STATEMENT OF WORK
FOR
AERONAUTICS AND EXPLORATION MISSION MODELING AND SIMULATION (AEMMS)

TABLE OF CONTENTS

1.0 INTRODUCTION

The principal purpose of this contract is to provide support to research and development activities of the Aeronautics Research Mission Directorate, the Aeromechanics Division and the Aeroflightdynamics Directorate (Army); the Applied Modeling and Simulation, and the Fundamental Modeling and Simulation Branches of the NASA Advanced Supercomputing (NAS) Division; the Atmospheric Science Branch of the Earth Science Division; and the Emerging Space Offices of the Partnerships Directorate (hereafter known as the Requesting Organizations). This document describes the current and anticipated research programs of the organizations. The major objectives include the development and application of technologies for the design, analysis and test of aerospace vehicles and systems, large-scale numerical simulations in support of NASA and Army mission critical engineering applications, and fundamental advances in numerical methodologies, algorithms, physical models, and application code development.

2.0 SCOPE OF WORK

The Contractor shall provide contract management functions, as well as multidisciplinary, highly inter-related scientific, engineering, and technical research and development services that support the projects in the Requesting Organizations. This contract requires the Contractor to provide management for the work to be performed, to assure the availability of qualified personnel for timely response to requirements, and to manage all requirements. The technical requirements will be performed pursuant to Contract Task Orders (CTOs) issued by the Contracting Officer. These services shall include the necessary personnel, facilities, equipment, and materials (unless otherwise provided by the Government) to accomplish the tasks. The majority of the work will be performed on-site at NASA Ames Research Center, Moffett Field, California.

The Contractor shall perform services to enable the modeling, simulation, and analysis of systems relevant to the NASA aeronautics, exploration, space operations and science missions as required by task order in the following technical areas:

a) Aerospace systems analysis tools development and application
b) Aerospace vehicle and system design, analysis, test and optimization
c) Development and application of tools for the high fidelity modeling and simulation of aerospace vehicles and systems including Computational Fluid Dynamics (CFD) and Computational Structural Dynamics (CSD)
d) Development of improved physical models
e) Integrated multidisciplinary design and analysis framework development and applications
f) Risk analysis methods development and application to aerospace systems
g) Geometry and Grid generation tool development and applications
h) Planetary and Earth Science modeling
i) Modeling and simulation of "green" technology applications
j) Optimization and mission decision support tools and analysis
k) Computational chemistry, computational biology, and computational material science
l) Alternate technologies for innovative space commercialization

Specific requirements will be defined for each task order according to the current and future needs of programs and projects involving the requesting organizations. The Contractor may be tasked to accomplish either an entire project from conception to operation, or a specific part of a project such as design or testing.

3.0 APPLICABLE DOCUMENTS

The Contractor shall comply with all current NASA and Ames Procedural Requirements (APR) and Directives that are applicable to the Requesting Organizations, including APR 1700.1, APR 7120.5 and NASA Procedural Requirements (NPR) 7120.5, APR 7120.7 and NPR 7120.7, and APR 7123.1 and NPR 7123.1. The Contractor shall also comply with software engineering requirements in accordance with NPR 7150.2A, NASA Software Engineering Requirements and APR 7150.2, Ames Software Engineering Requirements. The Ames' Quality System documents can be found at: http://ams.arc.nasa.gov

4.0 REQUIREMENTS

4.1 CONTRACT MANAGEMENT

Effective contract management is essential to the successful execution of this contract. Overall contract management is a primary responsibility of the Contractor and will extend over the entire performance period of the contract. The Contractor shall provide:

4.1.1 Resource Tracking

Provide management and administrative functions necessary to manage and to track the labor hours, materials, and associated costs to perform contract management, and IDIQ task orders under this contract. This contract will require the simultaneous performance of multiple, interrelated tasks.

4.1.2 Contract Compliance

Provide a management and administrative structure that provides a single point of contact for interface to the Contracting Officer (CO) and the Contracting Officer’s Representative (COR). Provide procedures and management supervision to ensure compliance with applicable Government policies, regulations, and contractual requirements for all work performed under this contract.

