

Human Research Program Program Plan

Revision A

April 13, 2009



**National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058**

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Human Research Program

Program Plan

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4/08/09

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1. HUMAN RESEARCH PROGRAM OVERVIEW

1.1 INTRODUCTION

Crew health and performance is critical to successful human exploration beyond low Earth orbit. The Human Research Program (HRP) investigates and mitigates the highest risks to human health and performance, providing essential countermeasures and technologies for human space exploration. Risks include physiological effects from radiation, hypogravity, and planetary environments, as well as unique challenges in medical treatment, human factors, and behavioral health support. Without HRP results, NASA will face unknown and unacceptable risks for mission success and post-mission crew health.

The HRP was established in October 2005 at the Johnson Space Center (JSC) in response to NASA's decision to move human research program management from Headquarters to the JSC and to focus its research investment on investigating and mitigating the highest risks to astronaut health and performance in support of exploration missions. Strategically, the HRP conducts research and technology development that: 1) enables the development or modification of Agency-level human health and performance standards by the Office of the Chief Health and Medical Officer (OCHMO) and 2) provides Exploration Systems Mission Directorate (ESMD) and Space Operations Mission Directorate (SOMD) with methods of meeting those standards in the design, development, and operation of mission systems.

1.2 PROGRAM GOALS, OBJECTIVES AND METRICS

1.2.1 Goals and Objectives

The HRP is an applied research and technology program that contributes to the NASA Strategic Plan, NASA Policy Directive (NPD) 1001.0, through:

- Strategic Goal 3: Develop a balanced overall program of science, exploration, and aeronautics consistent with the redirection of the human spaceflight program to focus on exploration
 - Sub-goal 3F: Understand the effects of the space environment on human performance, and test new technologies and countermeasures for long-duration human space exploration.

The goal of the HRP is to provide human health and performance countermeasures, knowledge, technologies, and tools to enable safe, reliable, and productive human space exploration. The specific objectives of the HRP are:

1. Develop capabilities, necessary countermeasures, and technologies in support of human space exploration, focusing on mitigating the highest risks to crew health and performance. Enable the definition and improvement of human spaceflight medical, environmental and human factors standards.
2. Develop technologies that serve to reduce medical and environmental risks, to reduce human systems resource requirements (mass, volume, power, data, etc.) and to ensure effective human-system integration across exploration mission systems.

3. Ensure maintenance of Agency core competencies necessary to enable risk reduction in the following areas: space medicine, physiological and behavioral effects of long duration spaceflight on the human body, space environmental effects, including radiation, on human health and performance and space human factors.

1.2.2 Metrics

Since the HRP provides key information on human health and performance risks to ensure exploration program success, the HRP measure of success is defined by providing high-quality products that meet customer requirements and are delivered in time to meet exploration needs. The HRP products are: 1) the reduction or elimination of human health and performance risks, 2) the reduction in uncertainty surrounding human health and performance risks, 3) countermeasures translated into medical operations practice, 4) technologies for monitoring and treatment of adverse outcomes, and 5) information to update the human health and performance standards.

The HRP monitors and tracks the progress of tasks to ensure timely inputs to the OCHMO space flight health standards, to major Constellation Program (CxP) reviews, and to medical operations, mission procedures, and flight rule requirements development. The HRP, in conjunction with stakeholders, annually reviews the research progress in closing gaps in technology or knowledge. As gaps are closed, risks are reassessed to verify progress toward meeting the spaceflight health standards for exploration missions. Progress is indicated by changes in the likelihood, consequence, or uncertainty of human health and performance risks. As this data matures, it allows OCHMO, ESMD, and SOMD managers to accept, mitigate, transfer, or retire the risks.

The Government Performance and Results Act (GPRA) of 1993 provides for the establishment of strategic planning and performance measurement in the Federal Government. Assessing compliance with program objectives and resulting assessment rating are functions of the Office of Management and Budget, which utilizes the Program Assessment and Rating Tool (PART). NASA Procedural Requirements (NPR) 1080.1, Requirements for the Conduct of NASA Research and Technology (R&T), Section 4.3, Performance Management, is the Agency's response to the GPRA. The HRP provides annual inputs for inclusion in the PART in accordance with NPR 1080.1A.

1.3 CUSTOMER/BENEFICIARY AND STAKEHOLDER DEFINITION AND ADVOCACY

1.3.1 Customers and Stakeholders

Three organizations are the primary recipients of HRP outcomes and products: OCHMO, ESMD, and SOMD. HRP research focuses on reducing crew health and performance risks for exploration missions. In addition, HRP research gathers the data necessary to understand and mitigate the long-term health risks to the crew, to allow the update of specific crew health standards for each mission scenario, to support crew selection, and to address any rehabilitation requirements. HRP technology development enables the advancement of medical care and countermeasure systems. The program also develops and matures operations concepts that will

inform requirements for the design and operation of space vehicles and habitats needed for exploration missions. HRP products will be incorporated into OCHMO standards, ESMD/CxP requirement documents and vehicle designs, and SOMD operational processes and documents.

Since the goal of the HRP is to provide human health and performance countermeasures, knowledge, technologies, and tools to enable safe, reliable, and productive human space exploration, a key stakeholder is the Astronaut Office at JSC. Flight crewmembers are the equivalent risk takers per NPD 8700.1E, NASA Policy for Safety and Mission Success. The HRP consults with representatives from the Astronaut Office and involves crew personnel in decision-making as members of the HRP control boards.

Another HRP stakeholder is the Exploration Technology Development Program (ETDP), a co-program with the HRP within the ESMD Advanced Capabilities Division (ACD). The HRP will work with the ETDP to prevent duplication of technology developments and coordinate efforts where appropriate. In addition, the HRP will provide the ETDP with human systems expertise to assist with their hardware and software developments.

1.3.2 Customer and Stakeholder Advocacy

Customers and stakeholders must be active participants in the process of planning, reviewing, and assessing the direction and results of HRP activities. Frequent communication with the customer will ensure HRP products remain relevant to exploration needs and goals. Customers and stakeholders will provide inputs to the products by reviewing the proposed standards, requirements, countermeasures, and systems solutions to ensure that products are usable, crew health is maintained, operating efficiency is improved, and vehicle and habitat designs are conducive to safe and efficient crew performance. HRP research and technology development are conducted to satisfy customer requirements, therefore, the HRP will establish formal stakeholder agreements to ensure deliverables meet those requirements. These agreements are essential for defining anticipated use, operational concepts, and stakeholder expectations and for identifying requirements for the research and technology development. Stakeholder agreements will also describe the responsibilities for transitioning and infusing the product into the customer's program.

1.4 PROGRAM AUTHORITY AND MANAGEMENT STRUCTURE

1.4.1 Program Authority, Organizational Structure, and Reporting

The HRP Program Commitment Agreement (PCA) assigns management of the HRP to the JSC. The HRP Program Manager reports directly to the ESMD Associate Administrator (AA). The governing Program Management Council for the HRP is the ESMD Program Management Council (DPMC). The ESMD AA delegates the project decision authority to the HRP Program Manager. The "project" description in NPR 7120.8, NASA Research and Technology Program and Project Management Requirements, equates to the "element" description for the HRP. Thus, the HRP Program Manager authorizes element implementation with approval of the element plan. The reporting and management structure, including the program control boards, for the HRP is shown in Figure 1-1.

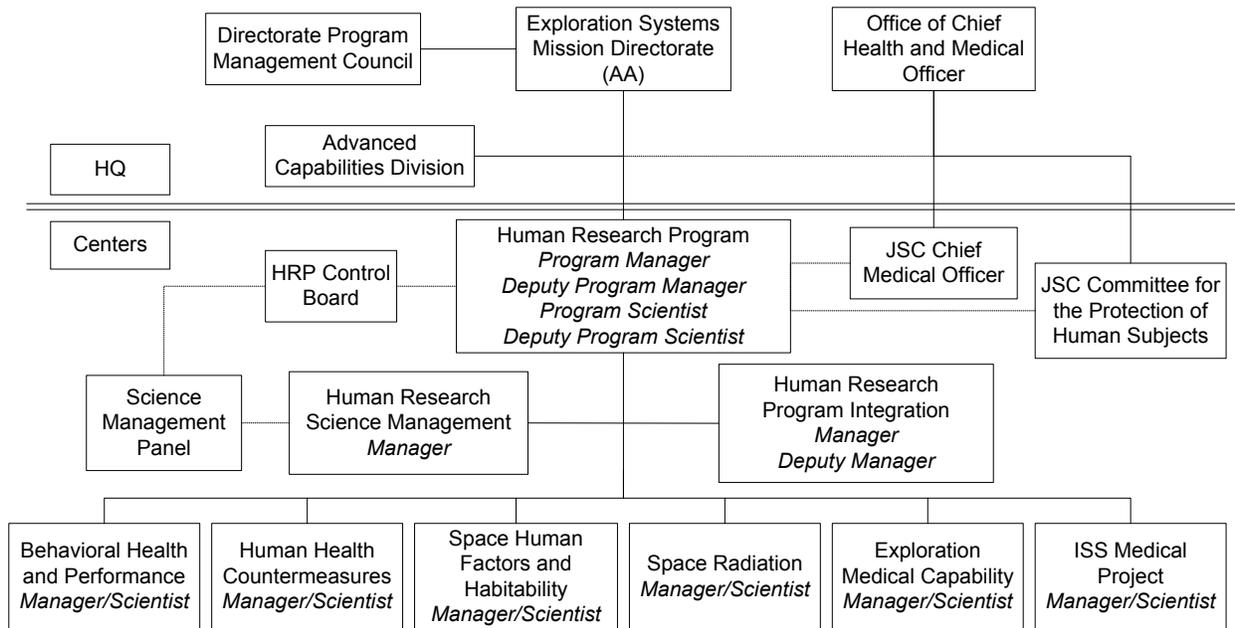


Figure 1-1: Human Research Program Management and Reporting Structure

The OCHMO plays a key role as the NASA Health and Medical Technical Authority (HMTA), providing health standards for the development of exploration requirements and by approving HRP countermeasure deliverables for operational use.

The ACD within the ESMD provides the necessary advocacy, monitoring of program progress, and compliance of the HRP to Agency needs, goals, and objectives. The Director of the ACD is responsible for developing opportunities to leverage non-NASA, HRP-related research to enhance mission requirements. The Director of the ACD also validates the applicability of internal and external research and technology development activities to address ESMD requirements.

The HRP organization is designed to support and accomplish the goals of the ESMD and OCHMO. The Program Manager and Deputy Program Manager lead all aspects of the program. The Program Scientist and Deputy Program Scientist lead the science management and coordination. Any references in this document to the Program Manager and Program Scientist apply to the deputy positions as well, unless specifically identified for the Deputy Program Manager or Deputy Program Scientist. Two offices, the Science Management Office (SMO) and the Program Integration Office (PIO), support program and science management and provide integration across the elements. Six program elements comprise the HRP and are focused to accomplish specific goals for investigating and mitigating the highest risks to astronaut health and performance. An element may elect to establish formal projects within its element in order to focus management and resources across related tasks.

The HRP is a multi-center program with program and element management at JSC. The HRP utilizes expertise at the JSC, the Ames Research Center (ARC), the Glenn Research Center

(GRC), and the Langley Research Center (LaRC) to accomplish its objectives. Each supporting center ensures institutional capabilities and processes are in place with center management receiving general status and progress reports, as needed.

HRP leadership is a collaboration of program/project management and science management at the program, element, and project levels. Both management and science skills are required at each level to implement the program and successfully meet objectives. Personnel collaboration is critical to the success of the HRP. Roles and responsibilities of key management personnel are identified in Section 1.4.6. Roles and responsibilities of key science management personnel are identified in the Science Management Plan (HRP-47053).

With program management located at JSC, the HRP utilizes existing JSC tools and processes as much as possible to facilitate program implementation and efficiently use program resources. Since HRP support at JSC is matrixed from the Space Life Sciences Directorate (SLSD), the HRP uses many SLSD tools and processes, such as for configuration management. Details on the use of JSC and SLSD tools and processes are contained throughout this document.

1.4.2 Management Processes and Documents

The HRP was formulated and initially implemented as an applied research program in accordance with NPR 7120.5C, NASA Program and Project Management Processes and Requirements. In February 2008, NPR 7120.8 was approved. The HRP is a R&T Program per NPR 7120.8. Revision A of the HRP PCA and this program plan implement the NPR transition.

NPR 7120.8 applies at the program level as well as all of the HRP elements, except for the ISS Medical Project (ISSMP). The ISSMP is the HRP element associated with space flight hardware and software development. Thus, the ISSMP is managed in accordance with NPR 7120.5D, NASA Space Flight Program and Project Management Requirements. The remaining HRP elements, and their associated projects, are assigned responsibility to investigate and mitigate the highest human health and performance risks composed of gaps and associated tasks. Most tasks are applied research, but some technology development is completed in concert with those research tasks. This parallel flow of activity within an element correlates to the R&T Portfolio Project per NPR 7120.8. The elements use the management processes identified for an R&T Portfolio Project as well as any additional content levied per this document.

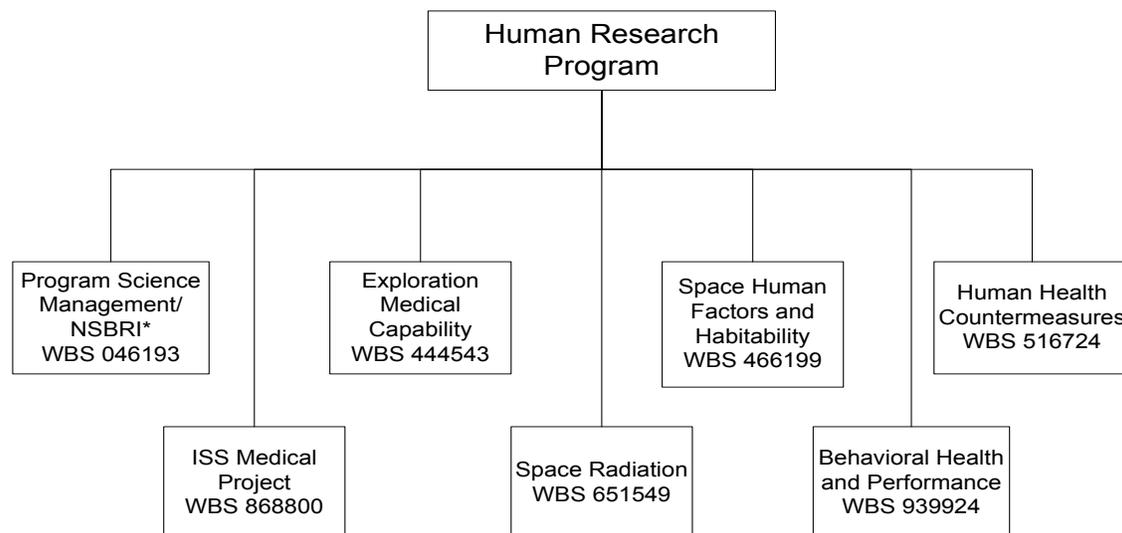
Program, element and project management plans were baselined using NPR 7120.5C templates. The HRP assessed the NPR templates and concluded all NPR 7120.8 template requirements are met within the NPR 7120.5C templates. The HRP elected to maintain the NPR 7120.5C templates to provide more specific information on research and technology strategy, safety and mission assurance, environmental impact, institutional and logistics, physical and information technology security, verification and validation, education and public outreach, and termination review criteria. This content is addressed in this program plan as well as the element and project management plans. Although documentation may not be formatted per the NPR 7120.8 templates, any content specifically required per NPR 7120.8 is included in the program, element, and project plans.

The HRP Documentation Tree (HRP-47054) identifies the principal program documents and associated hierarchy. The HRP Program Plan and budget are approved by the ESMD AA. All other HRP documents are controlled by the HRP Control Board (HRPCB). The HRP utilizes

standard documents for program management, such as the Program Requirements Document (PRD) (HRP-47052) and Integrated Master Schedule (IMS). In addition, the HRP utilizes unique documents to facilitate management of the science and research content, which are the Science Management Plan (HRP-47053), Evidence Reports, and Integrated Research Plan (HRP-47065). The Science Management Plan describes the policies and processes utilized in the science management of the HRP. The Evidence Reports are a collection of evidence-based review articles that provide a current record of the state of knowledge from research and operations for each of the identified human health and performance risks within the HRP. The Integrated Research Plan is a comprehensive document that defines the research and technology required over the next 15-20 years for both flight and ground experiments and facilities. These three documents are key management tools for resource allocation across the program and product delivery to stakeholders.

1.4.3 Program Work Breakdown Structure

The top-level Work Breakdown Structure (WBS) for the HRP is shown in Figure 1-2. The complete WBS is presented in Appendix C.



*Note: The NSBRI cooperative agreement is funded within the Program Science Management WBS.

Figure 1-2: Human Research Program Work Breakdown Structure

With the exception of the Program Science Management/National Space Biomedical Research Institute (NSBRI) WBS, each WBS item corresponds to a program element described in Section 1.4.4. The tasks within the Program Science Management/NSBRI WBS are described in Section 1.4.5. Although the NSBRI is funded within the Program Science Management/NSBRI WBS, scientific and technical work is performed across several WBS elements within the HRP.

1.4.4 Program Elements

The program is divided into six (6) major elements, described in the following subsections. These elements provide the program knowledge and capabilities to conduct research to address

the human health and performance risks as well as advance the readiness levels of technology and countermeasures to the point of transfer to the customer programs and organizations. An element consists of the aggregation of related projects and research tasks focused toward developing products that reduce risks to the crew. As previously stated, an element may elect to establish formal projects within its element. A project is characterized as an integrated set of tasks undertaken to deliver a product or set of products to a designated customer on a specified date.

Each element is managed by the JSC with research and technology development expertise provided by JSC as well as other NASA centers, NSBRI, and other organizations identified in the following element descriptions. Management and technical resources at each center supporting the element are included in each element WBS.

1.4.4.1 Space Radiation (SR) Element

The SR Element performs investigations to develop the scientific basis to accurately project and mitigate health risks from the space radiation environment. This knowledge yields recommendations to permissible exposure limits, assessment/projection tools/models of crew risk from radiation exposure, and models/tools to assess vehicle design for radiation protection.

The major deliverables for the SR Element include inputs to standards for radiation health, habitability, and environments; requirements for radiation protection; early technology development for monitoring equipment; models and tools to assess and predict risks due to space radiation exposure as well as vehicle design; and strategies to mitigate or treat exposure effects. Although information exists to recommend crew exposure limits and spacecraft design requirements for missions in low earth orbit, there is insufficient knowledge of the health effects of radiation, the space radiation environment, and countermeasure efficacy to provide recommendations on crew exposure limits and design requirements for extended lunar and future exploration missions. Therefore, a major focus of the SR Element is basic and fundamental research to expand the knowledge base and reduce the uncertainty inherent in current exposure limits and design requirements.

The SR Element conducts research using accelerator-based simulation of space radiation. The LaRC, ARC, and NSBRI Center of Acute Radiation Research (CARR) contribute to the SR Element.

1.4.4.2 Behavioral Health and Performance (BHP) Element

The BHP Element identifies and characterizes the behavioral and performance risks associated with training, living and working in space, and return to Earth. The BHP Element develops strategies, tools, and technologies to mitigate these risks.

Deliverables for the BHP Element include inputs to the BHP health and medical standards, requirements for behavioral health maintenance, and operational tools for exploration. The BHP Element also delivers knowledge, tools, and technology to detect or prevent performance degradation, human errors, or failures during critical operations resulting from sleep loss, circadian de-synchronization, fatigue or work overload; deterioration of morale and motivation; interpersonal conflicts or lack of team cohesion, coordination, and communication; team and

individual decision-making, performance readiness factors (fatigue, cognition, and emotional readiness); behavioral health disorders; and individual selection and crew assignments.

The ARC contributes to the BHP Element as do international agencies cooperating on joint proposals. The BHP Element also works in close collaboration with its NSBRI partners.

1.4.4.3 Exploration Medical Capability (ExMC) Element

The ExMC Element is responsible for defining requirements for crew health maintenance during exploration missions, developing treatment scenarios, extrapolating from the scenarios to health management modalities, and evaluating the feasibility of those modalities for use during exploration missions. The ExMC Element is also responsible for the technology and informatics development that will enable the availability of medical care and decision systems for missions to the Moon and beyond.

Exploration objectives present significant new challenges to crew health care capabilities. These challenges include the hazards created by the terrain of lunar or planetary surfaces that may be difficult to traverse during exploration, the effects of gravity transitions, low gravity environments, and limited communications with ground-based personnel for diagnosis and consultation. Each challenge has associated medical implications and medical requirements and technologies to ensure safety and success.

The major deliverables for the ExMC Element are inputs to medical standards for crew selection and retention criteria; requirements for medical equipment, clinical care capabilities, medical equipment technology development; and medical informatics.

The GRC, ARC, and NSBRI contribute technology development and clinical care expertise to the ExMC Element.

1.4.4.4 Space Human Factors and Habitability (SHFH) Element

The SHFH Element is focused on the human system in space environments: how do humans interface with spacecraft systems and what environmental and habitation factors are essential to maintain crew health and performance? The SHFH Element has three main focus areas: space human factors engineering, advanced environmental health, and advanced food technology.

The major deliverables for the SHFH Element are inputs to the CxP Human-Systems Integration Requirements, CxP 70024; validated models for predicting the effects of interface designs on human performance, such as the overall acoustics environment; methods for measuring human and human-system performance; design concepts for and evaluations of advanced crew interfaces and habitability systems; inputs to environmental health standards and research needed to inform requirements for exploration spacecraft and habitats; and extended shelf life foods with improved nutritional content, quality, reduced mass, and higher packaging efficiency to facilitate trash management.

The ARC and NSBRI contribute to the SHFH Element.

1.4.4.5 Human Health Countermeasures (HHC) Element

The HHC Element is responsible for understanding the physiological effects of spaceflight and developing countermeasure strategies and procedures. The element provides the biomedical expertise for the development and assessment of medical standards and vehicle and spacesuit requirements dictated by human physiological needs. In addition, the HHC Element develops a validated and integrated suite of countermeasures for exploration missions to ensure the maintenance of crew health during all mission phases.

Countermeasures target human physiology and performance capabilities at risk from space flight missions at each stage of mission performance. Pre-flight countermeasures involve crew selection, physical fitness and exercise, physiological adaptation training, and health stabilization. In-flight countermeasures cover physiological and nutritional health, physical fitness, and mission performance. Post-flight countermeasures target rehabilitation strategies.

The major deliverables for the HHC Element are input for the refinement of health and medical standards, validated human health prescriptions, validated exercise system requirements, extravehicular activity (EVA) pre-breathe protocols and physiological requirements for suit development, integrated physiological countermeasures, partial gravity human performance predictions and requirements, and criteria for the agency fitness for duty and crew selection/retention standards. Core laboratories provide the biomedical expertise that enables the development of medical standards, the assessment of the risks to crew health and performance, and the validation of countermeasures.

The ARC, GRC, and NSBRI contribute to the HHC Element, as do international agencies cooperating on joint flight proposals, reduced gravity studies, and collaborative bedrest studies.

1.4.4.6 International Space Station Medical Project (ISSMP) Element

The ISSMP is responsible for managing all ISS human research activities, including those integrated with operational medical support of the crews, to ensure research tasks are completed. The ISSMP is responsible for all planning, integration, and implementation services for HRP research tasks and evaluation activities requiring access to space or related flight resources on the ISS, Shuttle, Soyuz, Progress, or other spaceflight vehicles and platforms. This includes support to related pre-flight and post-flight activities.

