In this ISS onboard photo, Expedition Six Science Officer Donald R. Petit works to set up the Pulmonary Function in Flight (PuFF) experiment hardware in the Destiny Laboratory. The PuFF experiment was developed to better understand what effects long-term exposure to microgravity may have on the lungs.

Biological Sciences Research

MAJOR EVENTS IN FY 2005

Biological Sciences Research (BSR) major events listed below will be accomplished **pending the Exploration Replanning**. Bioastronautics events will occur in conjunction with priorities developed with the Bioastronautics Critical Path Roadmap.

- BSR-Bioastronautics will systematically explore the utility of Artificial Gravity as a multi-system countermeasure in ground based venues using test subjects deconditioned by bed rest.
- BSR-Bioastronautics will improve ability to predict risks associated with exposure to radiation by funding additional high quality research using the National Space Radiation Laboratory.
- BSR-Bioastronautics will complete preliminary study of Advanced Integration Matrix.
- BSR-Bioastronautics will continue to development of Sabatier technology to help close the water loop on the International Space Station (ISS).
- BSR-Fundamental Space Biology (FSB) will reach its anticipated Flight Hardware Availability status for the Habitat Holding Rack No. 2.
- BSR-FSB will reach its anticipated Flight Hardware Availability status for the Life Sciences Glovebox from the Japanese Aerospace Exploration Agency (JAXA).
- BSR-FSB will initiate development of flight experiments solicited in the FY 2004 International Research Announcement.

Theme: Biological Sciences Research

OVERVIEW

PENDING EXPLORATION REPLANNING. Biological Sciences Research (BSR) includes: (1) strategic research that is required to support development of tools, procedures, and technologies to ensure the health, safety, and efficient support of human crews engaging in space exploration; (2) research to enable understanding of how cells, organisms, animals and plants respond to gravity and its absence in space exploration; and (3) projects to develop and demonstrate concepts for new technologies that will improve life support and environmental systems used in human space flight. The Biological Sciences Research theme addresses the understanding of how gravity interacts with life processes at the molecular, cellular, systems, or behavioral levels on human crews in space. The research findings also have application on Earth. Just as studying life's interaction with other environmental factors, such as light and oxygen, provides fundamental insight into life's inner workings, the ability to manipulate gravity levels also provides a new and powerful means of studying the fundamental mechanisms of living processes. (Note: BSR will be conducting a major review of priorities to ensure alignment of activities with the new Exploration vision. Some of the specific activities described here may change.)

Missions	Goals supported by this Theme	Objectives supporting these Goals
To Explore the Universe and Search for Life	4. Explore the fundamental principles of physics, chemistry, and biology through research in the unique natural laboratory of space.	4.1 Determine how fundamental biological processes of life respond to gravity and space environments.
Exploration Capabilities	9. Extend the duration and boundaries of human space flight to create new opportunities for exploration and discovery.	9.1 Understand human physiological reactions to reduced gravity and develop countermeasures to assure survival of humans traveling far from Earth.
		9.2 Develop new human support systems and solutions to low gravity technological challenges to allow the next generation of explorers to go beyond low earth orbit.

RELEVANCE

Human space flight is inherently risky. The maintenance of crew health is required to operate the International Space Station (ISS) and its associated research, as well as to expand human presence beyond where we have been. A key element of our strategic research is specifically established to focus on methods to reduce risk, improve safety and maintain health, through attaining new knowledge and developing countermeasures required to enable flight crews to leave Earth, and eventually low-Earth orbit, perform their assigned tasks, and return to Earth with their health intact. This also includes sponsoring research to develop therapeutics, procedures, techniques, and equipment needed to address flight medical, safety, and performance issues.

Studies of the response and adaptation of cells and organisms to space will result in new insights into the effects of gravity and other space environment characteristics on biological processes, providing critical knowledge about the mechanisms underlying the human health risks associated with space flight. In addition, novel information about general principles that regulate biological systems in space provides fundamental knowledge regarding general biological processes on Earth. Long duration exposures to space provide the first opportunity to study how organisms respond to this new environment through complete life cycles and through multiple generations.

This research seeks to unravel the underlying mechanisms to answer the intriguing question: What is the capacity of life to adapt and thrive as it ventures off the home planet for more extended periods of time?

Education and Public Benefits
Biological Sciences Research generates knowledge that promotes understanding of basic biological principles leading to advances in avoiding or eradicating debilitating diseases and physical conditions. Public benefits are gained from development of health-related technologies and processes never before possible. Biological sciences research promotes academic excellence by engaging teachers and students in challenging, relevant space research experiences that provide practice and application of standards-based science, math, and technology concepts. Educational benefits include improvement in science proficiency of educators, availability of unique space research-related teaching tools and techniques, and increased numbers of students selecting math, science, and technology courses and careers.

IMPLEMENTATION

The Enterprise Official for the Biological Sciences Research Theme is Mary Kicza, Associate Administrator for the Biological and Physical Research Enterprise (BPRE). The Headquarters Division Director for Fundamental Space Biology (FSB) is Dr. Terri Lomax. The Fundamental Space Biology Program is managed and implemented by the Ames Research Center (ARC) under the authority of the ARC Fundamental Space Biology Research Integration Office. The Center Responsible Official at ARC is Dr. Gary Jahns. The HQ Division Director for Bioastronautics Research is Dr. Guy Fogleman. The Bioastronautics Research (BR) Program coordination responsibility is assigned to the Johnson Space

Center (JSC), under the supervision of John Rummel, Chief, Office of Bioastronautics. The Center Responsible Officials at JSC are Cindy Haven, Bill Paloski, and Mark Jernigan.