4.1.3 Workforce Management and Allocation

Provide overall management and oversight of all resources, facilitating the sharing of expertise as required across contract task orders. Plan, manage, control, and coordinate contract management requirements and technical task orders as issued by the Contracting Officer; manage the resources allocated by NASA for specific elements in a manner to ensure goals are reached in accordance with agreed upon milestones; and ensure that personnel assigned to elements have the training and expertise required for that element. The Contractor shall identify conflicting and/or complementary needs among task orders, and provide proposed approaches to leveraging resources, within ten working days of receipt of a task order, to ensure that conflicts are resolved and that needs are met.

4.1.4 Workforce Training

Ensure that all contract employees attend relevant training provided by the Government, prior to the due dates, as required for all on-site employees.

4.1.5 Risk Management

Ensure that the Government has adequate insight into the risks associated with the Contractor’s ability to accomplish tasks. Include identification and mitigation of any risks with task order responses.

4.1.6 Health, Safety and Environmental

Comply with the health and safety requirements contained in APG 1700-1, the system safety and mission assurance requirements in NPG 7120.5, NASA Program and Project Management Processes and Requirements, environmental policies and procedures contained in APG 8500.1, and Entry Systems and Technology Division processes and procedures.

4.1.7 Compliance Management

Participate with the Government to upgrade and maintain required plans, procedures, and work instructions in order to maintain the organization’s compliance with any thirdparty quality system and shall participate in any audits to maintain the quality system certification. Where the Contractor has primary responsibility for a functional or business area, the Contractor shall have primary responsibility for maintaining compliant documentation associated with that area.

4.1.8 Government Property Management

Provide property management to ensure accountability for installation-provided equipment and facilities and be responsible for annual inventory surveys and accountability verification forms.

4.1.9 Travel Management

Contractor personnel may be required to travel for short periods of time to attend meetings, to participate in industry site visits, or to attend technical conferences. The Contractor shall budget for these expenses as well as anticipated publication expenses in the submission of the response to a task order or modification to a task order. The contractor shall coordinate contract employees' travel to conferences, field sites, universities, and other agencies in the performance of research, integration of products, technology development and infusion, and other important demonstration of results. All foreign travel by Contractors supporting NASA requirements must be completed following the policies and procedures of the Ames International Services Office and NFS 1852.242-71.

4.1.10 Resource Acquisition

Acquire resources (equipment, supplies) as needed, not otherwise provided by the Government, to support the successful completion of all work. The Contractor may purchase, with COR approval, and in accordance with the Subcontracts clause at FAR 52.244-2, any materials (consumables and non-consumables) necessary for the fulfillment of their task requirements.

4.1.11 Staffing Level Management

Be prepared to adjust the staffing level to accommodate the actual workload, i.e., hire and/or lay off staff as required within a reasonable time frame.

4.1.12 Employee Background Checks and Clearances

Ensure that all foreign national visitors and all employees have completed the required background checks, approvals, and clearance requirements for access to the NASA Ames Research Center.

Performance under this requirement will involve access to classified information, including attendance at classified meetings, up to a Department of Defense (DoD) level of "Secret".

4.2 TECHNICAL REQUIREMENTS

The Contractor shall be responsible for the successful performance of specific technical tasks. Aside from contract management, all other specific technical, scientific, and engineering requirements are categorized as Indefinite Delivery/Indefinite Quantity

(IDIQ), as defined in individual CTOs. IDIQ assignments involve administrative, scientific, and engineering tasks designed to achieve a specific technical objective. These assignments and their associated schedules, milestones, and deliverables, are defined in individual CTOs. Specific objectives will be defined for each CTO according to the current and future needs of programs and projects being undertaken by the Requesting Organizations. The Contractor may be tasked to accomplish either an entire project from conception to operation, or a specific part of a project such as design or testing.

Since these tasks are internally funded by the requesting organization, contractor expense accountability must be accomplished on an individual task basis. The Contractor shall adhere to the performance measurements detailed in each CTO.

The following detailed requirements are included under the scope of the IDIQ technical, scientific, and engineering elements.

4.2.1 Systems Analysis Office

Research and Development in the Systems Analysis Office focuses on the development, test, application and evolution of computational modeling and simulation tools and technologies for system and vehicle conceptual analysis and design. In support of the aeronautics and space exploration missions, the branch develops tools and integrated processes to enable new analysis methods in support of technology portfolio, vehicle, and mission analysis. Technologies and tools using high end computing for mission simulation and vehicle design are developed for, and applied to, advanced aerospace vehicle and system concepts.

