## SOW APPENDIX A

# CORE CAPABILITIES and ADDITIONAL CAPABILITIES A.1 CORE CAPABILITIES

The following are descriptions of the Core Capabilities (i.e., Aviation Domains and Cross-Cutting Edge Techniques and Skills):

**A.1.1 Avionics Systems**: Technical knowledge and experience in the systems engineering and testing activities of avionics systems, their functions, capabilities and interface requirements, and associated standards compliance requirements

**A.1.2 Commercial Space**: Technical knowledge and experience with launch and reentry vehicles; Super/Hypersonic Aircraft; space tourism; NAS Air transportation Systems links to commercial space; and the challenges of safely and efficiently integrating commercial space with current NAS Airspace ATM operations. Evaluation of economic, technological, and institutional developments related to commercial space and advice on new ideas and approaches for Federal policies, regulations, standards, and programs.

A.1.3 Cybersecurity: Technical knowledge and experience in cybersecurity risks in the NAS, Research & Development, and Mission Support Systems in accordance with the Presidential Executive Order (EO) 13636, EO 13800, Presidential Policy Directive (PPD) 21, Federal Information Security Modernization Act (FISMA), the NIST Cybersecurity Framework (CSF) (e.g., Framework Core Functions: Identify, Protect, Detect, Respond, Recover), OMB Circular A-130 Appendix III, and FAA Cybersecurity Strategy. This knowledge and experience includes, but is not limited to, the continuous monitoring/identifying, protecting, detecting, responding, and recovering of any cyberattacks that may/may not impact the continuity of mission, detection, of and effective response to incidents, and resiliency to protect information systems and information infrastructure along with the sensitive data they contain from unauthorized access, use, disclosure, disruption, modification, or destruction from threats that can impact confidentiality, integrity, and availability of the information, information technology services, and communications.

**A.1.4** Enterprise Architecture Products & Enterprise Services: Technical knowledge and experience in the development of Enterprise Architecture products and the Enterprise Services in the area of aviation.

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**A.1.5** Integrated Laboratories & Operations: Technical knowledge and experience in the design, development, operation, and maintenance of integrated aviation laboratories and test beds.

**A.1.6 Trajectory Based Operations (TBO)**: Technical knowledge and experience in defining, planning and transitioning the NAS to TBO by making flight operations more efficient and predictable, while maintaining operational flexibility. TBO (i.e., initial TBO (iTBO), Full TBO, and Dynamic TBO) is an ATM methodology for strategically planning, managing, and optimizing flights throughout the operation by using time-based management, information exchange between air and ground systems, and the aircraft's ability to fly precise paths in time and space.

A.1.7 Unmanned Aircraft Systems (UAS): Technical knowledge and experience with UAS operations, including UAS Traffic Management (UTM) at low altitudes beyond visual line-of-sight (BVLOS) to facilitate their integration safely and efficiently into the air traffic management operation of the NAS. This effort requires collaboration with a broad spectrum of stakeholders, which includes manufacturers, commercial vendors, industry trade associations, technical standards organizations, academic institutions, research & development centers, governmental agencies, and other regulators. Ultimately, technical knowledge and experience to support UAS integration into the NAS without reducing existing capacity, decreasing safety, negatively impacting current operators, or increasing the risk to airspace users or persons and property on the ground any more than the integration of comparable new and novel technologies. In those areas of the NAS that have demanding communications, navigation, and surveillance performance requirements, successful demonstration of UAS to meet these requirements will be necessary.

A.1.8 Air Traffic Management (ATM) Automation: Technical knowledge and experience in NAS ATM automation systems (e.g., Terminal Automated Modernization/Replacement (TAMR), Terminal Facility Display Management (TFDM), Decision Support Tools (DSTs), En Route Automation Modernization (ERAM), Traffic Flow Management System (TFMS), Time Based Flow Management (TBFM), and Advanced Technologies and Oceanic Procedures (A-TOP) (Ocean 21)) and future NAS systems to include awareness of international system development trends and latest developments to include trust in a framework format of blockchain technology.

A.1.9 Communications, Navigation, and Surveillance (CNS): Technical knowledge and experience in voice and data communications, navigation, and surveillance ground/air/satellite-based communication, navigation, and surveillance (CNS) systems, including common surveillance, spectrum engineering, standards, policies, and procedures.

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### A.2 ADDITIONAL CAPABILITIES

The following are descriptions of Additional Capabilities (i.e., Aviation Domains and Cross-Cutting Edge Techniques and Skills):

**A.2.1 Air Traffic Rules and Procedures**: Technical and operational knowledge and experience in current procedures and policies, and technical and operational experience in developing proposed rules and procedures related to Air Traffic operations in the NAS.

**A.2.2 Airspace Design and Analysis**: Technical knowledge and experience in airspace analysis, design/redesign, test, procedure development and configuration recommendations.

**A.2.3 Cost Benefit Analysis**: Capability to prepare rough order of magnitude costbenefit analysis. Conduct lifecycle cost and benefit analyses for individual and grouping of concepts commensurate with the scope and level of maturity of the concept. Technical knowledge and experience in providing Investment Analysis cost and benefit studies for large scale government type programs.