The ISSMP provides and manages the Human Research Facility, enabling generic test and monitoring capabilities for HRP flight studies on the ISS. ISSMP services include operations and sustaining engineering for HRP flight hardware; experiment integration and operation, including individual research tasks and on-orbit validation of next generation on-orbit equipment; medical operations; procedures; crew training concepts; and operation and sustaining engineering for the Telescience Support Center, which provides real-time operations and data services to all HRP flight experiments. This element integrates the HRP-approved flight activity complement and interfaces with external implementing organizations, such as the ISS Payloads Office and International Partners, to accomplish HRP objectives.

The ARC contributes to the ISSMP with technical support to experiment management, hardware development, and international partner integration. The Kennedy Space Center (KSC) provides

support for baseline data collection as well as launch and landing support. Both centers provide resources and coordination for landings at Dryden Flight Research Center (DFRC).

1.4.5 Program Science Management / NSBRI WBS

This WBS item includes the top program management and scientist positions as well as the Program Integration Office (PIO) and the Science Management Office (SMO), which provide key integration of activities across the HRP in support of the Program Manager, Program Scientist, and elements. Although the NSBRI supports multiple elements within the HRP, the cooperative agreement is centrally funded under this WBS.

1.4.5.1 Program Management

Program management covers the HRP Program Management Office personnel and operations, including the Program Manager, Deputy Program Manager, Program Scientist, and Deputy Program Scientist. Program management and supporting offices, PIO and SMO, provide coordination with other NASA programs, participating NASA centers, and NSBRI as well as communication with the ESMD/ACD, OCHMO, and SOMD offices at Headquarters.

1.4.5.2 Program Integration

Responsibility for specific program integration efforts is delegated to the HRP PIO. The PIO ensures close coordination of exploration customer needs and program deliverables to meet those needs. The HRP PIO is responsible for program planning, integration, and coordination in support of the HRP Program Manager. The PIO will:

- a. Develop and maintain the HRP baseline technical requirements with allocations to the element level.
- b. Develop and maintain the baseline HRP budget and schedule. The PIO leads budget formulation and integration and integrates program input to the annual ESMD Planning, Programming, Budgeting, and Execution (PPBE) process.
- c. Lead the acquisition process for procurement of program support tasks. This does not include the selection of science through NASA Research Announcements (NRAs), Announcements of Opportunity (AOs), Broad Agency Announcements (BAAs), etc., which is a science management responsibility conducted per Section 1.4.5.3.
- d. Coordinate and integrate HRP program-level reports. The PIO synthesizes reporting products for delivery to external stakeholders in their required format.
- e. Ensure HRP product and process quality control by developing and tracking execution of HRP internal processes and facilitating process improvement activities.
- f. Establish and lead or coordinate technical and programmatic trade studies that involve more than one HRP element. This effort may involve coordination of key inter-program responses.
- g. Develop tools and analyses of the program portfolio to assure proper balance of content and priorities. Coordinate with the SMO, as needed.
- h. Collect and assess the integrated programmatic risk posture per the HRP Risk Management Plan (see Appendix E). The PIO assures thorough risk assessment is

conducted for all program activities and provides recommendations for elevating and rating of program risks.

- i. Provide a formal conduit to the CxP by working with the SLSD Constellation Support Office, transmitting key information to the HRP and providing program-level assessments of CxP documents, design packages, and other products. The PIO also develops program-level informational and decision packages for presenting to CxP forums.
- j. Seek out, and formally establish, collaborative activities that either reinforce HRP core competencies or develop products that help the HRP meet its goals and objectives.

1.4.5.3 Science Management

Responsibility for HRP science management, planning, and coordination is delegated to the Program Scientist. The SMO supports the Program Scientist in carrying out these responsibilities. The SMO will:

- a. Ensure identification and prioritization of the research objectives that reduce the operationally relevant human health and performance risks associated with exploration missions. The prioritized research needs, goals, and objectives are documented in the Integrated Research Plan (HRP-47065). The plan will guide allocation of HRP resources to manage the portfolio of ground and flight research, which encompasses both NASA and NSBRI research.
- b. Establish HRP science management policy including appropriate standards for obtaining scientific evidence. The HRP SMO will ensure that the integrated research portfolio is properly designed, that measurement techniques are consistent with contemporary standards, and that scientific integrity is maintained via rigorous external community reviews and internal program reviews throughout the life of the program. The HRP SMO will develop and evaluate criteria, including termination criteria, for the review of on-going research.
- c. Assure that acquisition approaches achieve appropriate results consistent with programmatic resources and schedules. The HRP SMO will advocate for competitive selection whenever appropriate and help recruit and retain the highest quality investigators to participate in competitive solicitations, directed studies, and review panels. The NSBRI solicitation processes and investigator recruitment is essential to the process, including assurance that NSBRI research objectives are aligned with HRP goals and objectives as described in the Integrated Research Plan.
- d. Support the development of external relationships with domestic and international agencies to help achieve the research goals and objectives of the program. Domestic agencies include other U.S. Government agencies, academic institutions, and commercial entities.
- e. Coordinate procurement of HRP scientific research and technology development tasks through NRAs, AOs, BAAs, etc.
- f. Develop tools and analyses of the program portfolio to assure proper balance of content and priorities. Coordinate with the PIO, as needed.

Science management activities will comply with NPR 1080.1A, Requirements for the Conduct of NASA Research and Technology (R&T).

1.4.5.4 National Space Biomedical Research Institute (NSBRI)

The HRP partners with the NSBRI to investigate the physical and psychological challenges of long duration space flight. As a research consortium, the NSBRI is another forum to bridge the research, technical, and clinical expertise of the biomedical community with the scientific, engineering, and operational expertise of NASA. The HRP and NSBRI management are closely integrated to ensure activities align with program objectives; and the NSBRI research products are integrated with each element/project to contribute to the mitigation of human health and performance risks.

1.4.6 Key Personnel Roles and Responsibilities

1.4.6.1 HRP Program Manager

The HRP Program Manager is accountable to the ESMD AA for the performance of the program against the established ESMD objectives. The Program Manager is responsible for program safety, security, cost, schedule, technical performance, and risk. The HRP Program Manager is also responsible for integration, oversight, and assistance to the constituent program elements. The HRP Program Manager coordinates program content with the ESMD, provides leadership, and is responsible for the successful accomplishment of the program that meets the needs of the customers. The Program Manager informs the ESMD of the establishment or termination of program elements.

In addition to the responsibilities defined in NPR 7120.8, the Program Manager will:

- a. Manage and implement the HRP, including activities performed at participating NASA centers.
- b. Support ESMD/ACD by providing necessary program support to strategic management functions.
- c. Integrate program planning and direction, including the program schedule.
- d. Develop the program budget.
- e. Allocate and manage program resources.
- f. Manage and implement program outreach activities.
- g. Approve elements and projects and communicate organizational changes to the ESMD.
- h. Manage research, including investigation selection and termination in consultation with ESMD, and NRA/AO development.
- i. Implement international agreements.
- j. Implement ISS human research, including flight assignment/manifesting and payload certification for flight.
- k. Implement program metrics assessments and reporting.
- l. Implement intergovernmental agreements such as those with the National Institute of Health (NIH) and the U.S. Department of Energy (DoE).

- m. Implement a programmatic risk management process. (See Section 3.8.)
- n. Coordinate HRP center-level implementation activities with supporting center management.
- o. Generate an annual assessment of HRP progress in meeting metrics, delivering products, and risk mitigation and closure.
- p. Assure communication of HRP results and their relevancy to the operations community.

1.4.6.2 HRP Science Management

The Program Scientist is responsible for science management, planning, coordination and integration as well as maintaining the scientific integrity of the HRP through peer reviews. The SMO Manager is the primary interface for internal HRP science management activities across the program elements and projects, in support of the Program Scientist.

The Element Scientists are responsible for the scientific component of their respective element and closely coordinating with the Program Scientist and SMO. If an element establishes formal projects, then the Project Scientist is responsible for the scientific component of their respective project and closely coordinating with the Element Scientist and SMO. Each science lead is partnered with a management lead at the program, element, and project levels to ensure HRP deliverables successfully meet exploration needs and goals.

The HRP also utilizes Discipline Teams identified by scientific discipline research areas to work with the elements and projects. Each team consists of personnel with scientific knowledge, clinical and technical expertise, and operational experience in space life sciences.

The Science Management Plan (HRP-47053) details the specific roles and responsibilities of all science positions and the policies and processes utilized for science management within the HRP. Collaboration is critical between management and science personnel utilizing the content of this plan and the Science Management Plan to successfully implement the HRP and meet its objectives.

1.4.6.3 PIO Manager

The PIO Manager leads all program integration functions described in Section 1.4.5.2. The PIO Manager is responsible for the internal coordination of HRP deliverables to external customers and stakeholders and for the integration of program activities involving multiple program elements. The PIO Manager will:

- a. Ensure program level documents and processes are developed, maintained, and implemented.
- b. Coordinate and integrate HRP products to be provided to external customers and stakeholders.
- c. Ensure cross element coordination and integration occurs for activities involving multiple elements.
- d. Lead the development of the annual HRP PPBE package in support of the Program Manager's submittal.

- e. Ensure that the HRP Integrated Master Schedule (IMS) is developed and maintained.
- f. Ensure that the HRP Risk Management Plan is implemented.

1.4.6.4 Element Manager

The HRP Program Manager delegates the implementation, management, and oversight of the constituent projects and tasks to the Element Managers. Each Element Manager will:

- a. Manage the technical content, including performance and integration of projects within the element, based on the requirements, resources, goals and objectives, and direction provided by the Program Manager.
- b. Work closely with the Element Scientist to ensure all element scientific or technological activities and procurement plan are synchronized with the element schedule, cost, and milestones and all element reviews are properly supported.
- c. Provide technical, cost, and schedule status reports at the element level.
- d. Ensure timely and effective grants management per NPR 5800.1E, Grant and Cooperative Agreement Handbook.
- e. Coordinate element activities across the Agency.
- f. Support the Element Scientist in recommending updates to the Integrated Research Plan.
- g. Maintain communication with other elements to insure solutions are integrated.
- h. Provide direction to the Project Managers as needed.
- i. Develop and manage inter-center agreements for element and project-level support and tasks.
- j. Manage the implementation of international agreements and other Agency-approved agreements and provide technical support for the development of these agreements.
- k. Participate in the HRP programmatic risk management process.
- l. Maintain an element-level schedule that integrates lower-level project schedules and feeds key milestones in the HRP IMS.

1.4.6.5 Project Manager

If an element establishes formal projects, then each Project Manager is responsible for implementing project activities in accordance with the provided objectives within the cost, schedule, and resources. The Project Manager will:

- a. Implement the assigned projects within budget, schedule, and content guidelines and direction provided by the Element and Program Managers.
- b. Work closely with the Project Scientist to ensure all project scientific or technological activities and procurement plan are synchronized with the project schedule, cost, and milestones and all project reviews are properly supported.
- c. Develop project plans, work breakdown structures, budgets and schedules, make or buy decisions, statements of work, and requests for proposal.
- d. Implement and manage program-approved inter-center task agreements.

- e. Approve requirements and interface with flight or ground analog teams to implement the definition, design, development, integration, test, launch (if flight), and operation of experiment hardware and software within the project schedule.
- f. Report status to the Element Manager in a timely manner.
- g. Manage project reserves.
- h. Develop and implement project risk mitigation plans and support program risk management processes.
- i. Conduct technical cost/schedule tradeoffs.
- j. Inform the Element Manager of deviations to the schedule, budget, and content.
- k. Develop and implement project-related inter-center agreements.
- l. Maintain a project-level schedule that feeds key milestones in the HRP IMS.

1.4.6.6 Center Point of Contact (POC)

The Center POC performs program management functions at those NASA centers that participate in the HRP. These functions are in addition to the support provided to the individual program elements. The Center POC directly interfaces with HRP management. The Center POC will:

- a. Provide overall coordination of center activities in support of the HRP including center programmatic content, budget, resource assessment and allocation, and staffing.
- b. Ensure its center meets all of its commitments to the HRP.
- c. Assist the HRP management team in strategic planning, implementation, and advocacy.

2. HUMAN RESEARCH PROGRAM BASELINE

2.1 PROGRAM REQUIREMENTS/OBJECTIVES

The HRP, in consultation with customers and stakeholders, will be responsive to OCHMO, SOMD, and ESMD needs, goals, and objectives for maintaining crew health and performance during exploration missions. CxP documents provide the mission architecture definitions, mission concepts of operations, vehicle, habitat, and space suit performance requirements, and other technical information needed to focus the HRP efforts for specific exploration missions. As a program within the ESMD, HRP objectives are identified in the Exploration Need, Goals, and Objectives (ENGO) Document and requirements are assigned in the Exploration Architecture Requirements Document (EARD).

The Chief Health and Medical Officer (CHMO) is the HMTA per NPD 1000.3C, The NASA Organization. The CHMO appoints the HMTA Chief Medical Officer (CMO) designee at each NASA center (as appropriate). The JSC CMO established the Human System Risk Board (HSRB) to ensure a consistent, integrated process is established and maintained for managing human system risks. (See Section 3.1.3 for further descriptions of the HMTA and HSRB.)

The Bioastronautics Roadmap (BR) was used as a starting-point to establish the human health and performance risks identified in the PRD (HRP-47052). The BR captured the human system risks associated with exploration missions. However, it did not capture the level of detail

necessary to prioritize across disciplines or compare strategies for a given risk across mission architectures. The JSC CMO developed the Risk Management Analysis Tool (RMAT) to fill this gap and facilitate discussion and decisions by the HSRB.

The RMAT is used as a communication tool to understand human system risks, compare standards, requirements, mitigation strategies, etc. against known mission architectures and resources. The RMAT collects the appropriate information to allow decision-makers to develop mitigation strategies for the highest priority human risks for each architecture. The RMAT format reviews medical risks in terms of probability, impact, and proposals for mitigating the risks, and reviews each risk in terms of multiple mission architectures (short-duration Earth-orbital mission, ISS 6-month mission, ISS 12-month mission, short-duration Lunar sortie, long-duration Lunar mission, and Mars Mission).

The HSRB establishes risk priorities based on an assessment of likelihood and consequence. If the board determines there is sufficient evidence for a risk but additional research is required to understand or mitigate the risk, it is assigned to the HRP. The HRP will complete an analysis of the risk and develop a research plan to further understand, inform the standards, or develop mitigation or monitoring strategies for the assigned risk.

The EARD requirements are merged with applicable HSRB human system risks to form the requirements of the HRP documented in the HRP PRD, HRP-47052. See Figure 2-1. The requirements are further decomposed in the element and project plans. The PRD is updated as needed per EARD revisions and HSRB decisions regarding HRP-applicable human system risks. Performance against requirements is a function of progress in mitigating or eliminating human system risks that is achieved via research and technology development tasks and assessed by independent review, approved through the HMTA, and implemented by the OCHMO, ESMD, and SOMD.

The HRP conducts research, develops countermeasures, and undertakes technology development to inform and support compliance with NASA's health, medical, human performance, and environmental standards. HRP research and technology development results in:

- Identification and quantification of the risks associated with human spaceflight for the various exploration missions
- Delivery of data to support development of, and updates to, applicable human health and performance standards for the various exploration missions
- Development of countermeasures to provide mission planners and system developers with strategies for mitigating crew health and performance risks
- Development of technologies to provide mission planners and system developers with strategies for monitoring and mitigating crew health and performance risks
- Maintenance of NASA's core competency in space life sciences.

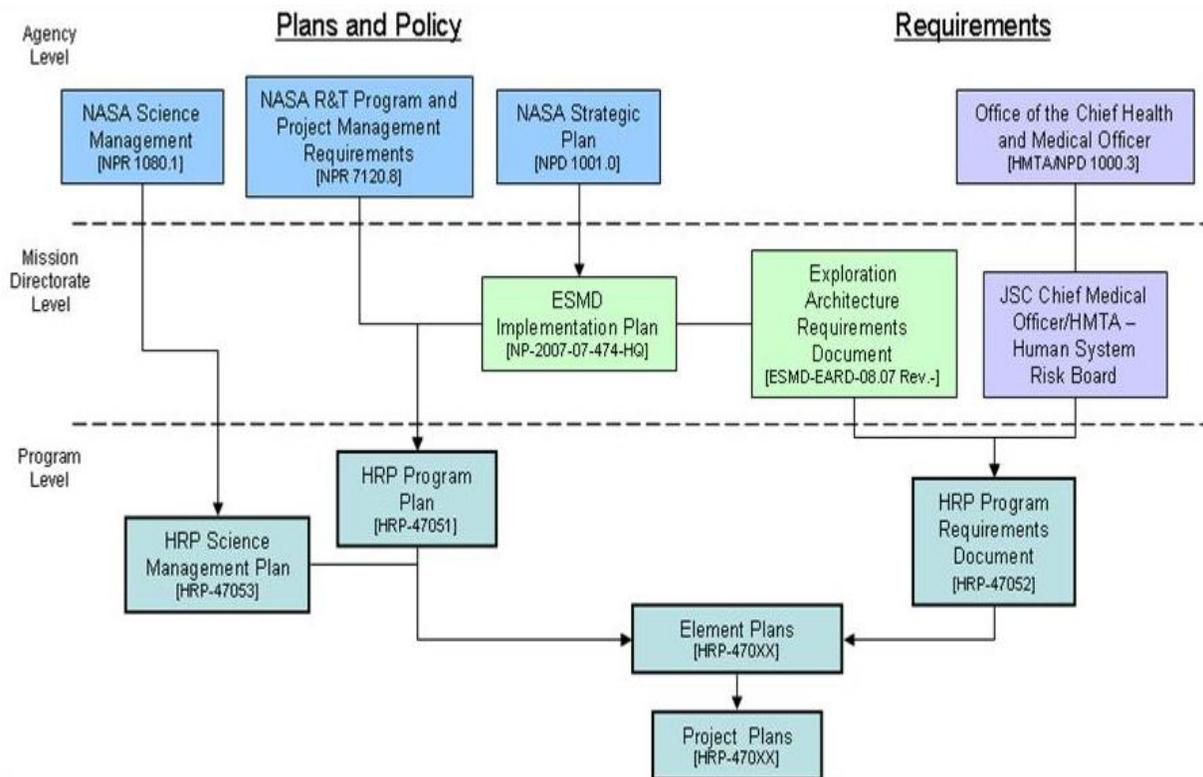


Figure 2-1: HRP Requirements Flow

2.2 PROGRAM SCHEDULE

The key target milestones for the HRP are defined in the HRP PCA and reflected in Appendix D. The schedule is a roll-up of significant program, element, and project activities.

The HRP maintains an IMS with further definition of these key target milestones. HRP management reviews the visibility and control milestones with the elements and projects on a quarterly basis. The elements and projects have further detailed schedules that support the milestones. Following each quarterly review, the IMS is updated and approved by the HRPCB.

2.3 PROGRAM RESOURCES

HRP resources are defined in the HRP PCA. The Program Manager makes formal recommendations to the ESMD to establish resource commitments with annual updates as part of the PPBE process defined in NPR 7120.8 and NPD 1000.0A, NASA Governance and Strategic Management Handbook. The HRP Program Manager coordinates center-level resources with the Center POCs. For JSC, the Program Manager coordinates with the SLSD Director for further reporting to the Center Director.

The Program Manager manages program resources to maintain focus on program goals and objectives and to control program costs. The Program Manager implements a budget control

process to support Agency full cost accounting objectives. The HRP Program Manager holds reserves for discretionary use within the program.

The budgets for each contributing field center cover the full cost of the assigned responsibilities from the HRP and include ground-based research and technology endeavors and flight definition, implementation, and operations activities. Each element integrates and reports field center budgets as part of its submittal during the annual PPBE process. Budget agreements between contributing centers are documented using Internal Task Agreements (ITAs). The element PPBE submittal also addresses specific resources necessary to fulfill applicable commitments from international agreements. Changes to budgets are tracked and authorized using Budget Change Directives (BCDs).

3. SUBPLANS

3.1 CONTROLS AND COMPLIANCE

The HRP uses existing SLSD processes and tools for the management and control of the program in order to maintain operating efficiency and reduce costs.

Program management will monitor changes affecting the HRP that warrant modifications to the PCA and Program Plan. The Program Manager will prepare modifications and document in the change log, as required. The ESMD/ACD will coordinate approval of the modified PCA and Program Plan through Headquarters.

3.1.1 Requirements Monitoring and Control

Requirements from a number of sources drive the content and direction of the HRP. The HRP Program Manager is responsible for ensuring that requirements monitoring and change control activities are consistent with agency policies, practices, and procedures and support ESMD needs, goals, and objectives.

Program reviews will be conducted as defined in Section 3.13 to ensure that program goals and objectives, as well as research and development activities, remain consistent with current ESMD research and mission needs. Each task will be reviewed to assess the status and continuing relevance of HRP content against the evolving ESMD research and mission requirements. These reviews may result in adjustments to HRP content to align it with updated ESMD research and technology development requirements.

The results of the research conducted within the HRP, as well as evolving exploration requirements and mission definitions, may identify the need for a new task to further understand and mitigate the effects and risks associated with human spaceflight. The HRP will work with the ESMD and stakeholders to fully define the scope of these tasks, obtain funding, and gain authorization to proceed.

3.1.2 Program Configuration Management

Configuration management of program-level documents, milestones, and element/project plans identified in the HRP Documentation Tree (HRP-47054) will be in accordance with the SLSD Configuration Control Management Plan, JSC 28330. Configuration of these items will be

controlled through the HRPCB. Configuration control of internal element and project implementation documents, schedules and products is delegated to the appropriate element or JSC/SLSD division configuration control board (CCB).

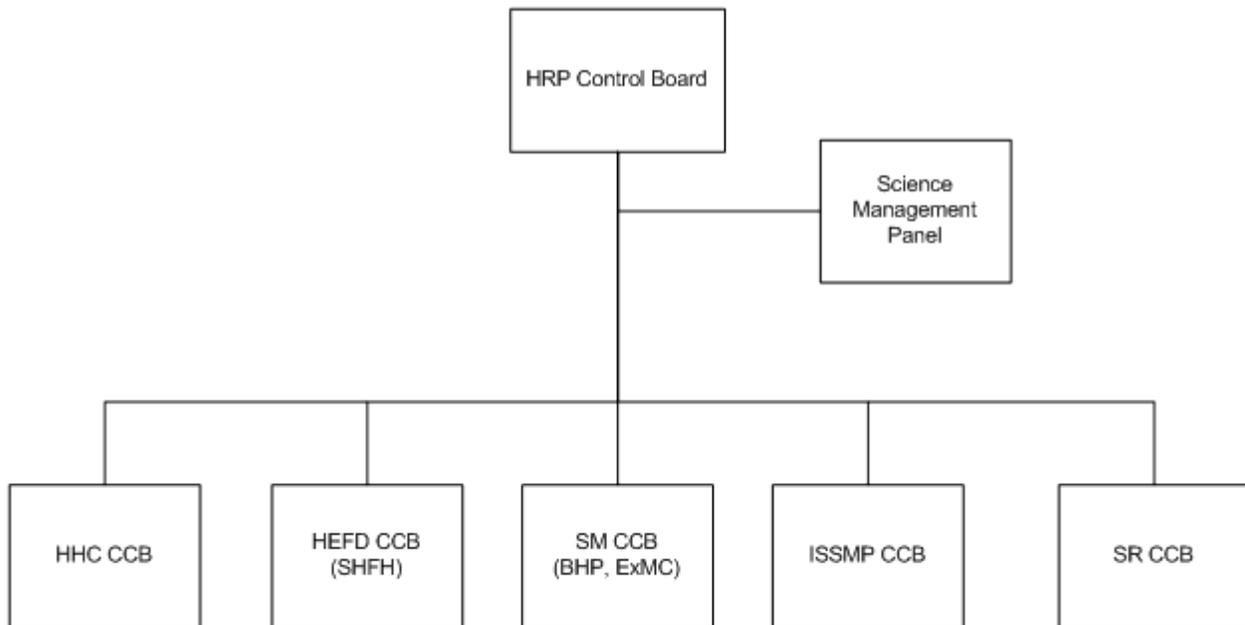
3.1.3 Configuration Control Boards

The HRP uses a series of boards to provide configuration management and review of HRP content. Primary control is through the HRPCB.

