

**RVGSS SAMPLE TASK ORDER # 5****TASK ORDER TITLE: Flight Software and Avionics Services****PERIOD OF PERFORMANCE: May 28, 2014 – May 27, 2015****TASK OVERVIEW:**

The objective of this task is to develop flight software and avionics systems for current and future NASA manned spacecraft programs. In accordance with Statement of Work 3.5, Flight Software and Avionics Services, the contractor shall provide the technical requirements listed below.

**TECHNICAL REQUIREMENTS:**

1. The Engineering Directorate is responsible for supporting the Orion Multi-Purpose Crew Vehicle (MPCV) program through utilization of the Engineering Directorate's Kedalion laboratory and other test facilities, including Orion MPCV flight software development, integrated hardware and simulation testing, hardware emulation of avionics, and systems engineering.
  - 1.1. *Integrated Hardware/MPCV Simulation* – The contractor shall develop and support flight hardware-in-the-loop testing capabilities through the use of Orion MPCV programmatic simulations that provide interfaces to emulated hardware, dynamics, and environmental models (gravity, wind, etc.).
  - 1.2. *MPCV Hardware Emulators* – The contractor shall develop and support emulated hardware capabilities for the Orion MPCV vehicle using Wind River's Simics and Vehicle Management Computer (VMC) Emulator for hardware-in-the-loop testing and analysis applications. Documentation artifacts accompanying developed software should be developed to Capability Maturity Model Integration for Development (CMMI-Dev) Maturity Level (ML) 3 compliant quality standards.
  - 1.3. *MPCV Engineering* – The contractor shall provide engineering support to the Orion MPCV flight software systems engineering group, Orion MPCV Avionics System Test group, including managing and operating high fidelity MPCV avionics system test rigs, and other MPCV testbeds, that provide command, data, and sensor interfaces to exercise and test MPCV avionics in flight-like conditions. The contractor shall have the ability to understand, develop, and automate the testing of MPCV avionics data table defined wiring configurations (also known as channelization).
2. The Engineering Directorate is supporting numerous advanced exploration projects, many of which employ the Core Flight Software (CFS) framework as an effective means of flight software reuse. In support of this, the Advanced Exploration Systems (AES) CFS project is evolving the Core Flight Software (CFS) system

toward human-rating. Additionally, CFS-compliant applications must be written to support AES and other NASA projects/programs.

- 2.1. *CFS Product Development* – The contractor shall develop, test, and document next generation releases of the CFS product-line including Core Flight Executive (cFE), Operating System Abstraction Layer (OSAL), Platform Specific Package (PSP), and Application Layers in support of next generation computing hardware platforms, operating systems, and mission specific applications.
  - 2.2. *CFS Certification* – The contractor shall develop, test, and document additions to the CFS product line to aid in certification of the reusable flight software across multiple programs/projects.
  - 2.3. *CFS FSW Development* – The contractor shall develop, test, and document enhancements to the CFS development and test environment to aid in flight software development and analysis.
  - 2.4. *CMMI-Dev ML 3* - For each task, documentation artifacts shall be developed to CMMI-Dev ML 3 compliant quality standards. In addition to product-line releases, the contractor shall plan the work to support an integrated demonstration and shall participate in the demonstration.
3. The Engineering Directorate has a need to maintain 21<sup>st</sup> Century Training Systems (TS21) International Space Station (ISS) Flight Software (FSW) execution for the simulation, emulation, and virtualization of the On-Board Computing System (OBCS) elements. The Engineering Directorate will continue this type of support post Operational Readiness Review (ORR) throughout the life of the ISS.
    - 3.1. *OBCS MDM Maintenance* – The contractor shall provide maintenance and troubleshooting support for virtualized Multiplexer/Demultiplexer (MDM) infrastructure that allows execution of re-hosted ISS FSW.
    - 3.2. *OBCS Infrastructure Maintenance* – The contractor shall provide maintenance and troubleshooting support for OBCS subsystem interfaces to other ISS elements including virtual Portable Computing System (vPCS) and virtual Robotic Workstation (vRWS) using real-time communication and virtual 1553 over Internet Protocol (IP).
    - 3.3. *OBCS Supporting Utilities* – The contractor shall provide maintenance and troubleshooting support for various utilities for the configuration of virtual emulators, data flow, ISS Standard Out (STDOUT), and configuration files from the Mission Build Facility (MBF).

## **DELIVERABLES & SCHEDULES:**

1. Subtask 1 deliverables:
  - A. Initial flight hardware-in-the-loop lab configuration to support Orion MPCV testing (November 28, 2014).
  - B. Final flight hardware-in-the-loop lab configuration to support Orion MPCV testing (May 27, 2015).

- C. Demonstration of Kedalion lab flight software test capabilities (November 28, 2014).
  - D. Analysis, design artifacts, and integrated hardware/software prototypes of test systems developed for advanced Orion MPCV test facilities. (November 28, 2014). Associated documentation should be compliant with CMMI-Dev ML3 standards.
  - E. Coordinated schedule related to operating Orion MPCV system test rigs (May 27, 2015).
2. Subtask 2 deliverables:
- A. Initial CFS product-line release, CMMI-Dev ML3 compliant documentation, and demonstration (November 28, 2014).
  - B. Final CFS product-line release, CMMI-Dev ML3 compliant documentation, and demonstration (May 27, 2015).
3. Subtask 3 deliverables:
- A. Initial OBCS integrate subsystem suite maintenance release (November 28, 2014).
  - B. Updated OBCS integrated subsystem suite maintenance release (May 27, 2015).

**DEPENDENCIES:**

NASA shall provide access to required development resources including workstations, laptops, network infrastructure, software licenses, avionics system engineering units, vehicle and environment simulations, and supporting tools resources at JSC.