Personnel Qualifications

1. General Description

It is anticipated that the contractor shall have some form of multilevel position structure for his staff. The position descriptions defined herein assumes a three level system consisting of senior, mid-level and junior positions. Unless noted otherwise, a BS in engineering, mathematics or physics from an accredited institution and a TOP SECRET security clearance are required for all professional positions. The qualifications for these positions are as follows:

1.1. Senior Engineer

A minimum of 10 years in the professional field with experience in the aerospace or aerospace related fields is required. At least one half of the experience must be directly related to the specified field. Technical team leadership experience is also required.

1.2. Engineer

A minimum of 5 years in the professional field with experience in the aerospace or aerospace related fields is required. At least one half of the experience must be directly related to the specified field.

1.3. Junior Engineer

A minimum of 1 year in the professional field is required. Where applicable, training in the use of the indicated commercial software packages is required.

2. Positions

2.1. Program Manager

A minimum of 10 years with an interdisciplinary background in the development of aerospace hardware and management of aerospace programs is required. This experience must include aerospace project assignments with tasks that include a minimum of 5 years of supervisory/management responsibilities and significant interaction with program management. A minimum of 5 years of aerospace design, analysis and/or hardware test experience is required.

2.2. Project Engineer

A minimum of 10 years with an interdisciplinary background in the development of aerospace hardware is required. This experience must include aerospace project assignments with tasks that include a minimum of 5 years of supervisory/management responsibilities and significant interaction with program management. A minimum of 5 years of aerospace structural analysis and hardware test experience is required.

2.3. Senior Staff Engineer

This position requires experience in developing computer simulations of structural/mechanical phenomena and significant exposure in the development of structural analysis techniques. Experience in structural dynamic modeling and aerospace vehicle transient loads analysis is required. Experience in FORTRAN coding and the use of the Windows and UNIX operating systems is required.

2.4. Structural Dynamics Engineer

2.4.1. Senior Level: This level provides leadership in developing new analytical tools, supports the development of structural designs, analyzes and evaluates structural performance to show that specified requirements are satisfied. This experience must include the analysis of aerospace structural systems and components when subjected to static, transient/steady state dynamic, and random vibration loads. Knowledge and experience must include preparation of models for Coupled Loads Analysis. A minimum of 5 years of experience with the MSC/NASTRAN finite element code, FEMAP or equivalent pre- and post-processor software package, and numerical analysis techniques in general along with minimum of 3 years of experience with the calculation and spreadsheet software packages, Mathcad and Excel, or equivalent, and use of the MS Windows operating system is required.

2.4.2. Mid Level: This position requires experience in structural analysis, development of analysis techniques, and computer simulation of aerospace hardware. This experience is to include the analysis of aerospace subsystems and components when subjected to static, transient/steady state dynamic, random vibration loads. A minimum of 3 years of experience in finite element modeling with at least 2 years of experience with the MSC/NASTRAN analysis program, FEMAP or equivalent pre- and post-processor software package along with a minimum of 2 years of experience with the calculation and spreadsheet software packages, Mathcad and Excel, or equivalent, and use of the MS Windows operating system is required.

2.4.3. Junior Level: A minimum of 2 years in the structural analysis and computer simulation of aerospace hardware using the MSC/NASTRAN program is required. This experience is to include the analysis of structures when subjected to static, transient/steady-state dynamic loads and launch vehicle loads. A minimum of 1 year of experience with the calculation and spreadsheet software packages, Mathcad and Excel, or equivalent, and use of the MS Windows operating system is required.

2.5. Structural Analysis Engineer

2.5.1. Senior: This position requires experience in aerospace detailed stress analysis. The experience must include thorough knowledge of materials, material properties and specific background with aerospace hardware. Some experience in fracture mechanics analysis desired. A minimum of 5 years

of experience in the use of MSC/NASTRAN or equivalent finite element code results for internal structural loads and stresses is required along with experience in the use of the MS windows operating system.