IMPLEMENTATION SCHEDULE

Theme Element	Schedule by Fiscal Year 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10	Purpose
Biomass Production System (BPS)		Developed as a precursor for systems capable of supporting plant growth and botanical experimentation in microgravity for extended periods of time on board the ISS.
Habitat Holding Rack-1 (HHR-1)/Qual Rack		Provides the functional support services required by each subrack payload. Also provides a passive vibration control system to protect the payloads from ISS vibration.
Incubator		A temperature-controlled chamber for conducting life science research with animal, plant and microbial specimens.
Insect Habitat		Designed to support experiments for a variety of insect species; provided by an International Cooperative Agreement with the Canadian Space Agency.
Life Sciences Glovebox (LSG)		A Sealed work area that provides bioisolation waste control where crew members perform experimental procedures; provided by an ISS Barter Offset Agreement with the Japanese Aerospace Exploration Agency.
Centrifuge (CR)		Supports a variety of habitat types and provides a selectable, simulated gravity environment for biological specimens on the ISS; provided by an ISS Barter Offset Agreement with the Japanese Aerospace Exploration Agency (JAXA).
Fundamental Space Biology Research		Provides research grants for the study of life sciences research concerning the space environment.
Human Research Facility-1 (HRF-1)		Enables a systematic study of human physiological, behavioral and chemical changes induced by space flight.
Human Research Facility-2 (HRF-2)		Builds on the HRF-1, by adding new hardware that allows additional science capability.
Bioastronautics Research		Provides research grants for the systematic study of human physiological and behavioral changes induced by space flight, and for the development of technologies to support humans in space.
Habitat Holding Rack-2 (HHR-2)		Provides functional support services required by each subrack payload. Also provides a passive vibration control system to protect the payloads from ISS vibration.
Cell Culture Unit (CCU)		Provides highly automated cell culture experiments.
Advanced Animal Habitat (AAH)		Designed to support experiments utilizing rodents; interfaces with LSG and CR.
Plant Research Unit (PAU)		Designed to support experiments for large plant species; interfaces with LSG and CR.
Passive Dosimeter System		Measures biologically active space radiation at specific experiment locations; provided by an International Cooperative Agreement with the Hungarian Space Agency.

Tech & Adv Concept Development Operations Research

Full compliance with NPR 7120.5B will be achieved in FY04 for the relevant portions.

STATUS

During FY03, the FSB program supported 154 investigations (128 ground-based/26 flight); released 2 solicitations for ground-based research resulting in the receipt of 117 proposals (Radiation investigations and 2 Radiation NSCORS were selected in FY03, additional ground-based research selections will be made in FY04); proceeded with planning for early ISS utilization including payloads developed for delivery to ISS by Progress missions; selected & developed for flight studies that will investigate changes in microbial virulence in space, muscle atrophy & potential countermeasures, and genomic changes associated with space flight. FSB investigators published over 200 articles in peer-reviewed journals in FY03 and publications have been submitted, reporting results from the BPS on Increment 4.

The BR program maintained a peer-reviewed research program in Biomedical Research & Countermeasures and in Advanced Human Support Technology to support health, safety, and performance of humans in space. BR sponsored a total of 272 investigations in FY03 and issued 5 Research Announcements. BR investigators published over 300 articles in peer-reviewed journals during 2003, and are also beginning to publish results of experiments conducted during ISS Increments 1-8. There are currently 3 published peer-reviewed papers from early ISS Increments; 4th paper awaits publication. BR completed the NASA Space Radiation Laboratory (NSRL) in Jun03 to enable investigators to perform research using heavy ion radiation. Commissioning experiments began in Jul03. NASA selected 29 individual investigators as the first group of NSRL researchers for the first operational runs set for Oct03.

Theme: Biological Sciences Research

BR investigators gathered data using the HRF on ISS. During FY03, there were 11 biomedical experiments on ISS. There are currently 23 experiments in the ISS flight program in various stages of preparation, operation, or data analysis. Three examples are: Foot Reaction Forces During Space Flight (studies leg loads on Earth & during treadmill running on ISS to better understand effectiveness of ISS exercises to develop/maintain bone strength), Crew-Member & Crew-Ground Interactions during International Space Missions (studies important interpersonal factors that impact crew and ground support personnel performance during ISS missions), and Pulmonary Function in Flight (measures the effects of long-duration exposure to microgravity and EVA on lung function). HRF Rack 2 has been delivered to KSC & is awaiting a new launch date. In FY03, risk mitigation accomplishments included a Sabatier reactor for ISS, including design of a long life compressor & a gas-water separator to be manufactured in FY04, along with substantial progress on the Vapor Phase Catalytic Ammonia Removal (VPCAR) system which contributed to a reduction of the calculated system mass by 40% compared to the ISS baselined system.

The Program Assessment Tool (PART) evaluation concluded that BSR had not demonstrated results. Although the selection and prioritization of scientific research has improved, additional work is needed to develop suitable performance goals and demonstrate results. To improve the next PART evaluation, the program must refocus to support the new exploration vision.

Go to http://spaceresearch.nasa.gov/research_projects/programs.html for more information.

PERFORMANCE MEASURES

Outcomes/Annual Performance Goals (APGs)	
Outcome 4.1.1	*Use ground-based simulators and ISS to determine gravity responses for at least five model organisms by 2008.*
5BSR1	Solicit ground-based research on three widely studied model organisms.
5BSR2	Implement a tactical plan for plant research and solicit studies appropriate to that plan on at least two model plant species.
Outcome 4.1.2	*Develop predictive models of cellular, pathogenic, and ecological responses to space for at least two organisms by 2008.*
5BSR3	Solicit ground-based research on responses of cells and pathogens to space environments.
5BSR4	Initiate intra- and interagency programs to study microbial ecology and evolution
Outcome 4.1.3	*By 2008, structure the Fundamental Space Biology flight research program to emphasize at least five model organisms and teams of Principal Investigators.*
5BSR5	Develop selected flight research experiments on two model organisms in coordination with research teams for identified flight opportunities.
5BSR6	Align reprioritized fundamental biology flight experiments with available hardware and hardware development.
Outcome 9.1.1	*By 2008, develop and test candidate countermeasures using ground-based analysis and space flight.*
5BSR7	Increase the use of space flight analogs on the ground to better define hypotheses for flight experiments
5BSR8	Publish final results of Bioastronautics experiments conducted during ISS increment 8 and preliminary results from Increments 9 and 10.
5BSR9	Maintain productive peer-reviewed research program in Biomedical Research and Countermeasures including a National Space Biomedical Research Institute that will perform team-based focused countermeasure-development research.
5BSR10	Under the Human Research Initiative (HRI) increase the number of investigations addressing biomedical issues associated with human space exploration.
5BSR11	Conduct scientific workshops to fully engage the scientific community in defining research strategies for addressing and solving NASA's biomedical risks.
Outcome 9.1.2	*By 2008, reduce uncertainties in estimating radiation risks by one-half.*
5BSR12	Expand the space radiation research science community to involve cutting edge researchers in related disciplines by soliciting, selecting, and funding high quality research.
5BSR13	Use 1000 hours/yr of beam time at the National Space Radiation Laboratory (NSRL) at Brookhaven National Laboratory (BNL) to measure survival, genetic mutation (mutagenesis) and chromosome aberrations in cells and tissues to improve understanding of the biological effects of the space radiation environment.
5BSR14	Integrate research data collected over the past two years at NSRL, with existing database to develop more accurate predictions resulting in improved biological strategies for radiation risk reduction.
Outcome 9.1.3	*Advance understanding of the role of gravity in biological processes to support biomedical research.*
5BSR15	Maintain a completed, productive, peer-reviewed ground-based research program in appropriate fundamental biology disciplines to lay the groundwork for advanced understanding of the role of gravity in biological processes associated with the human health risk of space flight.
5BSR16	Initiate a nanosatellite program for in-situ analytical technology for producing the fundamental biological understanding necessary for countermeasure development.