**A.2.4 Modeling and Simulation**: Technical knowledge and experience in the design, development, testing and execution of modeling and simulation using appropriate/validated tools. Developing foundational methods and tools for addressing problems characterized as system-of-systems. Establishment of an effective frame of reference, crafting of a common lexicon, and study of various modeling, operation analysis, and simulation techniques, including fast-time modeling and simulation, probabilistic robust design (including uncertainty modeling/management), agent-based modeling, network theory, object oriented simulations, and tools for capturing the interaction of requirements, concepts, and technologies.

**A.2.5 Human Factors**: Technical knowledge and experience to identify, analyze, model, and predict the physical, cognitive, and social behavior characteristics of human interactions within the aviation system environments.

**A.2.6 Human–in-the-Loop Simulations**: Technical knowledge and experience to simulate and evaluate human interactions within aviation environments in dynamic situations.

**A.2.7 Information Technology**: Technical knowledge and experience in the development, implementation, and lifecycle support of information technology systems, flexible alternative for Networking, evolving advance computing technologies such as

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information trust frameworks, blockchain technologies, and quantum computing that may be used in future NAS and Mission Support Systems.

**A.2.8** Investment Analysis: Technical knowledge and experience in providing Investment Analysis cost studies for large scale government type programs.

**A.2.9** NAS Air Traffic Facilities: Technical knowledge and experience in the operations, maintenance, and certification of various types, kinds, and functions of NAS Air Traffic facilities.

**A.2.10** Information Management Services (IMS): Technical knowledge and experience in providing industry best practices around data and information management, capabilities, and services. Information management will enable FAA's workforce and the aviation communities to more easily find, access, and analyze the information needed to make business and operational decisions.

**A.2.11 Operational Concept Development and Validation**: Technical knowledge and experience of the activities performed to support concept development and validation. Concept development is characterized as the process that describes, evaluates, and prepares a proposed capability, technology or procedure. Validation activities help quantify and qualify the operational feasibility and expected benefits of the concept.

**A.2.12** Aerospace Medical: Technical knowledge and experience to develop new and innovative ways to support FAA regulatory and advisory missions to improve the safety of humans in civilian aerospace operations. As such, the goal is to continuously maintain the Absorptive Capacity for applying Science, Medicine, Bioengineering, and Technology to unrelentingly enhance human safety.

**A.2.13 Program Planning and Financial Analysis**: Technical knowledge and experience in providing support to large organizational programs pertaining to planning and financial analysis.

**A.2.14 Security**: Technical knowledge and experience in researching, designing, and developing and implementing of policies; procedures; standards; systems; and infrastructure to ensure the security (e.g., cyber, information, physical, etc.) of the NAS & Mission Support, including, but are not limited to:

- 1. NAS and relevant Mission Support information systems;
- 2. Air Traffic Management operations and crisis response (both internal and external to the FAA);
- 3. Technical knowledge of National Institute of Standards and Technology (NIST) federal and special publications; particularly those providing details

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for FAA compliance with the Federal Information Security Management Act (FISMA);

- 4. Technical knowledge and experience in the control families defined in NIST SP 800 series;
- 5. Technical knowledge and experience in FAA Information Security and Privacy (IS&P) Program and Policy, FAA Order 1370.121; FAA Information/Data Management, FAA Order 1375.1; and
- 6. Technical knowledge and experience in FAA Facility Security Management Program, FAA Order 1600.69.

A.2.15 Service-Oriented Architecture: Technical knowledge and experience in designing and developing procedures and systems, such as System Wide Information Management (SWIM), which provide network centricity and service orientation to NAS and Mission Support systems.

**A.2.16 Standards Development**: Technical knowledge and experience in the development and implementation of both national and international technical aviation standards (e.g., FAA and ICAO standards).

**A.2.17 NAS System Safety**: Technical knowledge and experience with FAA and International SRM/SMS by assessing NAS system operational safety of the proposed initiative. This assessment identifies, assesses, and documents operational hazards and risks associated with alternative system solutions. No alternative is pursued whose operational risk cannot be mitigated to an acceptable level at affordable cost.

**A.2.18** Weather: Technical knowledge and experience associated with detection, collection, processing, analysis, and dissemination of weather data and the integration of weather data into automated decision-aiding systems, including weather avoidance and impact.

**A.2.19** Environmental Analysis: Technical knowledge and experience in environmental analysis including baseline analysis, alternatives analyses, and the National Environmental Policy Act (NEPA) and the use of tools such as the FAA's Aviation Environmental Design Tool (AEDT). Proven skills in generating environmental analysis metrics (e.g., noise, emissions, fuel burn) from fast-time and human-in-the-loop simulations as well as historical data.

**A.2.20** Systems Engineering & Integration: Technical knowledge and experience with Systems Engineering and Integration involving the design and development, testing,

installation, implementation, integration and transition of systems and systems-of-systems, components and equipment as required by the FAA Systems Engineering Manual (SEM).

