NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Ames Research Center
Intelligent Systems Division
Moffett Field, California 94035-0001

DRAFT
STATEMENT OF WORK
For
INTELLIGENT SYSTEMS RESEARCH AND DEVELOPMENT SUPPORT (ISRDS)-3
April 30, 2018
# TABLE OF CONTENTS

1.0 INTRODUCTION .......................................... 3  
2.0 SCOPE OF WORK .................................... 3  
3.0 INTELLIGENT SYSTEMS RESEARCH AND DEVELOPMENT SUPPORT-3 REQUIREMENTS ........... 4  
3.1 CORE MANAGEMENT .................................... 4  
3.1.1 TECHNICAL DIRECTION ......................... 4  
3.1.2 CONTRACT COMPLIANCE, QUALITY ASSURANCE, AND WORKFORCE QUALIFICATIONS ......... 5  
3.1.3 RESOURCE TRACKING .............................. 7  
3.1.4 RESOURCE ACQUISITION ......................... 7  
3.1.5 SAFETY, HEALTH, AND ENVIRONMENTAL ........ 8  
3.1.6 RISK MANAGEMENT .................................. 8  
3.1.7 GOVERNMENT PROPERTY MANAGEMENT ....... 8  
3.1.8 PHASE-OUT ........................................ 9  
3.2 CORE TECHNOLOGY RESEARCH, DEVELOPMENT AND SUPPORT .............................. 9  
3.2.1 TECHNOLOGY AREA: AUTONOMOUS SYSTEMS AND ROBOTICS (ASR) .................. 9  
3.2.2 TECHNOLOGY AREA: COLLABORATIVE AND ASSISTANT SYSTEMS (CAS) ............. 11  
3.2.3 TECHNOLOGY AREA: DISCOVERY AND SYSTEMS HEALTH (DASH) ................. 13  
3.2.4 TECHNOLOGY AREA: ROBUST SOFTWARE ENGINEERING (RSE) ...................... 13  
3.2.5 TECHNOLOGY SUPPORT ............................ 16  
3.3 INDEFINITE DELIVERY INDEFINITE QUANTITY (IDIQ) REQUIREMENTS .................. 17  
3.3.1 TECHNOLOGY RESEARCH AREAS .................. 17  
3.3.2 MISSION OPERATIONS ............................... 17  
3.3.3 FLIGHT OPERATIONS ............................... 18  
3.3.4 SOFTWARE SYSTEMS ENGINEERING AND SOFTWARE PROJECT MANAGEMENT .......... 20  
4.0 DELIVERABLES ........................................ 21  
5.0 PHASE-IN ............................................. 22  
APPENDIX A (FOR INFORMATIONAL PURPOSES ONLY) ........................................ 23  
APPENDIX B ............................................. 24
1.0 INTRODUCTION

The Intelligent Systems Research and Development Support (ISRDS)-3 Statement of Work (SOW) defines the research and development requirements that shall be performed in the following domains: artificial intelligence (AI), knowledge-based systems, knowledge discovery and data mining, information processing and sensors, signal analysis and feature extraction, model-based diagnostic reasoning, system fault diagnostics, prognostics, decision making, automated software methodologies, software verification, validation and safety assurance, fault-tolerant computing hardware and networking, tele-presence and tele-control of remote, mobile platforms, autonomous and adaptive control, unmanned aero and terrestrial based vehicle technologies, human-centered computing, collaborative system design, quantum computing, and distribution of research information in various formats and forums.

2.0 SCOPE OF WORK

The ISRDS-3 contract elements, requirements, and contract line item numbers (CLINs), for the Base period and three Option periods are outlined as follows:

<table>
<thead>
<tr>
<th>CLINs</th>
<th>Contract Element (Pricing type)</th>
<th>General Requirements Definition</th>
<th>Specific Requirements Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>Phase-in (Firm Fixed Price (FFP))</td>
<td>Section 5.0 Phase-In</td>
<td>Section J(a), Attachment 2, “Contract Data Requirements List” (CDRL)</td>
</tr>
<tr>
<td>0002,</td>
<td>Core Management (FFP)</td>
<td>Section 3.1 Core Management</td>
<td>Section J(a), Attachment 2, “Contract Data Requirements List” (CDRL)</td>
</tr>
<tr>
<td>0006,</td>
<td>Core Technology Research, Development and Support (Core Technical)</td>
<td>Section 3.2 Core Technology</td>
<td>Technical Directions (TDs) – See *Note 1 below</td>
</tr>
<tr>
<td>0010,</td>
<td>(Cost-Plus-Fixed-Fee (CPFF))</td>
<td>Research, Development and Support</td>
<td></td>
</tr>
<tr>
<td>0014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0003,</td>
<td>Indefinite Quantity / Indefinite Delivery (IDIQ) (CPFF)</td>
<td>Section 3.3 Indefinite Quantity</td>
<td>Task Orders (TOs) – See **Note 2 below</td>
</tr>
<tr>
<td>0007,</td>
<td></td>
<td>Delivery Requirements</td>
<td></td>
</tr>
<tr>
<td>0011,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0004,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0008,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0012,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0005,</td>
<td>Indefinite Quantity / Indefinite Delivery (IDIQ) (FFP)</td>
<td>Section 3.3 Indefinite Quantity</td>
<td>Task Orders (TOs) – See **Note 2 below</td>
</tr>
<tr>
<td>0009,</td>
<td></td>
<td>Delivery Requirements</td>
<td></td>
</tr>
<tr>
<td>0013,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0017</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following descriptions represent the Government’s best effort to project future research support requirements. The core requirements for this contract are outlined in Sections 3.1 and 3.2, respectively. The Contractor shall be responsible for providing a
flexible, responsive, coordinated, and comprehensive research workforce that possess the qualifications to perform the defined requirements. The Contractor shall administer all work to be performed, and assure the availability of qualified personnel and resources to complete all contractual requirements.

*Note 1: Performance of the Core Technology Research, Development and Support (Core Technical) under Section 3.2 are further subject to the specific written Technical Directions (TDs) from the Contracting Officer Representative (COR), with approval from the Contracting Officer (CO). The TDs will be provided to the Contractor after award. TDs will include defined requirements (such as deliverables and significant milestone dates) and established performance measurement criteria.