Theme: Biological Sciences Research

Outcomes/Annual Performance Goals (APGs)	
Outcome 9.2.1	*Identify & test technologies by 2010 to reduce total mass requirements by a factor of three for Life Support using current ISS mass requirement baseline.*
5BSR17	Demonstrate, through vigorous research and technology development, a 55% reduction in the projected mass of a life support flight system compared to the system base-lined for ISS.
Uniform Measures	
5BSR18	Complete all development projects within 110% of the cost and schedule baseline.
5BSR19	Deliver at least 90% of scheduled operating hours for all operations and research facilities.
5BSR20	At least 80%, by budget, of research projects will be peer-reviewed and competitively awarded.

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
Independent Cost Assessment	MSFC CFO	1/02	N/A	Assess non-recurring SSBRP hardware
COLSA Independent Assessment	COLSA Corp.	11/01	N/A	Basis for Habitat Holding Rack cost growth and solutions
ReMAP	Independent Committee	9/02	N/A	Set priorities for ISS research
NASA Advisory Committee	BPRAC	10/03	2/04	Program Review (usually three times a year) including performance measures
Enterprise Strategy Review	BPRAC members/PIs/NASA Centers	6/03	6/06	Review BPRE's Enterprise Strategy with Research Community.

BUDGET

Budget Authority ($ millions)	FY 2003	FY 2004	Change	FY 2005	Comments
Biological Sciences Research	**268.6**	**368.0**	**+123.5**	**491.5**	Pending Exploration Replanning
Development	12.7	10.4	-6.9	3.5	
Human Research Facility (HRF) - 2	3.5	2.1	-2.1		
Habitat Holding Rack (HHR)	9.2	8.3	-4.8	3.5	
Operations	79.3	128.3	-9.3	119.0	
Operations - Bioastronautics Research (BR)	29.0	47.3	-13.6	33.7	
Operations - Fundamental Space Biology (FSB)	50.3	81.0	+4.3	85.3	
Research	176.6	229.3	+139.7	369.0	
Research - Bioastronautics Research (BR)	126.5	163.9	+144.9	308.8	Increase reflects new priority based on Exploration vision
Research - Fundamental Space Biology (FSB)	50.1	65.4	-5.2	60.2	

Indicates changes since the previous year's President's Budget Submit

Indicates budget numbers in full cost.

Theme: Biological Sciences Research
Development: Habitat Holding Rack (HHR)

PURPOSE

Objectives	Performance Measures
4.1	5BSR5-6,18

PENDING EXPLORATION REPLANNING. The Habitat Holding Rack (HHR) provides living quarters for various organisms and cells to be used in experiments aboard the ISS. The HHR extends the capability to conduct life sciences research in weightlessness with greatly improved on-orbit facilities. In concert with a large diameter variable gravity centrifuge, the suite of research equipment provided by the Space Station Biological Research Project (SSBRP) provides the life sciences research community the capability to perform research using a wide range of specimen types in controlled environments investigating biological processes using gravity as a tool. In addition, researchers will be able to investigate the effects of weightlessness and variable gravitational forces (e.g., 1/6 or 3/8 of Earth's gravity corresponding to the Moon and Mars, respectively) on living specimens and how to control and mitigate those effects. (Note: BSR will be conducting a major review of priorities to ensure alignment of activities with the new Exploration vision. Some of the specific activities described here may change.)

OVERVIEW

The HHR is a core element of the SSBRP and will provide an integrated suite of equipment on the International Space Station (ISS) to perform biological research. The facility will be located in the Centrifuge Accommodation Module (CAM), a module built specifically for the SSBRP facility. The HHR provides a vibration-isolated weightless environment for life science experiments. It has common habitat interfaces with the 2.5m Centrifuge and the Life Science Glovebox (LSG), and with those resources, will enable the determination of gravity thresholds for important physiological and developmental responses, providing the knowledge necessary to develop countermeasures and risk assessment for long duration human presence in space. The HHR provides unique resources necessary for life science research such as cold water cooling, video recording, backup resources for specimens, and crew time saving features. Two HHRs will be located on the International Space Station (ISS). The first is planned to be positioned in the US Lab. Once the CAM is integrated into the Station, both HHRs will be moved to the CAM to be co-located with the LSG and the Centrifuge. Link to project homepage for more information: http://brp.arc.nasa.gov/ .

PROGRAM MANAGEMENT

The Enterprise Official for the BSR Theme is Mary Kicza, Associate Administrator for Biological and Physical Research. The HQ Division Director for Fundamental Space Biology is Dr. Terri Lomax. The SSBRP, of which the HHR is a part, is a project managed and implemented by the Ames Research Center (ARC) under the authority of the ARC Fundamental Space Biology Research Integration Office. The Center Responsible Official at ARC is Dr. Gary Jahns. The Habitat Holding Rack is developed by Marshall Space Flight Center (MSFC) under the authority of an Intercenter agreement. The HHR is manufactured by Boeing for MSFC as part of a contract developing the HRF, EXPRESS, and Window Observational Research Facility (WORF) racks. HHR development is being implemented per ISSRC Program Commitment Agreement (PCA) dated July 9, 2003.

TECHNICAL COMMITMENT

PENDING EXPLORATION REPLANNING. HHR Development is being implemented per ISSRC Program Committement Agreement (PCA) dated July 9, 2003.

Technical Specifications	FY 2005 President's Budget	Change from Baseline
HHR-1 & HHR-2 operational lifetime	10 years	--
HHR-1 & HHR-2	Two units on orbit	--
	Accommodates 4 habitats (subrack payloads designed to accommodate specific science specimens)	--
	Provides passive vibration isolation for science specimens	--
	Provides cold water cooling to Habitats	--
	International Subrack Interface Standard (ISIS) interfaces to Habitats	--
	Animal well being redundancy	--
	Video recording/compression capability	--
	Compatibility with 2.5m Centrifuge and Life Science Glovebox	--

Theme: Biological Sciences Research
Development: Habitat Holding Rack (HHR)

Schedule	FY 2005 President's Budget	Change from Baseline
HHR-1 Flight Hardware Availability	July-04	--
HHR-2 Flight Hardware Availability	Dec-04	--

ACQUISITION STRATEGY AND PERFORMING ORGANIZATIONS

The HHR development consists of a Center agreement between MSFC and ARC and a cost plus contract with Boeing (HHR, combined contract with HRF, EXPRESS, and WORF rack development). Changes since the FY04 President's Budget: None.

