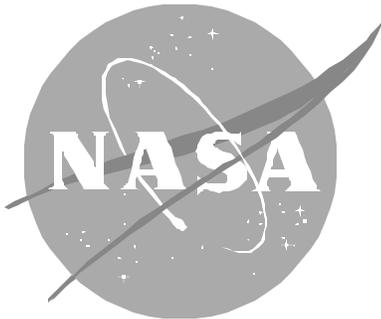


BIOMEDICAL RESEARCH AND COUNTERMEASURES PROGRAM

PROGRAM PLAN

Space and Life Sciences Directorate

May 12, 2000



National Aeronautics and Space Administration

Lyndon B. Johnson Space Center

Houston, Texas

***BIOMEDICAL RESEARCH AND COUNTERMEASURES
PROGRAM PLAN***

Human Space Life Sciences Programs Office

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ACRONYMS

AA	Associate Administrator
ARC	Ames Research Center
BRC	Biomedical Research & Countermeasures Program
CCCDP	Clinical Care Capability Development Project
CEVP	Countermeasures Evaluation & Validation Project
CPR	Critical Path Roadmap
DARPA	Defense Advanced Research Projects Agency
DOE	Department of Energy
DSO	Detailed Supplementary Objective
DTO	Detailed Test Objective
EP	Equivalent Personnel
ESSSED	Earth Science and Solar System Exploration Division (Code SN)
EVA	Extra-Vehicular Activity
FACB	Flight Activities Control Board
FED	Flight Experiments Development Project
FTE	Full-Time Equivalent
GPMC	Governing Program Management Council
GRI	Ground Research Investigations
HEDS	Human Exploration & Development of Space
HQ	Headquarters
HSLSPO	Human Space Life Sciences Programs Office
IPT	Integrated Product Team
ISLSWG	International Space Life Sciences Working Group
ITA	Interim Task Agreement
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Center
KSC	Kennedy Space Center
LMSAC	Life & Microgravity Sciences Advisory Council
LSD	OLMSA Life Sciences Division (Code UL)
LSDA	Life Sciences Data Archive
LSRL	Life Sciences Research Laboratories (JSC-SD3)
MOU	Memoranda of Understanding
MSDCCB	Medical Sciences Division Configuration Control Board
NIH	National Institutes of Health
NRA	NASA Research Announcement
NSBRI	National Space Biomedical Research Institute
NSCORT	NASA's Specialized Center of Research & Training
NSF	National Science Foundation
OLMSA	Office of Life & Microgravity Sciences & Applications (Code U)
PAPAC	Provide Aerospace Products & Capabilities
PCA	Program Commitment Agreement
POP	Program Operating Plan
R&D	Research and Development
SLSD	Space & Life Sciences Directorate (JSC-SA)
SRH	Space Radiation Health Project

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1.0 INTRODUCTION AND PROGRAM OVERVIEW

The Biomedical Research and Countermeasures Program (BRC) performs basic and operational/applied research to first investigate the effects of spaceflight on humans and then formulate, validate, and implement appropriate countermeasures. These activities concomitantly expand understanding of human physiology and performance while enhancing biomedical capabilities to benefit life on Earth.

1.1 Program Organization

The Biomedical Research and Countermeasures Program is one of three “human element” programs of the Human Space Life Sciences with Lead Center responsibility assigned to the Johnson Space Center (JSC). Figure 1 depicts the organizational structure of the JSC Human Space Life Sciences Programs Office (HSLSPO) within the overall Human Exploration and Development of Space (HEDS) Enterprise, while Figure 2 details line management organizations and roles within HSLSPO.

The BRC Program is composed of three projects, each of which encompass a distinct functional element:

- **Space Radiation Health Project (SRH)** – provides accurate risk assessments of radiation exposure in the spacecraft environment; establishes standards and countermeasures for protecting humans from radiation.
- **Countermeasures Evaluation and Validation Project (CEVP)** – evaluates and validates the optimal complement of countermeasures required to protect astronaut safety, health, and performance during and after short- and long-duration spaceflight.
- **Flight Experiments Development Project (FED)** – provides scientific and programmatic management for biomedical investigations that require access to space.

In addition, BRC has established a five-year cooperative agreement (renewable for up to 20 years) with the National Space Biomedical Research Institute (NSBRI). The primary objective of this partnership is to develop countermeasures that support exploration-class mission requirements. An additional element of the BRC Program is Ground Research Investigations (GRI), which manages NASA’s applied and fundamental biomedical research activities involving ground-based research.

The BRC Program and Project structure and functions are summarized in Figure 3. The roles listed under each project are not all-inclusive but are delineated in detail in the respective project plans.

2.0 PROGRAM OBJECTIVES

The overall programmatic goal of the Biomedical Research and Countermeasures Program is to develop, evaluate, validate, and implement countermeasures that will ensure the safety, health, and performance of spaceflight crews. This will be achieved by implementing a strategy and a management/organizational approach that, together with the operational aspects of the flight program, will be integrated into the medical operations, operational research, fundamental/applied research, ground-based and spaceflight experiment programs. These tasks will be implemented and executed in compliance with the Program Commitment Agreement (PCA). The specific objectives of the program are to:

- Understand and describe the processes of human adaptation to the space environment and the subsequent readaptation upon return to Earth.
- Apply the knowledge obtained to ensure the health, safety, and performance of astronauts, including the evaluation and validation of countermeasures.