3.1.3.1 Human Research Program Control Board (HRPCB)

The HRPCB is chaired by the Program Manager and serves as the configuration management and decision-making forum for the HRP. The HRPCB provides the forum for approval of the HRP technical, management, operations, user and integration requirements, science priorities, as well as program schedules and resources. Detailed responsibilities and duties are defined in the HRPCB charter.

The HRPCB uses element CCBs for controlling HRP internal element and project implementation level activities. Elements may elect to use existing JSC/SLSD division CCBs as their element CCB. The relationship between the HRPCB and the element and division CCBs are shown in Figure 3-1.



Human Health Countermeasures = (HHC)
Habitability and Environmental Factors Division = (HEFD)
Space Medicine = (SM)
International Space Station Medical Project = (ISSMP)
Space Radiation = (SR)

Figure 3-1: Control Boards for the HRP

3.1.3.2 Science Management Panel

The Science Management Panel (SMP) is the HRP-Chartered forum chaired by the HRP Program Scientist to facilitate the science management function. Detailed responsibilities and duties are defined in the SMP charter.

3.1.3.3 Health and Medical Technical Authority

The JSC CMO is responsible for implementing the HMTA process for programs managed at the JSC. The JSC CMO is an independent entity responsible for assuring compliance and approving deviations to program health and medical technical requirements, processes, and policies.

Results from the HMTA process inform JSC, other center, and agency level reviews of program and project progress, including concurrence or non-concurrence on technical issues.

The JSC CMO has the responsibility to review appeals of standards and requirements that are not met in a specific program based on the analysis of their respective owners (program and division configuration and control boards). Appeals of HMTA decisions are reported through independent chains, i.e., program and project managers to the ESMD AA and the HMTA to the

NASA CHMO. The ESMD AA and CHMO will work resolution of the appeal. If agreement cannot be reached, then the issue will be escalated to the NASA Administrator for resolution.

3.1.3.4 Human System Risk Board (HSRB)

Human system risks encompass environmental exposures, crew performance issues, biomedical stressors/susceptibilities, the ability to provide medical care, and any other challenges that affect the human as a system. The JSC CMO established the HSRB to ensure a consistent, integrated process is established and maintained for managing human system risks. The HSRB advises the JSC CMO, HMTA delegates, SLSD management, and key SLSD program boards concerning the identification, status, coordination, integration, mitigation, and research strategy of all human system risks. The HSRB is the primary board for establishing official recommendations and positions regarding human system risks.

The HSRB is delegated responsibility by the HMTA Board for two categories of activities:

- Documenting and tracking all risks to the human system associated with spaceflight activities.
- Managing all human system risks and specifying actions to be taken with respect to the risks: accept, mitigate, transfer, watch, research, or retire.

For the HRP, the HSRB establishes what human system risks require research and determines if research results sufficiently reduce, mitigate, or retire a human system risk. The HSRB advises the ISS Program, Shuttle Program, and CxP on status and recommendations to disposition human system risks applicable to their programs and/or missions.

3.1.3.5 Engineering and Safety and Mission Assurance (S&MA) Technical Authorities

As a research and technology development program focused on investigating and mitigating human health and performance risks, the HRP more directly and frequently interfaces with the HMTA. However, the HRP also interfaces with the Engineering and S&MA Technical Authorities established per the governance model.

The Office of the Chief Engineer (OCE) ensures that missions are planned and conducted with sound engineering practices and with proper controls and management. OCE requirements are contained within NASA Policy Directives (NPD), NASA Procedural Requirements (NPRs) and technical standards. The Office of Safety and Mission Assurance (OSMA) assures the safety and enhances the success of all NASA activities through the development, implementation, and oversight of Agency wide safety, reliability, maintainability, and quality assurance policies and procedures.

Engineering and S&MA Technical Authority are individuals funded independent of programs and projects with formally delegated Technical Authority traceable to the Administrator through the NASA Chief Engineer and Chief, Safety and Mission Assurance, respectively. These individuals are identified in center Technical Authority implementation documents.

The HRP interfaces with the technical authorities primarily through development of flight hardware systems, use of ground facilities for testing, and associated reviews and boards established at the center, ESMD, and Agency levels. Appeals of Technical Authority decisions

are reported through independent chains, i.e., HRP Program Manager to the ESMD AA and the Technical Authority through the OCE or OSMA. The ESMD AA and OCE or OSMA, as applicable, will work resolution of the appeal. If agreement cannot be reached, then the issue will be escalated to the NASA Administrator for resolution.

3.1.4 Cost and Schedule Controls

The HRP uses regular cost and schedule reporting, as coordinated through the PIO, to measure performance of the elements and projects against the program baseline. Individual elements and projects report status at quarterly technical, cost, and schedule reviews (TCSRs). The HRP uses BCDs to re-allocate funding at the element and project levels. Changes to control milestones must be approved by the HRP Program Manager.

3.1.5 Communication Plan

The primary communication paths for the HRP are depicted in Figure 3-2.

3.1.5.1 Formal Communication

Formal communication includes all deliverables as well as management and technical information related to the technical, cost, schedule, and risk performance of the HRP. All formal program communication with the ESMD, CxP, OCHMO, and SOMD is controlled through the HRP Program Office (including the PIO and SMO) and is approved by the Program Manager or designee. All formal communication with NSBRI, grantees and contractors is through the Contracting Officer's Technical Representative and the Contracting Officer.

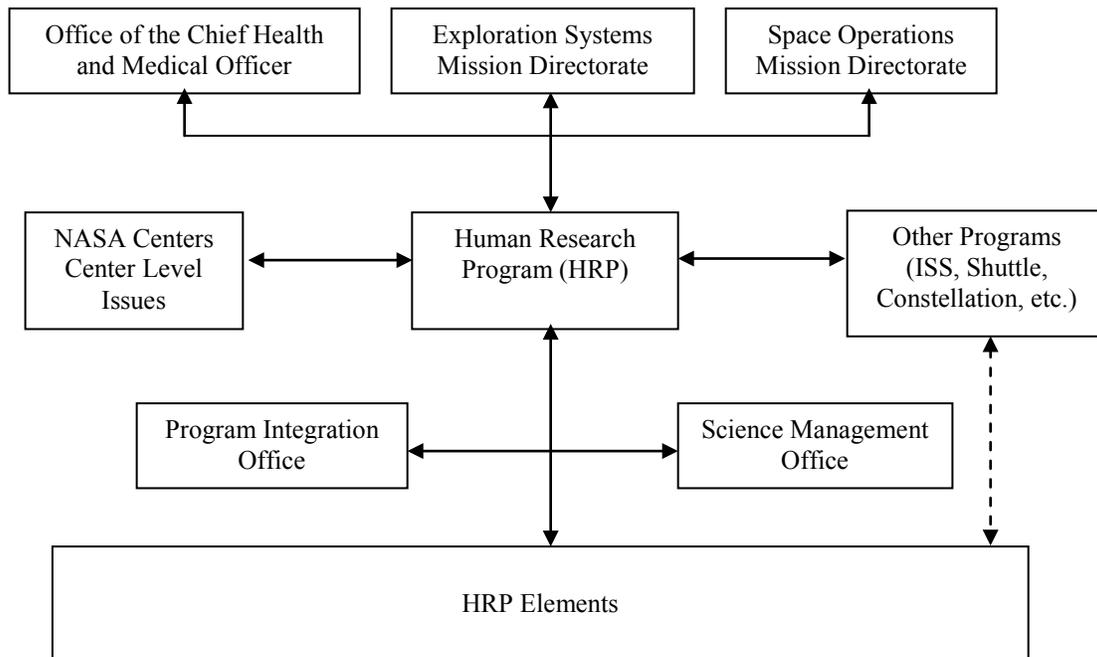


Figure 3-2: HRP Communication Paths

3.1.5.2 Informal Communication

HRP management fosters an environment for open and timely communication by providing regularly scheduled forums, such as the SMP and HRPCB, as well as access for special topic meetings. A weekly tagup is conducted with program and element managers to convey status across the program. The HRP program offices also flow information and requirements to and from the external organizations to the points of contact within the elements and projects as necessary. Program and element management facilitate communication between elements and projects to ensure HRP objectives are met. This communication provides integration of the output from the various research and development tasks. The HRP program offices, elements, and projects conduct all day-to-day communication with internal and external researchers and support organizations with respect to meeting program objectives. This communication is with principal investigators, research facilities, academia, international support teams, NSBRI, supporting NASA centers, ESMD Strategic Communications Office, and other research organizations as well as other program offices. Any issues that may affect cost or schedule or that cannot be resolved at the element level will be forwarded to the program offices for resolution.

3.2 RELATIONSHIPS TO OTHER PROGRAMS AND ORGANIZATIONS

3.2.1 Internal Relationships and Agreements

Internal relationships and agreements are those that exist within NASA between the various programs and centers. Internal agreements that may be concluded with the authority of the HRP Program Manager include those with organizations at the NASA centers, including other program offices. These agreements shall be formally documented either through the use of Memoranda of Agreement (MOA), Stakeholder Agreements, or the PPBE process, including the use of ITAs and BCDs. Internal agreements that must be developed under the authority of the ESMD include agreements with other NASA organizations that require reprogramming of funds. The HRP is not dependent on any NASA activities outside of the ESMD, SOMD, and OCHMO to fulfill its objectives.

3.2.2 External Relationships and Agreements

External relationships and agreements are those that exist with organizations outside NASA. External agreements that may be concluded under the authority of the Program Manager include partnering opportunities as solicited through Internal Calls for Proposals, directed research projects, AOs, and BAAs. External agreements that must be developed under the authority of the ESMD include agreements with other federal agencies and United States industries for the purpose of sharing research facilities, multi-user hardware, and collaboration on research activities of mutual interest. The ESMD also authorizes agreements with international space agencies for the purpose of sharing research facilities, multi-user hardware, and collaboration on research activities of mutual interest. The current list of external agreements is presented in Appendix F.

3.3 BUDGET AND ACQUISITION STRATEGY

The HRP elements and projects use the NASA PPBE process to generate their baseline budgets.

The HRP uses available NASA and ESMD acquisition methods, such as AOs, BAAs, NRAs, Cooperative Agreement Notices, Small Business Innovation Research (SBIR) solicitations, Internal Calls for Proposals, Requests for Proposals (RFPs), and Requests for Quotes (RFQs) to acquire research and technology development support. In addition, acting in partnership with NASA, the NSBRI provides access to the external research community by supporting research via national solicitations.

Directed research is another acceptable acquisition method. Directed research can involve in-house, external, or a combination of both researchers. The HRP uses directed research as an acquisition method for obtaining selected research data and technology development when:

- a. There is insufficient time for solicitation. In certain cases, NASA must define scientific activities in a short time (e.g., because of the emergence of new opportunities to carry out activities in space on the Shuttle or ISS). When this is the case, use of a directed study may be the only practical way to respond.

- b. The research is highly constrained. In this case, the element or project requires constrained data gathering and analysis that is more appropriately obtained through a well-defined solicitation using a RFP or by a non-competitively developed proposal (e.g., the research task may involve extensive operational practices and associated operational personnel who must be heavily involved in the development of the study design).

Participating NASA centers also utilize competitive contracts for procurement of support to intramural project tasks. The centers have multiple options for procurements and select the optimal procurement method based on the Agency policy of the widest possible use of competitive processes.

Regardless of the acquisition method, the review and selection of science is in accordance with NASA policies and is merit reviewed per the Science Management Plan, HRP-47053.

3.4 RESEARCH AND TECHNOLOGY STRATEGY

3.4.1 Basic and Applied Research

The HRP performs research tasks that focus on the reduction of the most significant health risks to the crew as a result of exploration missions and increase the knowledge base to inform the development of standards for human support systems. Tasks include basic and applied research to inform crew health and medical standards and guide the development of human health countermeasures.

Basic and applied research includes the test and validation of hypotheses, formulation of countermeasure concepts and initial demonstration of efficacy, clinical trials/testing, and finally, validation and delivery for operational implementation.

The Transition to Medical Practice process defined by the OCHMO is used to review and approve HRP deliverable countermeasures and technologies prior to their operational use.

3.4.2 Countermeasure Development

The HRP nominally begins a countermeasure development at Countermeasure Readiness Level-4 (CRL-4) and develops the selected countermeasure to CRL-7 or -8. At this point, the HRP transfers the countermeasure to the implementing organization for incorporation. For some elements, Space Radiation for example, countermeasure development must begin at much lower CRLs and are thus developed to CRL-6 prior to transition. See Figure 3-3.

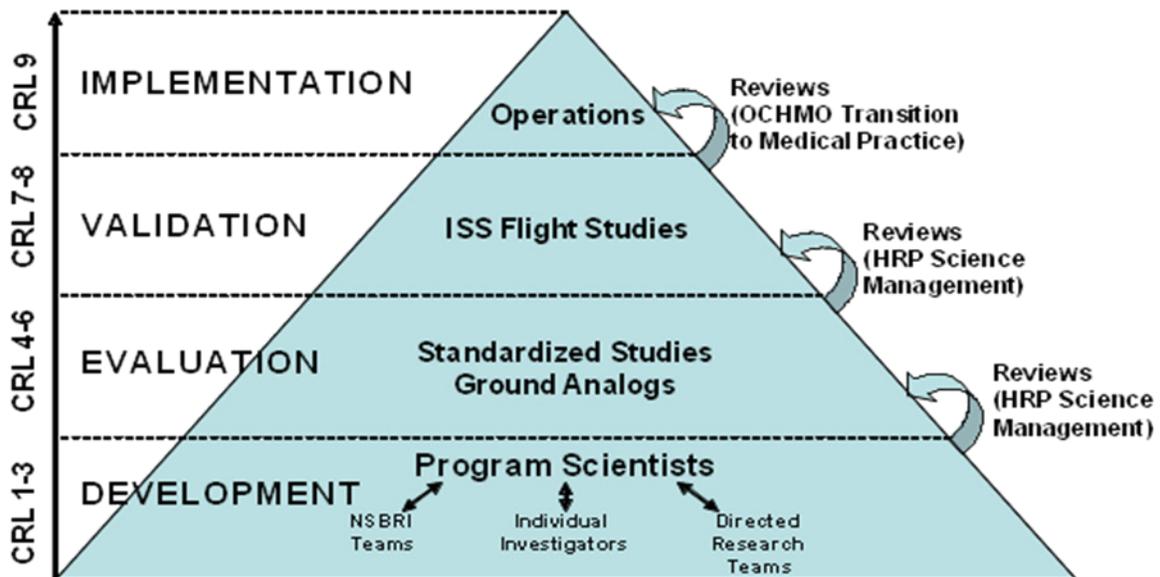


Figure 3-3: Countermeasure Development Process

3.4.3 Technology Development

The HRP nominally develops critical human system technologies to Technology Readiness Level-6 (TRL-6) by the time of the applicable Preliminary Design Review. See Figure 3-4. However, in cases where the individual technology is mature but requires alternate integration techniques to satisfy operational reliability requirements, the integrated technology may only be developed to TRL-4. Technology development may include those tasks needed to mature countermeasures as defined in Section 3.4.2. The HRP utilizes the ISS and ground testbeds to integrate and demonstrate technologies. Technology deliverables will be transitioned to the customer for final maturation, development, and insertion into the flight program.

Before technologies are delivered, the HRP completes an infusion process, which includes assessment of TRLs and successful completion of development control gates. This includes an independent technical review with the participation of the implementing program (e.g. CxP). This review will provide early visibility of technology capabilities to the program and stakeholders, enabling the identification of preferred technology insertion paths. An internal review of the technology development status will be conducted to assess its readiness for delivery to the targeted customers.

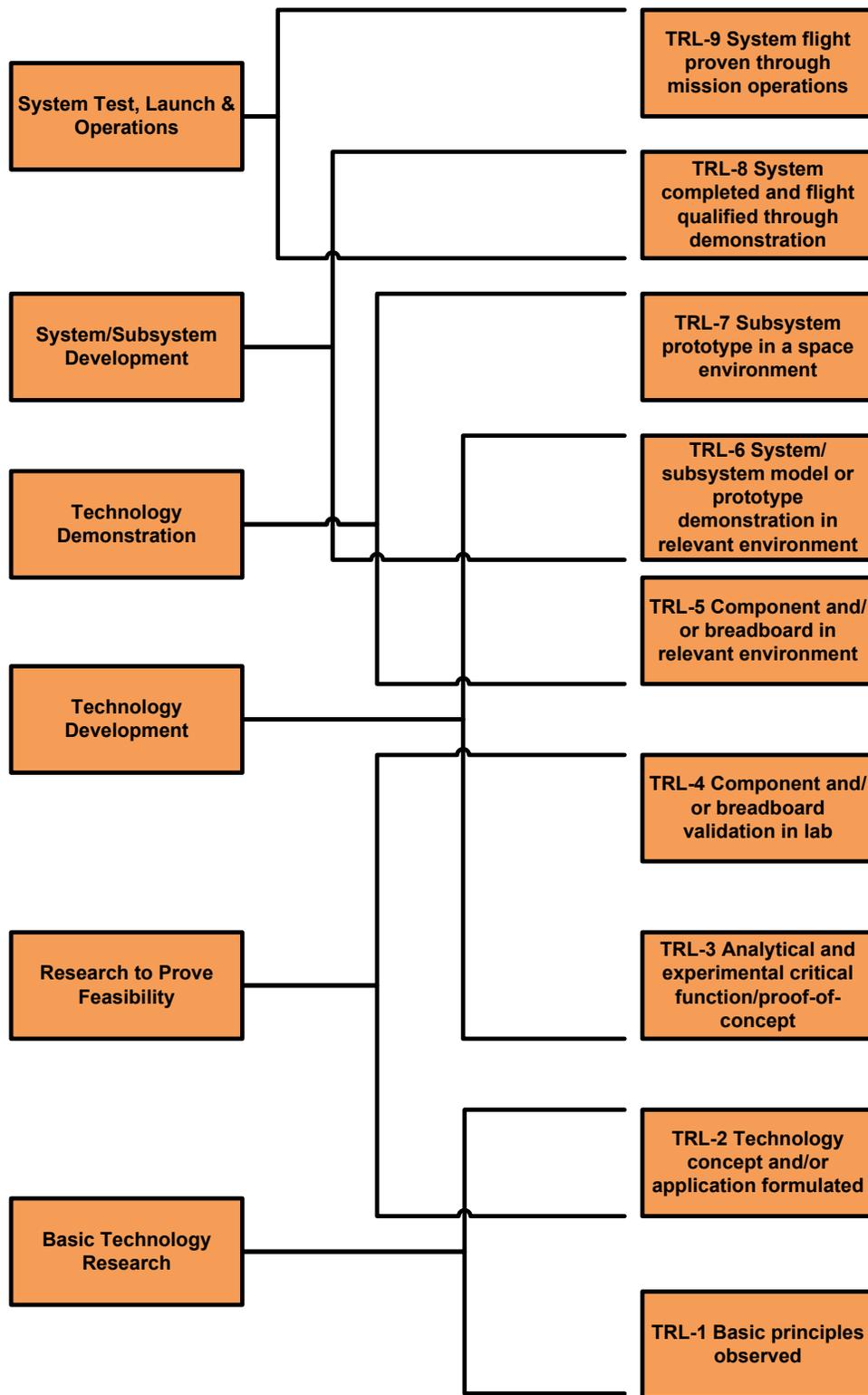


Figure 3-4: Definition of Technology Readiness Levels

3.5 COOPERATION AND COMMERCIALIZATION

The JSC Innovation Partnerships Office will support the HRP to identify and evaluate commercial opportunity options. As applicable, the JSC Innovation Partnerships Office works with the HRP to develop specific commercialization partnership and/or technology transfer opportunities. Innovation Partnerships Office support of partnership development includes industry market analysis, search for and connection to potential partners, and partnership due diligence and evaluation. Agreement negotiation and definition are performed within the JSC Directorate by the delegated representative of the agreement's sponsoring organization. Similarly, the supporting NASA centers use their own commercialization and technology transfer organization, as appropriate, in support of their content.

3.6 DATA MANAGEMENT AND DISTRIBUTION

The documents developed under the HRP are stored in JSC/SLSD managed databases for configuration management and are available to the general public in accordance with JSC policy. For cross-center integration, the HRP utilizes an ESMD-provided storage location and tools for review documents and schedules.

The Life Sciences Data Archive (LSDA) provides a system to capture and disseminate life science research findings. It currently contains summarized flight experiments and descriptions of research results with references to publications, as well as raw data files from flight. Data management and distribution capabilities are also available within the LSDA system and may be used to collect structured data for experiments, distribute that data, and archive experiment data for future use. Astronaut data collected for clinical purposes are available for research through the Lifetime Surveillance of Astronaut Health (LSAH). A written request for research data must be submitted to the LSAH Executive Committee who reviews and dispositions all requests for information in accordance with the Privacy Act of 1974.

A goal within the HRP is to maximize the availability and access of data by appropriate users within fiscal constraints. The HRP complies with NPR 7100.1, Protection of Human Research Subjects, which is implemented at JSC via JPD 1382.5, Maintaining the Privacy of Biomedical Research Data. Its purpose is to establish a policy for protecting the privacy of data collected during voluntary medical research involving active, inactive, or retired space flight crew members and for ground-based and in-flight data collection. No data attributable to an individual will be publicly released without the written permission of the subject. This concept encompasses non-disclosure of an individual's name and requires sufficient pooling of data to preclude determining an individual's identity by combining or cross-referencing data (e.g., height, weight, sex, and flight number may identify a specific individual).

HRP documents also include published journal articles, conference papers, and/or technical presentations generated by extramural and/or intramural researchers. HRP deliverables are archived using approved database applications.

3.7 SAFETY AND MISSION ASSURANCE (S&MA)

3.7.1 Research S&MA

3.7.1.1 Human Test Subjects

For NASA-funded investigations involving human subjects, the element or project will comply with NPD 7100.8E and NPR 7100.1, Protection of Human Research Subjects, to insure the health, safety, and privacy of the subjects are protected. All human research funded, sponsored, conducted, or supported by NASA, is reviewed by an Institutional Review Board (IRB) approved by NASA or the Office of Human Research Protection at the Department of Health and Human Services. IRBs are established at NASA centers to review all ground-based and aeronautical flight research involving human subjects that is conducted at the centers or utilizes center equipment or personnel.

All research performed on NASA spacecraft involving crewmembers is reviewed by the JSC IRB, the Committee for the Protection of Human Subjects (CPHS). The HRP requires all HRP research to be reviewed by the appropriate IRB. IRBs, including the CPHS, have the authority to approve, disapprove, or require changes in the proposed human research protocols and procedures and to suspend or terminate its approval of research activities that are not conducted in accordance with the approved protocol or that have been associated with serious harm to subjects. For international projects, element or project strategies will be submitted for additional review by the Human Research Multilateral Review Board.