** Note 2: The Government will use Task Orders (TOs) to support Indefinite Delivery/Indefinite Quantity (IDIQ) requirements under the scope of Section 3.3. A TO will only be issued if the CO and the COR determine that the new requirement cannot be supported under the established Core Technical. TOs will include defined requirements (such as deliverables and significant milestone dates), negotiated cost and fee, and established performance measurement criteria. Individual task plans shall be negotiated and managed on a per task basis. IDIQ TOs will be issued in accordance with NASA FAR Supplement (NFS) 1852.216-80, Task Ordering Procedure.

3.0 INTELLIGENT SYSTEMS RESEARCH AND DEVELOPMENT SUPPORT-3 REQUIREMENTS

3.1 Core Management
The Contractor shall provide overall management and administrative functions to ensure that the proper resources are available and allocated to complete all contractual requirements; that required reports and documentation are prepared; and that the overall environment supports the research requirements for the entire performance period of the contract (for both TDs and TOs). Core Management requirements are set at contract award under CLIN 0002. The Contractor shall perform the following core Management support functions:

3.1.1 Technical Direction
Prior to each contract year or each Option period, the Government will prepare TDs for Core Technical requirements under CLINs 0003, 0007, 0011, and 0015, including ODCs and cost charge points related to the next contract year or the next option period. The Contractor shall review the TDs and provide its implementation plan, as required by CDRIL Item18. The TDs may be updated when necessary and the Contractor shall provide updated implementation plans accordingly.
Prior to each Option period, and when otherwise necessary, the Government will prepare a 
TO for each new requirement for IDIQ work requirements and ODCs, and cost charge 
points. The Contractor shall review the TOs and provide the task plans in accordance with 
NASA FAR Supplement (NFS) 1852.216-80 Task Ordering Procedure. It is estimated 
that approximately 10 – 20 IDIQ TOs will be issued within the Base period and each 
Option period. When a TO is determined to be well-defined and without cost 
uncertainties, it will be awarded on a FFP basis under CLINs 0005, 0009, 0013, and 0017, 
otherwise it will be awarded as CPFF TO under CLINs 0004, 0008, 0012, and 0016.

The Contractor shall identify conflicting and/or complementary needs among the TDs and 
TOs and provide proposed approaches to leveraging resources to ensure that conflicts are 
resolved and that needs are met.

The Contractor shall represent that it has reviewed the TDs and TO requirements for the 
delivery of technical data or computer software and shall inform the Contracting Officer 
that—
1. None of the data proposed for fulfilling the data delivery requirements qualifies as 
   limited rights data or restricted computer software; or
2. Data proposed for fulfilling the data delivery requirements qualify as limited rights 
   data or restricted computer software.

The format of such a representation is set forth in the contract (see Section H, Data Rights 
and Subcontracting). Any identification of a proposed delivery of Limited Rights Data or 
Restricted Computer Software by the Contractor will be reviewed by the Government and 
is not determinative of the status of the data for use on the requirements under the TDs and 
TOs.

The COR is authorized to provide technical direction in accordance with the SOW and 
NASA Form NF 1634 (Contracting Officer’s Representative (COR)/Alternate COR 
Delegation). Remaining funds on contract (by base or option year) shall be assessed by the 
Contractor with the COR, and concurred by the CO to ensure that remaining scope / 
refined scope can be completed within contract value awarded in Section B of the 
contract.

The COR does not have the authority to, and shall not, issue any instructions purporting to 
be technical direction that constitutes an assignment of additional work outside the SOW; 
constitutes a change as defined in the changes clause; constitutes a basis for any increase 
or decrease in the total estimated contract cost, the fixed fee (if any), or the time required 
for contract performance; changes any of the expressed terms, conditions, or specifications 
of the contract; or interferes with the Contractor’s rights to perform the terms and 
conditions of the contract. Any disagreement with the aforementioned items or between 
the COR and the Contractor must be elevated to and resolved by the CO.

3.1.2 Contract Compliance, Quality Assurance, and Workforce Qualifications
The Contractor shall provide procedures and management supervision to ensure compliance with applicable Government policies, regulations, and contractual requirements, including all applicable NASA Policy Directives (NPDs), NASA Procedural Requirements (NPRs), NASA Information Technology Security Handbooks (ITS-HBKs), NASA Technical Standards, Ames Policy Directives (APDs), and Ames Procedural Requirements (APRs), in their entirety. Specific procedures will be indicated on each TD or TO. These procedures include, but are not limited to, the following documents:

- NPD 1280.1 NASA Management Systems
- APR 1280.1 Ames Management System (AMS)
- APR 5100.1, Purchasing/Procurement Initiator's Guide
- NPR 8730.5 NASA Quality Assurance Program Policy
- NPR 1600.1 NASA Security Program Procedural Requirements

The Contractor shall participate with the requesting organizations to upgrade and maintain required plans, procedures, and work instructions in order to maintain the organization's compliance with any third-party (e.g., OSHA) quality assurance 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.

The Contractor shall ensure that all foreign national visitors and all employees have completed the required background checks, approvals, and clearance requirements for access to worksites (e.g., NASA Ames Research Center) according to directives and policies of the requesting organization.

Pertaining to foreign national employees performing work for NASA, the Contractor shall comply with NPR 1600.4A (Identity and Credential Management) Section 4.2.10:

"Physical access permissions are granted by the Center Protective Services Office. IT access permissions are granted by IT system owners. The decision to grant physical and/or logical access to foreign nationals to NASA’s restricted areas, mission essential infrastructure, sensitive or classified information, and/or export-controlled data may require a higher level of identity vetting due to the heightened risk of exposing these areas and data."

Other requesting organizations may have similar policies, and the Contractor shall comply with those policies when hiring foreign nationals. Government will identity the technical areas in which foreign national restrictions are to be exercised via TDs and TOs.

Contractor personnel may be required to travel for short periods of time to attend planning meetings, participate in industry site visits, attend technical conferences, or support requesting organizations.

For any foreign program travel related to this contract, the Contractor shall comply with NPR 9710.1, chapter 7 entitled Foreign Travel, and with NFS 1852.242-71, Travel Outside of the United States. The Contractor shall submit all foreign travel requests to the
cognizant ARC Foreign Travel Coordinator for review/approval a minimum of four weeks before the planned departure date, so that an electronic country clearance (eCC) can be obtained. The applicable program, project, agreement and/or contract should be referenced in the supporting documentation included with the request. Prior to commencing any official program foreign travel, Contractor employees shall also have successfully completed High Threat Security Overseas Training described in section 7.2 of NPR 9710.1.