Current Acquisition	Actual*	Selection Method	Actual*	Performer	Actual*
Cooperative Agreement	0%	Full & Open Competition	100%	Industry	100%
Cost Reimbursable	100%	Sole Source	0%	Government	0%
Fixed Price	0%		100%	NASA Intramural	0%
Grants	0%			University	0%
Other	0%	Sci Peer Review	0%	Non Profit	0%
*As of FY03 direct procurement	100%	*As of FY03 direct procurement		*As of FY03 direct procurement	100%

Future Acquisition - Major	Selection	Goals
None (HHR complete, Boeing contract ends)	N/A	N/A

AGREEMENTS

Internal: None. External: The HHR development supports the Japanese Aerospace Exploration Agency (JAXA) development of the 2.5m diameter Centrifuge and the LSG by providing the design and development of most subsystems and core software used by all three hardware items. The HHR, LSG, and Centrifuge are the three rack level systems which make up the SSBRP, utilizing common spares and interfaces. The LSG and Centrifuge are developed by JAXA for NASA via barter agreement. Changes since the FY04 President's Budget: None

RISK MITIGATION

Risk Date: 1/15/2004

Top Risks	G	Overall	G	Cost	G	Schedule	G	Technical	Probability	Impact	Mitigation Plan
G	Software related issues								high	low	Reserves applied

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
COLSA Independent Assessment	COLSA Corp.	11/01	N/A	Determine basis for HHR cost growth and recommend cost reductions.
Independent Cost Assessment	MSFC CFO	1/02	N/A	Assess non-recurring SSBRP hardware development
ReMAP	Independent committee	9/02	N/A	Set priorities for ISS research

Theme: Biological Sciences Research
Development: Habitat Holding Rack (HHR)

BUDGET/LIFE CYCLE COST

Budget Authority ($ millions)	Prior	FY03	FY04	FY05	FY06	FY07	FY08	FY09	BTC	Total	Comments
FY2005 PRESBUD	75.8	9.2	8.3	3.5	0.8					97.6	
Development	75.8	9.2	8.3	3.5	0.8					97.6	
Changes since 2004 PRESBUD	+65.8	+5.7		-0.1	+0.8					+72.2	
Development	+65.8	+5.7		-0.1	+0.8					+72.2	FY03 changes due to full cost adjustments and design changes. FY04-05 changes due to design changes and institutional adjustments. "Prior" data column corrected.
FY2004 PRESBUD	10.0	3.5	8.3	3.6						25.4	
Development	10.0	3.5	8.3	3.6						25.4	
Initial Baseline		3.5	8.3	3.6						15.4	
Habitat Holding Rack (HHR)		3.5	8.3	3.6						15.4	

Indicates changes since the previous year's President's Budget Submit
Indicates budget numbers in full cost.

Theme: Biological Sciences Research
Development: Human Research Facility (HRF) - 2

PURPOSE

Objectives	Performance Measures
9.1	5BSR18

PENDING EXPLORATION REPLANNING. The Human Research Facility (HRF) enables a systematic study of physiological and behavioral changes induced by space flight. The goal is to accumulate long-term data on adaptation to the space environment. HRF allows high-resolution imaging for diagnostics and research applications for human organs. NASA studies areas of concern to human well-being and performance, such as renal stone risk, bone deterioration and the effects of ionizing radiation. (Note: BSR will be conducting a major review of priorities to ensure alignment of activities with the new Exploration vision. Some of the specific activities described here may change.)

OVERVIEW

The HRF is a modular International Standard Payload Rack (ISPR) that contains scientific equipment used in human research. The HRF rack provides a modular equipment interface for equipment and distributes the utilities of power, data networks, and thermal control. The HRF 2 contains the following subracks: a) the Refrigerated Centrifuge used to separate biological substances of differing densities; b) the Space Linear Acceleration Mass Measuring Device which will provide an accurate means of determining the on-orbit mass of human subjects; c) the Pulmonary Function System which provides the capability to perform pulmonary and cardiovascular measurements; and d) the Rack 2 Workstation which is designed to support human physiological, psychological, and cognitive and human factors studies. HRF-1 has been on orbit since March 2001 and has 3 subracks: a) the Ultrasound Imaging System; b) the Gas Analyzer System for Metabolic Analysis Physiology; and c) a computer workstation that allows crewmembers to command and test the rack's equipment data. Link to project homepage for more information. http://hrf.jsc.nasa.gov/ .

PROGRAM MANAGEMENT

The Enterprise Official for the Biological Sciences Research Theme is Mary Kicza, Associate Administrator for Biological & Physical Research. The HQ Division Director for Bioastronautics Research is Dr. Guy Fogleman. HRF program management responsibility is delegated to the Johnson Space Center (JSC). The Center Responsible Official at JSC is Ms. Cindy Haven. HRF Development is being implemented per ISSRC Program Commitment Agreement (PCA) dated July 9, 2003.

TECHNICAL COMMITMENT

PENDING EXPLORATION REPLANNING. HRF Development is being implemented per ISSRC Program Commitment Agreement (PCA) dated July 9, 2003.

Technical Specifications	FY 2005 President's Budget	Change from Baseline
Support Biomedical	2 Racks	--
Power to Payload	3 kW per rack	--
Research and Countermeasure	HRF-2 on schedule for launch on ULF-1 (March 2004)	--
Validation - 1	Science Verification Testing HRF-1; August 2000	--
Validation - 2	Science Verification Testing HRF-2; June 2002	--
Science Instruments	Space Linear Acceleration Mass Measuring Device, Pulmonary Function System, Refrigerated Centrifuge, computer workstation	--
Facility operational lifetime	10 years	--

Schedule	FY 2005 President's Budget	Change from Baseline
HRF-1 on-orbit	March 2001	--
HRF-2 on dock at KSC	August 2002	--

ACQUISITION STRATEGY AND PERFORMING ORGANIZATIONS

HRF development is essentially complete. The balance of the development funds are programmed to cover integration cost of equipment provided by the European Space Agency, including the Muscle Atrophy and Resistive Exercise System (MARES) and the Eye Tracking Device. Integration of these components is under contract to Lockheed-Martin. Also under development is the Urine Monitoring System being developed by Hamilton-Sundstrand.

Theme: Biological Sciences Research
Development: Human Research Facility (HRF) - 2

Current Acquisition	Actual*	Selection Method	Actual*	Performer	Actual*
Cooperative Agreement	0%	Full & Open Competition	100%	Industry	100%
Cost Reimbursable	100%	Sole Source	0%	Government	0%
Fixed Price	0%		100%	NASA Intramural	0%
Grants	0%			University	0%
Other	0%	Sci Peer Review	0%	Non Profit	0%
*As of FY 2003 direct procurement	100%	*As of FY 2003 direct procurement		*As of FY 2003 direct procurement	100%

Future Acquisition - Major	Selection	Goals
Major acquisitions complete. No new acquisitions scheduled.	N/A	N/A

AGREEMENTS

Internal: None. External: Provision of the Pulmonary Function Module is dependent on the European Space Agency (ESA), according to NASA/ESA Letter of Agreement signed December 1999. Changes since the FY04 President's Budget: None.