3.7.1.2 Animal Test Subjects

For tasks involving animal subjects, the element or project will obtain prior approval from the Institutional Animal Care and Use Committee for the appropriate testing location and will comply with the *NRC Guide for the Care and Use of Laboratory Animals* and the *Animal Welfare Act* (Code Fed. Reg. Title 9), and NPD 8910.1B and NPR 8910.1A, Care and Use of Animals.

3.7.1.3 Ground Research

Ground-based research will be conducted at multiple NASA centers and non-NASA facilities. The HRP will comply with the approved safety, environmental, and quality standards for the performing center and facility.

3.7.1.4 Flight Research

For flight research, the element or project will comply with the applicable standards and procedures governing flight payloads including NSTS 1700.7B, Safety Policy and Requirements for Payloads Using the STS, and SSP 50021, Safety Requirements Document. The ISSMP Project Manager and the funding Element or Project Manager will ensure that S&MA processes are properly established and implemented within the task.

Hardware will be presented to the JSC Payload Safety Review Panel (PSRP). Safety engineers participate in all phases of the hardware and software design process and develop Phase 0, I, II, and III Flight and Phase 0/I/II and III Ground Safety Data Packages for hardware items and act

as a liaisons to the PSRP. Safety engineers review flight and ground procedures for compliance with safety requirements and identify hazard controls during the procedure development process prior to baseline. Compliance will be verified during the safety reviews as well as the Certification of Flight Readiness (CoFR) review process.

3.7.2 Technology Development

Technology development projects will comply with S&MA requirements at the relevant centers.

3.8 RISK MANAGEMENT STRATEGY

The HRP Program Manager implements a continuous risk management process in accordance with NPR 8000.4, Risk Management Procedural Requirements. As a program within the ESMD, the HRP implements the ESMD risk management process in accordance with ESMD-RMP-04.06, Exploration Systems Risk Management Plan. Appendix E, Program Risk Management Plan, contains further details of the programmatic risk management process.

The HRP uses the JSC Integrated Risk Management Application (JSC IRMA) as the common tool for documenting and tracking all programmatic risks. From the JSC IRMA, risks are entered in other program databases as appropriate, such as the ESMD Active Risk Manager (ARM), the CxP IRMA for all CxP related risks, the ISS IRMA for all ISS-unique risks, and the SIRMA for all Shuttle-specific risks. The HRP uses the ESMD ARM to track only top program risks and those risks that affect other ESMD programs.

3.9 ENVIRONMENTAL IMPACT

The HRP will comply with the responsibilities defined in NPD 8500.1B, NASA Environmental Management. The HRP requires each element and project to evaluate the environmental risks and liabilities associated with each task. The Element or Project Manager is responsible for compliance with environmental requirements and will develop documentation associated with environmental compliance considerations, as needed.

3.10 INSTITUTIONAL AND LOGISTICS

Institutional facilities and equipment exist at various NASA centers to support HRP tasks, including ARC, GRC, JSC, and KSC.

External to NASA, the NSBRI consortium consisting of twelve member institutions provides facilities and equipment to support research and technology development aimed at preventing or addressing health problems related to long-duration space travel and prolonged exposure to microgravity.

In addition, the HRP utilizes bed rest facilities at the University of Texas Medical Branch in Galveston, Texas, and has access to similar facilities in Europe through partnering agreements with international agencies. The program will also utilize parabolic aircraft as needed to support its research projects.

The HRP makes use of the NASA Space Radiation Laboratory (NSRL) at the U.S. Department of Energy (DoE) Brookhaven National Laboratory, as well as other DoE laboratories and international laboratories. The HRP also utilizes radiation research facilities at the Loma Linda University Medical Center.

The General Clinical Research Center and the Lerner Research Institute at the Cleveland Clinic provide facilities supporting the HRP. These facilities provide bedrest and six degree head down tilt simulation along with a Zero-gravity Locomotion Simulator (ZLS). The ZLS is a horizontal treadmill providing footfall forces and conditioning similar to that of the treadmill used on ISS.

3.11 PHYSICAL AND INFORMATION TECHNOLOGY SECURITY

To ensure export controlled data, human subject privacy data, and NASA internal data are protected appropriately, the HRP manages its information in accordance with NASA information technology security policy, including export control per NPR 2190.1, NASA Export Control Program, and information security per NPR 2810.1, Security of Information Technology.

3.12 VERIFICATION AND VALIDATION

As an applied research program, the HRP will ensure verification and validation of all HRP research and technology development deliverables, such as standards updates, new technologies, countermeasures, design models, and risk projection models. Verification and validation of HRP products will be completed prior to delivery.

The elements and projects will subject hardware and software used in flight experiments and tests to functional verification and safety reviews as required by the Shuttle, ISS, and CxP programs. The elements and projects will document these requirements in associated plans as required by these programs.

Validation of research tasks includes scientific merit review. Therefore, where possible, results from the research used in developing a deliverable will be published in peer-reviewed journals, using the appropriate refereed journal publication processes. Deliverables developed from the integration or research results will be validated through merit review and verified, where applicable, through independent procedure, hardware, or software verification processes.

The verification and validation of HRP deliverables are element and project unique and will be documented in their management plans. Verification and validation are driven by the customer or stakeholder requirements and will be identified in associated stakeholder agreements.

3.13 REVIEWS AND OPTIONAL KDPS

3.13.1 Program Reviews and Reporting

The HRP will conduct management and technical reviews to maintain cognizance of current status and risks and to discuss progress toward accomplishment of goals and objectives for the program. The HRP will provide monthly, quarterly, and annual reports and status briefings to ESMD as listed in Table 3-1 to keep the directorate apprised of current status, cost, schedule, and risks.

The HRP contains the life sciences tasks first initiated by the NASA Office of Biological and Physical Research and the new initiatives that enable the NASA exploration architecture. The HRP represents the human health, performance, and human systems integration content from the previous ESMD Human Systems Research and Technology (HSRT) Program. As such, the HRP was established as an existing program under the terms of NPR 7120.5C, thus, a Formulation Authorization Document (FAD) was not required.

The content of the HSRT Program was reviewed and modified by ESMD during the Zero-Base Review (ZBR) process in FY04-05. The content of the HRP was further modified in FY05-06 to reflect the Exploration Systems Architecture Study (ESAS) results and report by the Independent Program Assessment Office (IPAO) as well as budget constraints imposed as part of the PPBE process. This series of evaluations constitutes the Non-Advocate Review (NAR) for the HRP, which is the Formulation Review per NPR 7120.8.

Since the HRP was established as an existing program under the terms of NPR 7120.5C, a Program Implementation Review (PIR) was conducted in accordance with NPR 7120.5C two years after the approval of the HRP Program Plan (HRP-47051, June 1, 2006). As an R&T Program under NPR 7120.8, Program Status Reviews (PSRs) will be conducted in accordance with NPR 7120.8 beginning in 2010 and every two years thereafter. This independent assessment is coordinated and led by the IPAO. Results are outbriefed to the DPMC and as needed to the Agency Program Management Council.

Quarterly technical, cost, schedule, and risk reviews of each multi-center program element, and applicable projects, are conducted at the program level with representation from each participating center. The element or project obtains status from the centers and NSBRI and presents an integrated status of the research and technology development tasks across the element or project. In addition, HRP management and the Center POCs have a separate session during the review to address center-specific issues. The key metric in the quarterly timeframe is how well the planned activities adhere to schedules and whether or not expected results were achieved.

3.13.2 Research Reviews

The quality of basic and applied research efforts within the HRP is assured by competition and merit review, where merit review means independent evaluation by internal or external subject matter experts who do not have a conflict of interest. For all investigations/tasks (science and technology) funded by the HRP, merit reviews are conducted in accordance with the HRP Science Management Plan, HRP-47053, which implements NPR 1080.1A, Requirements for the Conduct of NASA Research and Technology (R&T). The merit review determines the quality, relevance, and value of the work.

3.13.3 Other Reviews

The HRP Program Manager will recommend use of advisory boards when external advice is required. Any advisory board usage will be approved and managed by the ESMD. Examples of advisory boards relevant to the HRP include the National Research Council (NRC), National Academy of Sciences (NAS), the National Academy of Engineering (NAE), and the Institute of

Medicine (IOM). Elements and projects will use focused advisory boards or working groups when external advice specific to element or project objectives are required.

The HRP elements and projects will support CoFR Reviews per JSC 28225, SLSD CoFR Implementation Plan, for missions involving HRP research objectives or flight experiments. This document addresses specific reporting to the vehicle programs, such as SSP 52054, ISS Program Payloads CoFR Implementation Plan, Generic.

The HRP supports independent assessments, external audits, and other program evaluations as required by NPR 7120.8.

Table 3-1: HRP Program Reporting and Reviews

Review / Report	Frequency	Customer Organization	Input Responsibility
ESMD Level			
HRP Monthly Activity Report (MAR)	Monthly	ESMD	HRP Program Office
HRP Quarterly Review	Quarterly	ESMD	HRP Program Office
HRP Annual Report	Annual	ESMD	HRP Program Office
Planning, Programming, Budgeting, and Execution (PPBE)	Annual	ESMD / HRP	Elements and Projects
Program Status Review (PSR)	Every two years after PIR	ESMD / ESMD designated independent review team	HRP Program Office and IPAO
Cancellation Reviews	As required	ESMD / HRP	Elements and Projects
Program Level			
Weekly Activity Report (WAR) (used to generate monthly reports)	Weekly	HRP Program Office	Elements and Projects
HRP Quarterly Review (TCSR)	Quarterly	HRP Program Office	Elements and Projects
Certification of Flight Readiness (CoFR) Review	Prior to related launch	Flight Vehicle Program Office	JSC/SLSD and Elements and Projects

3.14 EDUCATION AND PUBLIC OUTREACH

The HRP Education and Outreach (E&O) provides educational and general information to students, educators, and the general community to help clearly communicate the full scope of NASA HRP research. The target audience ranges from K-12 and higher education to professional and life-long learning. The focus of this material is to communicate relevant

aspects of the HRP to the community and to help stimulate students to further their education in math, science, engineering and related technology fields.

3.15 TERMINATION REVIEW CRITERIA

The HRP will review the status of each element and project annually and assess the ability to meet its objectives. HRP elements and projects are subject to termination as authorized by the HRP Program Manager. Criteria for termination includes:

- Strategic: inconsistent with the exploration vision; inconsistent with the program/mission objectives; overlap with another funded activity; or low priority ranking for the HRP given funding constraints
- Technical/Scientific: performance measures indicate that the technology will not achieve the required technical results by the scheduled need date; performance measures indicate degradation in projected performance versus performance commitments; product delivered is of insufficient quality and/or does not meet performance requirements
- Cost: over budget by 5% per year for an element; over budget by 15% per year for a project
- Schedule: missed milestone(s) or key decision points; missed due dates for major activities, projected delay in the operational readiness review greater than 6 months from the committed date
- Noncompliance with Agency or ESMD policy
- Knowledge sought is obtained through means other than the current HRP-funded activities.

3.16 WAIVERS

There are no known deviations or waivers against NASA policies, directives or external requirements, either in existence within the HRP or to be obtained by the HRP.

APPENDIX A: APPLICABLE DOCUMENTS

The following documents of the specified revision, or the latest revision if not identified, form a part of this plan to the extent defined herein.

Document No.	Revision	Document Title
	March 8, 1995	Policy Guidelines for Space Flight Medical Research Experiments (SLSD / FCOD)
Code Fed. Reg. Title 9	January 1, 2003	Animal Welfare Act
		NRC Guide for the Care and Use of Laboratory Animals
EXPLORATION- RMP-0001	Version 1.0 April 11, 2006	Exploration Systems Risk Management Plan
JMI 1382.5B Appendix P	January 27, 2004	Maintaining Privacy of Biomedical Research Data
JSC 28225	Revision D	Space and Life Sciences Directorate Certification of Flight Readiness (CoFR) Implementation Plan
JSC 28330	Revision C	Space and Life Sciences Directorate Configuration Control Management Plan
NASA / SP-2004- 6113	Feb. 2005	Bioastronautics Roadmap
NPD 1000.0A	August 2005	NASA Strategic Management and Governance Handbook
NPD 7100.8E	May 31, 2002	Protection of Human Research Subjects
NPD 8500.1B	December 20, 2007	NASA Environmental Management
NPD 8910.1B	May 28, 2008	Care and Use of Animals
NPR 2810.1	August 26, 1999	Security of Information Technology
NPR 1080.1A	February 2, 2005	NASA Science Management
NPR 2190.1	April 10, 2003	NASA Export Control Program
NPR 5800.1E	May 19, 2005	NASA Grant and Cooperative Agreement Handbook
NPR 7100.1	March 28, 2003	Protection of Human Research Subjects
NPR 7120.5C	March 22, 2005	NASA Program and Project Management Processes and Requirements

Document No.	Revision	Document Title
NPR 7120.5D	March 6, 2007	NASA Space Flight Program and Project Management Requirements
NPR 7120.8	February 5, 2008	NASA Research and Technology Program and Project Management Requirements
NPR 8000.4A	December 16, 2008	Agency Risk Management Procedural Requirements
NPD 8700.1E	October 28, 2008	NASA Policy for Safety and Mission Success
NPR 8910.1A	March 15, 2004	Care and Use of Animals
NSTS 1700.7B	January 1989	Safety Policy and Requirements for Payloads Using the Space Transportation System
SSP 50021	Sept. 4, 1996	Safety Requirements Document

APPENDIX B: ACRONYMS AND ABBREVIATIONS

AA	Associate Administrator	ETDP	Exploration Technology Development Program
ACD	Advanced Capabilities Division	EVA	Extravehicular Activity
AO	Announcement of Opportunity	ExMC	Exploration Medical Capability
ARC	Ames Research Center	FY	Fiscal Year
ARM	Active Risk Manager	GPRA	Government Performance and Results Act
BAA	Broad Agency Announcement	GRC	Glenn Research Center
BCD	Budget Change Directive	HEFD	Habitability and Environmental Factors Division (SLSD)
BHP	Behavioral Health and Performance	HHC	Human Health Countermeasures
BR	Bioastronautics Roadmap	HMTA	Health and Medical Technical Authority
CCB	Configuration Control Board	HQ	Headquarters (NASA)
CHMO	Chief Health and Medical Officer	HRP	Human Research Program
CMO	Chief Medical Officer	HRPCB	HRP Control Board
CoFR	Certification of Flight Readiness	HSRB	Human System Risk Board
CPHS	Committee for the Protection of Human Subjects	HSRT	Human Systems Research and Technology
CRL	Countermeasure Readiness Level	IMS	Integrated Master Schedule
CRM	Continuous Risk Management	IOM	Institute of Medicine
CxP	Constellation Program	IPAO	Independent Program Assessment Office
DFRC	Dryden Flight Research Center	IRB	Institutional Review Board
DoE	Department of Energy	IRMA	Integrated Risk Management Application
DPMC	ESMD Program Management Council	ISS	International Space Station
EARD	Exploration Architecture Requirements Document	ISSMP	ISS Medical Project
E&O	Education and Outreach	ITA	Internal Task Agreement
ENGO	Exploration Need, Goals, and Objectives	JSC	Johnson Space Center
ESAS	Exploration Systems Architecture Study	KSC	Kennedy Space Center
ESMD	Exploration Systems Mission Directorate (HQ)		

LaRC	Langley Research Center	PPBE	Planning, Programming, Budgeting, and Execution
LSAH	Lifetime Surveillance of Astronaut Health	PRD	Program Requirements Document
LSDA	Life Sciences Data Archive	PSR	Program Status Review
MAR	Monthly Activity Report	PSRP	Payload Safety Review Panel
MOA	Memorandum (Memoranda) of Agreement	R&T	Research and Technology
NAE	National Academy of Engineering	RFP	Request for Proposal
NAR	Non-Advocate Review	RFQ	Request for Quote
NAS	National Academy of Sciences	RIDM	Risk-Informed Decision Making
NASA	National Aeronautics and Space Administration	RMAT	Risk Management Analysis Tool
NIH	National Institute of Health	S&MA	Safety and Mission Assurance
NPD	NASA Policy Directive	SBIR	Small Business Innovation Research
NPR	NASA Procedural Requirements	SHFH	Space Human Factors and Habitability
NRA	NASA Research Announcement	SIRMA	Shuttle IRMA
NRC	National Research Council	SLSD	Space Life Sciences Directorate (JSC)
NSBRI	National Space Biomedical Research Institute	SM	Space Medicine Division (SLSD)
NSRL	National Space Radiation Laboratory	SMO	Science Management Office
OCE	Office of the Chief Engineer	SMP	Science Management Panel (HRP SMO)
OCHMO	Office of the Chief Health and Medical Officer (HQ)	SOMD	Space Operations Mission Directorate (HQ)
OSMA	Office of Safety Mission Assurance	SR	Space Radiation
PART	Program Assessment and Rating Tool	TCSR	Technical, Cost, and Schedule Review
PCA	Program Commitment Agreement	TPR	Top Program Risk
PIO	Program Integration Office	TRL	Technology Readiness Level
PIR	Program Implementation Review	TTCO	Technology Transfer and Commercialization Office
PMC	Program Management Council	WBS	Work Breakdown Structure
POC	Point of Contact	ZBR	Zero-Base Review
		ZLS	Zero-gravity Locomotion Simulator

APPENDIX C: PROGRAM WORK BREAKDOWN STRUCTURE

Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
PSM	01	Program Science Management/NSBRI	046193					
PSM	02	Portfolio Management	046193.01					
PSM	03	ARC-Portfolio Management		046193.01.01				
PSM	04	ARC-Program / Science Management			046193.01.01.01			
PSM	04	ARC-ISSRC Flight Project Management			046193.01.01.02			
PSM	04	ARC-Termination / De-Scoping Liability			046193.01.01.03			
PSM	04	ARC-Conferences & Workshops			046193.01.01.04			
PSM	04	ARC-HRF ISS Med Proj			046193.01.01.05			
PSM	03	GRC-Portfolio Management		046193.01.02				
PSM	04	GRC-Program / Science Management			046193.01.02.01			
PSM	04	GRC-ISSRC Flight Project Management			046193.01.02.02			
PSM	04	GRC-Termination / De-Scoping Liability			046193.01.02.03			
PSM	03	HQ-Portfolio Management		046193.01.03				
PSM	03	JSC-Portfolio Management		046193.01.04				
PSM	04	JSC-P/SM Institutional			046193.01.04.01			
PSM	04	JSC-ISSRC Flight Project Management			046193.01.04.02			
PSM	04	JSC-Termination / De-Scoping Liability			046193.01.04.03			
PSM	04	JSC-USRA Core Support			046193.01.04.04			
PSM	04	JSC-ODIN & JIMMS Support			046193.01.04.07			
PSM	03	KSC-Portfolio Management		046193.01.05				
PSM	04	KSC-Program / Science Management			046193.01.05.01			
PSM	04	KSC-ISSRC Flight Project Management			046193.01.05.02			
PSM	04	KSC-Termination / De-Scoping Liability			046193.01.05.03			
PSM	03	MSFC-Portfolio Management		046193.01.06				
PSM	04	MSFC-Program / Science Management			046193.01.06.01			
PSM	04	MSFC-ISSRC Flight Project Management			046193.01.06.02			
PSM	04	MSFC-Termination / De-Scoping Liability			046193.01.06.03			
PSM	04	MSFC-Program Science Mgmt-NSBRI NISN Spt			046193.01.06.04			
PSM	03	GSFC-Portfolio Management		046193.01.08				
PSM	02	Funded Research/Awards	046193.02					
PSM	03	ARC-Funded Research/Awards		046193.02.01				
PSM	04	ARC-Labor and Travel			046193.02.01.01			
PSM	04	ARC-Non Exploration Biology			046193.02.01.02			
PSM	05	ARC-Non EX Bio SPEGIS ISS				046193.02.01.02.01		
PSM	05	ARC-Non EX Bio Microbe ISS				046193.02.01.02.02		
PSM	05	ARC-Non EX Bio FIT ISS				046193.02.01.02.03		
PSM	05	ARC-Non EX Bio Foton M3 ISS				046193.02.01.02.04		
PSM	05	ARC-Non EX Bio Foton M2 ISS				046193.02.01.02.05		
PSM	05	ARC-Non ExBio Microsat IFF				046193.02.01.02.06		
PSM	05	ARC-TROPI ISS				046193.02.01.02.07		
PSM	05	ARC-Non-Ex Bio BION				046193.02.01.02.08		
PSM	04	ARC-Non ExBio Labor & Travel			046193.02.01.03			
PSM	04	ARC-Special Studies ITA			046193.02.01.04			
PSM	03	GRC-Funded Research/Awards		046193.02.02				
PSM	04	GRC-Labor and Travel			046193.02.02.01			
PSM	04	GRC-Core Competency Management			046193.02.02.02			
PSM	03	HQ-Funded Research/Awards		046193.02.03				
PSM	04	HQ-Labor and Travel			046193.02.03.01			
PSM	04	HQ-Core Competency Mgmt/ De-scoping			046193.02.03.02			
PSM	04	HQ-IPA Tasks			046193.02.03.03			
PSM	03	JSC-Funded Research/Awards		046193.02.04				
PSM	04	JSC-P/SM Labor & Travel			046193.02.04.01			

Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
PSM	04	JSC-Core Competency Management			046193.02.04.02			
PSM	04	JSC-HRP Education & Outreach			046193.02.04.03			
PSM	05	JSC-UTMB Space Physiology Course				046193.02.04.03.01		
PSM	04	JSC-Oregon State Close-out			046193.02.04.04			
PSM	03	KSC-Funded Research/Awards		046193.02.05				
PSM	04	KSC-Labor and Travel			046193.02.05.01			
PSM	04	KSC-Core Competency Mgmt/ De-scoping			046193.02.05.02			
PSM	03	MSFC-Funded Research/Awards		046193.02.06				
PSM	04	MSFC-Labor and Travel			046193.02.06.01			
PSM	04	MSFC-Core Competency Management			046193.02.06.02			
PSM	03	Human Health & Performance Earmarks		046193.02.99				
PSM	04	Biodef Res Infrac Project/St. Louis Un			046193.02.99.01			
PSM	05	ARC-Bio-def Res Infrac Project/St. Loui				046193.02.99.01.02		
PSM	04	Human Health & Perf in Space			046193.02.99.02			
PSM	05	GRC-Human Health & Perf in Space				046193.02.99.02.03		
PSM	04	Nat'l Tech Transfer Ctr/Wheeling Jesuit			046193.02.99.03			
PSM	05	HQ-Nat'l Tech Transfer Ctr/Wheeling Jesu				046193.02.99.03.01		
PSM	05	GSFC-Nat'l Tech Transfer Ctr/Wheeling Je				046193.02.99.03.06		
PSM	04	Institute for NanoBio Tech/Johns Hopkins			046193.02.99.04			
PSM	05	JSC-Inst for NanoBio Tech/John's Hopkins				046193.02.99.04.10		
PSM	04	Indiana Unv Solar Proton Radiation Resea			046193.02.99.05			
PSM	05	JSC-Indiana Unv Solar Proton Radiation				046193.02.99.05.10		
PSM	04	Ball State Unv, Ind, Human Perf Lab			046193.02.99.06			
PSM	05	JSC-Ball State Unv, Ind, Human Perf Lab				046193.02.99.06.10		
PSM	04	Unv of Louisville Rejuv Injured Tissues			046193.02.99.07			
PSM	05	JSC-Unv/Louisville Rejuv Injured Tissues				046193.02.99.07.10		
PSM	04	Pittsburgh Tissue Engineering Initiative			046193.02.99.08			
PSM	05	JSC-Pittsburgh Tissue Engineering Initia				046193.02.99.08.10		
PSM	04	Comb Positron Emission Tomography & CT			046193.02.99.09			
PSM	05	JSC-Comb Positron Emiss Tomography & CT				046193.02.99.09.10		
PSM	04	Franklin & Marshall Life Science Facilit			046193.02.99.10			
PSM	05	JSC-Franklin & Marshall Life Science Fac				046193.02.99.10.10		
PSM	04	Loma Linda Univ Space Radiation Research			046193.02.99.11			
PSM	05	JSC-Loma Linda Univ Space Radiation Rese				046193.02.99.11.10		
PSM	02	Facilities, Testbeds and Operations	046193.03					
PSM	03	ARC-Facilities, Testbeds & Operations		046193.03.01				
PSM	04	ARC-ISS Medical Projects			046193.03.01.01			
PSM	05	ARC-Utilization Support				046193.03.01.01.04		
PSM	03	GRC-Facilities, Testbeds & Operations		046193.03.02				
PSM	03	HQ-Facilities, Testbeds & Operations		046193.03.03				
PSM	03	JSC-Facilities, Testbeds & Operations		046193.03.04				
PSM	04	JSC-Flt Projects Mgmt (formerly ISSRC)			046193.03.04.01			
PSM	05	JSC-Sustaining Engineering				046193.03.04.01.02		
PSM	05	JSC-Experiment Unique Equip (EUE)				046193.03.04.01.03		
PSM	05	JSC-Utilization				046193.03.04.01.04		
PSM	05	JSC-Telescience Support Center				046193.03.04.01.06		
PSM	04	JSC-Probabilistic Risk Assessment			046193.03.04.02			
PSM	04	JSC-Cooperative Agreement NSBRI			046193.03.04.03			
PSM	05	JSC-NSBRI Core				046193.03.04.03.01		
PSM	05	JSC-NSBRI Core Award SMS 00702-Whitmore				046193.03.04.03.02		
PSM	05	JSC-NSBRI Core Award - Prisk				046193.03.04.03.03		

Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
PSM	04	JSC-Human Research Admin Support			046193.03.04.05			
PSM	04	JSC-Cooperative Agreement USRA			046193.03.04.06			
PSM	04	JSC-NSBRI Non-Core Award Sonnenfeld			046193.03.04.07			
PSM	04	JSC-NSBRI Non-Core Award Ferrando			046193.03.04.08			
PSM	04	JSC-BCC 2.8.1.8 Subtask Funding			046193.03.04.09			
PSM	04	JSC-EVA Constellation Support			046193.03.04.10			
PSM	05	JSC-EVA Suppt Labor & Travel				046193.03.04.10.01		
PSM	05	JSC-EVA Suppt Procurement				046193.03.04.10.02		
PSM	03	KSC-Facilities, Testbeds & Operations		046193.03.05				
PSM	04	KSC-ISS Medical Projects			046193.03.05.01			
PSM	05	KSC-BDC Support				046193.03.05.01.04		
PSM	03	MSFC-Facilities, Testbeds & Operations		046193.03.06				
PSM	03	LaRC-PSM Funded Research and Awards		046193.03.07				
PSM	04	LaRC-HRP Program Implementation Review			046193.03.07.01			
PSM	03	JSC-Program & Science Management		046193.03.15				
PSM	04	JSC-PSM Support Contracts			046193.03.15.01			
PSM	05	JSC-PSM Wyle/Bioastronautics Cont				046193.03.15.01.01		
PSM	06	JSC-Program Integration Office Support					046193.03.15.01.01.01	
PSM	06	JSC-Probabilistic Risk Assessment					046193.03.15.01.01.02	
PSM	06	JSC-Science Management Office Support					046193.03.15.01.01.03	
PSM	05	JSC-USRA Cooperative Agreement				046193.03.15.01.02		
PSM	06	JSC-USRA Core					046193.03.15.01.02.01	
PSM	06	JSC-USRA PIO/SMO					046193.03.15.01.02.02	
PSM	06	JSC-USRA Workshops					046193.03.15.01.02.03	
PSM	05	JSC-Integration Office Support				046193.03.15.01.03		
PSM	05	JSC-Procurement Office Support					046193.03.15.01.04	
PSM	05	JSC-Secretarial Support					046193.03.15.01.05	
PSM	04	JSC-Facilities			046193.03.15.02			
PSM	05	JSC-Facilities				046193.03.15.02.01		
PSM	04	JSC-Inf Tech Related Support			046193.03.15.03			
PSM	05	JSC-Inf Tech Related Support				046193.03.15.03.01		
PSM	04	JSC-Microgravity Flight Services C9 Sppt			046193.03.15.04			
PSM	04	JSC-SLSD HRP Internships			046193.03.15.05			
PSM	02	Prog Sc Mgmt CofF Projects	046193.98					
PSM	03	Center for Human SF Perf & Res		046193.98.01				
PSM	04	Construction Human SF Perf & Res			046193.98.01.02			
PSM	05	JSC-Construction Human SF Perf & Res				046193.98.01.02.10		
PSM	02	Agency Cost Assessment	046193.99					
ExMC	01	Exploration Medical Capabilities	444543					
ExMC	02	Portfolio Management	444543.01					
ExMC	03	ARC-Portfolio Management		444543.01.01				
ExMC	04	ARC-Exploration Medical Capabilities			444543.01.01.01			
ExMC	04	ARC-Core Competency Management			444543.01.01.02			
ExMC	03	GRC-Portfolio Management		444543.01.02				
ExMC	04	GRC-Exploration Medical Capabilities			444543.01.02.01			
ExMC	04	GRC-Termination / De-Scoping Liability			444543.01.02.02			
ExMC	03	HQ-Portfolio Management		444543.01.03				
ExMC	03	JSC-Portfolio Management		444543.01.04				
ExMC	04	JSC-EMC Institutional			444543.01.04.01			
ExMC	04	JSC-Termination / De-Scoping Liability			444543.01.04.02			
ExMC	04	JSC-ODIN & JIMMS Support			444543.01.04.07			

Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
ExMC	03	KSC-Portfolio Management		444543.01.05				
ExMC	04	KSC-Exploration Medical Capabilities			444543.01.05.01			
ExMC	04	KSC-Termination / De-Scoping Liability			444543.01.05.02			
ExMC	03	MSFC-Portfolio Management		444543.01.06				
ExMC	04	MSFC-Exploration Medical Capabilities			444543.01.06.01			
ExMC	04	MSFC-Termination / De-Scoping Liability			444543.01.06.02			
ExMC	02	Funded Research/Awards	444543.02					
ExMC	03	ARC-Funded Research/Awards		444543.02.01				
ExMC	04	ARC-Labor and Travel			444543.02.01.01			
ExMC	04	ARC-Core Competency Management			444543.02.01.02			
ExMC	04	ARC-EMC			444543.02.01.03			
ExMC	04	ARC-EMC Integrated Data Mgmt			444543.02.01.04			
ExMC	04	ARC-EMC HARDWARE TEST AND ANALYSIS			444543.02.01.05			
ExMC	03	GRC-Funded Research/Awards		444543.02.02				
ExMC	04	GRC-Labor and Travel			444543.02.02.01			
ExMC	04	GRC-Core Competency Management			444543.02.02.02			
ExMC	03	HQ-Funded Research/Awards		444543.02.03				
ExMC	04	HQ-Labor and Travel			444543.02.03.01			
ExMC	04	HQ-Core Competency Mgmt/ De-scoping			444543.02.03.02			
ExMC	03	JSC-Funded Research/Awards		444543.02.04				
ExMC	04	JSC-EMC Labor & Travel			444543.02.04.01			
ExMC	04	JSC-Core Competency Management			444543.02.04.02			
ExMC	04	JSC-NSBRI Medicine			444543.02.04.03			
ExMC	04	JSC-EMC Integrated Data Management			444543.02.04.04			
ExMC	04	JSC-EMC HW Test & Analysis			444543.02.04.05			
ExMC	04	JSC-NSBRI Mechanisms of Injury			444543.02.04.07			
ExMC	04	JSC-DC-9 Flight Funding			444543.02.04.08			
ExMC	03	KSC-Funded Research/Awards		444543.02.05				
ExMC	04	KSC-Labor and Travel			444543.02.05.01			
ExMC	04	KSC-Core Competency Mgmt/ De-scoping			444543.02.05.02			
ExMC	03	MSFC-Funded Research/Awards		444543.02.06				
ExMC	04	MSFC - Labor and Travel			444543.02.06.01			
ExMC	04	MSFC-Core Competency Mgmt/ De-scoping			444543.02.06.02			
ExMC	02	Facilities, Testbeds and Operations	444543.03					
ExMC	03	ARC-Facilities, Testbeds & Operations		444543.03.01				
ExMC	04	ARC-EMC Core Competency Mgmt			444543.03.01.01			
ExMC	04	ARC-Technology Infusion			444543.03.01.02			
ExMC	03	GRC-Facilities, Testbeds & Operations		444543.03.02				
ExMC	03	HQ-Facilities, Testbeds & Operations		444543.03.03				
ExMC	03	JSC-Facilities, Testbeds & Operations		444543.03.04				
ExMC	04	JSC-EMC Core			444543.03.04.01			
ExMC	03	KSC-Facilities, Testbeds & Operations		444543.03.05				
ExMC	03	MSFC-Facilities, Testbeds & Operations		444543.03.06				
ExMC	02	Agency Cost Assessment	444543.99					
SHFH	01	Space Human Factors Engineering (SHFE)	466199					
SHFH	02	Portfolio Management	466199.01					
SHFH	03	ARC-Portfolio Management		466199.01.01				
SHFH	04	ARC-Space Human Factors Engineering			466199.01.01.01			
SHFH	04	ARC-Termination / De-Scoping Liability			466199.01.01.02			
SHFH	03	GRC-Portfolio Management		466199.01.02				
SHFH	04	GRC-Space Human Factors Engineering			466199.01.02.01			

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SHFH	04	GRC-Termination / De-Scoping Liability			466199.01.02.02			
SHFH	03	HQ-Portfolio Management		466199.01.03				
SHFH	03	JSC-Portfolio Management		466199.01.04				
SHFH	04	JSC-SHFE Institutional			466199.01.04.01			
SHFH	05	JSC-Workshops				466199.01.04.01.03		
SHFH	04	JSC-Termination / De-Scoping Liability			466199.01.04.02			
SHFH	04	JSC-ODIN & JIMMS Support			466199.01.04.07			
SHFH	04	JSC-SHFH Labor & Travel			466199.01.04.10			
SHFH	05	JSC-SHFE Labor & Travel				466199.01.04.10.01		
SHFH	05	JSC-AEH Labor & Travel				466199.01.04.10.02		
SHFH	05	JSC-AFT Labor & Travel				466199.01.04.10.03		
SHFH	05	JSC-SHFH Program Management				466199.01.04.10.04		
SHFH	03	KSC-Portfolio Management		466199.01.05				
SHFH	03	MSFC-Portfolio Management		466199.01.06				
SHFH	02	Funded Research/Awards	466199.02					
SHFH	03	ARC-Space Human Factors Engr		466199.02.01				
SHFH	04	ARC-Labor and Travel			466199.02.01.01			
SHFH	04	ARC-Core Competency Management			466199.02.01.02			
SHFH	04	ARC-Lunar Dust			466199.02.01.03			
SHFH	03	GRC-Funded Research/Awards		466199.02.02				
SHFH	03	HQ-Funded Research/Awards		466199.02.03				
SHFH	04	HQ-Labor and Travel			466199.02.03.01			
SHFH	04	HQ-Core Competency Mgmt/ De-scoping			466199.02.03.02			
SHFH	03	JSC-Funded Research/Awards		466199.02.04				
SHFH	04	JSC-SHFE Labor & Travel			466199.02.04.01			
SHFH	04	JSC-Core Competency Management			466199.02.04.02			
SHFH	04	JSC-Space Human Factors			466199.02.04.03			
SHFH	05	JSC-Active Grants				466199.02.04.03.01		
SHFH	06	JSC-UTAF R&TD Speech Recognition					466199.02.04.03.01.04	
SHFH	06	JSC-UTAF R&TD Badler Support					466199.02.04.03.01.05	
SHFH	06	JSC-Automatic Speech Recognition					466199.02.04.03.01.12	
SHFH	06	JSC-RMS Operator Proficiency					466199.02.04.03.01.13	
SHFH	06	JSC-DoD TAG					466199.02.04.03.01.14	
SHFH	05	JSC-Human Factors Projects				466199.02.04.03.03		
SHFH	06	JSC-ABF R&TD					466199.02.04.03.03.02	
SHFH	06	JSC-UTAF R&TD Support					466199.02.04.03.03.03	
SHFH	06	JSC-Lessons Learned TDP					466199.02.04.03.03.06	
SHFH	06	JSC-Gap Analysis					466199.02.04.03.03.07	
SHFH	06	JSC-GRAF / LETF R&TD					466199.02.04.03.03.08	
SHFH	06	JSC-HDC R&TD					466199.02.04.03.03.09	
SHFH	06	JSC-HSIS, Vol. 1					466199.02.04.03.03.10	
SHFH	06	JSC-CEL					466199.02.04.03.03.11	
SHFH	06	JSC-Information Presentation					466199.02.04.03.03.12	
SHFH	06	JSC-Design & Evaluation Tools					466199.02.04.03.03.13	
SHFH	06	JSC-Anthro-Plus Modeling					466199.02.04.03.03.14	
SHFH	06	JSC-Human Factors Projects					466199.02.04.03.03.15	
SHFH	06	JSC-Acoustics Modeling					466199.02.04.03.03.16	
SHFH	06	JSC-Core Facilities					466199.02.04.03.03.17	
SHFH	06	JSC-UTMB Grad Student					466199.02.04.03.03.18	
SHFH	04	JSC-Advanced Food			466199.02.04.04			
SHFH	05	JSC-Advanced Food Technology				466199.02.04.04.03		

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SHFH	06	JSC-Advanced Food Technology					466199.02.04.04.03.01	
SHFH	06	JSC-DoD Collaboration					466199.02.04.04.03.02	
SHFH	06	JSC-Nutrition and Processing					466199.02.04.04.03.03	
SHFH	04	JSC-Environmental Standards			466199.02.04.05			
SHFH	05	JSC-Environmental Standards				466199.02.04.05.03		
SHFH	06	JSC-Lunar Dust Studies					466199.02.04.05.03.01	
SHFH	06	JSC-Lunar Dust - LADTAG Studies					466199.02.04.05.03.02	
SHFH	06	JSC-AEMC Support					466199.02.04.05.03.03	
SHFH	06	JSC-Characterization of Microorganisms					466199.02.04.05.03.04	
SHFH	06	JSC-Microbial Risk Assessment					466199.02.04.05.03.05	
SHFH	03	KSC-Funded Research/Awards		466199.02.05				
SHFH	04	KSC-Labor and Travel			466199.02.05.01			
SHFH	04	KSC-Core Competency Mgmt/ De-scoping			466199.02.05.02			
SHFH	03	MSFC-Funded Research/Awards		466199.02.06				
SHFH	04	MSFC-Labor and Travel			466199.02.06.01			
SHFH	04	MSFC-Core Competency Management			466199.02.06.02			
SHFH	03	SHFE Earmarks		466199.02.99				
SHFH	04	Spaceflight Health Mon Tech/Montana St.			466199.02.99.01			
SHFH	05	JSC-Spaceflight Health Mon Tech/Montana				466199.02.99.01.10		
SHFH	02	Facilities, Testbeds and Operations	466199.03					
SHFH	03	ARC-Facilities, Testbeds & Operations		466199.03.01				
SHFH	03	GRC-Facilities, Testbeds & Operations		466199.03.02				
SHFH	03	HQ-Facilities, Testbeds & Operations		466199.03.03				
SHFH	03	JSC-Facilities, Testbeds & Operations		466199.03.04				
SHFH	04	JSC-Project Management			466199.03.04.01			
SHFH	05	JSC-Project Management				466199.03.04.01.03		
SHFH	03	KSC-Facilities, Testbeds & Operations		466199.03.05				
SHFH	03	MSFC-Facilities, Testbeds & Operations		466199.03.06				
SHFH	02	Agency Cost Assessment	466199.99					
HHC	01	Human Health Countermeasures	516724					
HHC	02	Portfolio Management	516724.01					
HHC	03	ARC-Portfolio Management		516724.01.01				
HHC	04	ARC-Human Health Countermeasures			516724.01.01.01			
HHC	04	ARC-Termination / De-Scoping Liability			516724.01.01.02			
HHC	03	GRC-Portfolio Management		516724.01.02				
HHC	04	GRC-Exercise Countermeasures			516724.01.02.01			
HHC	04	GRC-Termination / De-Scoping Liability			516724.01.02.02			
HHC	04	GRC-Digital Astronaut			516724.01.02.03			
HHC	03	HQ-Portfolio Management		516724.01.03				
HHC	03	JSC-Portfolio Management		516724.01.04				
HHC	04	JSC-HHC Institutional			516724.01.04.01			
HHC	04	JSC-Termination / De-Scoping Liability			516724.01.04.02			
HHC	04	JSC-ODIN & JIMMS Support			516724.01.04.07			
HHC	03	KSC-Portfolio Management		516724.01.05				
HHC	04	KSC-Human Health Countermeasures			516724.01.05.01			
HHC	04	KSC-Termination / De-Scoping Liability			516724.01.05.02			
HHC	03	MSFC-Portfolio Management		516724.01.06				
HHC	04	MSFC-Human Health Countermeasures			516724.01.06.01			
HHC	04	MSFC-Termination / De-Scoping Liability			516724.01.06.02			
HHC	03	Agency FFS Full Cost Assessment		516724.01.25				
HHC	02	Funded Research/Awards	516724.02					

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HHC	03	ARC-Funded Research/Awards		516724.02.01				
HHC	04	ARC-Labor and Travel			516724.02.01.01			
HHC	04	ARC-Core Competency Management			516724.02.01.02			
HHC	04	ARC-Exercise Countermeasures Project			516724.02.01.03			
HHC	05	ARC-NSBRI Team Performance				516724.02.01.03.04		
HHC	05	ARC-ECP ISS Flight Research & Technology				516724.02.01.03.05		
HHC	06	ARC-FTT Data file conversion					516724.02.01.03.05.01	
HHC	04	ARC-Fractional Gravity Project			516724.02.01.04			
HHC	05	ARC-Fractional Gravity Project				516724.02.01.04.01		
HHC	05	ARC-Fractional Gravity Study				516724.02.01.04.02		
HHC	04	ARC-Non-Exercise Countermeasures Project			516724.02.01.05			
HHC	05	ARC-NxPCM Project Management & Controls				516724.02.01.05.01		
HHC	06	ARC-NxPCM Project Integration and Staff					516724.02.01.05.01.01	
HHC	05	ARC-NxPCM Special Projects				516724.02.01.05.02		
HHC	05	ARC-NxPCM Flight Research				516724.02.01.05.03		
HHC	06	ARC-NxPCM Immunology Infection Hermatol					516724.02.01.05.03.04	
HHC	07	ARC-Microbial Gene						516724.02.01.05.03.04.03
HHC	05	ARC-NxPCM Ground Research				516724.02.01.05.04		
HHC	06	ARC-NxPCM Sensory Motor					516724.02.01.05.04.07	
HHC	07	ARC-Translational Acceleration						516724.02.01.05.04.07.01
HHC	07	ARC-Gaze Movement						516724.02.01.05.04.07.02
HHC	04	ARC-EVA Bio Medical			516724.02.01.06			
HHC	05	ARC-EVA BioMedical Adv Alogorithm				516724.02.01.06.03		
HHC	05	ARC-EVA Dosimetry System				516724.02.01.06.04		
HHC	03	GRC-Funded Research/Awards		516724.02.02				
HHC	04	GRC-Engineering/sZLS			516724.02.02.03			
HHC	04	GRC-Digital Astronaut			516724.02.02.08			
HHC	05	GRC-Digital Astronaut				516724.02.02.08.01		
HHC	03	HQ-Funded Research/Awards		516724.02.03				
HHC	04	HQ-Labor and Travel			516724.02.03.01			
HHC	04	HQ-Core Competency Mgmt/ De-scoping			516724.02.03.02			
HHC	03	JSC-Funded Research/Awards		516724.02.04				
HHC	04	JSC-HHC Labor & Travel			516724.02.04.01			
HHC	04	JSC-Core Competency Management			516724.02.04.02			
HHC	04	JSC-Exercise Countermeasures Project			516724.02.04.03			
HHC	05	JSC-ECP Integration & Operations				516724.02.04.03.01		
HHC	05	JSC-Ground-Based 0-g Research & Tech				516724.02.04.03.02		
HHC	06	JSC-A Quantitative Test of On-Orbit Ex.					516724.02.04.03.02.01	
HHC	07	JSC-CEVP Close-Out						516724.02.04.03.02.01.02
HHC	06	JSC-Influence of Exercise on Human S.					516724.02.04.03.02.02	
HHC	06	JSC-Ground Based 0-gravity Research and					516724.02.04.03.02.03	
HHC	05	JSC-Ground-Based 1/6-g Research & Tech				516724.02.04.03.03		
HHC	05	JSC-NSBRI Core				516724.02.04.03.04		
HHC	06	JSC-NSBRI Core Sensorimotor Adaptation					516724.02.04.03.04.01	
HHC	06	JSC-NSBRI Core Tactile Sensory Supplem					516724.02.04.03.04.02	
HHC	06	JSC-NSBRI Core Effects of a Mscle Countr					516724.02.04.03.04.03	
HHC	06	JSC-NSBRI Core Effects of SpaceFlight CS					516724.02.04.03.04.04	
HHC	06	JSC-NSBRI Core Pharmaco Intranasal Scopa					516724.02.04.03.04.05	
HHC	06	JSC-NSBRI Bedrest & Immunity					516724.02.04.03.04.06	
HHC	06	JSC-Neurovestibular Adaptation					516724.02.04.03.04.07	
HHC	06	JSC-Dev of Gait Adaptability Prog					516724.02.04.03.04.08	