Information about attending High Threat Security Overseas Training and paperwork required for travel submission can be found by contacting your Center Foreign Travel Coordinator. Travel will not be approved without completion of the required training, receipt of a country clearance, and submittal of any other supporting documentation as described in NPR 9710.1. Consult with the Contracting Officer or Foreign Travel Coordinator for additional information regarding review/approval of foreign travel requests.

The Contractor shall provide a management structure to effectively manage a professional and technical workforce engaged in a wide range of research and development support services. The Contractor shall have organizational structure, procedures, and administrative support functions to effectively and efficiently manage the work performed under this contract. The Contractor shall provide any necessary secretarial and financial services for their employees, as well as all training required to perform work under this contract. The Government will not provide any such support services or training. All contractor personnel shall have required certification and skills to perform the tasks they are assigned to without further training provided by the Government.

3.1.3 Resource Tracking
The Contractor shall track and report status, labor hours and costs, other direct costs (ODCs), and indirect costs to perform Core Technical, and CPFF IDIQ TOs under this contract, as required by CDRIL Items 15, 16, and 17. ODCs shall be broken down into the following sub-categories: IT Hardware/Hardware Maintenance (servers, cables, network switches, etc.), Software/Software Maintenance, Parts, Equipment/Tools, Travel, Training, Consultant Fee, Visa Processing Fee, Green Card Processing Fee, Conference Fee, Subscriptions, and Membership costs. ODCs that do not fit in these categories shall be identified directly. Use of “miscellaneous” or “other” ODC categories will not be permitted.

3.1.4 Resource Acquisition
The Contractor shall acquire resources not otherwise provided by the requesting organization (e.g., staff, equipment, supplies, software) as needed to support the successful completion of all work.

For NASA acquisitions, the Contractor will coordinate with the Government Task Requesters to utilize the Agency’s Enterprise License Management Team (ELMT) when acquiring software for NASA in accordance with the NFS 1807.70 (Enterprise License Management Team (ELMT) Program), when possible, to ensure the Agency is getting the
best price value or utilizing existing contracts. Additionally, the Contractor shall consider utilizing the Solutions for Enterprise-Wide Procurement (SEWP) or GSA government-wide contracts, when possible, before procuring any software or hardware for the ISRDS-3 contract. For non-NASA acquisitions, Contractor shall follow appropriate organizational policies and directives.

The Contractor shall not perform purchasing functions or act in any other way as an agent for the government per ARC 52.230-90 Contractor Purchasing.

3.1.5 Safety, Health, and Environmental
The Contractor shall comply with the health and safety requirements contained in APR 8715.1 (Ames Safety and Health Procedural Requirements), and NPR 8715.1 (NASA Occupational Safety and Health Procedural Requirements), the system safety and mission assurance requirements in NPR 7120.5 (NASA Program and Project Management Processes and Requirements), and the environmental policies and procedures contained in NPD 8500.1 (NASA Technical Standards System). The Contractor shall provide a Safety and Health plan as required by CDRL Item 14.

3.1.6 Risk Management
The Contractor shall ensure that the CO and the COR have awareness and insight into the all risks associated with the Contractor’s ability to accomplish requirements. The Contractor shall include identification, assessment, prioritization, and mitigation of any risks within their responses to TDs and TOs in accordance with NPR 8000.4 (Agency Risk Management Procedural Requirements).

3.1.7 Government Property Management
The Government will provide all appropriate equipment and software necessary for the performance of work under this contract unless otherwise noted in the TDs and TOs. The Contractor shall follow NPR 4200.1H, NASA Equipment Management Procedural Requirements, and APD 4200.2, Equipment Management regarding movement and assignment of government owned equipment and provide information upon request for the following information: Property Assignments, Property Location, Unused Equipment and any required data needed for the NASA Property database (currently at https://equipment.nasa.gov). The Government provided equipment information in is listed in Section J(a), Attachment 3, “Installation-Accountable Government Property List”.

The Government shall provide all on-site Contractors with computers and maintenance services for equipment requiring access to the NASA internet protocol (IP) space through the Agency’s enterprise provider or other CIO-approved IT equipment necessary to meet the requirements. Any on-site Contractor-provided equipment connected to the NASA IP space shall comply with NFS 1852.204-76, Security Requirements for Unclassified Information Technology Resources, NASA IT Security Handbook ITS-HBK 2810.02-05 (Security Assessment and Authorization External Systems), and as required by CDRL Items 9 and 10.
The Government may provide or the Contractor may acquire property (Government Furnished Property or Contractor Acquired Property) that is not currently in the NASA Property database. The Contractor shall manage this property, as well as Installation-Accountable Government Property, in accordance with NPR 4200.1H, NASA Equipment Management Procedural Requirements, and APD 4200.2, Equipment Management, Section H (Employees), or applicable requesting organization policy, to ensure accountability. The Contractor shall generate a NASA Form 1018, “NASA Property in the Custody of Contractors” report as stated in CDRL Item 12. The Contractor, CO, and COR will review monthly the property managed by the Contractor, and the CO will determine if any property should be added to Section J(a), Attachment 3, and included in the NASA Property database. The Contractor shall submit a quarterly Property Management Report itemizing all purchases for the quarter, as required by CDRL Item 11. The Contractor shall provide a Government Property Management Information Plan as required by CDRL Item 26.

### 3.1.8 Phase-Out

Phase-Out: At the end of the period of performance of this contract, the outgoing Contractor is responsible for the orderly transfer of duties and records, including complete equipment and systems records, to the incoming Contractor or NASA, if there is no successor contract. This shall be accomplished in an expeditious manner, consistent with the phase-in schedule of the successor Contractor, while precluding interruption to the scheduled requirements in the TDs and TOs. During Phase-out, the Contractor shall have transferred all records and documentary material in an orderly manner and vacated all areas of Contractor responsibility, having left them in a clean, professional state and having completed the check-out process. The Contractor shall submit a Phase-Out Plan (CDRL Item 28), including all Standard Operating Procedures and required documentation to operate all systems, no later than 60 days before the end of the contract for government review and approval.

### 3.2 Core Technology Research, Development and Support

The Intelligent Systems Division performs research in four main technology areas: Autonomous Systems and Robotics, Collaborative and Assistant Systems, Discovery and Systems Health, and Robust Software Engineering. As the research matures or as projects require, work from multiple technology areas may be matrixed to support a single task, project, or program.