RISK MITIGATION

Risk Date: 1/15/2004

Top Risks	G	Overall	G	Cost	G	Schedule	G	Technical	Probability	Impact	Mitigation Plan
G	Risk is minimal as hardware is on dock at KSC.								Low	Low	N/A

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
Independent Annual Review	HQ, Space Flight Enterprise	10/01	N/A	No further reviews planned - HRF on-dock at KSC.
ReMAP	Independent Committee	9/02	N/A	Set priorities for ISS research

BUDGET/LIFE CYCLE COST

Budget Authority ($ millions)	Prior	FY03	FY04	FY05	FY06	FY07	FY08	FY09	BTC	Total	Comments
FY2005 PRESBUD	121.4	3.5	2.1							127.0	
Development	121.4	3.5	2.1							127.0	
Changes since 2004 PRESBUD	+114.8	-2.0								+112.8	
Development	+114.8	-2.0								+112.8	No significant changes to FY03-05. "Prior" data column corrected.
FY2004 PRESBUD	6.6	5.5	2.1							14.2	
Development	6.6	5.5	2.1							14.2	
Initial Baseline		5.5	2.1							7.6	
Human Research Facility (HRF)		5.5	2.1							7.6	

Indicates changes since the previous year's President's Budget Submit
Indicates budget numbers in full cost.

Theme: Biological Sciences Research
Operations: Fundamental Space Biology (FSB)

PURPOSE

Objectives	Performance Measures
4.1, 9.1	5BSR5-6,12,19

PENDING EXPLORATION REPLANNING. The Space Station Biological Research Project (SSBRP) extends the capability to conduct life sciences research in weightlessness with greatly improved on-orbit facilities. SSBRP research equipment provides the research community the capability to perform research using a wide range of specimen types in controlled environments. Investigations address biological processes using gravity as a tool to elucidate the effects of weightlessness on living specimens, and learn how to control and mitigate those effects. Knowledge gained through the SSBRP is used to enhance human exploration of space. Such knowledge will be used initially to establish the underlying biological mechanisms in responding and adapting to space. From this knowledge, it is expected that countermeasures to the deleterious effects of space on human health will be devised or enhanced. In addition, the knowledge gained often has wide-ranging application on Earth. (Note: BSR will be conducting a major review of priorities to ensure alignment of activities with the new Exploration vision. Some of the specific activities described here may change.)

OVERVIEW

The Space Station Biological Research Project (SSBRP) will provide an integrated suite of equipment on the International Space Station (ISS) to perform biological research. The facility will be located in the Centrifuge Accommodation Module (CAM), a module built specifically for the SSBRP facility. As part of a barter offset agreement, the Japanese Aerospace Exploration Agency (JAXA) is providing the Life Sciences Glovebox (LSG), which provides a contained environment for crew performance of science protocols on science specimens, and the Centrifuge, which provides an environment for physiological experiments at variable g forces. The variable g capability allows the investigation and potential establishment of gravity thresholds, i.e. gravity levels at which specific biological effects are observed. The Operations budget supports classes of experiments that examine a wide range of life from the cellular level to animals. Link to Project Homepage for more information. http://brp.arc.nasa.gov/.

PROGRAM MANAGEMENT

The Enterprise Official for the Biological Sciences Research Theme is Mary Kicza, Associate Administrator for Biological & Physical Research. The HQ Division Director for Fundamental Space Biology (FSB) is Dr. Terri Lomax. The FSB Program is managed and implemented by the Ames Research Center (ARC) under the authority of the ARC Fundamental Space Biology Research Integration Office. The Center Responsible Official at ARC is Dr. Gary Jahns. Full compliance with NPR 7120.5B will be achieved in FY04.

TECHNICAL COMMITMENT

PENDING EXPLORATION REPLANNING. Baseline commitment as of FY 2004 President's Budget Submit dated January 2003.

Technical Specifications	FY 2005 President's Budget	Change from Baseline
Centrifuge (provided by an International Partner)	2.5 meter diameter, 4 habitats, vibration isolation, 0.01g-2.0g, cold water cooling, International Subrack Standard Interfaces	--
Life Sciences Glovebox (provided by an International Partner)	2 operators, 2 habitats, airlock, lab support equipment capability, bioisolation, cleanability, cold water cooling	--
Passive Dosimeter System (PDS)	Nuclear track detectors	--
Incubator (2 units on orbit)	4°C to 45°C internal temp, data & video capability, 90 day cap	--
Insect Habitat (1 on orbit) Provided by an International Partner	Multiple generation insect experiment capability, 90 day capability	--
Cell Culture Unit (CCU) (2 on orbit)	18 cell culture chambers, 60 auto fixation/sample containers	--
AAH (8 on orbit)	Six rats (or 12 mice), environ control, video, 90 day capability	--
PRU (8 on orbit)	38cm high plants, environ control, video, 90 day capability	--
Aquatic Habitat (Provided by an International Partner)	14°C-30°C water temp., video recording, 90 day capability	--

Theme: Biological Sciences Research
Operations: Fundamental Space Biology (FSB)

Schedule	FY 2005 President's Budget	Change from Baseline
CCU Critical Design Review	Aug-03	--
PRU Delta Preliminary Design Review	Jan-04	--
AAH Delta Preliminary Design Review	Mar-04	--
Incubator Habitat Flight Hardware Availability	Jul-04	--
AAH Critical Design Review	Feb-05	--
PRU Critical Design Review	May-05	--
LSG Flight Hardware Availability	Jul-05	--
CCU Flight Hardware Availability	Mar-06	--
Centrifuge Rotor Flight Hardware Availability	Nov-06	--
AAH Flight Hardware Availability	Jun-07	--
PRU Flight Hardware Availability	Jan-08	--

ACQUISITION STRATEGY AND PERFORMING ORGANIZATIONS

FSB Operations has 2 primary components: Biological Research Projects (BRP) and Utilization. BRP consists of the following equipment building contracts: Lockheed Martin (Facility Integration & Incubator), ORBITEC (BPS/PRU), PSI (CCU), STAR (AAH); a co-op agreement with the Canadian Space Agency (Insect Habitat), and barter agreements for equipment w/other intern'l partners. Utilization covers all expenses associated with integrating experiments into the flight platform, performing experiments on-orbit (and related ground control experiments), and post-flight processing of specimens/data, including development of experiment unique HW, ground ops, flight ops, safety, and qual control. Changes since the FY04 Pres Budget: None