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HHC	06	JSC-NSBRI-CORE DC-9 Lackner					516724.02.04.03.04.10	
HHC	06	JSC-NSBRI Bloomberg BL01301					516724.02.04.03.04.12	
HHC	06	JSC-NSBRI Bloomberg SA01703					516724.02.04.03.04.13	
HHC	05	JSC-ECP ISS Flight Research & Technology				516724.02.04.03.05		
HHC	06	JSC-Effect of Long Duration Spaceflt					516724.02.04.03.05.01	
HHC	04	JSC-Fractional Gravity Project (FGP)			516724.02.04.04			
HHC	05	JSC-Fractional Gravity Project (FGP)				516724.02.04.04.01		
HHC	04	JSC-Non-Exercise Countermeasures Project			516724.02.04.05			
HHC	05	JSC-NxPCM Project Management & Controls				516724.02.04.05.01		
HHC	06	JSC-Project Integration Staff					516724.02.04.05.01.01	
HHC	06	JSC-Project Management and Control					516724.02.04.05.01.02	
HHC	06	JSC-NxPCM Project Study Data Arch -LSDA					516724.02.04.05.01.03	
HHC	06	JSC-NxPCM NASA/NIH oxid damg res wedge					516724.02.04.05.01.05	
HHC	07	JSC-NxPCM 2007 HRP NRA solicitation						516724.02.04.05.01.05.01
HHC	07	JSC-NxPCM 2008 HRP NRA solicitation						516724.02.04.05.01.05.02
HHC	07	JSC-NxPCM 2009 HRP NRA solicitation						516724.02.04.05.01.05.03
HHC	07	JSC-NxPCM 2010 HRP NRA solicitation						516724.02.04.05.01.05.04
HHC	07	JSC-NxPCM 2011 HRP NRA solicitation						516724.02.04.05.01.05.05
HHC	07	JSC-NxPCM 2012 HRP NRA solicitation						516724.02.04.05.01.05.06
HHC	05	JSC-NxPCM Special Projects				516724.02.04.05.02		
HHC	06	JSC-NxPCM Pnut Stability Study					516724.02.04.05.02.01	
HHC	07	JSC-Pnut Stability Study Project						516724.02.04.05.02.01.01
HHC	06	JSC-NxPCM CEVP Transition					516724.02.04.05.02.02	
HHC	06	JSC-CEVP Close-Out					516724.02.04.05.02.03	
HHC	05	JSC-NxPCM Flight Research				516724.02.04.05.03		
HHC	06	JSC-NxPCM Bone					516724.02.04.05.03.01	
HHC	07	JSC-MRI						516724.02.04.05.03.01.01
HHC	07	JSC-Renal Stone Risk Cntrmeasure Val						516724.02.04.05.03.01.11
HHC	07	JSC-Sub-Regional Asses Bone Loss						516724.02.04.05.03.01.21
HHC	07	JSC-Rubin Flight Grant						516724.02.04.05.03.01.22
HHC	07	JSC-Low Intensity Mechanical CM (Rubin)						516724.02.04.05.03.01.27
HHC	07	JSC-Bisphos CM Bone Loss (LeBlanc)						516724.02.04.05.03.01.34
HHC	06	JSC-NxPCM Muscle					516724.02.04.05.03.02	
HHC	07	Jsc-Efct Spcflt Human Skeletal Muscle						516724.02.04.05.03.02.04
HHC	07	JSC-Foot React Forces						516724.02.04.05.03.02.22
HHC	06	JSC-NxPCM Cardiovascular Studies					516724.02.04.05.03.03	
HHC	07	JSC-Test Mido Postflt Orth Intol (Meck)						516724.02.04.05.03.03.35
HHC	07	JSC-Assess Cardiac Ventr Dysrhyth (Meck)						516724.02.04.05.03.03.36
HHC	07	JSC-Integrated Cardio SMO (Bungo)						516724.02.04.05.03.03.41
HHC	07	JSC-Integrated Cardio SMO (Levine)						516724.02.04.05.03.03.42
HHC	07	JSC-Integrated Cardio SMO (Platts)						516724.02.04.05.03.03.43
HHC	06	JSC-NxPCM Immunology Infection & Hematol					516724.02.04.05.03.04	
HHC	07	JSC-Fit Induced Change Imm. Def						516724.02.04.05.03.04.14
HHC	07	JSC-Incid. Latent Virus Shedding						516724.02.04.05.03.04.15
HHC	07	JSC-Microorgans & Allergens						516724.02.04.05.03.04.16
HHC	07	JSC-Reactivation Latent Epstn-Barr Virus						516724.02.04.05.03.04.17
HHC	07	JSC-Effects of Sim Spceflight (Brks AFB)						516724.02.04.05.03.04.18
HHC	07	JSC-Val Proc Monitor Immune (Sams)						516724.02.04.05.03.04.37
HHC	07	JSC-Val Proc Monitor Immune (Pierson)						516724.02.04.05.03.04.44
HHC	06	JSC-NxPCM Pharmacology					516724.02.04.05.03.05	
HHC	07	JSC-Gastro Function Ext. Spcflt						516724.02.04.05.03.05.09

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HHC	07	JSC-Effects of PMZ						516724.02.04.05.03.05.10
HHC	07	JSC-Stab Pharm/Nut Cmpds Pharm (Putcha)						516724.02.04.05.03.05.30
HHC	06	JSC-NxPCM Nutrition Studies					516724.02.04.05.03.06	
HHC	07	JSC-Stab Pharm/Nut Cmpds Nut (Smith)						516724.02.04.05.03.06.31
HHC	07	JSC-Nutritional Status Assess (Smith)						516724.02.04.05.03.06.33
HHC	07	JSC-Dietary Intake Bone Metab (Smith)						516724.02.04.05.03.06.55
HHC	06	JSC-NxPCM Sensory Motor					516724.02.04.05.03.07	
HHC	07	JSC-Locomotor Dysfunction						516724.02.04.05.03.07.19
HHC	07	JSC-Spatial Reorientation						516724.02.04.05.03.07.20
HHC	06	JSC-NxPCM Clinical Care Studies					516724.02.04.05.03.08	
HHC	07	JSC-Adv Diag Ultrasound (Dulchavsky)						516724.02.04.05.03.08.24
HHC	05	JSC-NxPCM Ground Research				516724.02.04.05.04		
HHC	06	JSC-NxPCM Bone Studies					516724.02.04.05.04.01	
HHC	07	JSC-Epidem Anal Bone Loss/Recov (Amin)						516724.02.04.05.04.01.56
HHC	07	JSC-Tracer-less Ca Isotope (Anbar)						516724.02.04.05.04.01.57
HHC	07	JSC-Contrib Recov Bone Strength (Hogan)						516724.02.04.05.04.01.58
HHC	07	JSC-Bone Biomarkers Human Sweat (Clarke)						516724.02.04.05.04.01.59
HHC	07	JSC-Recov M/S Quantity/Quality (Judex)						516724.02.04.05.04.01.60
HHC	06	JSC-NxPCM Muscle					516724.02.04.05.04.02	
HHC	07	JSC-Reten of Skeleton						516724.02.04.05.04.02.18
HHC	07	JSC-VIBE Ground Supplemental Testing						516724.02.04.05.04.02.47
HHC	06	JSC-NxPCM Cardiovascular					516724.02.04.05.04.03	
HHC	07	JSC-Vestib-Cerebro						516724.02.04.05.04.03.12
HHC	07	JSC-Autonomic & Neuro						516724.02.04.05.04.03.13
HHC	07	JSC-Hypovolemia model spcfit (Platts)						516724.02.04.05.04.03.32
HHC	07	JSC-Determ CV Alter Sim Lunar (Platts)						516724.02.04.05.04.03.61
HHC	06	JSC-NxPCM IIH Studies					516724.02.04.05.04.04	
HHC	07	JSC-CHOICE Immunity Concordia (Sams)						516724.02.04.05.04.04.54
HHC	06	JSC-NxPCM Pharmacology					516724.02.04.05.04.05	
HHC	07	JSC-Effects of Sim Micro						516724.02.04.05.04.05.07
HHC	07	JSC-Ass. Pharm Stability						516724.02.04.05.04.05.08
HHC	07	JSC-Assess Pharm Stab Analog (Putcha)						516724.02.04.05.04.05.28
HHC	07	JSC-Meth Assess GI Fx Sim Lunar (Putcha)						516724.02.04.05.04.05.62
HHC	06	JSC-NxPCM Nutrition					516724.02.04.05.04.06	
HHC	07	JSC-Eff of Nut Ex Cm						516724.02.04.05.04.06.05
HHC	07	JSC-Nut BR Study						516724.02.04.05.04.06.06
HHC	07	JSC-Assess Nut Stab Gnd Sim (Smith)						516724.02.04.05.04.06.29
HHC	07	JSC-VitD Supp: Dosing Evaluation (Smith)						516724.02.04.05.04.06.53
HHC	06	JSC-NxPCM Sensory Motor					516724.02.04.05.04.07	
HHC	07	JSC-VR Cybersick Effect						516724.02.04.05.04.07.23
HHC	07	JSC-Invest. Neural Strat of Vis Search						516724.02.04.05.04.07.25
HHC	07	JSC-Head-Eye Coord. Dur Sim Orb. Land						516724.02.04.05.04.07.26
HHC	05	JSC-NxPCM Rapid Op Investigations (ROIs)				516724.02.04.05.05		
HHC	06	JSC-NxPCM IIH Studies					516724.02.04.05.05.04	
HHC	07	JSC-3D Tissue Analogues VZV (Goodwin)						516724.02.04.05.05.04.40
HHC	07	JSC-NEEMO Immune ROI (Sams)						516724.02.04.05.05.04.45
HHC	06	JSC-NxPCM Nutrition Studies					516724.02.04.05.05.06	
HHC	07	JSC-Eff Vit D Supp Antarctic (Smith)						516724.02.04.05.05.06.39
HHC	07	JSC-Oxid Damage 12-day Sat Dive (Zwart)						516724.02.04.05.05.06.46
HHC	07	JSC-Plr2 Antarctic VitD/Imm Fxn (Smith)						516724.02.04.05.05.06.52
HHC	06	JSC-NxPCM Clinical Care Studies					516724.02.04.05.05.08	

Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
HHC	07	JSC-Bioelectromechanics (Goodwin 2 07)						516724.02.04.05.05.08.38
HHC	05	JSC-NxPCM Clinical Care Studies				516724.02.04.05.08		
HHC	06	JSC-Bioelectromechanics (Goodwin)					516724.02.04.05.08.38	
HHC	04	JSC-EVA Physiological System Project (EP			516724.02.04.06			
HHC	05	JSC-EPSP Project Management				516724.02.04.06.01		
HHC	05	JSC-EPSP Pre-Breathe Protocols & Physiol				516724.02.04.06.02		
HHC	06	JSC-Mech. Musc. Decomp.					516724.02.04.06.02.01	
HHC	06	JSC-Buble Dynamic Models					516724.02.04.06.02.02	
HHC	06	JSC-AirBrk 100% O2					516724.02.04.06.02.03	
HHC	06	JSC-EPSP-Pre-Breathe Protocols & Physiol					516724.02.04.06.02.04	
HHC	05	JSC-EPSP Biomedical Performance Reqmts &				516724.02.04.06.03		
HHC	05	JSC-EPSP Adjunct Studies & Characterizat				516724.02.04.06.04		
HHC	04	JSC-Digital Astronaut			516724.02.04.07			
HHC	04	JSC-Digital Astronaut L1 - FY08 and out			516724.02.04.08			
HHC	05	JSC-Digital Astronaut - FY08 and out				516724.02.04.08.01		
HHC	03	KSC-Funded Research/Awards		516724.02.05				
HHC	04	KSC-Labor and Travel			516724.02.05.01			
HHC	04	KSC-Core Competency Mgmt/ De-scoping			516724.02.05.02			
HHC	03	MSFC-Funded Research/Awards		516724.02.06				
HHC	04	MSFC - Labor and Travel			516724.02.06.01			
HHC	04	MSFC-Core Competency Mgmt/ De-scoping			516724.02.06.02			
HHC	02	Facilities, Testbeds and Operations	516724.03					
HHC	03	ARC-Facilities, Testbeds & Operations		516724.03.01				
HHC	04	ARC-SPIFe Bed Rest			516724.03.01.01			
HHC	05	ARC-SPIFe Bed Rest				516724.03.01.01.04		
HHC	03	GRC-Facilities, Testbeds & Operations		516724.03.02				
HHC	03	HQ-Facilities, Testbeds & Operations		516724.03.03				
HHC	03	JSC-Facilities, Testbeds & Operations		516724.03.04				
HHC	04	JSC-Flight Analog Project			516724.03.04.01			
HHC	05	JSC-NIH/UTMB Direct				516724.03.04.01.01		
HHC	05	JSC-Flight Analog Project				516724.03.04.01.02		
HHC	06	JSC-2.2.11					516724.03.04.01.02.01	
HHC	06	JSC-BHP					516724.03.04.01.02.02	
HHC	06	JSC-USRA					516724.03.04.01.02.03	
HHC	06	JSC-UMMC					516724.03.04.01.02.04	
HHC	06	JSC-Contingency					516724.03.04.01.02.05	
HHC	05	JSC-FAP MEDES International LTBR Study				516724.03.04.01.03		
HHC	04	JSC-HTSF			516724.03.04.02			
HHC	04	JSC-Core Labs			516724.03.04.03			
HHC	05	JSC-SK BOR				516724.03.04.03.01		
HHC	05	JSC-Sustaining Core Capabilities				516724.03.04.03.02		
HHC	06	JSC-SK Biomedical Lab Audit					516724.03.04.03.02.01	
HHC	03	KSC-Facilities, Testbeds & Operations		516724.03.05				
HHC	03	MSFC-Facilities, Testbeds & Operations		516724.03.06				
HHC	02	Agency Cost Assessment	516724.99					
Rad	00	Space Radiation	651549					
Rad	01	Space Radiation	651549					
Rad	02	Portfolio Management	651549.01					
Rad	03	ARC-Portfolio Management		651549.01.01				
Rad	04	ARC-Space Radiation			651549.01.01.01			
Rad	04	ARC-Core Competency Managment			651549.01.01.02			

Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
Rad	04	ARC-Project Integration and Support			651549.01.01.03			
Rad	04	ARC-Workshop			651549.01.01.04			
Rad	03	GRC-Portfolio Management		651549.01.02				
Rad	04	GRC-Space Radiation			651549.01.02.01			
Rad	04	GRC-Core Competency Management			651549.01.02.02			
Rad	03	HQ-Portfolio Management		651549.01.03				
Rad	03	JSC-Portfolio Management		651549.01.04				
Rad	04	JSC-Sp Radiation Institutional			651549.01.04.01			
Rad	04	JSC-Core Competency Management			651549.01.04.02			
Rad	04	JSC-Project Integration and Support			651549.01.04.03			
Rad	05	JSC-Contingency and Program Support				651549.01.04.03.01		
Rad	05	JSC-Project Management IPA Sulzman				651549.01.04.03.02		
Rad	05	JSC-Reserve				651549.01.04.03.03		
Rad	04	JSC-Workshop & Website Coordination			651549.01.04.04			
Rad	04	JSC-NASA Space Radiobiology Training			651549.01.04.05			
Rad	04	JSC-New Awards			651549.01.04.06			
Rad	04	JSC-ODIN & JIMMS Support			651549.01.04.07			
Rad	03	KSC-Portfolio Management		651549.01.05				
Rad	04	KSC-Space Radiation			651549.01.05.01			
Rad	04	KSC-Core Competency Management			651549.01.05.02			
Rad	03	MSFC-Portfolio Management		651549.01.06				
Rad	04	MSFC-Space Radiation			651549.01.06.01			
Rad	04	MSFC-Core Competency Management			651549.01.06.02			
Rad	03	LARC-Portfolio Management		651549.01.07				
Rad	04	LARC-PORTFOLIO MANAGEMENT PROCUREMENTS			651549.01.07.03			
Rad	03	JPL-Portfolio Management		651549.01.08				
Rad	02	Funded Research/Awards	651549.02					
Rad	03	ARC-Funded Research/Awards		651549.02.01				
Rad	04	ARC-Labor and Travel			651549.02.01.01			
Rad	05	ARC-Constellation Srad 1%				651549.02.01.01.99		
Rad	04	ARC-Core Competency Management			651549.02.01.02			
Rad	04	ARC-Space Radiation Lunar Regolith			651549.02.01.03			
Rad	04	ARC-Biological Risk & Countermeasure			651549.02.01.04			
Rad	05	ARC-DNA Damage & Repair				651549.02.01.04.01		
Rad	05	ARC-Molecular Sruveillance				651549.02.01.04.02		
Rad	05	ARC-High Let Radiation				651549.02.01.04.03		
Rad	05	ARC-Functional Role of Betaig-H3 Gene				651549.02.01.04.04		
Rad	05	ARC-HZE Particle-induced Genetic				651549.02.01.04.05		
Rad	05	ARC-Mechanisms of Recombination				651549.02.01.04.06		
Rad	05	ARC-Bystander Effects by High LET rad				651549.02.01.04.07		
Rad	05	ARC-DNA Damage Responses				651549.02.01.04.08		
Rad	05	ARC-Fundamental Biological studies				651549.02.01.04.09		
Rad	05	ARC-Mechanisms of high LET rad				651549.02.01.04.10		
Rad	05	ARC-free radicals in malignant trans				651549.02.01.04.11		
Rad	05	ARC-Space Rad on degenerative tissue				651549.02.01.04.12		
Rad	05	ARC-Molecular and cellular effects				651549.02.01.04.13		
Rad	05	ARC-Simulated Hypergravity				651549.02.01.04.14		
Rad	05	ARC-Checkpoint reduced Cell Sensitivity				651549.02.01.04.15		
Rad	05	ARC-Mechanisms of the repair				651549.02.01.04.16		
Rad	05	ARC-Mechanisms				651549.02.01.04.17		
Rad	05	ARC-Epigenetic				651549.02.01.04.18		

Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
Rad	05	ARC-Tissue-specific				651549.02.01.04.19		
Rad	05	ARC-Early Detection				651549.02.01.04.20		
Rad	05	ARC-Dose Rate				651549.02.01.04.21		
Rad	04	ARC-Space Radiation TEPC			651549.02.01.05			
Rad	05	ARC-EVA NSBR Dosimetry System				651549.02.01.05.01		
Rad	03	GRC-Funded Research/Awards	651549.02.02					
Rad	04	GRC-Labor and Travel			651549.02.02.01			
Rad	04	GRC-Core Competency Management			651549.02.02.02			
Rad	03	HQ-Funded Research/Awards	651549.02.03					
Rad	04	HQ-Labor and Travel			651549.02.03.01			
Rad	04	HQ-Interagency Agreement with DOE			651549.02.03.02			
Rad	03	JSC-Funded Research/Awards	651549.02.04					
Rad	04	JSC-Sp Radiation Labor & Travel			651549.02.04.01			
Rad	04	JSC-Core Competency Management			651549.02.04.02			
Rad	04	JSC-Integrated Risk Assessment			651549.02.04.03			
Rad	05	JSC-Risk Assessment Project				651549.02.04.03.01		
Rad	05	JSC-Health Risks from High LET Radiation				651549.02.04.03.02		
Rad	05	JSC-Computational Modeling Chromosome Ab				651549.02.04.03.03		
Rad	05	JSC-Patterns of Energy Disposition byHZE				651549.02.04.03.04		
Rad	04	JSC-Biological Risk and Countermeasures			651549.02.04.04			
Rad	05	JSC-DOE Cooperative Radiation Research				651549.02.04.04.01		
Rad	05	JSC-NSCOR on Solid Tumor Cancer Risk				651549.02.04.04.02		
Rad	05	JSC-Radiation Leukemogenesis NSCOR				651549.02.04.04.03		
Rad	05	JSC-Prog Alter of Centr Nerv Sys Structu				651549.02.04.04.04		
Rad	05	JSC-Lung Cancer Pathogenesis & HZE Part				651549.02.04.04.05		
Rad	05	JSC-Autosomal Mutagenesis Vivo & In Vitr				651549.02.04.04.06		
Rad	05	JSC-Effect of Exposure to Heavy Parts				651549.02.04.04.07		
Rad	05	JSC-Sp Rad Effect Neuroimaging- NE-stern				651549.02.04.04.08		
Rad	05	JSC-DNA Dam Clusters in Human Cell Trans				651549.02.04.04.09		
Rad	05	JSC-Dose Resp Retinal Brain Corticle Mic				651549.02.04.04.10		
Rad	05	JSC-HZE Rad Effects Neuroinflammation				651549.02.04.04.11		
Rad	05	JSC-HZE Rad Modulation Genetic Effects				651549.02.04.04.12		
Rad	05	JSC-Impact of HZE Particle Exposure				651549.02.04.04.13		
Rad	05	JSC-In Vivo Ind of Chromosomal Dam				651549.02.04.04.14		
Rad	05	JSC-Individual Genetic Susceptibility				651549.02.04.04.15		
Rad	05	JSC-Non-Inv Asses Neuropathology CNS				651549.02.04.04.16		
Rad	05	JSC-Dietary Retinoid Prevention of 56Fe				651549.02.04.04.17		
Rad	05	JSC-Selenomethionine Prot from Sp Rad				651549.02.04.04.18		
Rad	05	JSC-Mitigating High Z Rad Ind Genomic				651549.02.04.04.19		
Rad	05	JSC-Brain Inflammation Particulate Irrad				651549.02.04.04.20		
Rad	05	JSC-Ionizing Radiation and Effects On				651549.02.04.04.21		
Rad	05	JSC-Mechanisms of Ocular Cataracts				651549.02.04.04.22		
Rad	05	JSC-Effect Estrogen Cataract Induction				651549.02.04.04.23		
Rad	05	JSC-Hum Endothelial Cells 2D & 3D Sys				651549.02.04.04.24		
Rad	05	JSC-Neurogenesis & Cognition in Hum ApoE				651549.02.04.04.25		
Rad	05	JSC-Hologous recomb in complex DSP Rep				651549.02.04.04.26		
Rad	05	JSC-Precise Asses Prevelence Lens Opacit				651549.02.04.04.27		
Rad	05	JSC-Non-Cancer NSCOR				651549.02.04.04.28		
Rad	05	JSC-Anal. of Clastogenic Factors				651549.02.04.04.29		
Rad	05	JSC-autosomal mutations in murine				651549.02.04.04.30		
Rad	05	JSC-mitotic catastrophe in mutagenesis				651549.02.04.04.31		