#### 3.2.1 Technology Area: Autonomous Systems and Robotics (ASR)

The Contractor shall support the objectives and missions of the Autonomous Systems and Robotics Area, consisting principally of four main Research Groups: (a) The Planning and Scheduling Group (PSG), (b) The Intelligent Robotics Group (IRG), (c) The
Advanced Controls and Evolvable Systems (ACES) Group, and (d) The Deployable Autonomous Technologies (DAT) Group.

The Contractor shall perform and/or support research, development, and deployment in areas of expertise including artificial intelligence, robotics, computer vision, aeronautics, theoretical computer science, operations research, software engineering, electrical engineering, and discrete and continuous control. The Contractor shall support spacecraft missions and operations, human spaceflight missions and operations, and rotorcraft and science mission operations using both manned and unmanned fixed wing aircraft.

The PSG research supports NASA ground and flight operations. The Contractor shall support research efforts in planning activities to achieve goals that are subject to complex temporal constraints (e.g., limited communications windows, precisely timed trajectory maneuvers, and precise sequence of activity execution), limited resources (e.g., power and memory), over-subscription and optimization, uncertainty, and control.

The IRG research enables humans and robots to explore and learn about extreme environments, remote locations, and uncharted worlds. The Contractor shall support applied research in a wide range of areas with an emphasis on robotics systems (e.g., mobility, thermal, power, avionics, communications, sensors, actuators, and structures), robotic science and field testing, applied computer vision (e.g., navigation, planetary mapping, and automated science support), interactive 3D user interfaces (e.g., interfaces for situational awareness, sensor data integration, path planning, and navigation), robot software architecture, and planetary rovers.

The ACES Group conducts research, development, and validation of advanced guidance, navigation, and control technologies for many aeronautical applications. The Contractor shall support research in prediction of loss-of-control, development of improved Flight Management Systems (FMS) for tactical and emergency flight planning and guidance, and constrained trajectory generation aimed at developing optimal trajectories under damaged and failure scenarios. The Contractor shall support development and execution of simulation experiments conducted to evaluate the FMS technologies being developed. The ACES Group also conducts multidisciplinary design, analysis, and optimization (MDAO) of advanced aircraft control concepts to enable efficient and safe operation of next-generation aircraft systems. In particular, the Contractor shall support research in active wing shaping control technologies for drag reduction which includes physics-based multidisciplinary modeling to develop integrated coupled physics models of aircraft aerodynamics and flight dynamics coupled with aeroelasticity.

The DAT Group performs research, development, and testing of software used to manage automated and autonomous operations for terrestrial and planetary surface systems and processes. The core of this automation software is centered on an executive that operates the system while monitoring the system state and responding to changes. The DAT Group designs, develops and implements the integration of this executive into robotic planetary exploration systems, and performs field testing of these systems to advance the
performance and achievement of science mission goals and objectives. Current target applications are autonomous robotic drilling systems for planetary exploration.

The Contractor shall provide software development support with state of the art experience in engineering and testing of high-performance embedded, application, and processing software in a variety of languages (C, C++, Python, Java, LISP, Matlab, and Simulink) on a variety of platforms (Linux, OS-X, Windows, and VxWorks). Application frameworks include Eclipse, Spring, Hibernate, Ajax and HTMLx. The Contractor shall also provide staff with expertise in 3D visualization, user interface design, and associated development tools.

The Contractor shall perform research and development of distributed coordination and collaboration capabilities that enable a range from complete autonomous system operation to autonomous systems designed to work in close collaboration with humans. This includes design, development, and deployment of the associated command and control systems and environments used to conduct mission planning, monitoring of remote autonomous systems, and interactions with those systems. The Contractor may be tasked to provide staff to support or participate in deployments and field campaigns in remote, austere sites, or to support extended flight test activities at other Government sites.

The Contractor shall employ a broad range of Artificial Intelligence (AI) methods to the missions and tasks such as model-based reasoning and simulation, planning and scheduling, constraint-based reasoning, local and global optimization, decision theory, machine learning, intelligent synthesis, multi-agent coordination, and other innovative or traditional techniques.

3.2.2 Technology Area: Collaborative and Assistant Systems (CAS)

The Contractor shall support the missions of the Collaborative and Assistant Systems (CAS) projects.

The core focus of this technology area includes (but is not limited to) Data/Information Management Technologies, Collaborative Systems, and Enterprise IT/Data/System Architecture focused projects and applications.

Data/Information Management Technologies include data, information, and knowledge management for the entire lifecycle, including system and information architecture, ontologies, taxonomies, modeling and semantics, and systems that facilitate sharing and collaboration. Collaborative Systems involve supporting the work of distributed NASA teams in varied work settings and environments. Enterprise IT/Data/System Architecture and Tools are focused on leveraging and evaluating best practices and standards for data integration, fusion, and consolidation, often working to recommend, design and build relevant enterprise architecture and software tools to meet project goals, objectives and vision for scalability, flexibility, and performance.
The Contractor will be involved in research, development, and deployment of methods that provide computer-based support for daily work activities of scientists, engineers, managers, and operational support personnel contributing to major NASA aeronautics and space programs. The Contractor will be involved in research, development and operational sustainment activities that require analysis of work environments, technology needs, and communication patterns. The Contractor shall design and develop advanced collaboration, communication, and performance support systems, and deliver these on conventional and mobile computing platforms. The Contractor shall employ and integrate a broad range of technologies including information architecture and integration, data repository systems, digital and semantic search, enterprise information management, ground/flight data systems, human-computer interfaces, and various associated methodologies. The Contractor shall focus application efforts so as to satisfy mission requirements in major NASA areas of focus such as Earth Sciences, Space Sciences, Human Exploration and Development of Space, Space Operations, Airspace Operations and Safety, Aeronautics, and the Office of the Chief Information Officer.