- Foster, develop, and conduct investigations in space that utilize the unique microgravity environment for the advance of science conducted both in space and on Earth.
- Develop, approve, and maintain the Space and Life Sciences Directorate (SLSD) Critical Path Roadmap (CPR) for biomedical research and countermeasures based on Agency operational and programmatic needs.
- Consolidate, manage, and execute the biomedical applied and fundamental research program for the Agency, assuring overall compliance with the approved CPR.
- Implement a vigorous countermeasure evaluation and validation program using a team approach that integrates medical operations with science discipline/clinical expertise.
- Develop advanced biomedical technology that enables human activities in space.

The program will pursue these objectives through every available ground- and space-based model and platform. Ground-based hypogravity and hypergravity models will be used in conjunction with spaceflight experiments conducted aboard multiple platforms of both short- and extended-duration missions. Research will be accomplished using human subjects, animal subjects, and appropriate models.

3.0 CUSTOMER DEFINITION AND ADVOCACY

The primary customer of the BRC Program is the HEDS enterprise and the Life Sciences Division of Office of Life and Microgravity Sciences and Applications (OLMSA, Code UL). NASA spaceflight crewmembers ultimately benefit from the accomplishments of the program.

4.0 PROGRAM AUTHORITY AND MANAGEMENT STRUCTURE

The BRC Program is an element of the JSC HSLSP0 within the SLSD. It was established in response to requirements outlined in the HSLSP0 Lead Center Management Plan of February 1997. Authority for BRC Program activities that involve biomedical operations as part of medical operations support is provided by the Space Medicine Program Plan, the NASA Medical Policy Requirements Document authorized under NMI 1152.59E, and direct guidance from OLMSA.

As Lead Center and Governing Program Management Council (GPMC), JSC relies upon two of its own Directorates, Space and Life Sciences and Engineering, in addition to a number of supporting NASA Field Centers and partners:

- Ames Research Center (ARC), Kennedy Space Center (KSC), Marshall Space Flight Center (MSFC), and Jet Propulsion Laboratory (JPL), and
- academic and government communities including the National Space Biomedical Research Institute (NSBRI).

Supporting Centers are mapped to each of the three BRC projects in Figure 3.

4.1 Documentation Tree

The BRC Program will follow the recognized guidelines and model to fulfill Enterprise program management and relies upon the following elements of the formal BRC Program documentation tree. Each document describes the roles and responsibilities of supporting programmatic components, and delineates how work in each component is assigned, accomplished, monitored and measured:

Agency and Enterprise Documents

- NASA Strategic Plan
- NASA's Enterprise for HEDS Strategic Plan
- Headquarters Level 1 HEDS Requirements Document
- NASA Strategic Management Handbook
- Headquarters Medical Policy Requirements Document

Lead Center JSC Documents

- Johnson Space Center Implementation Plan
- HSLSPO Lead Center Management Plan
- HSLSPO Implementation Plan
- SLSD Cooperative Agreement Management Plan with NSBRI

Programmatic Documents

- BRC Program Commitment Agreement
- BRC Program Plan
- Project Plans†
 - SRH Project Plan
 - CEV Project Plan
 - FED Project Plan
- Interim Task Agreements (ITAs) and/or Memoranda of Understanding (MOU) between the BRC Program and all implementing organizations
- Program and project status reports

† Respective documentation trees to be delineated in each project plan according to ISO

4.2 Roles and Responsibilities

Specific roles and responsibilities of the program, from both a program content and a management perspective, include the following:

4.2.1 HEDS Enterprise

As set forth in the Strategic Plan of NASA's HEDS Enterprise, the overarching goal is to enable human exploration and development of space.

4.2.2 OLMSA/Life Sciences Division

Responsibilities are set forth in the HSLSPO Lead Center Management Plan, February 1997.

The AA/OLMSA has delegated responsibility for carrying out the Enterprise-level management functions for life sciences research and to achieve the goals of this program to the Director of the NASA Headquarters Life Sciences Division (LSD). The LSD Director is responsible for the content of the BRC, to include:

- oversight and implementation of peer review for scientific research proposals,
- selection of research investigations,
- formulation of strategic direction consistent with current Agency and Enterprise strategic plans,
- budget development and advocacy, and
- monitoring and evaluation of program progress and accomplishments.

The LSD Director is the Selection Official for all NASA Research Announcements (NRAs) for life sciences research.

4.2.3 JSC

Johnson Space Center is the Agency's center of Excellence for Human Operations in Space, and has been designated the lead center for Biomedical Research and Countermeasures.

4.2.4 HSLSPO

Responsibilities are set forth in the Lead Center Management Plan, JSC Implementation Plan for HSLSPO, February 1997.

4.2.5 BRC Program Roles and Responsibilities

The BRC Program shall adhere to and implement the major roles and responsibilities set forth in the HSLSPO Lead Center Management Plan, February 1997.