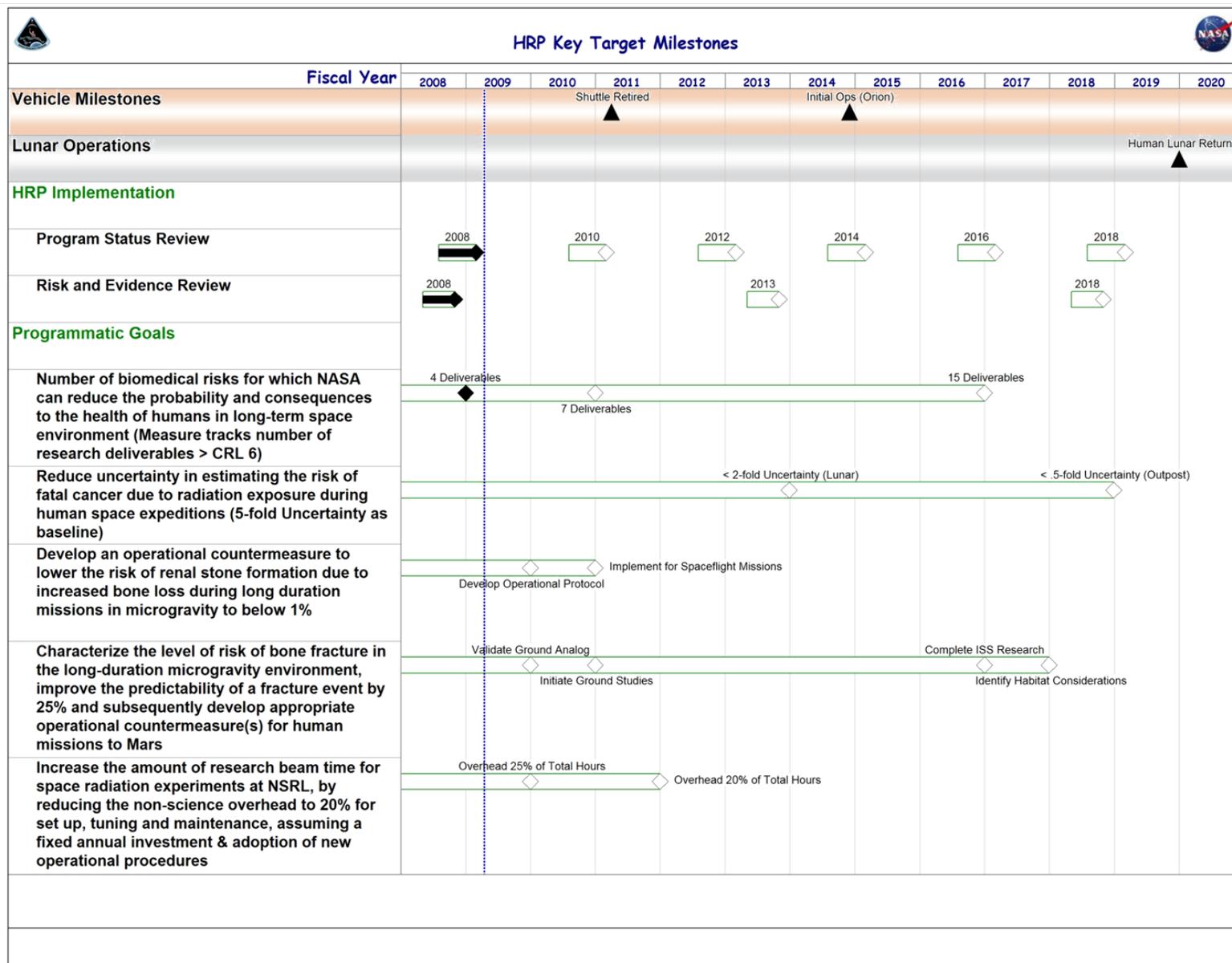
Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
Rad	05	JSC-Mouse models				651549.02.04.04.32		
Rad	05	JSC-Proteomic aided investigation				651549.02.04.04.33		
Rad	05	JSC-Telomeric proteins				651549.02.04.04.34		
Rad	05	JSC-DNA damage				651549.02.04.04.35		
Rad	05	JSC-High energy proton				651549.02.04.04.36		
Rad	05	JSC-The role of Gap-Junction				651549.02.04.04.37		
Rad	05	JSC- colon tumorigenesis				651549.02.04.04.38		
Rad	05	JSC-Neurochemical and behavioral				651549.02.04.04.39		
Rad	05	JSC-Cryogenetic Study Heavy Ion-Induced				651549.02.04.04.40		
Rad	05	JSC-Chromosome Aber				651549.02.04.04.41		
Rad	05	JSC-Dose-rate effects				651549.02.04.04.42		
Rad	05	JSC-miRNA profiling				651549.02.04.04.43		
Rad	05	JSC-Dose-Rate				651549.02.04.04.44		
Rad	05	JSC-HZE Particles				651549.02.04.04.45		
Rad	05	JSC-Biodosimetry				651549.02.04.04.46		
Rad	05	JSC-Exposure				651549.02.04.04.47		
Rad	05	JSC-Early Markers				651549.02.04.04.48		
Rad	05	JSC-High-LET rad				651549.02.04.04.49		
Rad	05	JSC-Genomic instab				651549.02.04.04.50		
Rad	05	JSC-Histone				651549.02.04.04.51		
Rad	04	JSC-Measurement Technology Research			651549.02.04.05			
Rad	05	JSC-Cryogenetic Study Heavy Ion-Induced				651549.02.04.05.01		
Rad	05	JSC-RT Meas of Dose & Charged Particle				651549.02.04.05.02		
Rad	05	JSC-Early Mark Sp Rad Induced Cataract				651549.02.04.05.03		
Rad	05	JSC-Monitor Rad-Induced Genetic Damage				651549.02.04.05.04		
Rad	05	JSC-MicroDosimeter iNstrument (MIDN) sys				651549.02.04.05.05		
Rad	04	JSC-Radiation Measurements & Trans Codes			651549.02.04.06			
Rad	05	JSC-RadiationTransportTravel				651549.02.04.06.01		
Rad	05	JSC-Measurements of Fragmentation				651549.02.04.06.03		
Rad	04	JSC-Radiation Shielding Design Tools			651549.02.04.07			
Rad	04	JSC-Phased-out Grants & Contracts			651549.02.04.08			
Rad	03	KSC-Funded Research/Awards		651549.02.05				
Rad	04	KSC-Labor and Travel			651549.02.05.01			
Rad	04	KSC-Core Competency Mgmt/ De-scoping			651549.02.05.02			
Rad	03	MSFC-Funded Research/Awards		651549.02.06				
Rad	04	MSFC-Labor and Travel			651549.02.06.01			
Rad	04	MSFC-Core Competency Management			651549.02.06.02			
Rad	04	MSFC-Radiation Measurement & Trans Codes			651549.02.06.06			
Rad	05	MSFC-Meas of Frag Cross Sections				651549.02.06.06.01		
Rad	05	MSFC-Rad Transport Code Development				651549.02.06.06.02		
Rad	05	MSFC-AGS				651549.02.06.06.03		
Rad	03	LARC-Funded Research/Awards		651549.02.07				
Rad	04	LaRC-Labor and Travel				651549.02.07.01		
Rad	04	LaRC-Core Competency Mgmt/ De-scoping				651549.02.07.02		
Rad	04	LARC-Integrated Risk Assessment				651549.02.07.03		
Rad	04	LARC-Radiation Measurements and Transpor				651549.02.07.06		
Rad	04	LARC-Radiation Sheilding Design Tools				651549.02.07.07		
Rad	03	JPL-Funded/Research/Awards		651549.02.08				
Rad	02	Facilities, Testbeds and Operations	651549.03					
Rad	03	ARC-Facilities, Testbeds & Operations		651549.03.01				
Rad	03	GRC-Facilities, Testbeds & Operations		651549.03.02				

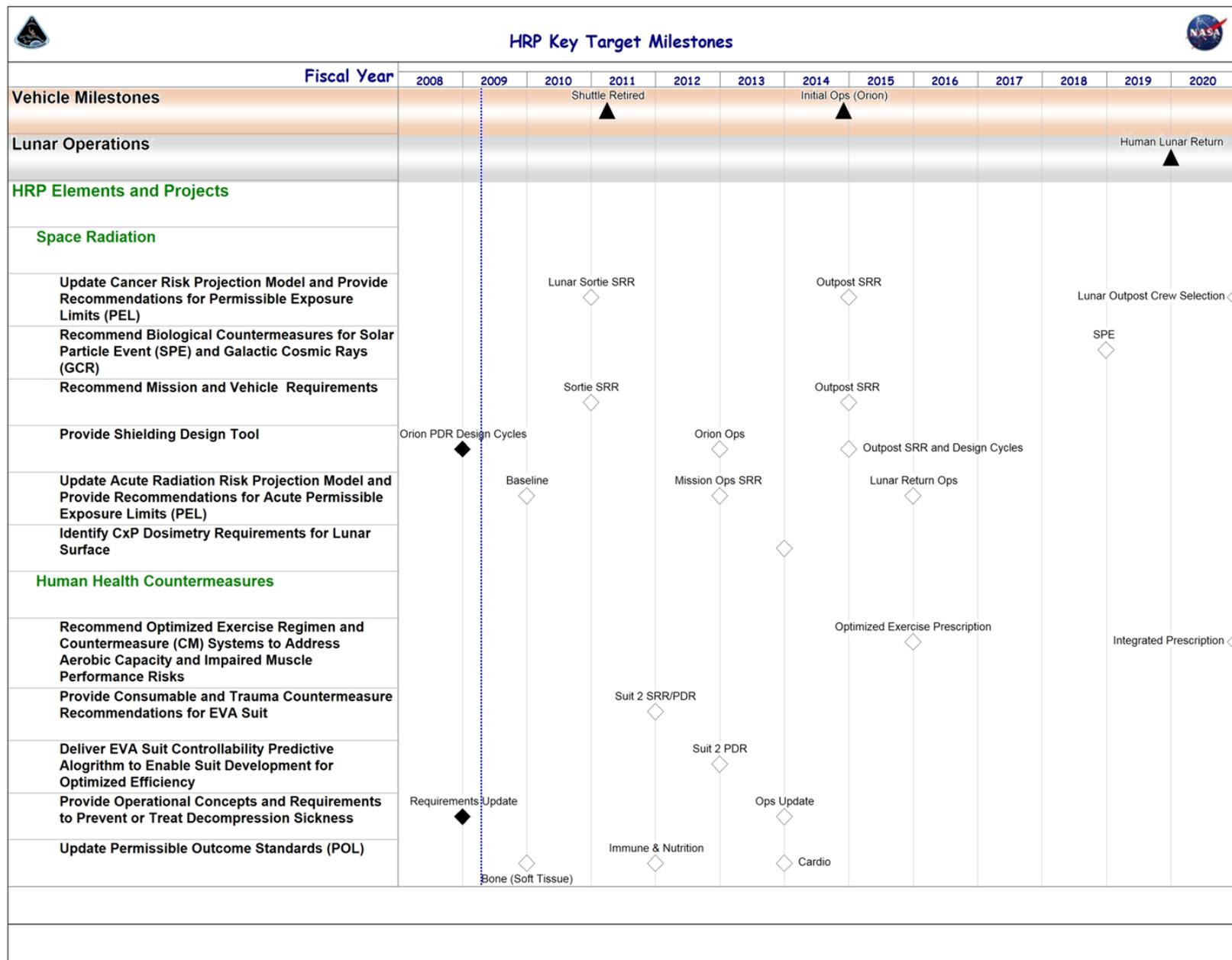
Prog Elmt	WBS Lvl/WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
Rad	03	HQ-Facilities, Testbeds & Operations	651549.03.03				
Rad	03	JSC-Facilities, Testbeds & Operations	651549.03.04				
Rad	04	JSC-Brookhaven National Laboratory		651549.03.04.01			
Rad	04	JSC-Terminated Facilities		651549.03.04.02			
Rad	04	JSC-Loma Linda Proton Treatment Fac		651549.03.04.03			
Rad	04	JSC-Operations Integration		651549.03.04.04			
Rad	03	KSC-Facilities, Testbeds & Operations	651549.03.05				
Rad	03	MSFC-Facilities, Testbeds & Operations	651549.03.06				
Rad	03	LARC-Space Radiation	651549.03.07				
Rad	04	LARC-SR LAT/MAT Studies		651549.03.07.03			
Rad	03	JPL-Facilities, Testbeds & Operations	651549.03.08				
Rad	02	Agency Cost Assessment	651549.99				
ISSMP	01	ISS Medical Project	868800				
ISSMP	02	ISSMP Portfolio Management	868800.01				
ISSMP	03	ARC-Portfolio Management		868800.01.01			
ISSMP	04	ARC-ISSMP Infrast Spt L/T			868800.01.01.01		
ISSMP	04	ARC-ISSMP Flight Project Management			868800.01.01.02		
ISSMP	04	ARC-Termination / De-Scoping Liability			868800.01.01.03		
ISSMP	04	ARC-Conference & Workshops			868800.01.01.04		
ISSMP	03	JSC-Portfolio Management	868800.01.04				
ISSMP	04	JSC-ISSMP Flight Project Management			868800.01.04.02		
ISSMP	04	JSC-Termination / De-Scoping Liability			868800.01.04.03		
ISSMP	04	JSC-ODIN & JIMMS Support			868800.01.04.07		
ISSMP	03	KSC-Portfolio Management	868800.01.05				
ISSMP	04	KSC-ISSMP Flight Project Management			868800.01.05.02		
ISSMP	04	KSC-Termination / De-Scoping Liability			868800.01.05.03		
ISSMP	02	ISSMP Funded Research & Awards	868800.02				
ISSMP	02	ISSMP Facilities, Testbeds & Operations	868800.03				
ISSMP	03	ARC-Facilities, Testbeds, & Operations		868800.03.01			
ISSMP	04	ARC-ISS Medical Projects			868800.03.01.01		
ISSMP	05	ARC-Fac Dev/Experiment Unique Equip				868800.03.01.01.03	
ISSMP	05	ARC-Utilization Support				868800.03.01.01.04	
ISSMP	03	JSC-Facilities, Testbeds, & Operations	868800.03.04				
ISSMP	04	JSC-Flight Projects Management		868800.03.04.01			
ISSMP	05	JSC-Sustaining Engineering			868800.03.04.01.02		
ISSMP	05	JSC-Fac Dev/Experiment Unique Equip			868800.03.04.01.03		
ISSMP	05	JSC-Utilization			868800.03.04.01.04		
ISSMP	05	JSC-Telescience Support Center			868800.03.04.01.06		
ISSMP	05	JSC-Risk Management			868800.03.04.01.07		
ISSMP	03	KSC-Facilities, Testbeds, & Operations	868800.03.05				
ISSMP	04	KSC-ISS Medical Projects		868800.03.05.01			
ISSMP	05	KSC-BDC Support			868800.03.05.01.04		
ISSMP	02	Agency Cost Assessment	868800.99				
BHP	01	Behavioral Health and Performance (BHP)	939924				
BHP	02	Portfolio Management	939924.01				
BHP	03	ARC-Portfolio Management		939924.01.01			
BHP	04	ARC-Behavioral Health and Performance			939924.01.01.01		
BHP	04	ARC-Core Competency Management			939924.01.01.02		
BHP	03	GRC-Portfolio Management	939924.01.02				
BHP	04	GRC-Behavioral Health and Performance			939924.01.02.01		
BHP	04	GRC-Core Competency Management			939924.01.02.02		

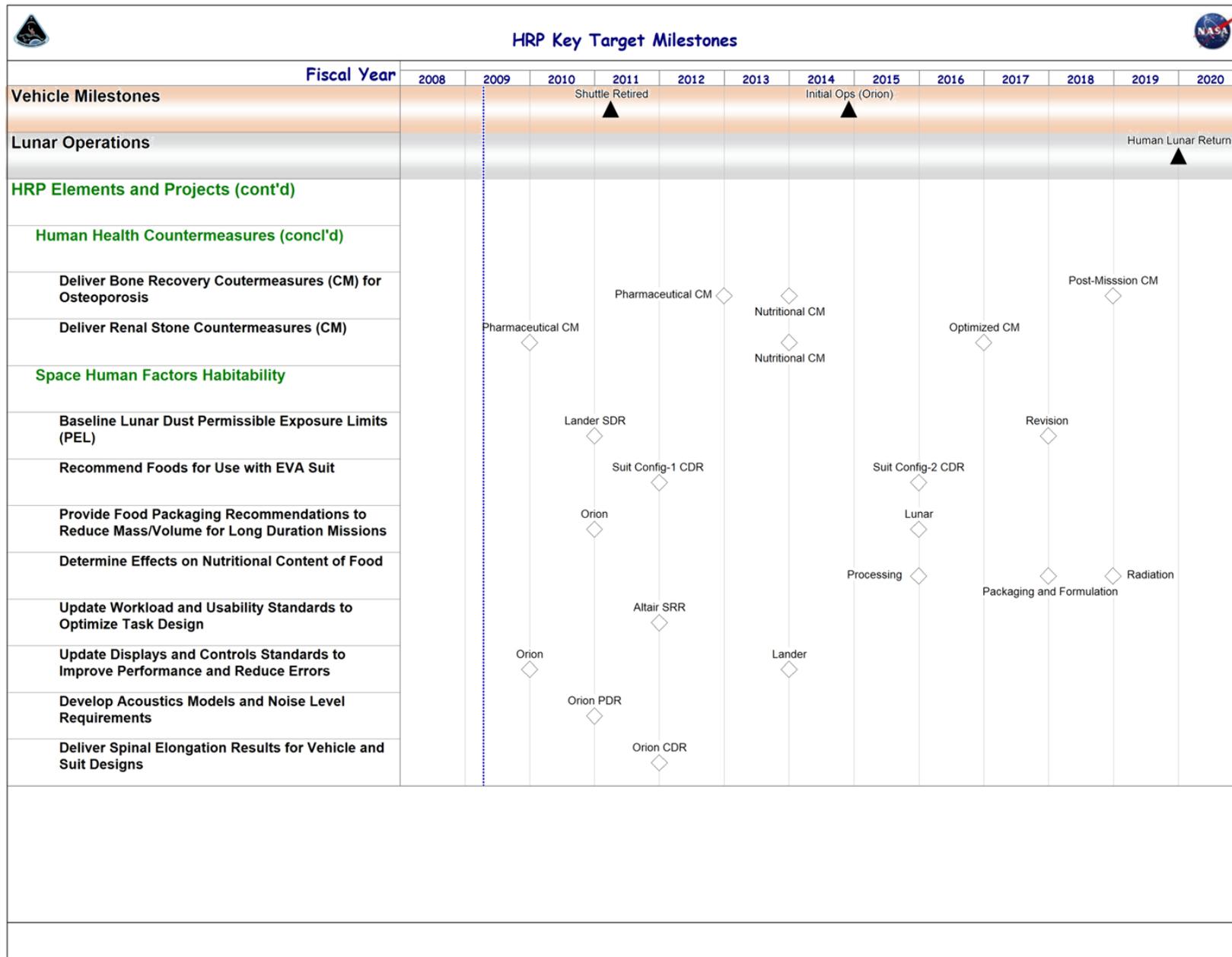
Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
BHP	03	HQ-Portfolio Management		939924.01.03				
BHP	03	JSC-Portfolio Management		939924.01.04				
BHP	04	JSC-BHP Institutional			939924.01.04.01			
BHP	04	JSC-Termination / De-Scoping Liability			939924.01.04.02			
BHP	04	JSC-ODIN & JIMMS Support			939924.01.04.07			
BHP	03	KSC-Portfolio Management		939924.01.05				
BHP	03	MSFC-Portfolio Management		939924.01.06				
BHP	02	Funded Research/Awards	939924.02					
BHP	03	ARC-Funded Research/Awards		939924.02.01				
BHP	04	ARC-Labor and Travel			939924.02.01.01			
BHP	04	ARC-Core Competency Management			939924.02.01.02			
BHP	03	GRC-Funded Research/Awards		939924.02.02				
BHP	04	GRC-Labor and Travel			939924.02.02.01			
BHP	04	GRC-Core Competency Management			939924.02.02.02			
BHP	03	HQ-Funded Research/Awards		939924.02.03				
BHP	04	HQ-Labor and Travel			939924.02.03.01			
BHP	04	HQ-Core Competency Mgmt/ De-scoping			939924.02.03.02			
BHP	03	JSC-Funded Research/Awards		939924.02.04				
BHP	04	JSC-BHP Labor & Travel			939924.02.04.01			
BHP	04	JSC-Core Competency Management			939924.02.04.02			
BHP	04	JSC-BHP Team Cohesion & Productivity			939924.02.04.04			
BHP	05	JSC-BHP Issues - Long Duration				939924.02.04.04.01		
BHP	05	JSC-BHP Psychosocial Training - Kanas				939924.02.04.04.02		
BHP	04	JSC-BHP Behavioral Health Management			939924.02.04.05			
BHP	05	JSC-BHP Behavioral Health Medical Standa				939924.02.04.05.01		
BHP	05	JSC-BHP Clinical Cognitive Medical Stand				939924.02.04.05.02		
BHP	04	JSC-BHP Performance Readiness			939924.02.04.06			
BHP	05	JSC-BHP Mental Represent / Spatial Cues				939924.02.04.06.01		
BHP	05	JSC-BHP Sleep-Wake Actigraphy and Light				939924.02.04.06.02		
BHP	05	JSC-Co-I Support for VOILA				939924.02.04.06.03		
BHP	05	JSC-BHP CogReadinessStnds3K&MedicalStnds				939924.02.04.06.04		
BHP	05	JSC-BHP Sleep and Fatigue Model - Dinges				939924.02.04.06.05		
BHP	05	JSC-BHP Circadian - Blue Light Activatio				939924.02.04.06.06		
BHP	05	JSC-BHP Workload Standards				939924.02.04.06.07		
BHP	04	JSC-BHP SelectionIndicators&CrewAssembly			939924.02.04.07			
BHP	05	JSC-BHP Selection Standards Res Plan				939924.02.04.07.01		
BHP	04	JSC-Russian Chamber Study			939924.02.04.09			
BHP	03	KSC-Funded Research/Awards		939924.02.05				
BHP	04	KSC-Labor and Travel			939924.02.05.01			
BHP	04	KSC-Core Competency Mgmt/ De-scoping			939924.02.05.02			
BHP	03	MSFC-Funded Research/Awards		939924.02.06				
BHP	04	MSFC-Labor and Travel			939924.02.06.01			
BHP	04	MSFC-Core Competency Management			939924.02.06.02			
BHP	02	Facilities, Testbeds and Operations	939924.03					
BHP	03	ARC-Facilities, Testbeds & Operations		939924.03.01				
BHP	03	GRC-Facilities, Testbeds & Operations		939924.03.02				
BHP	03	HQ-Facilities, Testbeds & Operations		939924.03.03				
BHP	03	JSC-Facilities, Testbeds & Operations		939924.03.04				
BHP	04	JSC-BHP Procurement Management			939924.03.04.01			
BHP	03	KSC-Facilities, Testbeds & Operations		939924.03.05				
BHP	03	MSFC-Facilities, Testbeds & Operations		939924.03.06				

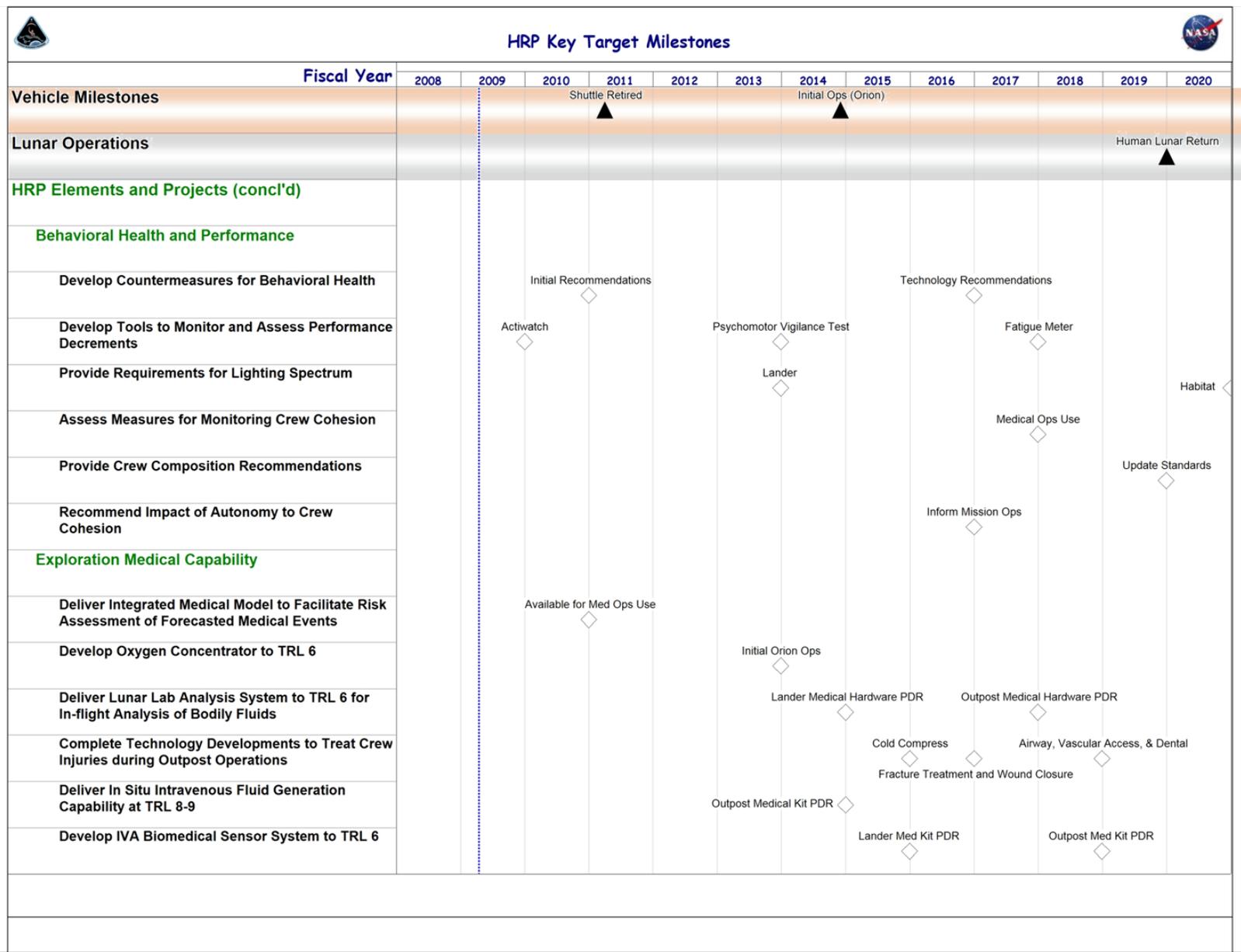
Prog Elmt	WBS Lvl	WBS Title	WBS Level 2	WBS Level 3	WBS Level 4	WBS Level 5	WBS Level 6	WBS Level 7
BHP	02	Agency Cost Assessment	939924.99					

APPENDIX D: HRP KEY TARGET MILESTONES









APPENDIX E: PROGRAM RISK MANAGEMENT PLAN

E1. INTRODUCTION

E1.1 Purpose

The purpose of this plan is to document the process by which the Human Research Program (HRP) will identify, assess, control and respond to risk factors that occur in the program. It provides personnel across the elements and projects with a description of how the HRP manages programmatic risks. This plan meets the intent of NPR 7120.8, NPR 8000.4, and ESMD-RMP-04.06 for the HRP risk management process.