For informational purposes, a recent example of such an effort that combines the core focus technology areas was the development of the Mission Tool Suite for Airborne Science Systems, a distributed science and engineering support environment as a computer-supported cooperative web application. That work involved science and engineering software development, and the specification, design, development, and integration of information for use by a science and engineering user community. The task thus included substantial communication and interfacing with a broad range of users in order to understand the needs that drive development requirements, in addition to the development of the hardware and software systems to support the resultant application and integration, and technology infusion for production use.
3.2.3 Technology Area: Discovery and Systems Health (DaSH)

The Contractor shall support the objectives of the Discovery and Systems Health (DaSH) technology area that encompasses four groups: Diagnostics and Prognostics, Data Sciences, Integrated System Health Management (ISHM) Technology Maturation, and Applied Physics. The Contractor will be involved in research, development, and deployment of advanced software technology supporting the development of diagnostic and prognostic algorithms and uncertainty management techniques; the development of standards and metrics for measuring the performance of ISHM algorithms; and the investigation of hazards, risk, component fault behavior and damage progression; and analysis of system state evolution, including assessment of systems safety, the application and maturation of health management technologies utilizing simulation testbeds, hardware-in-the-loop testbeds, integration into core flight software, and flight experiments. The Contractor shall also support fundamental research to create tools and methods to aid in the assimilation and understanding of scientific and engineering data to best advance NASA’s missions. The Contractor shall also support the development and deployment of machine learning, artificial intelligence, and optimization techniques; the development of tools for predictive analytics; and the development of analytics tools that can reason over large amounts of (possibly heterogeneous) data (i.e., Big Data). The Contractor shall support research to understand physical phenomena and mechanisms in design tradeoff studies and integrated vehicle environments, including root causes of system failure as well as risk identification, assessment, and mitigation; and, in an interdisciplinary way, combining laboratory and field experimental tests, physics-based modeling and analysis, and technologies for data analysis and statistical model and state inference. The Contractor shall support research into quantum computing algorithms and hardware; quantum annealing for combinatorial optimization; and understanding the role of noise and decoherence in quantum computing devices. The Contractor shall provide specific support in the development and deployment of advanced algorithms, such as model-based diagnosis, prognostic life estimation models, physics-based models, traditional machine learning, learning from partial or incomplete models, stochastic nonlinear model identification, Bayesian and other statistical and model-based learning methods, and decision support.

The main products from this technology area are advanced algorithms, software tools and applications applicable to a wide range of internal NASA activities such as Space Launch System (SLS), Ground Operations, Deep Space Habitat, Airspace Operations and Safety, Transformative Aeronautics Concepts, Advanced Aircraft Vehicles, and State Assessment and Management for autonomous vehicles, as well as support to external activities including aviation security applications and spacecraft applications with other government agencies.

3.2.4 Technology Area: Robust Software Engineering (RSE)

The Contractor shall support the objectives of the Robust Software Engineering (RSE) Technical Research Area, which includes involvement in research, development, and deployment of advanced software engineering tools into NASA missions and leading and
developing ground and flight software for NASA missions. The Contractor shall report research results in appropriate technical journals and at conferences and workshops. RSE research results are matured as prototypes and advanced software tools targeted to NASA's engineering lifecycle. The Contractor shall mature and adapt the tools so they can be incorporated directly into the software development and verification process and validation used in different NASA missions and in industry. In order to do this, the tools will need to be adapted to interoperate with specific commercial tools already chosen within targeted NASA projects. This activity may involve collaboration with industry partners.

RSE is organized under four interrelated disciplines: Systems Thinking, Architecture, and Collaboration; Models and Algorithms for Reliable Software; Assured Autonomy; and Core Avionics and Software Technologies.

**Systems Thinking, Architecture, and Collaboration** requires work at the system level, which includes computer systems, hardware/software framework, human-in-the-loop systems, and complex cyber-physical systems in general. Modeling and analysis techniques will include new modeling languages (including AADL, Stateflow, Simulink, SysML, WMC, and others as appropriate), probabilistic analysis techniques, frameworks supporting (live) data analysis, and human-machine analysis techniques. The Contractor shall support extensions of formal methods to encompass distributed teams of humans and automation interacting for a common goal such as development of the next generation airspace system. The Contractor shall employ techniques such as compositional verification of human/machine interactions. This theme also includes certifiable code synthesis and safety cases. The work will focus on developing tools for safety/assurance cases. The Contractor shall develop certifiable code synthesis to provide formal arguments for the research on safety cases, and in particular, on mixing formal and informal arguments. The Contractor is expected to lead research and develop tools using NASA relevant problems.

**Models and Algorithms for Reliable Software** requires software analysis aspects. The Contractor shall continue the research on the use of advanced Verification and Validation (V&V) techniques for analyzing code (including abstract interpretation using the IKOS and SeaHorn static analyzers), verifying and validating design models (including Simulink, Stateflow, SysML, AADL, and other modeling techniques used in aviation and space missions), advanced testing capabilities, requirement analysis tools, and compositional analysis techniques. The research may require coordination with external tools developed in academia, industry or other governmental agencies. The Contractor shall also support advanced V&V research for non-deterministic algorithms (e.g., prognostics, adaptive control, and autonomy in general), software health management, and complex autonomous systems in aviation and space missions. The Contractor-led research shall also explore the use of runtime assurance techniques and their connection with safety and assurance cases. Infusion in industry is our ultimate goal and progress will be
measured against how far the Contractor's research is from enabling the infusion of its results into real projects.

**Assured Autonomy** requires autonomous systems, their validation and verification, and their design and operation. The Contractor shall perform research on V&V techniques (probabilistic or not) for autonomy, the use of machine learning (including reinforcement learning) in autonomy (including tensegrity robots or multi-agent systems), and cybersecurity aspects related to the use of autonomy. This discipline also includes research in run-time assurance, from the language use for expressing monitors to the framework used to perform the monitoring.

**Core Avionics and Software Technologies** requires the development of flight software systems for space missions (including, but not limited to, small spacecraft) and aviation systems. The work may also include participating in the development of ground systems and also peer review activities for NASA and other governmental agencies in partnership with industry. The Contractor shall support refinement of a Core Flight System/Core Flight Executive (CFS/CFE) infrastructure for rapid development and deployment of software in support of NASA missions. The Contractor may use other software frameworks depending on the needs of missions. The Contractor shall develop the capability to produce mission critical software from dynamic systems models using automatic code generation. Applications of model-based techniques that the Contractor shall use include development of simulation frameworks, Processor-in-the-Loop (PIL) testbeds, and Hardware-in-the-Loop (HIL) testbeds. The Contractor shall develop support tools that interface and integrate with RSE tools (e.g., advanced V&V and safety assurance techniques, and report logging to feedback results for RSE researchers). The Contractor shall identify opportunities in the development process for conducting early-in-design verification and test.