Current Acquisition	Actual*	Selection Method	Actual*	Performer	Actual*
Cooperative Agreement	0%	Full & Open Competition	85%	Industry	100%
Cost Reimbursible	95%	Sole Source	15%	Government	0%
Fixed Price	5%			NASA Intramural	0%
Grants	0%		100%	University	0%
Other	0%	Sci Peer Review	0%	Non Profit	0%
*As of FY 2003 direct procurement	100%	*As of FY 2003 direct procurement		*As of FY 2003 direct procurement	100%

Future Acquisition	Selection	Goals
Support Services Contract (Lockheed/Martin)	Summer 06	100% Full & Open Competition, 100% Cost Reimbursable
Advanced Animal Habitat	Winter 04	100% SBIR, 100% Cost Reimbursable
Plant Research Unit	Winter 04	100% SBIR, 100% Cost Reimbursable

AGREEMENTS

Internal: None. External: cooperative agreement with the Hungarian Space Agency (PDS); cooperative agreement with the Canadian Space Agency (Insect Habitat); agreement with Japanese Aerospace Exploration Agency (JAXA) for (Aquatic Habitat)is TBD; and ISS barter offset agreement with JAXA for the CAM, Centrifuge, and the LSG. Changes since FY04PresBud: None

RISK MITIGATION

Risk Date: 1/15/2004

Top Risks	G Overall	G Cost	Y Schedule	G Technical	Probability	Impact	Mitigation Plan
Y	Incubator redesign (acoustics issue) impact on schedule				Moderate	Moderate	Under review
Y	Limited avail. flight opportunities impact on mission				Moderate	Moderate	Use other spacecraft
Y	CCU, S/W CDR slip; schedule impact				Moderate	Moderate	Under development

Theme: Biological Sciences Research
Operations: Fundamental Space Biology (FSB)

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
Independent Cost Assessment	MSFC CFO	1/02	N/A	Assess non-recurring SSBRP hardware development costs & perform parametric est
ReMaP	Indep Comm	9/02	N/A	Set priorities for ISS research.

BUDGET

Budget Authority ($ millions)	FY 2003	FY 2004	FY 2005	Comments
FY2005 PRESBUD	50.3	81.0	85.3	
ISSRC Fundamental Space Biology (Operations)	50.3	81.0	85.3	
Changes since 2004 PRESBUD	-5.7	+22.2		
ISSRC Fundamental Space Biology (Operations)	-5.7	+22.2		FY03delta:HW/util incr., add'l mandated content, FC. FY04-05delta: institutional adjustments
FY2004 PRESBUD	56.0	58.8		
ISSRC Fundamental Space Biology (Operations)	56.0	58.8		

Indicates changes since the previous year's President's Budget Submit
Indicates budget numbers in full cost.

Theme: Biological Sciences Research
Operations: Bioastronautics Research (BR)

PURPOSE

Objectives	Performance Measures
9.1	5BSR9,19

PENDING EXPLORATION REPLANNING. Bioastronautics Research performs systematic study of human physiological, behavioral, and chemical changes induced by space flight. NASA is accumulating long term data on adaptation to the space environment. The Human Research Facility (HRF) provides the major on-orbit capability to perform this research. HRF allows high resolution imaging for diagnostics and research applications for human organs. NASA studies areas of concern to human well-being and performance, such as renal stone risk, bone deterioration, and the effects of ionizing radiation. (Note: BSR will be conducting a major review of priorities to ensure alignment of activities with the new Exploration vision. Some of the specific activities described here may change.)

OVERVIEW

Bioastronautics Research operations include activities required for Human Research Facility (HRF) science development and operations, such as developing experiments and associated flight products. Some examples are devising operations concepts, defining flight resource and integration requirements and data management plans, developing crew procedures and displays, and creating products used to train the crew and ground support personnel. HRF operations include Principal Investigator (PI) hardware development including unique equipment, experiment kits and cables, and integration activities at HRF ground based integration facilities and KSC. HRF operations include sustaining engineering for on-orbit hardware and software. It also includes equipment upgrades and improvements. HRF operations also include experiment integration support for Advanced Human Support Technology flight experiments. This task also includes the execution of science performed during research increments, and the operation of the JSC Telescience Support Center and associated hardware and software. The Human Research Initiative started in FY 2004. This Initiative will accelerate the acquisition of knowledge and technology needed for decisions on human exploration beyond low-Earth-orbit.

Link to Project Homepage for more information: http://hrf.jsc.nasa.gov/.

PROGRAM MANAGEMENT

The Enterprise Official for the Biological Sciences Research Theme is Mary Kicza, Associate Administrator for Biological & Physical Research. The HQ Division Director for Bioastronautics Research is Dr. Guy Fogleman. The Bioastronautics Research Program coordination responsibility is assigned to the Johnson Space Center (JSC), under the supervision of Dr. John Rummel, Chief, Office of Bioastronautics. The Center Responsible Official at JSC is Ms. Cindy Haven. Full compliance with NPR 7120.5B will be achieved in FY04 for the relevant portions.

TECHNICAL COMMITMENT

PENDING EXPLORATION REPLANNING. Baseline commitment is as of the FY 2004 President's Budget dated January 2003.

Technical Specifications	FY 2005 President's Budget	Change from Baseline
Support Biomedical	2 Racks	--
Power to Payload	3 kW per rack	--
Research & Countermeasure	HRF Rack 2 on schedule for launch on ULF-1	--
Validation 1	Science Verification Testing HRF Rack 1 Aug 2000	Not included
Validation 2	Science Verification Testing HRF Rack 2 June, 2002	Not included
Science Instruments:	Gas Analyzer System for Metabolic Analysis Physiology (GASMAP), Ultrasound Imaging System, computer workstation	--

Schedule	FY 2005 President's Budget	Change from Baseline
SMO-006/Meck/test Midodrine as ctrmeasure agnst postflight orthostatic hypertens	--	--
E049/Pierson/comp. chararacterization of microorg./allergens in spacecraft env.	--	--
E104/Stuster/behav. issues assoc. w/long-duration space msn; review of journals	--	--
E083/Dulchavsky/advanced ultrasonic diagnosis in microgravity	--	--
E060/Bingham/optimizing root zone substrates for reduced gravity experiments	--	--
E010/Obe/chromosomal aberrations in blood lymphocytes of astronauts	--	--
E036/Levine/water offset nutrient delivery experiment	--	--
E057L/Whitson/ Renal Stone Risk During Spaceflight: Assessment and Countermeasure Validation,	--	--
E096/Kanas/crewmember and crew-ground interactions during ISS missions	--	--
E120/Bloomberg/Mobility Promoting Sensorimotor Response Generalizability: A Countermeasure to Mitigate LocomotorDysfunction after Long-Duration Space Flight,	--	--
E129/Barrett/space flight-induced reactivation of latent Epstein-Barr Virus	--	--
E318/Cavanagh/foot/ground reaction forces during space flight	--	--
E400/Fitts/effect of prolonged spaceflight on human skeletal muscle	--	--

ACQUISITION STRATEGY AND PERFORMING ORGANIZATIONS

The prime contractor for the HRF Operations mission is Lockheed Martin under the Wyle-led Bioastronautics contract, transferred from the "SEAT" contract on October 1, 2003. The contract covers 5 years of operations, renewable in May 2008. In FY 2003, direct procurement represented about 50% of budget authority. Changes since the FY 2004 President's Budget: new contractor, but no changes to program organization or execution.

