domain Architecture and Mission Integration Team	1	2024	4	2028
ASE: Operational Response Team	1	2024	4	2028
ABMS Digital Infrastructure (ABMS DI)	1	2022	4	2028
ABMS Consortium	3	2022	4	2028
ABMS Battle Lab	1	2024	4	2028
ABMS DI: Test	2	2022	4	2024
Cloud-Based Command and Control (CBC2)	1	2022	4	2025
Distributed Battle Management Applications (DBMA)	1	2024	4	2025
CBC2 Test	2	2022	4	2025
Airborne Edge Node (AEN) CR#1	1	2022	4	2026
Phalanx Griffon	1	2024	4	2026
AEN CR#1: Test	2	2022	4	2026
OGC-Test	2	2022	4	2028
FFRDC	1	2022	4	2028
A&AS	1	2022	4	2028
Other Support	1	2022	4	2028