In support of all themes, the Contractor shall provide software development support with staff possessing state-of-the-art experience in engineering and testing of embedded, application, and processing software in a variety of languages (e.g., C, C++, Python, Scala, Java, Matlab, Simulink, AADL, Stateflow, and SysML) and on a variety of platforms (e.g., Linux, OS-X, Windows, and VxWorks). The Contractor shall use various application frameworks (e.g., include Eclipse, JAVA, LLVM, ANDROID, AKKA, and appropriate web-browser frameworks) to support formal methods research, including:

- Model checking and analysis
- Compositional verification
- Probabilistic and mathematical approaches to verification
- Symbolic execution
- C/C++ program analysis model (including Simulink, Stateflow, and other modeling techniques used in aviation) models
- Integration of tools that can work across the lifecycle development process
- Smart test case coverage of the verification and validation state space
- Tools to support safety or assurance cases.
The tools and techniques developed in RSE target applications in aviation (large transport aircraft, general aviation, UAVs, and current and new generation of air traffic systems) and space (including, but not limited to, small spacecraft).

### 3.2.5 Technology Support

It is anticipated that the Contractor shall perform the following support functions as required for the technology research areas:

1. Collaborate and exchange technical information with the Government research staff.
2. Provide a qualified R&D workforce to support Government-directed primary research and indirect research support functions (such as technical and programmatic reviews).
3. Provide short turn-around deliverables for specific project milestones in the TDs.
4. Conform to all relevant standards and practices (e.g., configuration management and system integration requirements) for all projects and deliverables.
5. Support technology infusion/deployment efforts with NASA customers.
6. Attend and participate in group and project meetings.
7. Present research, work in progress, and results to civil service management and to research peers at conferences.
8. Support (occasionally short-notice) preparations for demonstrations and presentations of research, work in progress, and results to visitors and technical delegates, including supporting and/or hosting of technical workshops as needed.
9. Travel as needed to conferences, field sites, universities, and other agencies in the performance of research, integration of products, technology infusion, and other important demonstration of results.
10. Support a student program with students that have relevant research and work history within the core technical areas. Students will be mentored by senior researchers from the contract and government workforce to support the NASA projects and milestones.

It is anticipated that the Contractor shall perform the following operational and development functions as required for the technology research areas:

Provide the computing environment for the technology research and development. Support will include design, implementation and management of the Division research infrastructure. The Contractor shall provide a comprehensive, fully integrated heterogeneous computing environment for both the scientific research and Class D payload mission communities. The Contractor’s system architecture shall support on-site resources as well as operational deployments. The Contractor shall proactively perform research and test state-of-the-art technologies and deploy those technologies to the existing infrastructure in a seamless non-intrusive manner in coordination with each project. The Contractor shall have a strong understanding of all NASA safety and security requirements as mandated by NASA computer security and communicated by Division Computer Security Official (CSO).
Specific duties to be performed include –
- System architecture design
- System configuration definition and implementation
- Security plan development
- Integration of server systems
- Support of user systems

3.3 Indefinite Delivery Indefinite Quantity (IDIQ) Requirements

3.3.1 Technology Research Areas

It is anticipated that additional requirements to leverage research under Section 3.2 will be required during the performance of the contract. These additional requirements will be defined and issued under IDIQ contract task orders.

3.3.2 Mission Operations

Ames Research Center has successfully designed, built and flown a number of spacecraft, both small and large, dating back to Pioneer in the 1960s and Lunar Prospector in the late 1990s. In recent years, Ames has flown Small Spacecraft Missions, such as GeneSat and PharmaSat, as well as full-scale spacecraft, such as the Lunar Crater Observation and Sensing Satellite (LCROSS) and Kepler and the Lunar Atmosphere and Dust Environment Explorer (LADEE) and Interface Region Imaging Spectrograph (IRIS) missions. In addition, it also supports operation of International Space Station (ISS) payloads and science instrumentation, such as European Modular Cultivation System (EMCS), and Synchronized Position Hold, Engage, Re-orient, Experimental Satellites (SPHERES). Ames employs experienced project management, mission operations teams, and has a proven multi-mission operations center.

The Division holds a Capability Maturity Model Integration (CMMI) Level 2 rating, which is renewed every three years. The division works closely with Ames’ Multi-Mission Operations Center (MMOC), whose facilities and data systems are FISMA-compliant and operated in accordance with a NASA-approved security plan (CD-9999-M-ARC-3234).

Contractor shall provide systems, software, networks, and facilities to support ground and test operations for missions and research activities. These systems enable a diverse range of operational and test activities, including command and control, data visualization, engineering analysis, planning, science software, and other functions. The Contractor shall develop and provide a variety of program sets, ranging from off-the-shelf to custom built to open source software. Both Ames and the Division are on the forefront of adopting, enhancing, and using innovative and best practices such as Agile development methods, Model-Based System Engineering (MBSE) methods in operations, and centralized multi-mission operations centers. Many of these activities are accomplished through collaborative efforts with other NASA centers. For instance, Open MCT, which is available as an open source package, is a joint project with NASA AMMOS and JPL and is operationally deployed at JPL as well as Ames. The Resource Prospector project is using Agile methods and MBSE across Ames, JSC, and KSC. Ames teams maintain a healthy working relationship with other Centers. For example, the Ames LCROSS mission flight team, Mission Maneuver and Design subsystem, worked with the Jet Propulsion Laboratory (JPL) and Goddard Space Flight Center (GSFC) for navigation, orbit determination and Trajectory Correction Maneuver (TCM) attitude planning, and with JPL for Deep Space Network (DSN) scheduling. The Ames LADEE mission flight team performed these tasks in-house at Ames, and integrated with the science operations center at GSFC. The Ames IRIS mission flight team integrates with the science operations center at Lockheed. Ames flight teams continue to look to the NASA Centers for expertise and partnerships wherever it is most cost effective and beneficial to the mission and NASA.

3.3.3 Flight Operations

Ames specializes in the development and execution of innovative low-cost flight operations. Ames flight teams draw from a broad range of experience leading or collaborating on heliocentric, planetary, lunar, and Earth orbiting science and exploration missions. Ames collaborations with other flight centers on manned missions further augment their experience base. With operations exposure over the full range of mission risk classifications (Class D through A payloads), Ames staff are uniquely postured to leverage the best mix of skills and lessons learned to each mission it performs.