Current Acquisition	Actual*	Selection Method	Actual*	Performer	Actual*
Cooperative Agreement	0%	Full & Open Competition	100%	Industry	100%
Cost Reimbursible	100%	Sole Source	0%	Government	0%
Fixed Price	0%			NASA Intramural	0%
Grants	0%		100%	University	0%
Other	0%	Sci Peer Review	%	Non Profit	0%
*As of FY 2003 direct procurement	100%	*As of FY 2003 direct procurement		*As of FY 2003 direct procurement	100%

AGREEMENTS

Internal: None. External: None. Changes since the FY04 President's Budget: None.

RISK MITIGATION

Risk Date: 1/15/2004

Top Risks	G	Overall	G	Cost	G	Schedule	G	Technical	Probability	Impact	Mitigation Plan
G	Availability of flight opportunities determines ability to execute mission								Low	Moderate	Investigate way to min. impact

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
ReMaP	Independent committee	9/02	9/02	Set priorities for ISS Research.

Theme: Biological Sciences Research
Operations: Bioastronautics Research (BR)

BUDGET

Budget Authority ($ millions)	FY 2003	FY 2004	FY 2005	Comments
FY2005 PRESBUD	29.0	47.3	33.7	
Operations	29.0	47.3	33.7	
Changes since 2004 PRESBUD	+0.6	-0.4		
Operations	+0.6	-0.4		Correction to Human Research Initiative (HRI) funding from BR-Operations to BR-Research; and transfer of program reserves to other OBPR themes.
FY2004 PRESBUD	28.4	47.7		
Operations	28.4	47.7		

Indicates changes since the previous year's President's Budget Submit.
Indicates budget numbers in full cost.

Theme: Biological Sciences Research
Research: Fundamental Space Biology (FSB)

PURPOSE

Objectives	Performance Measures
4.1, 9.1	5BSR1-6,12,15-16,20

PENDING EXPLORATION REPLANNING. The Fundamental Space Biology Program uses the environment of space to enhance our understanding of biology by providing a continuum of research that investigates the role of gravity and other space flight factors at all levels of biological processes. The understanding, development, and implementation of this research supports long-term human space flight. Such knowledge will be used initially to establish the underlying biological mechanisms in responding and adapting to space. From this knowledge, it is expected that countermeasures to the deleterious effects of space on human health will be devised or enhanced. Additionally, information from this research provides new knowledge about biological processes and their applications on Earth. (Note: BSR will be conducting a major review of priorities to ensure alignment of activities with the new Exploration vision. Some of the specific activities described here may change.)

OVERVIEW

The Fundamental Space Biology Program will focus on research in Cell and Molecular Biology, Microbial Ecology, and Organismal and Comparative Biology. It will: (1) Develop the foundation of fundamental biological knowledge required to enable a long-duration human presence in space; (2) Effectively use microgravity and the other characteristics of the space environment to enhance our understanding of fundamental biological processes associated with human space flight; (3) Develop the biological understanding to support other biologically related NASA activities; and (4) Apply this knowledge and technology to improve our nation's competitiveness, education, and the quality of life on Earth. Ground-based and flight research grants are solicited and reviewed via a competitive peer review process.

Link to Project Homepage for more information: http://spaceresearch.nasa.gov/research_projects/FSB.html.

PROGRAM MANAGEMENT

The Enterprise Official for the Biological Sciences Research Theme is Mary Kicza, Associate Administrator for Biological & Physical Research. The HQ Division Director for Fundamental Space Biology is Dr. Terri Lomax. The Fundamental Space Biology Program is managed and implemented by the Ames Research Center (ARC) under the authority of the ARC Fundamental Space Biology Research Integration Office. The Center Responsible Official at ARC is Dr. Gary Jahns. Full compliance with NPG 7120.5B will be achieved in FY 04.

TECHNICAL COMMITMENT

PENDING EXPLORATION REPLANNING. Baseline commitment as of FY 2004 President's Budget Submit dated January 2003.

Technical Specifications	FY 2005 President's Budget	Change from Baseline
The Fundamental Space Biology Program	Flight and Ground-based research designed to understand the effects of the space environment on organisms and their interactions when exposed to space for varying periods of time.	--

Schedule	FY 2005 President's Budget	Change from Baseline
Research Announcements	Mar-04, Mar-05, Mar-06	--
Research Awards	Dec-04, Dec-05, Dec-06	--

ACQUISITION STRATEGY AND PERFORMING ORGANIZATIONS

Fundamental Space Biology research is performed by Principal Investigators (PI). Most are affiliated with universities. Some are civil servants assigned to NASA Centers and other Federal Agencies such as the National Institutes of Health. Research is solicited and selected for funding through a competitive scientific peer review process. The research program is implemented by the Ames Research Center (ARC) under the authority of the ARC Fundamental Biology Research Integration Office.

Theme: Biological Sciences Research
Research: Fundamental Space Biology (FSB)

Current Acquisition	Actual*	Selection Method	Actual*	Performer	Actual*
Cooperative Agreement	7%	Full & Open Competition	88%	Industry	20%
Cost Reimbursable	18%	Sole Source	12%	Government	0%
Fixed Price	2%			NASA Intramural	2%
Grants	73%		100%	University	70%
Other	0%	Sci Peer Review	55%	Non Profit	8%
*As of FY 2003 direct procurement	100%	*As of FY 2003 direct procurement		*As of FY 2003 direct procurement	100%

Future Acquisition	Selection	Goals
Cooperative Agreements	Spring 04	100% Cooperative Agreements- 100% Sole Source
Support Services Contract (Lockheed/Martin)	Summer 06	100% Full and Open, Cost Reimbursable
Annual Research Announcement (NRA)	Fall 04	100% Science Peer Review, 100% Grants

AGREEMENTS

Internal: None. External: None Changes since FY04 President's Budget: None

RISK MITIGATION

Risk Date: 1/15/2004

Top Risks	G	Overall	G	Cost	G	Schedule	G	Technical	Probability	Impact	Mitigation Plan
Y	Limited Availability of flight opportunities determines ability to execute mission.								Moderate	Moderate	Progress Experiments

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
Independent committee	ReMaP	9/02	N/A	Establish research priorities for OBPR.
NASA Advisory Committee	BPRAC	2/03	2/04	Program Review (usually three times a year).