- Develop, baseline, implement, and maintain an integrated research plan for NASA biomedical sciences that delineates a critical path based on Agency operational and programmatic goals:
 - Define risk levels
 - Conduct reiterative reviews of plans and research results and update/modify as required
- Coordinate and interface with other SLSD Program elements, including the Space Medicine Program and the Advanced Human Support Technology Program.
- Lead implementation of research priorities and planning for science representation in advanced mission initiatives involving human exploration of space.
- Develop and update milestones and schedules contingent on Agency and Enterprise plans.
- Oversee and manage all research grants and contracts within the BRC Program using organizational elements in a manner that avoids conflict-of-interest issues.
- Lead implementation of operational research requirements in the biomedical area.
- Implement NASA Medical Policy Board directives as they apply to the execution of pilot studies and data analysis.
- Coordinate resource utilization between the scientific community (intramural/extramural) and the NSBRI.
- Implement and manage a comprehensive, peer-reviewed, applied and fundamental research program in the biomedical sciences consistent with the approved CPR.
- Implement and manage a comprehensive countermeasures program that serves as the Agency's integration point for all countermeasure activities. Support operational and clinical research activities via two organizational elements:
 - The Non-Advocate Review Process for Clinical and Operational Research Activities, JSC 28775, is to be used for assessing proposals submitted to the CEV Project, the Clinical Care Capability Development Project (CCCDP), and other JSC-managed projects. NASA Headquarters will manage the Non-Advocate Review process, appoint the roster of reviewers to be based in part upon recommendations from the Medical Sciences Division, and make selections of proposals to be implemented.
 - Life Sciences Integrated Product Teams (IPTs) will provide discipline-specific expertise to key operational and clinical activities in support of crew health before, during, and after spaceflight. IPTs develop Supplemental Medical Objective (SMO) proposals for providing quick answers to operational

questions, assessing acute environmental issues and medical interventions, and establishing clinical norms. The IPTs will provide a working group interface between physicians, scientists, and international partners. IPT-endorsed research shall be reviewed through the Non-Advocate Review Process that is managed by NASA Headquarters.

- Implement all proposed Agency intramural/extramural research efforts within the scope of the BRC program.
- Support management and development functions for the NASA Life Sciences Biomedical Flight Experiments, which include Spacehab, Shuttle DSOs and DTOs (detailed supplementary objectives and detailed test objectives, respectively), the ISS Human Research Facility (HRF), and ISS-equivalent DSOs and DTOs.
- Actively support the development of NRA solicitations in the biomedical sciences.
 - Conduct formal annual review of science and technology accomplishments with annual preparation of integrated program results/assessments.
- Implement advanced biomedical technology development within the Agency and the commercial sector.
- Recommend BRC Program priorities and resource assessment and allocation among program elements.
- Develop required MOUs between implementing organizations within JSC and across centers.
- Support Lead Center HSLSPO program implementation and tactical planning, and establish program/project performance metrics and reporting.

5.0 PROGRAM REQUIREMENTS

Program requirements are supplied by OLMSA and derived from other directional tools, in compliance with the PCA and CPR. The program will be implemented in compliance with the guidelines set forth in the BRC PCA and the requirements for the International Space Station-related hardware and -software are documented in SSP 57000.

6.0 PROGRAM SCHEDULE

The BRC Performance Targets/Key Milestones are linked directly to the BRC Performance Goals and will be achieved through solicitation/funding to be consistent with HOWI 8000-U003 Revision A, “Research Solicitation, Evaluation, and Selection.” Key performance and schedule commitments are outlined and updated annually in the Biomedical Research and Countermeasures PCA. BRC Program milestones are delineated in Table 1, while FY00 funding and performance targets can be found in Table 3.

7.0 PROGRAM RESOURCES

7.1 Budget

Resource requirements for the BRC Program are developed, reviewed, and updated according to Agency and HSLSPO Program Operating Plan (POP) guidance and direction. The resource appropriations for this program are identified within the details of the annual Operating Plans. The current program resource plan is outlined by project in Table 2.

Funding for the BRC Program is derived from multiple sources within NASA programs and is collectively processed and allocated through the Lead Center HSLSPO (Table 2).

The POP budget management process is executed in accordance with Agency and Lead Center guidelines.

7.2 *Personnel and Facilities*

Personnel and facilities are integral elements of the BRC Program. A summary of the JSC civil servant and contractor workforce is presented in Table 4. The multiple core laboratories and facilities maintained and operated by the BRC are listed in Table 5.

8.0 CONTROLS

8.1 *Management Controls*

Program level controls will be accomplished by means of periodic technical cost and performance reviews with the individual BRC projects. These reviews will occur at a minimum on a quarterly basis and shall be at the discretion of the BRC Program Manager at other times. Cost variance will be reported on a monthly basis and explained in detail if program cost variance is plus or minus 5% of planned cost. Schedule performance will also be tracked on a monthly basis, with significant variances in schedule justified, and a mitigation plan presented by the respective project managers. An integrated schedule will be developed and maintained in order to track the performance and effect of individual project schedules relative to the overall program schedule. Proposed changes to the PCA, the Program Plan, the Project Plans, or the POP will be requested in writing and will include an assessment of associated impacts. At minimum, these documents should be reviewed as a part of the periodic technical, cost, and schedule reviews.

Each BRC Project Plan defines the management controls and processes to be used within that project.