2.5.2. Mid-level: This position requires direct experience in aerospace detailed stress analysis. The experience must include a working knowledge of materials, material properties and specific background with aerospace hardware. Some experience in fracture mechanics analysis is desired. A minimum of 2 years of experience in the use of MSC/NASTRAN or equivalent finite element code results for internal structural loads and stresses along with the ability to read engineering drawings and experience in the use of the MS windows operating system is required.

2.5.3. Junior Level: This position requires experience in the analysis of structures and a knowledge of material properties and structural analysis techniques. Familiarity with MSC/NASTRAN or equivalent finite element code and the ability to read engineering drawings along with experience in the use of the MS windows operating system is required.

2.6. Attitude Control Engineer

2.6.1. Senior Level: This position requires broad experience in the analysis and design of spacecraft control systems. The experience must include orbital analysis, spacecraft dynamics, stability analysis, spin stabilization methods, and experience in computer simulation techniques. The candidate must have a demonstrated ability in developing control laws and algorithms for the control of spacecraft. Experience with Windows and UNIX operating systems is required. A MS degree in engineering, mathematics or physics from an accredited institution is required.

2.6.2. Mid Level: This position requires experience in the analysis and design of spacecraft control systems and includes orbital analysis, spacecraft dynamics, stability analysis, spin stabilization methods, and experience in computer simulation techniques. Experience with the Windows and UNIX operating systems is required.

2.7. Astrodynamics Engineer

A minimum of 5 years in the analysis and design of orbits for spacecraft is required. This experience includes orbit mechanics analysis, orbit mission planning, fuel budget analysis, flight operations experience, and experience in computer simulation techniques. Programming experience in software languages such as C++, Matlab and FORTRAN and experience with UNIX, Linux, and Windows based workstations and a working knowledge of Satellite Tool kit (STK) is required.

2.8. Thermal Engineer

2.8.1. Senior Level: This position requires experience in thermal design and thermal analyses of spacecraft systems. This experience must include development of thermal analytical models and thermal analyses of spacecraft and instruments for free fliers and/or Shuttle attached payloads. A minimum of 5 years of experience with the thermal analysis software packages, TRASYS, SINDA, Thermal Desktop, or equivalent is desired. Experience in FORTRAN and PYTHON coding and the use of the Windows and UNIX operating systems is required.

2.8.2. Mid Level: This position requires experience in thermal design and thermal analyses of spacecraft systems. This experience must include development of thermal analytical models and thermal analyses of spacecraft and instruments for free fliers and/or Shuttle attached payloads. A minimum of 3 years of experience with thermal analysis software packages, TRASYS and SINDA, Thermal Desktop, or equivalent and use of the MS Windows operating system is required.

2.8.3. Junior Level: This position requires basic experience in thermal design and thermal analysis. The experience must include development of thermal analytical models and thermal analyses of spacecraft or instruments for free fliers. A minimum of 1 year of experience using the thermal analysis software packages, TRASYS and SINDA, Thermal Desktop, or equivalent and use of the MS Windows operating system is required.

2.9. Mechanical Engineer

2.9.1. Senior Level: This position requires experience in the design, analysis and testing of aerospace hardware. Specific experience with spacecraft mechanical systems, mass property control, material stability, interface definition and test plans and procedures is required.

2.9.2. Mid Level: This position requires experience associated with the design, analysis and testing of aerospace hardware. Specific experience with spacecraft mechanical systems, mass property control, material stability, interface definition and test plans and procedures is required.

2.9.3. Junior Level: This position requires experience associated with the design, analysis and testing of aerospace hardware. Specific experience with spacecraft mechanical systems, mass property control, material stability, interface definition and test plans and procedures is required.

2.10. Mechanical Designer

2.10.1. Senior Level: This position requires experience in the design and development of aerospace structures and mechanisms. This

background must include specific spacecraft hardware design experience and detailed knowledge of current aerospace design practices and hardware. CAD experience, preferably Unigraphics NX, and familiarity with Mil-Std-100 and ANSI Y14.5 is required.