The office performs computational aerodynamics and aero-acoustics modeling, simulation and analyses of advanced transport aircraft systems in support of wind tunnel test planning and post test analysis and develops computational models of advanced aircraft types for integration with airspace systems analysis models. In the realm of space flight vehicles, the Office performs entry vehicle research and analysis including aerodynamic and aerothermodynamic analysis of earth re-entry vehicles, decelerator concepts and planetary entry vehicles, and supports the design of thermal protection systems. The office develops and applies integrated multi-disciplinary analysis and optimization tools and processes for aerospace vehicle design and analysis, and participates in the research into and design of revolutionary aerospace including “green” aircraft technology development and Lighter than Air (LTA) vehicle and mission design and analysis.

The Contractor shall be responsible for conducting research and performing applied analysis in the following areas:

4.2.1.1 Integrated Analysis Environments

a) Support gap analysis to identify requirements for new tools, tool integration, tool modification, and/or tool validation to enable the activities listed in (b).

b) Support in the development, test, and integration of new tools to improve design and analysis of atmospheric flight, launch, and entry vehicles concentrating on the disciplines of aerodynamics, aerothermodynamics, structures and fluid/structures interaction, trajectory, weights and sizing, and TPS sizing.

c) Define and develop integration methods for multi-fidelity processes, including software integration within existing frameworks (e.g., Model Center, OpenMDAO), and data integration methods.

d) Develop and demonstrate methods to integrate engineering level tool processes and frameworks with NAS supercomputers and other cluster environments to enable the integration of high fidelity and parallelized codes within the analysis framework.

e) Develop and validate analysis process management capabilities to enable the selection of appropriate tools and input conditions, given a database of benchmarked tool results across a range of configurations and flight conditions.

f) Develop risk models and risk analysis tools for launch vehicles, exploration vehicles and subsystems, planetary entry vehicles and subsystems (e.g., TPS), and exploration architectures.

g) Provide specialized computer system administration and software support necessary for the development of the integrated analysis frameworks required for vehicle and systems analysis being performed under this contract. Other computer hardware, and software, that are deemed necessary for the direct fulfillment of the task orders, will be provided and administered by the Government.

h) Provide technical assistance for development of reports, and presentations documenting work accomplished. Support in the management of publications, and other documents.

4.2.1.2 Aerospace Vehicle and System Design and Analysis

a) Perform vehicle and systems analysis for aeronautics vehicles and systems including the integration of their flight characteristics with the airspace architecture.

b) Develop revolutionary concepts for aeronautics in pursuit of NASA goals and objectives for the aeronautics mission. Perform trade studies, and cost and benefits analysis of these concepts. Identify critical revolutionary technologies that will be required to develop these concepts.

c) Perform vehicle and systems analysis for launch, entry, and descent of exploration and space science missions.

e) Develop and validate new engineering and CFD capabilities as required to support the multi-disciplinary, multi-fidelity design and analysis of space, atmospheric flight, and planetary entry vehicles and systems.

f) Develop aerodynamic databases for aeronautics and space flight vehicles. Document best practices for application and set up of CFD codes for different configurations and flight conditions.

g) Develop and apply modeling and analysis capabilities for aerodynamic, aero-acoustic, structural, controls and fuel burn characterization of advanced aeronautics vehicles.

4.2.2 NAS Division Requirements

4.2.2.1 General

The NAS Division develops CFD/IT/Physical modeling and Computational Chemistry technologies to support the Human Exploration, Aeronautics, Space Operations and Science Missions. Emphasis is on tool development and analysis of mission enabling technologies and engineering applications on NAS High End Computing (HEC) systems. Applications are varied and evolving with the new NASA Exploration and Science missions. Flow regimes range from incompressible through hypersonic velocities. There is a constant need to develop new computational tools and risk assessment methodologies to improve the modeling and analysis capabilities in support of these missions .

A portion of this work involves the development, validation, and application of CFD and engineering risk tools involving the Space Launch Vehicle (SLV), Commercial Crew Program and collaboration with Commercial Crew Program partners. Fundamental research in support of these programs/missions as well as those in the Aerodynamic Research Mission Directorate is also pursued.