8.2 *Research Controls*

All BRC research activities that involve human subjects will implement the requirements and standards of NPD 7100.8B and NPG 7100, as implemented by the JSC Institutional Review Board and the ISS Human Research Multilateral Review Board for Space Station research. Additionally, all research proposals involving animals will be required to meet all requirements and standards of NPD 8910.1, as implemented by the appropriate Animal Care and Use Committee. Further, non-advocate technical reviews (e.g., scientific peer review, and technology reviews) are required prior to implementation and execution.

8.3 *Flight Resource Controls*

The JSC SLSD Flight Activities Control Board (FACB) is the management control for all BRC flight products. The Medical Sciences Division Configuration Control Board (MSDCCB) controls and coordinates flight product development and review at the operational level.

9.0 RELATIONSHIPS TO OTHER PROGRAMS AND AGREEMENTS

9.1 Relationships within NASA

The multiple programmatic and functional organizational interfaces of the BRC Program include:

JSC	HSLSPO	Program management
	SD2 (Medical Operations Branch)	Collaborate with SD3 in countermeasures evaluation and validation; support Life Sciences IPTs; acquire discipline-specific operational support
	SD3 (Life Sciences Research Laboratories Branch)	Perform peer-review-approved scientific investigations of the operationally relevant medical, physiologic, cellular, and biochemical issues associated with spaceflight; support the biomedical and physiologic performance tests completed as part of the crew medical operations; support Life Sciences IPTs; serve as countermeasure advocate for evaluation and validation of countermeasures
	SL	Program integration and data archiving
	SF	Payloads, facilities and flight experiment development and management
	EA	Flight hardware development and certification
	EVA Program Office and R&D Activities	Radiation and decompression issues and protocols
	Space Shuttle Program Office	Interface and requirements for payloads
	ISS Program Office	
OTHER CENTERS	OLMSA	HEDS Enterprise management (Codes U and M)
		Medical Policy Board
	ARC	Support biomedical research and facilities and countermeasure evaluation
	KSC	Biomedical research flight experiment processing and support including baseline data collection
	MSFC	ISS payload utilization activities
	JPL	Advanced technology development

9.2 Relationships with External Entities

To enhance research productivity, and to leverage program resources, the OLMSA LSD conducts collaborative efforts with multiple federal agencies relevant to the BRC Program objectives, based upon signed MOU. Examples of these interactions include: joint funding of research centers (NSCORTS), supplemental or joint funding of individual research grants that may have been funded by other federal agencies, NASA participation in the Human Brain Project, joint workshops and conferences with other government agencies, and partnering with NIH institutes for Space Shuttle and ISS missions and ground-based research as appropriate. An MOU has been signed with the Department of Energy (DOE) to use the Brookhaven National Laboratory accelerator facility as part of the Division's Radiation Research Program, in which NASA provides funding for beam time at the facility and for a joint research project. Interactions with the Department of Defense (DOD) include: an MOU with the Armed Forces Radiobiology Research Institute for support of radiation biology

research of mutual interest, discussions with the Defense Advanced Research Projects Agency (DARPA) on areas of mutual interest, and the partnership with the Office of Naval Research in Neurolab. With the exception of activities that are to occur within a limited time frame, all agreements are in effect until modified or terminated by mutual agreement of both parties or terminated with 90 days notice by either party. A complete list of current interagency agreements is maintained in the BR&C PCA, which is updated annually.

9.3 Relationships with International Partners

The International Space Life Sciences Working Group (ISLSWG) Charter established the working group in 1989 with a membership of NASA, ESA, NASDA, CSA, CNES, DARA (now DLR) to develop an international strategic plan for the space life sciences. The international strategic plan addresses the scientific goals and objectives of each participating space agency; each space agency's programmatic roles and responsibilities; the priorities for implementation of the goals and objectives; the required cooperative activities, including sharing of data and ground-based and flight resources; and the management mechanisms by which multilateral program activities are accomplished in the space life sciences. A near term activity will be to coordinate and integrate space radiation health research among our international partners and to coordinate content and implementation of the Integrated Testing Regimen to support the CEV project.

10.0 ACQUISITION STRATEGY

To accomplish its objectives, the BRC Program utilizes peer-reviewed ground-based and space-based research projects funded through grants, contracts, or cooperative agreements. All supported research shall conform to appropriate regulations governing the use of human or animal subjects as described in Section 8.2.

All BRC Program research projects are managed through NASA JSC, with supporting roles provided by ARC and KSC. This includes support for the Principal Investigators as well as hardware development.

NASA Research Announcements will provide Principal Investigators opportunities to manage the cost and schedule for developing and maintaining the experimental hardware required by their flight experiment.

11.0 COMMERCIALIZATION OPPORTUNITIES

The BRC Program will foster commercialization opportunities to establish partnerships to transfer technologies, discoveries, and processes with potential for commercialization. All activities are under the supervision of the BRC Program Manager.

12.0 TECHNOLOGY ASSESSMENT

The BRC Program has established a specific discipline team within the NSBRI, the Advanced Technology team, which is dedicated to the development of new technologies. All activities are under the supervision of the BRC Program Manager.