2.10.2. Mid Level: This position requires experience in the design and development of aerospace hardware. This background must include specific spacecraft hardware design experience and detailed knowledge of current aerospace design practices and hardware. CAD experience, preferably Unigraphics NX, and familiarity with Mil-Std-100 and ANSI Y14.5 is required.

2.11. Electro-Mechanical Systems Engineer

2.11.1. Senior Level: This position requires a minimum of 15 years experience in the design, development and qualification of electromechanical devices and systems for high reliability operation in space. This experience must include work on angular and linear positioning systems, latching and deploying mechanisms, scanning systems, solar array drives, slip rings and position sensors.

2.11.2. Mid Level: This position requires a minimum of 5 years experience in the design, development and qualification of electromechanical devices and systems for high reliability operation in space. This experience must include work on angular and linear positioning systems, latching and deploying mechanisms, scanning systems, solar array drives, slip rings and position sensors.

2.11.3. Junior Level: The desired level of experience sought for this position is a minimum of one year in the design and development of electromechanical devices and systems for space use. This experience is to include the analysis of such devices to predict performance in the variety of environments experienced in space.

2.12. Electro-Optical Engineer

2.12.1. Senior Level: This position requires experience in the analysis, design and management of optical/IR sensing systems. This experience must include the major disciplines of electro-optical engineering including visible/IR electromagnetic propagation, radiometric and image evaluation, optical systems and data processing in both design and analysis as well as implementation techniques. A BS degree in Physics or Electrical Engineering with advanced studies in optics is required.

2.12.2. Mid Level: This position requires experience in the analysis, design and management of optical/IR sensing systems. This experience must include the major disciplines of electro-optical engineering including visible/IR electromagnetic propagation, radiometric and image

evaluation, optical systems and data processing in both design and analysis as well as implementation techniques. A BS degree in Physics or Electrical Engineering with advanced studies in optics is required.

2.12.3. Junior Level: The required level of experience for this position is a minimum of 2 years in the analysis of optical systems. This experience must include optical system modeling, image quality evaluation, error budgeting, sensitivity analyses and wave front error analysis.

2.13. Software Development Engineer

A minimum of 5 years in the development of software programs used to control test equipment or in real-time embedded control applications in the C/C++ programming language is required. This experience must include the use of software development processes that increase the reliability and maintainability of the software product. Experience with basic support software tools (i.e. defect tracking tools and configuration management tools) is also required, along with work in Linux, UNIX and Windows operating systems.

2.14. Mechanical Technician

A minimum of 5 years in mechanical fabrication and assembly of space flight and prototype hardware is required. This experience must include the use of machine shop tools and familiarity with a variety of laboratory equipment such as scales, pressure/vacuum gauges and temperature sensors. The ability to read mechanical drawings is required.

2.15. Technical Writer

A minimum of 3 years in the preparation of technical documentation related to aerospace systems, operational and test environments and system operations is required. This must include experience with word processing and document publication systems.

2.16. Electrical Engineer

2.16.1. Senior Level: This position requires experience in the design, analysis, fabrication, test and integration of electrical systems for ground support and space based systems. This experience must include design, analysis and test of analog and digital circuitry for the measurement and control of thermal and electromechanical systems, control systems and instrumentation systems. A thorough understanding of component ratings, performance limitations due to cosmic radiation, impacts of grounding, shielding and electromagnetic compatibility and thermal effects due to power dissipation is required. Experience in the use of computer aided analysis, design and

simulation tools such as Orcad™, Pspice™, ELECTRO™, MAGNTO™ as well as electronic instrumentation and test equipment is required.

2.16.2. Mid Level (Analog Electronics): This position requires experience in the design, analysis, fabrication, test and integration of electrical systems for ground support and space-based systems. The experience must include development of analog signal processing and power electronics for measurement and control applications of thermal and electromechanical systems including the design of low noise electronics circuits for analog to digital and digital to analog conversion. Hands-on fabrication, testing and integration experience is required. Experience in the use of computer aided analysis, design and simulation tools such as Orcad™ and Pspice™ is required.