Areas of current and future activity include, but are not limited to:

- Computational Fluid Dynamic (CFD) algorithm and tool development
- Space Vehicle Launch and Ascent Analysis
- Space Shuttle Analysis
- Development and application of analysis tools in support of advanced rotorcraft design
- Development of automated CFD parameter-study tools
- Planetary and Earth Science CFD modeling
- Modeling and Simulation of green technology applications
- Computational chemistry modeling
- Engineering Risk Assessment

4.2.2.2 Adjoint-Based Shape Optimization Frameworks for Cart3D

Employ the Cart3D adjoint module for use in shape optimization with Cart3D. Work focuses on using error information from the solution of the discrete adjoint to guide mesh adaptation within the design cycle. This work includes investigation into the control of discretization error in gradient-based aerodynamic shape optimization through use of adaptive mesh refinement with the goal of dynamic mesh adaptation as design progresses. This effort should focus on examples relevant to ARMD Fundamental Aeronautics High Speed and Fixed Wing subprojects. Theoretical development should focus on formulation of a functional appropriate for automatic error control in design and on implementation of a basic strategy for progressive optimization, where the depth of mesh refinement is systematically increased as the design improves. All theoretical development should be accompanied by clear and extensive documentation of the method and its implementation.

4.2.2.3 Modeling and Simulation Support for Launch and Ascent Vehicle Analysis (LAVA) including Ground Operations

Apply Computational Fluid Dynamics (CFD) to deliver inviscid and viscous simulations of Space Launch Systems (SLS), SWORDS and Commercial Crew configurations within strict deadlines. This work includes generation of grid scripts to create viscous overset grid systems, while accommodating changing vehicles and geometries. Responsible for setup, execution, and analysis of large aerodynamic databases for rocket ascent, buffet loads, and stage-separation events, as well as launch pad environment and research problems. This task also involves evaluation of computational methodologies for the prediction of ignition overpressure (IOP), noise generation, and acoustic propagation during lift-off of space launch vehicles. Duties include performing spatial and temporal resolution studies of launch vehicles during lift-off in order to determine the computational requirements for accurate IOP/aeroacoustic simulations. In addition to characterizing the resolution requirements for lift-off simulations various modeling assumptions must be analyzed. These include examining the effects of different turbulence modeling assumptions, such as RANS and DES. Assistance in expanding prediction capabilities of LAVA solvers, developing pre- and post-processing tools, performing spectral and POD analysis might be additional requirement for this task. In vehicle aerodynamics activities of LAVA, duties will be CFD support to Fundamental Aerodynamics (FA) High Speed (HS) and fixed wing project (FW), Environmentally Responsible Avionics (ERA) subsonic fixed wing and high speed projects, SOFIA, RSAA activities, and additional upcoming projects related to vehicle aerodynamics. Duties include preparing CFD ready OML from a given CAD file, develop/expand/use pre-post-processing, utilizing Cart3D, OVERFLOW, STAR-CCM+, and suites of LAVA solvers. This subtask is expected to require four full time position during the current performance period.

4.2.2.4 Design Analysis for Large Civil Tiltrotor 2nd Generation (LCTR2)

Perform proof of concept 3-D flow analysis and design for the Large Civil Tilt Rotor 2 (LCTR2) blade in hover and forward flight mode. The task will employ the rotorcraft mode of the 3-D Navier-Stokes code, OVERFLOW2 and the Comprehensive code (CAMRAD II) coupling capability in the finite-difference design process to support the three-dimensional (3-D) design of LCTR2 blades in Code AV. The main emphasis of this sub-task is to complete an analysis of the feasibility of using large scale 3D Navier-Stokes simulations in a finite-difference gradient optimization design process.

4.2.2.5 Commercial Crew Transport Risk Studies

Support the performance of crew safety assessments in support of the Commercial Crew Program. The work focuses on continued development and application of a GoldSim dynamic simulation model and the Ames Reliability Tool for engineering risk assessment of a number of proposed launch vehicle/crew vehicle architectures. Results will include ascent, on-orbit, and EDL mission phase assessments, including key risk driver and sensitivity identification. A generic case study will be developed, likely to be based on a available commercial launch vehicles, to provide a focused demonstration of the new model. Wherever possible, the model should be parameterized in such a way as to allow the user to vary parameters as necessary to represent different vehicle architectures and missions. The adaptation of the risk model will also require coordination with personnel developing physics-based models to ensure appropriate interfacing of the failure inputs. The team will be responsible for completing risk analyses, documenting results and delivering/presenting these results to the customer.

It is expected that additional space exploration systems will be assessed, such as the Space Launch System (SLS), SWORDS, or Aquila II architectures, and risk modeling for these systems will be required. Models will be constructed, data synthesized to populate the models, and results documented and presented to partner teams.