13.0 DATA MANAGEMENT

Research data and findings from each project are maintained in project-specific databases and then collectively stored in an archive for analysis, integration, and utilization by the space life sciences community. Data obtained from flight experiments and selected ground-based experiments are archived for reference and use in future research projects in the Life Sciences Data Archive (LSDA). The LSDA is within the direct control of the BRC

Program and an approved and documented plan describes roles and responsibilities of the LSDA, how work is assigned, accomplished, monitored, and measured.

Astronaut medical records data will continue to be strictly confidential in the Medical Operations Branch Human Integrated Database for Space.

14.0 RISK MANAGEMENT

The BRC Program will track issues and risks with resolution plans in the quarterly reports provided to the BRC Program by each project. This information will also be provided to HSLSPO during SLSD Technical Cost Reviews.

15.0 LOGISTICS

As necessary, the BRC Program will develop a detailed Logistics and Maintenance Plan that encompasses payload manifesting, limited life items, special stowage requirements, and resupply requirements following the definition of specific payloads. These are to be documented within the FED Project Plan.

16.0 TEST & VERIFICATION

The BRC Program will utilize established processes for the conduct of test and verification as required by program elements.

17.0 REVIEWS

17.1 Programmatic Reviews

The BRC Program will conduct an annual review of program management to include all projects within the program. Individual project plans that have already been established will be modified in FY00 to reflect the Program Plan, and then reviewed on a biannual basis with informal project coordination and status meetings held as needed. Financial status reports to HSLSPO will be provided monthly and program management progress reports will be provided quarterly. BRC program management will also participate in HSLSPO program reviews and quarterly coordination meetings.

17.2 Scientific Reviews

An annual scientific review of the BRC Program will be conducted in conjunction with the HSLSPO annual review and will include all technical project elements within the program. An annual technical report will be submitted in conjunction with the formal review activities summarizing technical/scientific accomplishments and their relationship to the CPR. Additional reviews and reporting requirements will be detailed in the respective BRC project plans.

17.3 Independent Reviews

BRC Program activities are reviewed as directed by OLMSA and on the basis of other advisory inputs provided by the Life and Microgravity Sciences Advisory Committee (LMSAC) of the NASA Advisory Council, the Life Sciences Advisory Subcommittee of the LMSAC, and the NASA/NIH Advisory Subcommittee of the LMSAC.

18.0 TAILORING

BRC programmatic efforts include ground-based and space-based research and analysis, and in some cases, the development of flight hardware. Therefore, this program is not exclusively within PAPAC, and contains elements of the Generate Knowledge process. Therefore, this Program Plan is considered to be in compliance with NPG 7120.5A, but has been tailored to reflect the hybrid nature of the program.

FIGURES

Figure 1. HSLSPO and Key Program Elements.