BUDGET

Budget Authority ($ millions)	FY 2003	FY 2004	FY 2005	Comments
FY2005 PRESBUD	50.1	65.4	60.2	
Research	50.1	65.4	60.2	
Changes since 2004 PRESBUD	-5.9	+6.6		
Research	-5.9	+6.6		FY 03 changes due to full cost adjustments and addition of Congressionally mandated content. FY 04-05 changes due to center repricing of full cost elements to more accurately reflect requirements, and procurement increases.
FY2004 PRESBUD	56.0	58.8		
Research	56.0	58.8		

Indicates changes since the previous year's President's Budget Submit.
Indicates budget numbers in full cost.

Theme: Biological Sciences Research
Research: Bioastronautics Research (BR)

PURPOSE

Objectives	Performance Measures
9.1, 9.2	5BSR7-14,17,20

PENDING EXPLORATION REPLANNING. The Bioastronautics Research theme seeks to understand physical and psychological adaptation to space flight and return to Earth to develop countermeasures and technologies that reduce and manage risks to the crew. The theme also develops technologies that increase efficiency by improving spacecraft habitability, environmental controls, planetary habitability, and space systems. The Bioastronautics critical path roadmap is a systematic approach for preventing or reducing the known risks to crew health, safety and performance. Risks have been identified and Bioastronautics Research is aligned and focused toward reducing these critical risks. This research also has the potential to make significant contributions to medical care on Earth. (Note: BSR will be conducting a major review of priorities to ensure alignment of activities with the new Exploration vision. Some of the specific activities described here may change.)

OVERVIEW

Bioastronautics Research performs research and develops technology for systems that will enable humans to live and work safely and effectively in space. Special emphasis is placed on those technologies that will have a dramatic impact on the reduction of required mass, power, volume, and crew time, and on those that will increase safety and reliability. The program funds technologies that address both the near-, mid-, and long-term needs of space travel, and places a high priority on making NASA technologies available to the private sector for Earth applications. It also performs the scientific research that develops the knowledge base and technologies required to preserve health, morale, performance, and safety in astronaut crews. Program research results are directed to providing a better understanding of physiological, psychological, and behavioral adaptations to space flight that will enable improvements in: predictions of astronaut health and safety risks; diagnostics of health status; management of medical and behavioral problems; establishment of human physiological norms for space flight; protection of humans from the negative physiological and behavioral effects of space flight; and tools available for rehabilitation of crewmembers after space flight.

Link to Project Homepage for more information: http://spaceresearch.nasa.gov/research_projects/biomedical.html.

PROGRAM MANAGEMENT

The Enterprise Official for the Biological Sciences Research Theme is Mary Kicza, Associate Administrator for Biological & Physical Research. The Headquarters Division Director for Bioastronautics Research is Dr. Guy Fogleman. The Bioastronautics Research Program coordination responsibility has been delegated to the Johnson Space Center (JSC), under the supervision of Dr. John Rummel, Chief, Office of Bioastronautics. The Center Responsible Officials at JSC are Bill Paloski for Biomedical Research and Countermeasures, and Mark Jernigan for Advanced Human Support Technology.

TECHNICAL COMMITMENT

PENDING EXPLORATION REPLANNING. Baseline commitment is as of the FY 2004 President's Budget dated January 2003.

Technical Specifications	FY 2005 President's Budget	Change from Baseline
Bioastronautics Research	Biomedical Research and Countermeasures (BR&C) and Advanced Human Support Technology (AHST). These programs are further divided into a variety of research subdisciplines.	--

Schedule	FY 2005 President's Budget	Change from Baseline
Grant Awards	Dec 04, Dec 05, Dec 06	--
Research Announcements	Mar 04, Mar 05, Mar 06	--

ACQUISITION STRATEGY AND PERFORMING ORGANIZATIONS

Bioastronautics research is performed by Principal Investigators (PI). Most are affiliated with universities. Some are civil servants assigned to NASA Centers and other Federal agencies such as the National Institutes of Health. A substantial portion of BR's program is executed by the National Space Biomedical Research Institute (NSBRI), a consortium of 12 universities which uses funding provided by NASA and other sources to conduct open competition leading to award of peer-reviewed research grants. NSBRI coordinates its research goals with NASA to minimize duplication and ensure balanced research portfolios.

Theme: Biological Sciences Research
Research: Bioastronautics Research (BR)

Current Acquisition	Actual*	Selection Method	Actual*	Performer	Actual*
Cooperative Agreement	32%	Full & Open Competition	100%	Industry	23%
Cost Reimbursable	23%	Sole Source	0%	Government	6%
Fixed Price	0%			NASA Intramural	2%
Grants	45%		100%	University	69%
Other	0%	Sci Peer Review	77%	Non Profit	0%
*As of FY 2003 direct procurement	100%	*As of FY 2003 direct procurement		*As of FY 2003 direct procurement	100%

Future Acquisition	Selection	Goals
Annual Research Announcement	N/A	Issue announcement each March; awards in December.
Renew or re-compete NSBRI agreement	N/A	Next renewal option due in October 2007.

AGREEMENTS

Internal: None. External: NASA manages an extensive portfolio of interagency agreements with other Federal agencies such as DOD, DOE and NIH to leverage NASA resources and improve the quality of research results. Changes since FY04 Pres. Budget: None.

RISK MITIGATION

Risk Date: 1/15/2004

Top Risks	G	Overall	G	Cost	G	Schedule	G	Technical	Probability	Impact	Mitigation Plan
G	Limited availability of flight opportunities.								Low	low	N/A

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
NASA Advisory Committee	BPRAC	8/03	2/04	Program Review (three times a year).
ReMaP	Independent committee	9/02	N/A	Set priorities for ISS Research.
National Research Council (NRC)	Institute of Medicine		3/04	Evaluate critical path roadmap

BUDGET

Budget Authority ($ millions)	FY 2003	FY 2004	FY 2005	Comments
FY2005 PRESBUD	126.5	163.9	308.8	
Research	126.5	163.9	308.8	
Changes since 2004 PRESBUD	+13.4	+3.9		
Research	+13.4	+3.9		FY 2003 increase due to Congressionally directed funding; FY04 includes correction to HRI funding from BR-Operations to BR-Research.
FY2004 PRESBUD	113.1	160.0		
Research	113.1	160.0		

Indicates changes since the previous year's President's Budget Submit
Indicates budget numbers in full cost.