Many of the Ames Flight Operations staff gained their trained and experience through participation on flight projects and programs with JPL, JSC, GSFC, KSC and MSFC. Ames continues to pursue these flight operations collaborations.

The Division performs flight and ground tests and research for new technologies related to highly capable aerospace vehicles. Of particular emphasis are tests for intelligent systems, such as autonomous UAVs and rovers. The Division has primary responsibility for operating several research facilities nearby:

1. Roverscape – a field approximately 100 yards by 25 yards that simulates planetary landscapes.
2. M045 NUARC - facility for indoor testing of UAVs
3. Wind tunnel field – an adjacent football sized outdoor grass field for testing tethered UAVs.

The Contractor shall build, update, and maintain vehicles and equipment for specific research tests. The Contractor shall support test operations at these nearby facilities, as well as facilities that are outside of NASA Ames for more extended tests. Contractor responsibilities could include providing trained staff for piloting and other positions (meeting Ames certification requirements); coordinating with Ames center offices (Code JO) responsible for flight authorization, spectrum allocation, and land usage; and recording and analyzing data from vehicle tests for scientific validation of new technologies.

The Contractor shall support development of intelligent system technology for highly capable aerospace vehicles. Of particular interest are software, sensor, and hardware technology for autonomous vehicles that can operate either without human oversight or are members of human-machine teams. The Contractor shall provide technology development that will span multiple levels of maturity, from early concept, to laboratory demonstration, to vehicle tests at facilities, and potentially demonstration and deployment in extra-terrestrial environments such as on the ISS.

Maintenance and Operations Support

The Contractor shall be responsible for overall aircraft maintenance and operation of the NASA Category III aircraft in accordance with Code JO requirements. The Contractor shall verify the aircraft meets NASA airworthiness standards (APR 1740.1) and provide inputs to NASA's airworthiness and flight safety review process. Contractor shall maintain NASA Category III UAS in accordance with NPR 7900.3. The Contractor shall provide personnel to deploy with the CAT III aircraft for all flight missions. The Contractor shall prepare and ship the CAT III aircraft and all support hardware for deployments as required. The Contractor shall assemble and disassemble all CAT III aircraft at deployed locations as required to maintain and provide operational support of aircraft.

The Contractor shall be responsible for ensuring all Category III UAS be managed according to the NASA Aircraft Management Information System (NAMIS). The Contractor shall be responsible for maintaining current information within the following NAMIS modules: Logistics and Asset Management, Aircraft Maintenance, and Work Card.

The Contractor shall be responsible for scheduled and unscheduled maintenance of the airframes and aircraft subsystems. The Contractor shall work with the Government to provide integration support as required for ground and flight testing. The Contractor shall support procurements of GSE and aircraft parts as well as assistance with GSE setup and maintenance.
The Contractor shall be responsible for providing quality assurance and performing aircraft inspections to ensure that all work performed on the aircraft are in compliance with NASA policies and procedures.

The Contractor shall be responsible for fabrication of hardware, wiring harnesses and other items needed by the program or individual projects in order to support platform upgrades and in support of instrument integration onto the aircraft.

The Contractor shall be responsible for procurement of replacement components and/or spare parts. The Contractor shall maintain inventory of all aircraft parts.

3.3.4 Software Systems Engineering and Software Project Management

In addition to being a fundamental research organization, the Division also develops and deploys applications to customers at other NASA Centers, other Federal agencies, and industry. These applications are infusions of technology developed through Division research. The focus of this area is to apply standard engineering practices to deliver reliable applications, within schedule, and within budget. Current recipient of Division technology infusion include:

The ARC Small Spacecraft Office (SSO) develops, launches, and operates small space missions using a low-cost methodology. The objective is to develop missions in less time, at lower cost, and capable of delivering highly useful scientific and technical payloads in order to aid future NASA missions. One of the primary goals is to develop the capability within NASA to have space vehicles that could be deployed faster and cheaper than conventional spacecraft today in order to expand the number of flight opportunities and to take advantage of the latest technologies through shorter development cycles. In order to achieve low cost access to space, the SSO looks at alternative launch vehicles, as well as hardware developed under past and current Department of Defense (DoD) investments.

The activities of the Small Spacecraft Office include technology evaluation, proposal development, spacecraft hardware development, and mission implementation and operations. The SSO evaluates technology and processes that can enable low-cost spacecraft development, such as structures, avionics, sensors, flight software, propulsion, integration and testing, and mission operations. These components are used to develop full mission proposals that, if selected, could lead to mission development projects. Current projects include earth-orbiting nano- and micro-spacecraft, as well as deep-space spacecraft bus designs.

In order to successfully support the development and deployment of Division technologies in these areas, the Contractor shall be required to provide staff with expertise in:

(1) System architecture design
(2) System configuration definition and implementation
(3) Security requirements during the system design
(4) System test and verification
Integration of project systems into the division facility
Development and design of laboratories and testbeds for the various technologies
Network management of infrastructure to support project requirements
Security plan development for systems and projects
Configuration and security control of real time operating systems
Setup and configuration of avionics hardware testbed platforms
Security and customization of embedded operating systems and micro-kernels
Application of CMMI Maturity Level 2 processes as called for by NASA software engineering requirements

The Contractor shall be responsible for communicating knowledge about Division technologies to technical and non-technical audiences as required by Division projects. This communication includes the design, development and distribution of informational products in a wide variety of output formats including written, graphical, and electronic media, and live or static demonstrations.

The Contractor shall perform the following tasks:

(1) Technical writing and editing
(2) Web site content development and maintenance
(3) Interfacing with technology groups to develop project requirements and acquire data
(4) Collecting, formatting and distributing highlight reports to line and program management
(5) Compiling and updating research portfolios for line and program management

4.0 DELIVERABLES

4.1 For Core management requirement
For Core Management requirement issued under CLINs 0002, 0006, 0010, and 0014, the Contractor shall deliver all contract deliverables, reports, and plans identified and described in Section J(a), Attachment 2, “Contract Data Requirements List” (CDRL).

4.2 For Core technical requirement
The contractor shall perform the technical functions to produce the deliverables as specified in the TDs issued under CLINs 0003, 0007, 0011, and 0015. Deliverables specified in TDs may include:

- Software requirements
- Software testing and V&V tools
- Software code
- Software documentation
- Algorithms, including evaluation standards and performance metrics
- Field tests data and analysis
- Conference and journal papers and presentations
- NASA technical publications and memorandums

At the end of the Base and each Option period, the Contractor shall submit the Core Technical Summary Report as required in CDRL Item 29.