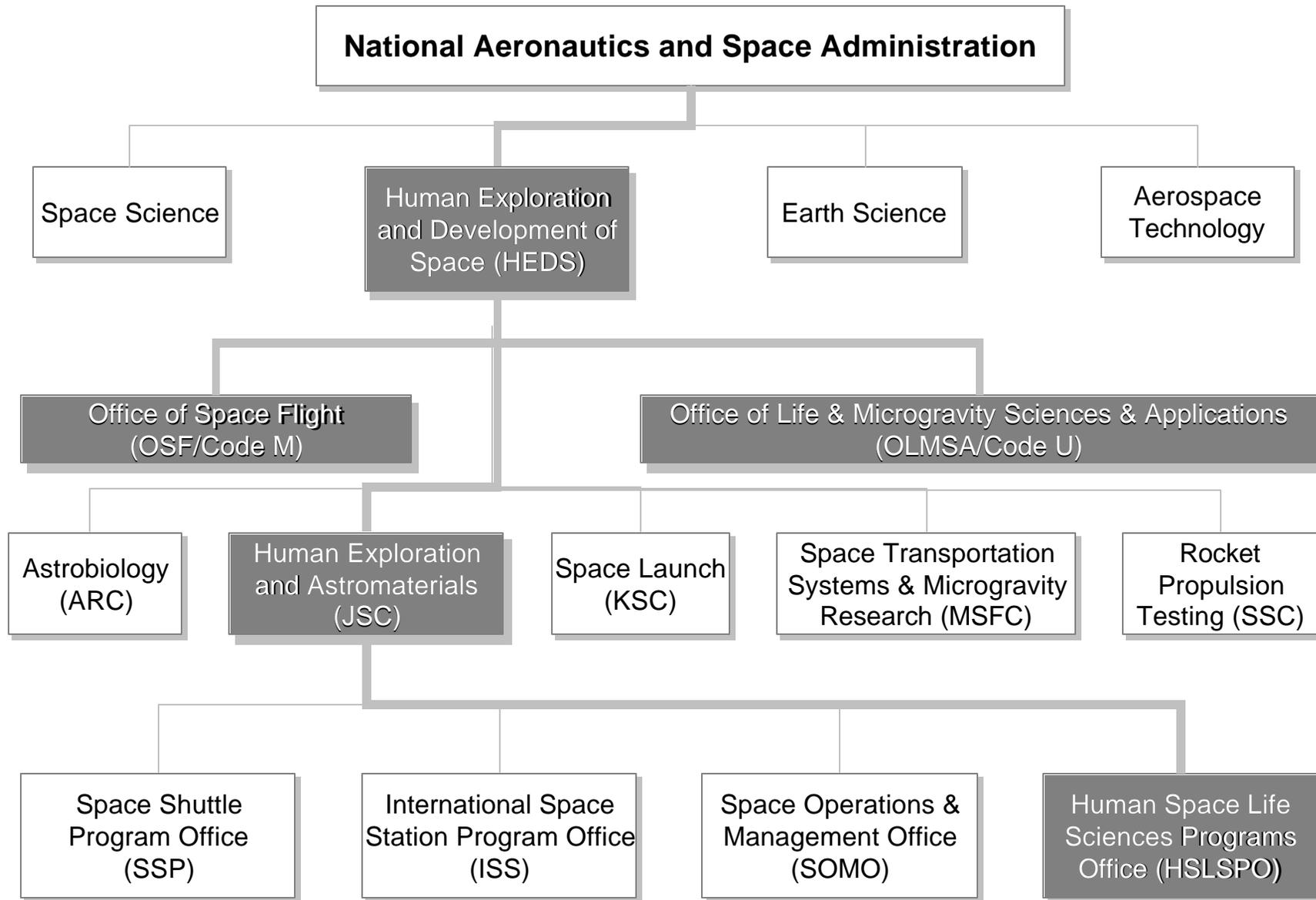


Figure 2. HSLSPO Organizational Chart.

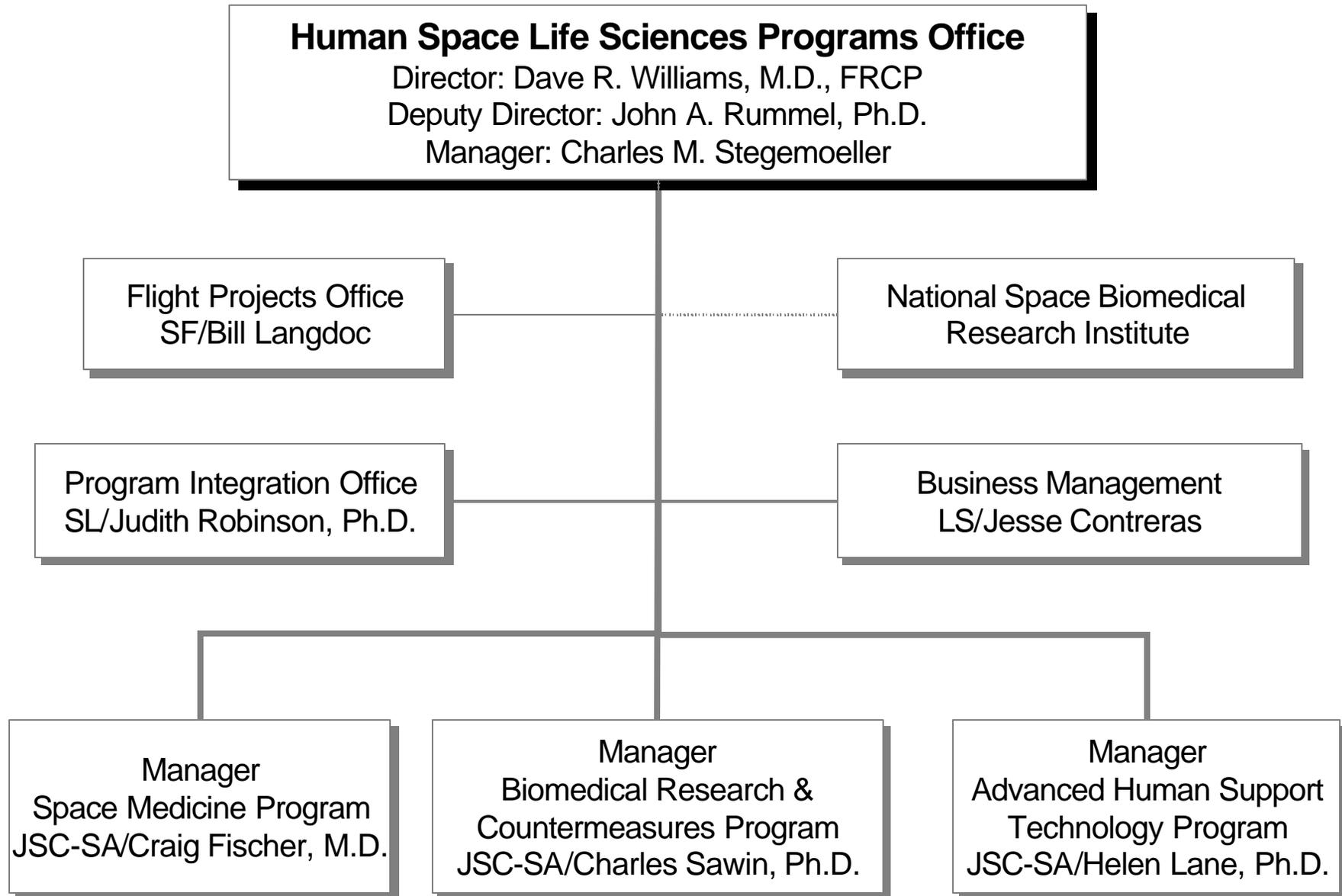
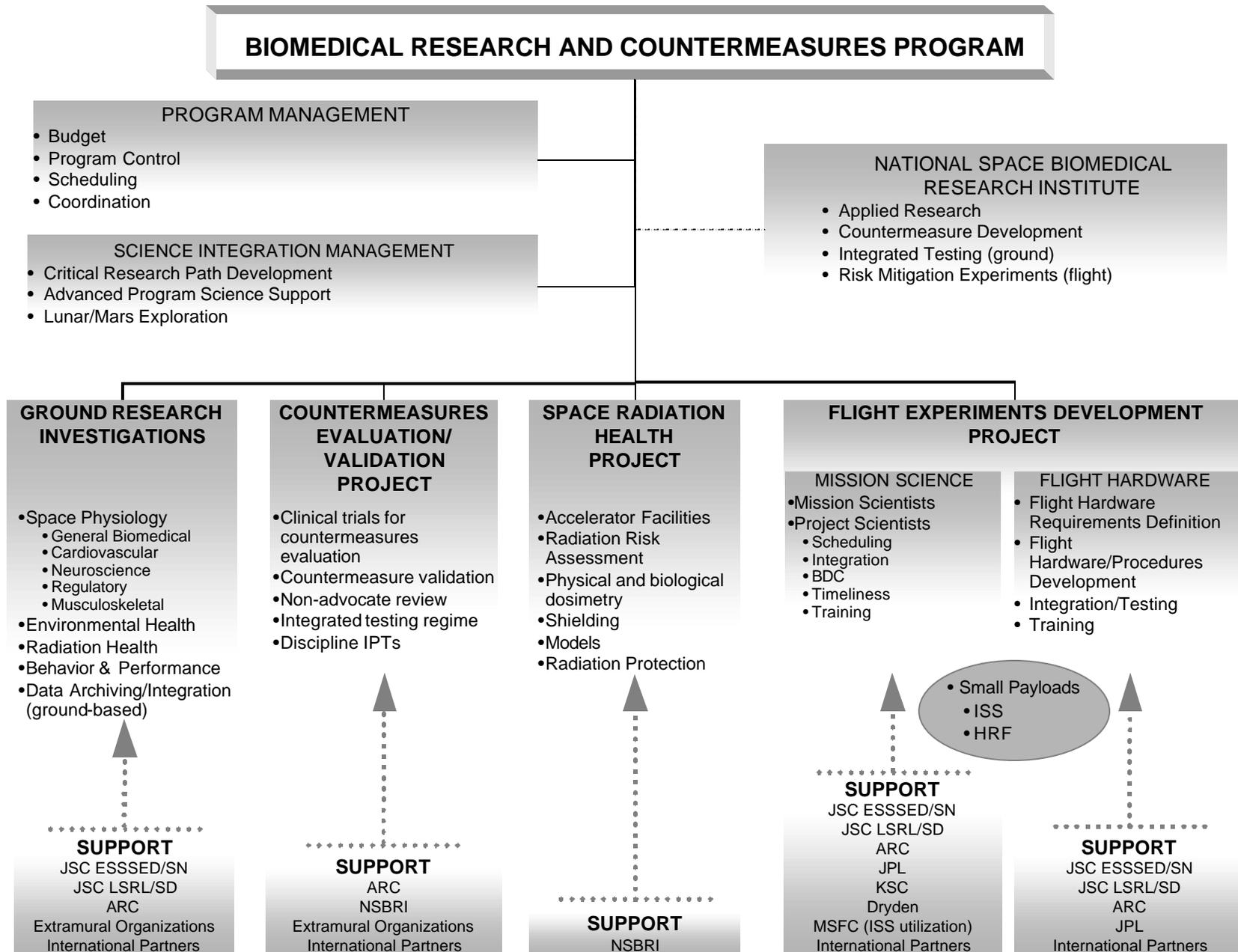