4.2.2.6 Coupled Aero-structural Simulations with Cart3D

Focus on development of structural deformation loosely-coupled aero-structural solutions using the Cart3D analysis package aimed at supporting multidisciplinary optimization (MDO). Work will focus on incorporation of static structural deformation due to simulation-based estimates of flight loads and producing a preliminary aero-structural module for use with Cart3D. This module should include a clearly defined interface to the structural model and aero package so that alternative packages can be explored. This effort should focus on examples relevant to ARMD Fundamental Aeronautics High Speed and Fixed Wing subprojects. All theoretical development must be accompanied by clear and detailed documentation of the methods and their implementation. Software must be written for supportability and developed in collaboration with other team members, and must be compatible with both the Cart3D analysis package and aero-design framework.

4.2.3 Computational Fluid Dynamics Applications for Rotary-Wing Vehicles

4.2.3.1 General

The Army Aviation Development Directorate develops and applies tools for the computational simulation of rotorcraft, including codes to model rotor aerodynamics and methods for the coupling of computational fluid dynamics with computational structural dynamics.

Computational simulations of rotor aerodynamics require models for the discrete rotor blades including relative motion between the main rotors, plus the fuselage and tail rotor. These types of calculations involve high-resolution multiple overset grids and small time steps to capture the details of the interactional aerodynamic forces and rotor wake. These calculations also typically involve coupled structural deformations of the rotors and fuselage.

The Army Aviation Development Directorate has teamed with the High Computational Research and Engineering Acquisition Tools and Environments Air-Vehicles (CREATE-A/V) Program to jointly develop high-fidelity modeling and simulation software tools for rotorcraft aeromechanics. The 12-year DoD CREATE-AV program was established in FY2008 with a charter to develop high-accuracy computational analysis software to improve the DoD acquisition engineering design process.

Within this CREATE-AV umbrella, the AFDD has recently released version 4 of its "Helios" software product that provides high-fidelity, physics-based computational aeromechanics modeling for rotary-wing vehicles. Version 4 of Helios provides modeling capability for multiple rotors and rotor-fuselage combinations with aeroelastic deformations of the rotor blades. Ultimately, the Helios goal is to transform the analysis-test paradigm that currently exists within the domestic rotorcraft industry to one built around high-performance computing.

The Helios software product is typically coupled to rotorcraft comprehensive analyses such as “RCAS” and “CAMRAD-2” in order to provide the rotor structural dynamics and rotor trim. In addition to direct support for Helios, the Army also requires support for the development, validation, and testing of the RCAS and CAMRAD-2 rotorcraft comprehensive analyses.

This new Helios software package uses either structured or unstructured-grid CFD codes for the near-body flow solver, a uniform Cartesian off-body flow solver, plus a new rotor dynamics and trim model that is truly scalable. The Army Aviation Development Directorate needs software developers, software testers, and software quality control experts for this new code development project.

4.2.3.2 Helios Aeromechanics Analysis Software

Apply the Helios aeromechanics analysis software to analyze specific Army and NASA rotorcraft problems. These applications will entail both structured and unstructured overset-grid generation for practical rotary-wing fuselages and rotor systems such as the Army's CH-47 Chinook and the UH-60 Blackhawk helicopters.

4.2.3.3 Rotor Dynamics and Trim Models

Develop scalable finite-element computational analysis methods for rotor dynamics and trim. These rotor dynamics and trim models must integrate with the overall Helios CFD/CSD framework for rotor aeromechanics.

4.2.3.4 Helios Code Maintenance

Take responsibility for software quality control, testing, and evaluation of the new Helios code during its multi-year development cycle.

4.2.3.5 New Capabilities for Helios Software

Develop and test new capabilities for Helios aeromechanics analysis software. These new software modules must be integrated into the Helios environment and scale effectively on large parallel computer systems.

4.2.4 Rotorcraft Aeromechanics Research and Development

4.2.4.1 General

The NASA Aeromechanics Office is responsible for aeromechanics research activities that directly support the civil competitiveness of the U.S. helicopter industry. The work will support the Aeronautics Research Mission Directorate (ARMD) and the Fundamental Aeronautics Program, through the Rotary Wing Project. This work will address all aspects of the rotorcraft which directly influence the vehicle's aerodynamic performance, structural, and dynamic response, loads, external acoustics, flight dynamics and control, handling qualities, vibration, and aeroelastic stability. The work to be performed is both theoretical and experimental in nature, including the development of new technologies and new vertical lift aircraft concepts.