In the event that the Contractor proposed and the Government accepts inclusion of Limited Rights Data or Restricted Computer Software as part of contract deliverables, and where the Government needs the assistance of third-party subject matter experts to resolve an emergency, the Government may need to provide such experts with access to Contractor Limited Rights Data or Restricted Computer Software. See paragraph (g) of Section I, FAR clause 52.227-14, Rights in Data—General (Alt II and III) [(Modified by NFS 1852.227-14, Rights in Data—General)]

4.3 For IDIQ requirements
The contractor will be tasked to perform the technical functions to produce the deliverables as specified in the task orders issued under IDIQ CLINs 0004, 0005, 0008, 0009, 0012, 0013, 0016, and 0017. Each task order may consist of multiple discrete subtasks from individual projects and customers, which consist of unique requirements and deliverables for that customer. Each task order will define the level of internal technical, labor and budget tracking and reporting required to ensure traceability of resources at a level appropriate to manage the work.

In the event that the Contractor proposed and the Government accepts inclusion of Limited Rights Data or Restricted Computer Software as part of contract deliverables, and where the Government needs the assistance of third-party subject matter experts to resolve an emergency, the Government may need to provide such experts with access to Contractor Limited Rights Data or Restricted Computer Software. See paragraph (g) of Section I, FAR clause 52.227-14, Rights in Data—General (Alt II and III) [(Modified by NFS 1852.227-14, Rights in Data—General)]

5.0 PHASE-IN

Phase-In: The phase-in process shall be accomplished as expeditiously as possible, with a maximum phase-in period of 60 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 at which time it will assume full responsibility for the performance of all contractual requirements. The Contractor shall submit a Phase-In Plan as required by CDRL Item 27.
APPENDIX A (For informational purposes only)

About The Intelligent Systems Division

The Intelligent Systems Division provides leadership in the computational sciences and engineering for NASA by conducting mission-driven, user-centered research, development, and demonstration of innovative technologies, and maturing and deploying these new capabilities for utilization in support of NASA missions.

The Intelligent Systems Division (hereafter referred to as Code TI or the Division) is part of the Exploration Technology Directorate (Code T) at the NASA Ames Research Center (ARC). The Division is a major contributor to enabling intelligent software technology research and development for NASA in all of the Agency Mission Directorates.

Programs currently supported by the Division include:

For the Aeronautics Research Mission Directorate (ARMD)
- The Airspace Operations and Safety Program,
- Advanced Air Vehicles Program,
- Transformative Aeronautics Concepts Program
- The Integrated Aviation Systems Program (possibly in the future);

For the Science Mission Directorate (SMD)
- Airborne, Space and Earth Science data pipelines and analyses
- Mission operations

For the Office of the Chief Technologist (OCT)
- Evolving advanced space technology development and demonstration programs,

For the Human Exploration and Operations Mission Directorate (HEOMD)
- The Advanced Exploration Systems (AES) Program
- Human/Robotic systems and other capability-driven programs in development

In addition, the Division supports the Center’s Small Satellite Research projects.

In support of the advanced research in computational sciences, the Division personnel is made up of 80% with advanced degrees in disciplines such as computational sciences, aeronautical engineering, and physics. Activities performed by these personnel include research in basic computer sciences, advanced physics simulations, research in quantum computing, algorithm development for use on unmanned aerial vehicles (UAV), and building operations software for flight and space missions. Many research projects require participation across the various technology disciplines. Code TI maintains strong relationships with other U.S. government agencies, industrial organizations, and academic partners for the purposes of joint research and rapid technology transfer.
APPENDIX B

Definitions

- ACES: Advanced Controls and Evolvable Systems
- AI: Artificial Intelligence.
- AES: Advanced Exploration Systems (HEOMD Program)
- APD: Ames Policy Directive
- APR: Ames Procedural Requirement
- ARC: NASA’s Ames Research Center, Moffett Field, California
- ARMD: Aeronautics Research Mission Directorate
- CMMI: Capability Maturity Model Integration
- CO: Contracting Officer, the primary point of contact between the contractor and the Government
- COR: The Contracting Officer’s Representative, charged with providing the CO with technical information and assessments about the contract
- CSO: Computer Security Official
- DAT: Deployable Autonomous Technologies
- DOD: Department of Defense
- DSN: Deep Space Network
- EMCS: European Modular Cultivation System
- GFE: Government Furnished Equipment
- GSE: Ground Support Equipment
- GSFC: NASA Goddard Space Flight Center
- HEOMD: Human Exploration and Operations Mission Directorate
- HET: Human Exploration Telerobotics (HEOMD Program)
- IAGP: Installation-Accountable Government Property
- IDIQ: Indefinite Delivery, Indefinite Quantity
- IRG: Intelligent Robotics Group
- IRIS: Interface Region Imaging Spectrograph
- ISHM: Integrated System Health Management
- ISRDS: Intelligent Systems Research and Development Support
- ISS: International Space Station
- IT: Information Technology
- JPL: Jet Propulsion Laboratory
- JSC: NASA Johnson Space Center
- KSC: NASA Kennedy Space Center
- LADEE: Lunar Atmosphere and Dust Environment Explorer
• LCROSS: Lunar Crater Observation and Sensing Satellite
• MBSE: Model-Based System Engineering
• MMOC: Multi Mission Operations Center
• MSFC: NASA Marshall Space Flight Center
• NAMIS: NASA Aircraft Management Information System
• NASA: National Aeronautics and Space Administration
• NF: NASA Form
• NPD: NASA Policy Directive
• NPR: NASA Procedural Requirement
• OCT: Office of Chief Technologist
• ODC: Other Direct Cost
• POC: Point of contact – the designated contact person
• PSG: Planning and Scheduling Group
• SACE: Solar Array Constraint Engine
• SMD: Science Mission Directorate
• SMO: Software Management Office
• SOW: Statement of Work
• SPHERES: Synchronized Position Hold, Engage, Re-orient, Experimental Satellites
• SSO: Small Spacecraft Office
• TCM: Trajectory Correction Maneuver
• TDs: Technical Directions
• TOs: Task Orders
• V&V: Verification and Validation