Figure 3. BRC Program and Project Structure Including the Roles of Supporting Centers.



TABLES

Table 1. BRC Program Milestones (CY00 to CY01).

Task Name	2000				2001				Qtr 1
	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
BRC Program Management Milestones									
Monthly Project Reviews									
Quarterly Program and Project Status Reports	◇	◇	◇	◇	◇	◇	◇		
Quarterly BRC Technical, Cost, and Schedule Reviews	◇	◇	◇	◇	◇	◇	◇		
Quarterly SA Technical Cost Review	◇	◇	◇	◇	◇	◇	◇		
HLSPO Coordination Meetings	◇	◇	◇	◇	◇	◇	◇		
BRC Program Management Review	◇				◇				
HLSPO Annual Program Review	◇				◇				
BRC Annual Scientific Review	◇				◇				
HLSPO Annual Program Reviews	◇				◇				
Ground and Flight Research Investigation Milestones									
Annual NRA Milestones for CY00 (dates estimated)									
Preparation			06/01/00	▨					
Release			09/01/00	▨					
Proposal Submission Deadline					◇	11/30/00			
Proposal Review Period				01/03/01	▨				
NASA Review Period					04/02/01	▨			
Selections							◇	06/29/01	
Awards released							◇	07/03/01	
Key Flight Research Start Dates									
STS-107	◇	01/01/00							
ISS Increment 2 Initiated		◇	04/03/00						
ISS Increment 3 Initiated					◇	12/04/00			
CMEV Project Milestones									
Baseline Review 2 of Integrated Test Regimen		◇	02/01/00						
Increment 4 Crew Solicitation	◇	11/01/99							
Increment 5 Crew Solicitation		◇	02/01/00						
Increment 6 Crew Solicitation			◇	06/01/00					
Increment 7 Crew Solicitation					◇	10/02/00			
Space Radiation Health Project Milestones									
End-to-End risk Assessment Meeting					01/02/01				
ISC-LLU-NSBRI Collaboration Meeting	03/00								
Bio-Ethics and Radiation Workshop	03/00								