E1.2 Scope

The HRP defines and manages programmatic risks related to achieving its baseline schedule, budget, and deliverable products. This plan is applicable to the management offices (PIO and SMO), elements, and projects that comprise the HRP, including associated contractor support.

Although the purpose of the HRP is to reduce human health and performance risks for exploration missions, the process for managing these risks is not addressed in this plan. The Science Management Plan, HRP-47053, governs this risk content and contains the policies utilized in the science management of the human health and performance risks.

This plan does not cover risks identified when performing tasks for external programs (i.e. Shuttle Program, ISS Program, CxP), such as trades, analyses, or other assessments. Risks identified as a consequence of those tasks are owned by the funding program.

E2. DOCUMENTS

E.2.1 Applicable Documents

NPR 7120.8	February 5, 2008	NASA Research and Technology Program and Project Management Requirements
NPR 8000.4A	December 16, 2008	Agency Risk Management Procedural Requirements
ESMD-RMP-04.06	Rev 2, August 16, 2007	Exploration Systems Risk Management Plan

E3. RISK MANAGEMENT METHODOLOGY, PROCESS, AND TOOLS

E3.1 Risk-Informed Decision Making (RIDM) and Continuous Risk Management (CRM)

NPR 8000.4A requires the integration of RIDM and CRM into a coherent framework to better inform decision making through better use of risk information. HRP utilizes this construct wherein research and planning decisions are made with regard to outcomes of the decision alternatives, taking into account applicable risks and uncertainties. The HRP primarily uses CRM to manage programmatic risks related to achievement of human performance requirements and safety for space operations.

The HRP implements the CRM process as described in NPR 8000.4A. The CRM process, shown in Figure E-1, is an iterative process based on six specific steps. The six CRM steps include: identify, analyze, plan, track, control, and communicate and document. The CRM principles are incorporated throughout the HRP management offices, elements, and projects. The HRP CRM process flow is illustrated in Figure E-2 from the HRP Scorecard in the JSC Integrated Risk Management Application (IRMA).



Figure E-1: CRM Process

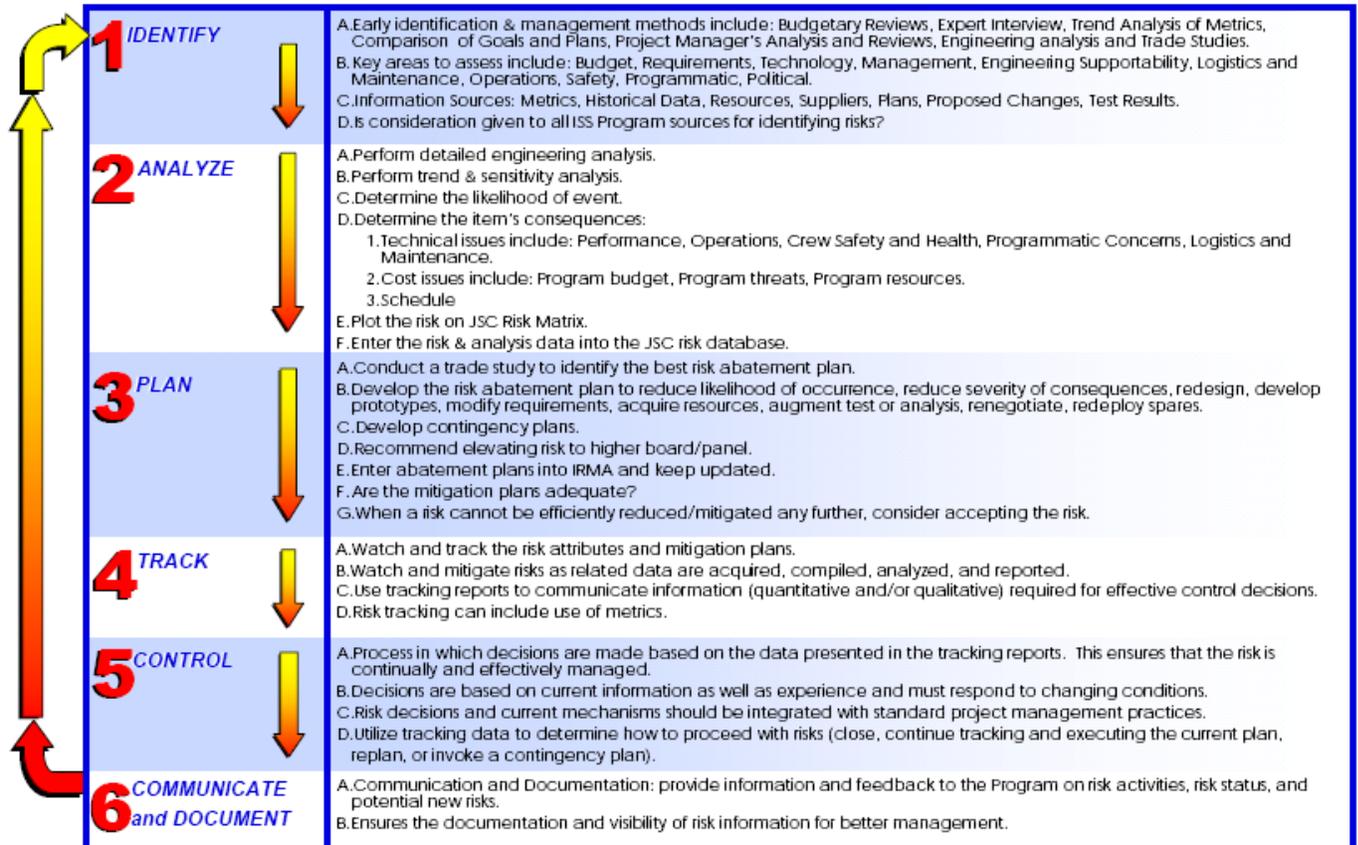


Figure E-2: CRM Process Flow

E3.2 HRP Risk Management Process

E3.2.1 Risk Identification

Programmatic risks are driven by technical risks, budget constraints, and schedule. Risks are identified during daily activities of personnel, close call reports, lessons learned, meeting proceedings, etc. Risk statements are written, citing only one risk condition, and one or more consequences of that condition. Circumstances, contributing factors and other related issues are captured. Good risk identification information provides the what, how, when, where, and why of the risk condition. Each risk has a responsible person(s) assigned as owner.

E3.2.2 Risk Analysis

Each risk is evaluated as to the likelihood and the consequences of the risk. A scale of 1 to 5 is used, where 1 is the lowest likelihood/least consequence, and 5 is the highest likelihood/consequence. The risk consequence score is based on cost, schedule, safety, and technical (mission success) parameters. The likelihood and consequence matrices are shown in Table E-1 and E-2. The impact of the risk is determined from a matrix of the likelihood crossed with the consequence of the risk, which is displayed using the 5 x 5 matrix method shown in Figure E-3.

Table E-1: Consequence Criteria Matrix for Assessment of HRP Risks

Classification		Consequence Criteria			
		Safety	Schedule	Cost	Technical (Mission Success or Supportability)
5	Very High	Condition may lead to death or permanent disabling injury, facility destruction, or loss of crew, major systems or vehicle	Slip in delivery to the flight program, slip in delivery of major system or subsystem beyond 6 months of milestone schedule	≥10% increase to HRP budget allocation	Loss of mission
4	High	Condition may cause severe injury or occupational illness, or major property damage to facilities, systems, equipment or flight hardware.	Delay of > 5 month ≤6 month for deliverables from milestone schedules	≥8% but < 10% increase to budget allocation	Loss of critical function or major science objective
3	Moderate	Condition may cause minor injury or occupational illness, or minor property damage to facilities, systems, equipment or flight hardware.	Delay of > 3 months < 5 months for deliverables from milestone schedules	>5% but <8% increase to budget allocation	Inability to meet power, weight, size and/or performance requirements; major science objectives not fully met
2	Low	Condition may result in minor first aid though would not adversely affect personal safety or health. Subjects facilities, equipment or flight hardware to more than normal wear and tear.	Delay of > 1 month ≤3 month for deliverables from milestone schedules	< 5% increase to budget allocation	Loss of design margins, some desired science objectives not met: some desired technical performance not completely met
1	Very Low	No impact to personnel or facilities.	Delay of ≤1 month for deliverables from milestone schedule	Minor impact to budget allocations	Small impact to design margins

Table E-2: Likelihood Classification Matrix for Assessment of HRP Risks

Likelihood of Occurrence	Description
5 -Very High (> 90% chance)	Occurrence is very likely and cannot be prevented by existing processes, procedures, and plans; no alternative approaches or processes are available.
4 -High (> 70% chance)	The existing processes, procedures, and plans cannot prevent this event, but a different approach or process may prevent the event.
3 -Moderate (40% to 70% chance)	The existing processes, procedures and plans may prevent this event, but additional actions shall be required.
2 -Low (10 % to 39% chance)	The existing processes, procedures, and plans are usually sufficient to prevent this type of event.
1 -Very Low (< 10% chance)	The existing processes, procedures, and plans are sufficient to prevent this event.

Identify and Assess Risk

- Start with a Concern.** Is this a program risk?
 - What information is available? Gather information: requirements status, problem data, trends, hazards, critical items, history, etc.
- Define Risk Statement.**
 - Given the condition (A), there is a possibility that (B) shall occur.

(A) – Single phrase briefly describing current key circumstances or situations that are causing concern, doubt, anxiety or uncertainty.

(B) – Consequence or impacts of the current conditions that could be realized due to (A)
- Define the Consequences (B).** Locate the most accurate description(s) among the Safety, Schedule, Cost, and Technical (Mission Success or Supportability) consequence descriptions.
- How likely is the risk scenario?** Locate the most accurate Likelihood description that corresponds to the risk statement. Only one Likelihood score is possible. Note: Quantitative likelihood ratings refer to program lie and are provided as guidelines only.
- Plot the Risk.** Select the highest consequence score. Plot this against the ONE Likelihood score on the RED/YELLOW/GREEN risk matrix.

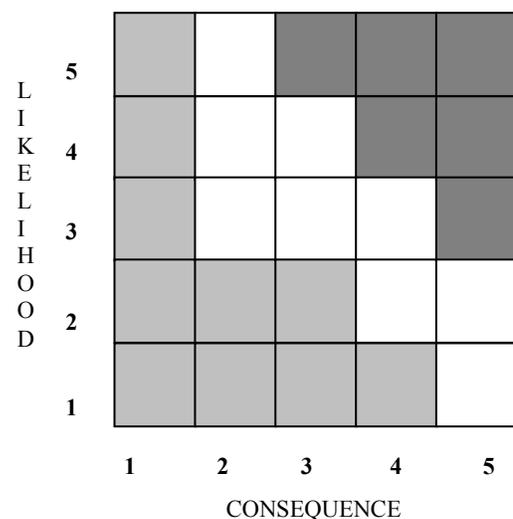


Figure E-3: HRP Risk Management Scorecard in JSC IRMA

E3.2.3 Risk Planning

As new risks are identified and analyzed, the next step is to determine the appropriate approach for responding to those risks: retain responsibility, delegate responsibility, or transfer the risk responsibility to the appropriate team within the organization. Risks are assigned to the appropriate management office, element, or project for managing all aspects of the risk. The Program Manager may request transfer of a risk to an external organization if that organization is best suited to handle the risk.

Techniques for handling or controlling risks include:

- Avoidance: The program, element, or project plan or approach is modified or not selected in order to avoid or eliminate a risk.
- Mitigation: Actions are taken by the program, element, or project to reduce the likelihood of occurrence of an event or to reduce the severity of the impact if the event occurs. Mitigation plans are a way to apply methods aimed at eliminating the risk or reducing the likelihood and/or consequence.
- Monitoring: The program, element, or project decides to continue to monitor the event, without action, for later re-assessment and handling.
- Transference: Ownership of a risk is transferred to another program, project, or organization that can more effectively handle the risk or for which the risk has a greater potential impact.
- Acceptance: The program, element, or project decides to accept the risk based on low likelihood of occurrence or low consequence.

E3.2.4 Tracking Risk

The goal of tracking risks is to collect, update, organize, and analyze risk information to provide routine status reports on mitigation activities to the Program Manager. The tools used by the HRP to track risks are the JSC Integrated Risk Management Application (IRMA) and ESMD Active Risk Manager (ARM).

The HRP uses the JSC IRMA as the common tool database for documenting and tracking all programmatic risks. From the JSC IRMA, risks are entered in other program databases as appropriate, such as the ESMD ARM, the CxP IRMA for all CxP related risks, the ISS IRMA for all ISS-unique risks, and the SIRMA for all Shuttle-specific risks. The HRP uses the ESMD ARM to escalate and track only top program risks and those risks that affect other ESMD programs.

E3.2.5 Controlling Risk

During risk reviews, decisions are made to close risks, continue to research, mitigate or watch risks, re-plan or re-focus actions or activities, or invoke contingency plans. The Program Manager authorizes and allocates resources to reduce risks. Once a risk has been mitigated down to a 2 x 2 on the risk matrix, it may be considered an accepted risk.

Contingency plans are made when necessary to reduce the severity of impact should the adverse event, as identified by the risk, occur. The disposition of risks is reviewed every quarter to determine progress and if the risk handling technique should be changed or if the risk can be closed or accepted.

E.3.2.6 Communicating and Documenting Risk

Successful risk management relies upon:

- Open communication at and among all organizational levels
- Continuously addressing areas that may potentially cause future problems
- Continuously assessing risks and strategies to mitigate those risks

A review of management office, element, and project status is conducted on a quarterly basis as the technical, cost, and schedule review (TCSR), which includes an emphasis on impacts to program risks and discussion of top PIO, SMO, element, and project risks. During the TCSR, a programmatic risk review is conducted with program and element management participants. The purpose of this review is to discuss the Top Program Risks (TPRs), determine if any element/project risks should be escalated as program risks, and determine if any other program risks should be escalated as TPRs to the ESMD and entered into the ESMD ARM. The HRP Program Manager then reports the TPRs and status to the ESMD AA during the ESMD Quarterly Program Management Review (QPMR).

The overall process for communicating the HRP programmatic risks is in Figure E-4.

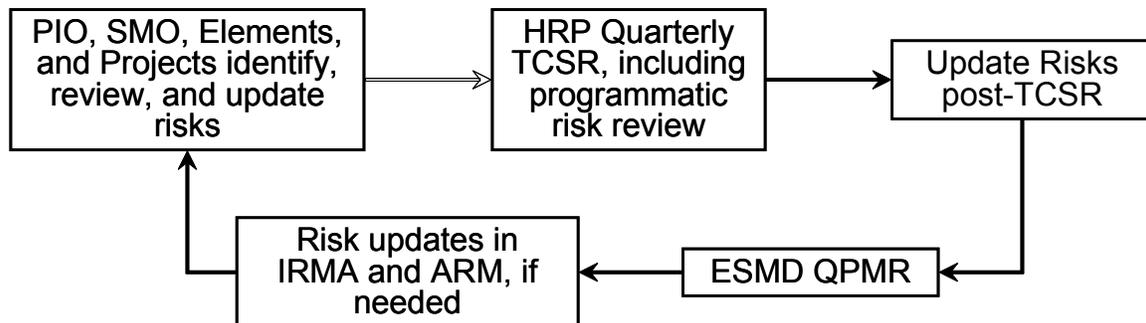


Figure E-4: Risk Communication Flow

APPENDIX F: CURRENT HRP EXTERNAL AGREEMENTS

Subject/Type	Partners	Effective Date	End Date	Comments
US AGREEMENTS				
NASA/NSBRI Cooperative Agreement (NCC9-58)	NASA - NSBRI	Apr-97; Oct-07 initiated 3rd increment	Continuing	
Cancer Research	NIH - NCI	Jul-94	Continuing	
Space Life Sciences Database - on World Wide Web	NIH - NLM	FY1994	Continuing	
Establish Formal Scientific Collaboration between NASA and DOE - OBER	DOE - OBER	Jan-07	Continuing	
Radiobiology Heavy Ion Beam Research	DOE - BNL	May-07	Continuing	
UTMB Testbed Facilities	NIH	Jan-05	Continuing	
Flight Food Systems	DoD-Soldier Systems Center	Dec-07	Continuing	
Foster New Areas of Cooperation between USDA and NASA	USDA	Jan-07	TBD	
Low Dose Radiation Research	DOE	Jan-07	Continuing	
Validation of Space Radiation Analysis Tools (IA1-872)	Lawrence Berkley National Laboratory	Oct-07	Oct-12	
Antarctic Activities	NSF	Jan-91	Continuing	
Nonreimbursable Space Act Agreement for the John Glenn Biomedical Engineering Consortium	See comments column	May-02	Jul-11	Partners: Cleveland Clinic, Case Western Reserve University, University Hospitals Case Medical Center, National Center for Exploration Research, NASA GRC
Nonreimbursable Space Act Agreement for the Cleveland Clinic Center for Space Medicine	NASA GRC - Cleveland Clinic	Oct-04	Oct-10	
Nonreimbursable memorandum of agreement between NASA JSC and President's Council on Physical Fitness and Sports for NASA Fit Explorer and PCPFS Program (Space Act Agreement SAA-AT-07-024)	President's Council on Physical Fitness and Sports	2007	2010	
Nonreimbursable Space Act Agreement between NASA LYNDON B. Johnson Space Center and Houston Dynamo for Sports and Exploration (SE) Education Partnership (SAA-AT-07-002)	Houston Dynamo, MLS	2007	2010	
INTERNATIONAL AGREEMENTS				
International Space Life Sciences Flight Experiments on the ISS (ISLSWG)	ESA/CSA/JAXA/NASA	Sep-07	Sep-12	
Arrangement among the Canadian Space Agency, the European Space Agency, the National Aeronautics and Space Administration of the United States of America, and the National Space Development Agency of Japan concerning International Space Life Sciences Flight Experiments on the ISS	CSA/ESA/NASA/NASDA	Sep-02	10 years	Covers experiments such as: Visuomotor and Orientation Investigations in Long Duration Astronauts (VOILA); PKINASE and LEUKIN; Alendronate-Zolendronate; Tissue Equivalent Proportional Counter (TEPC)/Matroshka; Cardiovascular Control on Return from International Space Station (CCISS); Evaluation of Maximal Oxygen Uptake (VO2max) During Long Duration International Space Station Missions; Thermolab; EKE; Sodium LOading in Microgravity (SOLO)
NASA/ESA Agreement for activities associated with the launch and cooperative utilization of ESA's Analyzing Interferometer for Ambient Air, aboard the ISS (ANITA)	ESA/NASA	Dec-04	5 years OR 2 years post-ANITA return from ISS	

Subject/Type	Partners	Effective Date	End Date	Comments
INTERNATIONAL AGREEMENTS (concluded)				
Ambiguous Tilt and Translation Motion Cues After Space Flight (Z-Aligned Gravito-inertial) and Otolith Assessment During Postflight Re-Adaptation (ZAG/Otolith)	ESA/NASA			
NASA-ESA Letter Agreement on International Space Station (ISS) Biomedical Research, involving in particular the ESA European Physiology Modules (EPM) and the NASA Human Research Facility (HRF)	ESA/NASA	Dec-99	Extended to Dec-08; Further Extension in Progress	Covers experiment/hardware content such as: launch of Muscle Atrophy Research and Exercise System (MARES); Cardiac Atrophy and Diastolic Dysfunction During and After Long Duration Spaceflight: Functional Consequences for Orthostatic Intolerance, Exercise Capacity, and Risk of Cardiac Arrhythmias (Integrated Cardiovascular (ICV) Flight Investigation)
Pulmonary Function System (PFS) Joint Utilization Plan	ESA/NASA	Aug-06		Covers experiment/hardware content such as: Long Term Microgravity: A Model for Investigating Mechanisms of Heart Disease with New Portable Equipment (CARD); Energy; PFS upgrade
Portable Pulmonary Function System (PPFS) Letter of Agreement	ESA/NASA			Covers hardware such as: power converter and Pressurized Inhalation Gases (PIG)
NASA/ESA Agreement on the utilization of NASA's Microgravity Science Glovebox for ESA sponsored physical sciences research during ESA Taxi Missions 7S and 8S, and during Increment 8	ESA/NASA	Oct-03	5 years	
Utilization of archived biospecimens at ARC Life Sciences Data Archive	JAXA/NASA	Jan-04	3 years	
International Multidisciplinary Artificial Gravity (IMAG) Project Pre-Phase I and Phase I Agreement [Artificial Gravity]	DLR/RAS	Oct-04	Oct-07	
US/Russian Joint Working Group on Space Biomedicine, Life Support Systems, and Microgravity Sciences (JWG)	Russian Biomedical	Apr-04	Continuing	
Agreement between the USA and the Russian Federation Concerning Cooperation on the Exploration and Use of Outer Space for Peaceful Purposes	USA/Russian Federation	June/July 1992		
Russian 105-day Chamber Study	IMBP/NSBRI	Jul-08	Dec-09	
Agreement between the Russian Federation State Research Center Institute of Biomedical Problems of the Russian Academy of Sciences and the National Aeronautics and Space Administration of the United States of America Concerning Scientific Cooperation on the Foton-M3 Mission	IMBP/NASA	Aug-05	5 years	Foton-M2 Mission (Dec 2004, 5 years)
All Female Long Term Head Down Tilt Bed Rest Study (WISE)	ESA/CNES/CSA	Jul-04	Jul-09	No current HRP participation
Consequences of long-term confinement and hypobaric hypoxia on immunity in the Antarctic Concordia environment (CHOICE)	ESA/NASA	In Work		Determine efficacy of extended analogue for spaceflight-associated immune dysregulation