## A.2.21 William J. Hughes Technical Center (WJHTC) Laboratory Operations:

Technical knowledge and experience with the FAA William J. Hughes Technical Center (WJHTC) Laboratory which is the nation's premier air transportation system laboratory in the test and evaluation, verification and validation, and the sustainment of the FAA's full spectrum of aviation systems. WJHTC activities span the development of scientific solutions to current and future air transportation safety challenges by conducting applied research & development utilizing a robust, one-of-a-kind, world class laboratory environment to identify integrated system solutions for the modernization and sustainment of the NAS for delivering the future NAS operational capabilities.

A.2.22 Airplane Modernization and Manufacturing (Large – 14 Code of Federal Regulations (CFR) Part 25 and other applicable Parts) Support Services: Technical knowledge and support services experience in the research, design, engineering, manufacturing (i.e., safety, certification, standards, etc.), modernization, including Hypersonic/Supersonic Transport (SST) and certification of transport category airplanes above a Maximum Takeoff Weight of 12,500 lbs.

A.2.23 Airplane Modernization and Manufacturing (Small - 14 Code of Federal Regulations (CFR) Part 23 and other applicable Parts) Support Services: Technical knowledge and support services experience in the research, design, engineering, manufacturing (i.e., safety, certification, standards, etc.), modernization, including Hypersonic/Supersonic Transport (SST) and certification of airplanes in utility and acrobatic categories up to a Maximum Takeoff Weight of 12,500 lbs., and commuter airplanes up to a Maximum Takeoff Weight of 19,000 lbs.

**A.2.24 Large Scale Demonstrations**: Technical knowledge and experience in planning and conducting complex, large scale aviation demonstrations (which includes Pre-operational Trials) in a controlled laboratory setting, site specific demonstration test bed, or operational field environment.

A.2.25 Rotorcraft Modernization and Manufacturing (Large – 14 CFR Part 29 and other applicable Parts) Support Services: Technical knowledge and support services experience in the research, design, engineering, manufacturing (i.e., safety, certification, standards, etc.), modernization, and certification of rotorcraft with a Maximum Takeoff Weight greater than 7,000 lbs. and less than 20,000 lbs.

A.2.26 Rotorcraft Modernization and Manufacturing (Small – 14 CFR Part 27 and other applicable Parts) Support Services: Technical knowledge and support services experience in the research, design, engineering, manufacturing (i.e., safety, certification, standards, etc.), modernization, and certification of rotorcraft up to a Maximum Takeoff

Weight of 7,000 lbs. and a maximum of nine passengers.

A.2.27 Simulators, Airplane (Large – 14 CFR Part 25 and other applicable Parts) Support Services: Access to, technical knowledge of, and support services experience using and networking simulators for Part 25 transport category airplanes into large scale disparate simulation test beds.

A.2.28 Simulators, Airplane (Large – 14 CFR Part 25 – Level C and D Fidelity and other applicable Parts) Support Services: Access to, technical knowledge of, and support services experience using and networking simulators for Part 25 transport category airplanes at different fidelity levels into large scale disparate simulation test beds.

A.2.29 Simulators, Rotorcraft (Large – 14 CFR Part 29 – Level C and D Fidelity and other applicable Parts) Support Services: Access to, technical knowledge of, and support services experience using and networking simulators for Part 29 rotorcraft at different fidelity levels into large scale disparate simulation test beds.

**A.2.30** System of Systems (SoS) Integration: Technical knowledge and experience in the integration of system of systems (SoS) that allows the FAA to leverage new or existing systems capabilities to provide needed and unique functionality to fulfill a common operational need. The SoS approach results in an integrated capability greater than the sum of the capabilities of the constituent systems.

**A.2.31** Aviation Safety and Certification: Technical knowledge and experience in the aviation safety and certification programs that advance operational safety (surveillance, oversight, education, inspections), establish safety rules and regulations (rulemaking), and certify the aviation competency of people (pilots) and organizations (individual airlines) and the airworthiness of aircraft and equipment.

**A.2.32 Performance-Based-Navigation (PBN)**: Technical knowledge and experience in navigation (i.e., Area Navigation (RNAV)/Required Navigation Performance (RNP)) based on specified system performance requirements for aircraft operating on an air traffic route, instrument approach procedure, or in a designated airspace.

**A.2.33 Cloud Computing**: Technical knowledge and experience in Cloud computing as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model is composed of five essential characteristics (i.e., on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service), three service models (i.e., Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS)), and four deployment models (i.e., private cloud, community cloud, public cloud, and hybrid cloud).

A.2.34 Data Analytics (DA): Technical knowledge and experience in the process of

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examining data sets, especially aviation data sources and formats, in order to draw conclusions about the information they contain, increasingly with the aid of specialized systems and software. Data analytics technologies and techniques are widely used in the aviation communities to enable organizations to make more-informed business decisions and by scientists and researchers to verify or disprove scientific models, theories and hypotheses.

A.2.35 Intelligent Automation and Artificial Intelligence (IAAI)/Machine Learning Systems: Technical knowledge and experience in the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction. An IAAI system that combines and utilizes mainly machine learning and other types of Predictive Data Analytics methods to achieve artificial intelligence capabilities.

(End of Section C)