*Table 2. BRC Program Guidelines (FY00-05).***HUMAN SPACE LIFE SCIENCES PROGRAMS OFFICE****POP 99 GUIDELINES: *BIOMEDICAL RESEARCH AND COUNTERMEASURES PROGRAM BUDGETS***

	FY00	FY01	FY02	FY03	FY04	FY05
PROGRAM TOTAL	52.325	53.426	52.826	52.826	54.426	54.426
Ground Research Investigations	6.258	4.631	4.650	4.700	4.700	4.700
Flight Experiments Development Project	12.454	10.695	11.484	10.808	11.119	11.119
Countermeasures Evaluation & Validation Project	2.581	2.010	2.010	2.000	2.140	2.140
Space Radiation Health Project	13.020	13.078	9.805	9.830	9.830	9.830
NSBRI	5.225	5.315	4.316	4.492	4.492	4.492
Program Management/Other	12.777	17.697	20.561	20.996	22.145	22.145

Table 3. BRC Program FY00 Funding and Performance Targets.

PROGRAM ELEMENT	FUNDING (NOA IN \$M)		MAJOR PERFORMANCE TARGETS	WBS
	CODE U	CODE M		
Ground Research Investigations	6.26	-	<ul style="list-style-type: none"> ▪ Support effort to expand research programs 	2.1
Flight Experiments Development Project	12.45	18.30	<ul style="list-style-type: none"> ▪ Prepare payloads for STS-107 (FY01) ▪ Complete data analysis and final reports on human life sciences experiments performed on Neurolab and STS-95 ▪ Prepare payloads and execute biomedical research on ISS ▪ Support robotic exploration of Mars 	2.4
Countermeasures Evaluation & Validation Project	2.581	-	<ul style="list-style-type: none"> ▪ Prepare two countermeasure candidates for evaluation and validation 	2.2
Space Radiation Health Project	13.020	-	<ul style="list-style-type: none"> ▪ Continue development of Brookhaven Acceleration Facility ▪ Continue partnership activities with Loma Linda University ▪ Support robotic exploration of Mars 	2.3
NSBRI	5.225	5.235	<ul style="list-style-type: none"> ▪ Sponsor space-oriented Research Activities Symposium ▪ Prepare three countermeasure candidates for evaluation and validation 	2.5
Program Management/Other	12.777	6.675	<ul style="list-style-type: none"> ▪ Complete data analysis and final reports on human life sciences experiments performed on Neurolab and STS-95 ▪ Update and baseline the Critical Path Roadmap ▪ Support development and implementation of the annual BRC NRA ▪ Provide leadership and resources for undergraduate and graduate students ▪ Conduct BRC advanced technology efforts 	2.0

*Table 4. Workforce Summaries (FY00-05).***HUMAN SPACE LIFE SCIENCES PROGRAMS OFFICE****POP 99 BUDGET GUIDELINES***Biomedical Research & Countermeasures Program**Summary of Workforce by Center*

	FY00	FY01	FY02	FY03	FY04	FY05
Program Total						
Civil Service (FTE)	50.2	50.0	50.0	51.0	53.0	54.0
Support Contractor (EP)	26.5	26.5	25.5	25.5	24.5	24.5
ARC						
Civil Service (FTE)	2.2	2.0	2.0	2.0	2.0	2.0
Support Contractor (EP)	0.5	0.5	0.5	0.5	0.5	0.5
KSC						
Civil Service (FTE)	2.0	2.0	2.0	2.0	2.0	3.0
Support Contractor (EP)	3.0	3.0	3.0	3.0	3.0	3.0
HQ						
Civil Service (FTE)	4.0	4.0	4.0	4.0	4.0	4.0
Support Contractor (EP)	0.0	0.0	0.0	0.0	0.0	0.0
JSC						
Civil Service (FTE)	42.0	42.0	42.0	43.0	45.0	45.0
Support Contractor (EP)	23.0	23.0	22.0	22.0	21.0	21.0

Table 5. BRC Facilities Listing.

JSC	Baseline Data Collection Facility Cell Science and Biochemistry Facility Human Research Facility Pre-Adaptation Training Facility Psychophysiological Research Facility Behavior and Performance Laboratory Bone and Muscle Laboratory Cardiovascular Laboratory Clinical Chemistry Laboratory Environmental Physiology Laboratory Exercise Physiology Laboratory Microbiology Laboratory Neuroscience Laboratory Nutritional Biochemistry Laboratory Pharmacology Laboratory
ARC	20-G Centrifuge Bed Rest Facility
KSC	Baseline Data Collection Facility