The objective of this effort is to research, develop, apply, and validate advanced computational methodology research using computational fluid dynamics, multi-disciplinary comprehensive analyses, advanced flight dynamics and control methodologies, and rotary wing preliminary design processes. Experimental research seeks to obtain accurate data to validate these analyses, investigate phenomena currently beyond predictive capability, and to achieve rapid solutions to flight vehicle problems, including pilot-in-the-loop research. Databases from the flight and wind tunnel experimental programs are validated, documented and maintained for the benefit of the U.S. rotorcraft technology base.

4.2.4.2 Computational and Experimental Methods for Rotary Wings

Develop and apply advanced computational methodology in CFD, multi-disciplinary analyses, advanced flight dynamics and controls, and experimental methodologies for rotary wing preliminary design processes.

4.2.4.3 Rotorcraft Technology Transfer

Perform technology exploration, transfer, and transition in high risk, pre-competitive rotorcraft technology research areas.

4.2.4.4 Rotary Wing Testing

Perform rotary wing component testing, developing high quality data acquisition and measurement systems as required.

4.2.5 Airborne Tropical Tropopause Experiment (ATTREX) Mission Modeling and Simulation

4.2.5.1 General

The Atmospheric Science Branch of the Earth Science Division conducts scientific research on environmental and climatic issues in stratospheric chemistry and ozone depletion, climatic changes due to clouds, aerosols, and greenhouse gases, stratosphere-troposphere exchange, and perturbations in the chemical composition of the troposphere. The Branch develops and deploys highly sensitive, state-of-the-art instruments to ground sites and on a variety of platforms including aircraft, balloons, unmanned aerial systems (UAS), and ship to make observations. The Branch develops unique models of clouds, chemistry, dynamics, and radiative transfer processes to understand and elucidate controlling mechanisms. The Branch performs laboratory experiments to advance and understand the detailed dynamic chemical interactions in the stratosphere.

The task will require development, test, application, and evolution of tools and integrated modeling and simulation capabilities for conceptual aircraft analysis and design processes, exploiting existing Schoeberl-Dessler codes for the extension of current models and prediction of aircraft capabilities under different mission conditions and scenarios. The task will also require analysis of ATTREX field data, including participation in ATTREX publications.

4.2.5.2 Schoeberl-Dessler Code

Update/modify existing NASA Goddard Schoeberl-Dessler code to accommodate potential flight planning, analysis, and forecasting.

4.2.5.3 Dryden Mission Operations

Maintain liaison with Dryden Mission Operations for raw data and verification of scenario details.

4.2.5.4 Schoeberl-Dessler Code Validation

Validate the modified Schoeberl-Dessler results with mission trajectory outputs and make recommendations for aircraft design and missions constraints.

4.2.5.5 Data Analysis Documentation

Provide a data analysis report to the Science Team that documents the results of the software validation and mission scenario results and makes recommendations for next steps in development.

4.2.5.6 ATTREX Field Data Analysis

Apply the model capabilities described in "4.2.5.2" and "4.2.5.4" above to analyze ATTREX field data with a view to answering science questions in the ATTREX proposal.

4.2.5.7 ATTREX Publications

Participate directly in publication of results of ATTREX data analysis in peer-reviewed journals.

4.2.6 Physics-Based Modeling and Simulation of Potential Spacecraft Mission Scenarios for Innovative Space Commercialization

4.2.6.1 General

The NASA Space Portal and Emerging Space Offices were formed in recognition of the rising importance of private-sector individuals and organizations that invest their own time and money in space activities. This emerging space community is increasingly a major force in American space developments. The Space Portal Office actively pursues the transfer of NASA technology to commercial companies and acts as a catalyst for aligning goals and leveraging technologies and capabilities among partner organizations to create new opportunities in the commercial space arena. The NASA Emerging Space Office (ESO) monitors and provides analytical support to the Office of the Chief Technologist (OCT) on the state of the rapidly growing emerging space sector.

This task will require the development and application of a model necessary for the detailed characterization and comparison of potential space commercialization opportunities. One problem application area is the International Space Station National Laboratory providing not only a platform for innovative commercialization but also a solid anchorage point for expanding sustainable human presence in space. Another important aspect of this task is to provide the technical guidance and liaison towards identification of areas within a mission design scenario where physics-based analysis provides a significant benefit over current state of the art.