2.16.3. Mid Level (Digital Electronics): This position requires experience in the design, analysis and development of digital and microprocessor based electronic system for the measurement and control of thermal and electromechanical systems. The experience must include the design, development and testing of microprocessor code for processing digital data real time. Hands on fabrication, testing and integration and on-orbit operation of flight electronics hardware is required. Knowledge in the use of computer aided design tools and digital electronic test hardware is required.

2.17. Contamination Control Engineer

2.17.1. Mid Level: This position requires experience in performing contamination management, analyses and impact assessments. The experience must include development of requirements, performing environmental analyses and developing impact reports. Experience in the use of contamination programs such as CAP, MOLFLUS, ISEM and DSMC is required.

2.17.2. Junior Level: This position requires experience in performing contamination analyses and contamination management. Experience in contamination requirement development and the knowledge of FORTRAN are required.

2.18 Analytical Dynamics Engineer

2.18.1 Senior Level: This level provides leadership in the development of new analytical and numerical simulation tools in the area of dynamics, including orbit and attitude dynamics, mechanisms, multi-body dynamical systems (e.g., robotic manipulators and tethers), propellant slosh, as well as other complex phenomena related to spacecraft and the space environment. A minimum of a Masters degree in Aerospace or Mechanical Engineering, Physics, or a related discipline and have at least 5 years of experience in the analysis and simulation of aerospace-related dynamical systems is required. This engineer shall be familiar with existing software

packages such as SD/FAST and ADAMS, and be able to generate simulation code from scratch in programming languages such as ANSI C and C++ that will be provided to other engineers for integration into larger simulation codes. This engineer will support spacecraft design efforts as an expert in analytical and computational dynamics, and may be called upon to act as an external reviewer to other spacecraft programs. The Senior Analytical Dynamics Engineer will support all phases of a spacecraft program, from concept design to detailed design, fabrication, testing and mission operations. This engineer may also be required to support proposal efforts in his areas of expertise.

2.18.2 Mid Level: This level requires a proficiency in the application of existing dynamics software packages such as SD/FAST and ADAMS to complex dynamical systems related to spacecraft and the space environment. A minimum of a Bachelors degree in Aerospace or Mechanical Engineering, Physics, or a related discipline is required. It is also required that the individuals proposed to fill this position have a minimum of 2 years of experience related to spacecraft engineering and a desire to work in the analytical and computational dynamics field. The engineer should have a demonstrated proficiency in programming languages such as FORTRAN, ANSI C, C++, and/or Matlab. This engineer will work as part of a larger team to support spacecraft programs from concept design through detailed design, fabrication, testing and mission operations. It would be highly desirable if this engineer has experience with application of commercial software such as SD/FAST and ADAMS to spacecraft systems.

2.19 Opto-Mechanical Engineer, Senior Level

This position provides leadership in the development and application of new opto-mechanical analysis and simulation tools to space-based telescope and other precision space-based optical systems. It is required that individuals proposed to fill this position have a Masters degree in Aerospace, Mechanical or Electrical Engineering, Physics, or a related discipline, as well as 3 years of experience in the analysis, prediction and test-verification of opto-mechanical system performance. The Senior Opto-Mechanical Engineer shall be an expert in diffraction analysis, structural finite-element modeling, ray tracing and image processing. Experience in the development of optical metrology systems and wavefront control are highly desirable, as well as experience in a research and development environment. The engineer shall also be knowledgeable of existing software tools such as NASTRAN, ZEMAX, MACOS and Matlab, and be proficient in programming languages such as ANSI C and C++. The engineer will participate in all phases of the optical system development including concept design, prototyping, testing, detailed instrument design, fabrication and integrated system testing. This engineer will also support external reviews of related programs and proposal development.

2.20 Robotics Engineer

Must have at least three (3) years of robotics systems analysis or development and robotics or dynamics simulation software development experience. Requires strong robotics systems expertise and software skills in C programming, Unix/Linux OS and scripting languages. Experience with software simulation with real-time, human-in-the-loop, hardware in the loop systems is also required. Bachelor's degree in Aerospace, Electrical, or Mechanical engineering is required. MS or PHD with an emphasis in robotics or dynamic systems is required.