4.2.6.2 Space Commercialization Activities

Develop alternative scenarios and methodologies to construct, leveraging on past efforts, the concept of “return on alternatives” in support of space commercialization activities. The capability, when developed, will highlight the pros and cons of alternative technologies for space commercialization and provide a quantitative means for prioritizing the options in order to guide investment decisions.

4.2.6.3 ISS Sustainable Technologies

Define and identify sustainable technologies on ISS and new areas where the impact of the microgravity environment has not been previously considered.

4.2.7 Concept Design and Assessment Focus Area Contractor Support

4.2.7.1 General

The Advanced Design Office (ADO) of the Army Aviation Development Directorate (ADD-AFDD) synthesizes and analyzes rotorcraft concepts against user requirements, develops tools and methods to improve the conceptual design process, and conducts trades to assess the impact of technology insertion into conceptual rotorcraft designs.

The Advanced Design Office (ADO) requires a senior rotorcraft design subject matter expert (SME) to support S&T planning exercises and support CD&A Focus area activities. The rotorcraft design engineering SME also will serve as a participant on the integrated product team as needed to support Future Vertical Lift working groups. The SME will support definition of concept vehicle characteristics, development of aircraft level technical metrics and component level technology factors, system level synthesis, prioritization and coordination of ADO design iterations to meet required schedule and deliverables.

The ADO regularly synthesizes conceptual rotorcraft concepts to meet the desired future vertical lift capabilities of the US Department of Defense (DoD). This requires iterative interaction with the user community and the S&T community to gather both user requirements and technology investment status to inform ADO’s conceptual design models. These models are used to communicate the impact of user requirements as well as the impact of technology at the system level. This task will support Future Vertical Lift activities.

4.2.7.2 ADO Subject Matter Expert (SME)

Participate in the FVL S&T planning activity and serve as a subject matter expert for the ADO on integrated product teams. Assist in the long term planning and coordination of ADO tool development efforts. Support development of tactical and strategic approaches for products of the ADO to specifically satisfy the needs of the Army’s user community. This will include conversion of these approaches into spreadsheets and presentations with updating over the period of this task to include user comments and address programmatic requirements and issues.

4.2.7.3 Concept Vehicle Design Characteristics

Assist in definition of concept vehicle characteristics that will show the impact of design requirements and system level. Systematically solicit and collect technical information from the S&T, programmatic, and user communities that will have an impact on requirements and missions used to inform conceptual designs. Help to identify technologies that will be included in vehicle designs.

4.2.7.4 SME Consultation

Provide consultation in the prioritization of system level synthesis activities, including developing system trades, negotiating technical products with the IPT component focus areas, and coordination of ADO design iterations.

5.0 DELIVERABLES AND REPORTS

Contract deliverables and reports are identified and described in the Data Requirements List attachment to this contract. Task specific deliverables will be defined in each task. Since tasks are internally funded by the ARC requesting organization, contractor expense accountability must be accomplished on a task basis.

6.0 EMERGENCY PREPAREDNESS AND RESPONSE

The Contractor's obligation may include resolution of unusual or emergency situations. The Contractor may be required to assist NASA, within the general scope of work, but in currently unidentified ways, in preparation for, or in response to emergencies. Obligations under this requirement shall only arise when one or more of the criteria at FAR 18.001, enabling NASA to utilize "Emergency Acquisition Flexibilities", are met. If the emergency preparedness and response requirements result in changes to the contract, all contract adjustments will be processed in accordance with the Changes clause of this contract.

7.0 SECURITY REQUIREMENTS

The Security classification level for this contract will be categorized as Secret.

8.0 PHASE-IN AND PHASE-OUT

Phase-In: The phase-in process shall be accomplished as expeditiously as possible, with a maximum phase-in period of 30 days. The phase-in process shall not adversely impact the work being done by the outgoing contractor. It shall be conducted in a manner consistent with safe operation requirements. The incoming contractor is responsible for providing a qualified contractor staff by the end of the phase-in period.

Phase-Out: Upon completion of this contract, the outgoing contractor is responsible for the orderly transfer of duties and records to the incoming contractor. This should be accomplished in an expeditious manner, consistent with any contract phase-in schedule, while minimally impacting ongoing task orders. The contractor shall submit a phase-out plan no later than 60 days before the end of the contract for Government review and approval.