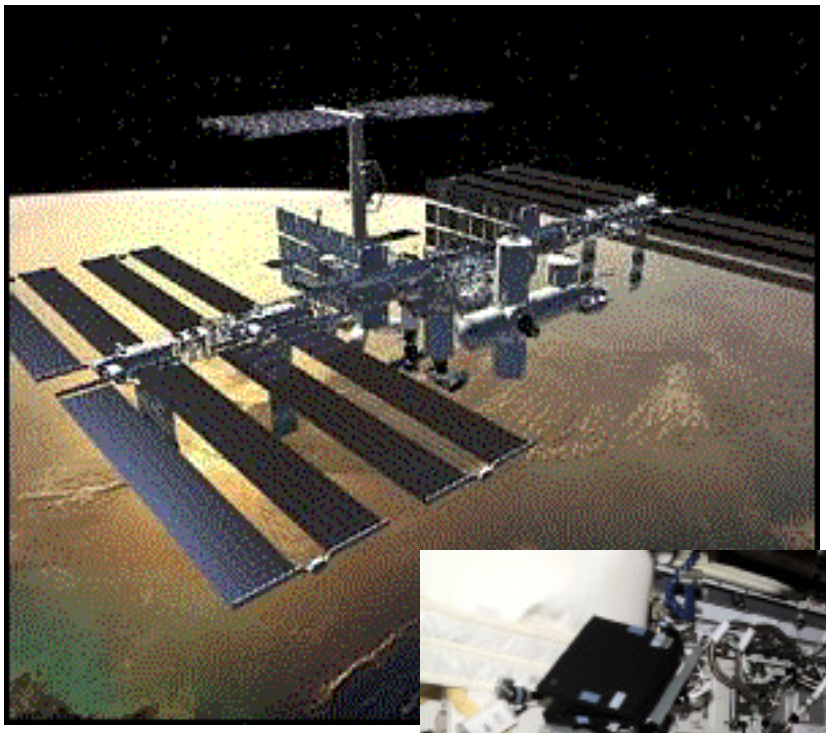
Non-Governmental Organization Concept Development for Management of International Space Station Utilization

Final Report of the Internal Study Team
June 2001



National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

MAY 2 9 2001

Reply to Attn of: UM

TO: Distribution

FROM: U/Acting Associate Administrator for Biological and Physical Research

SUBJECT: Non-Government Organization for Management of International Space Station Utilization

In conjunction with the STS-104 launch, currently planned no earlier than June 20, 2001, I would like to extend an invitation to all NASA stakeholders to participate in a briefing on the status of planning for a potential non-government organization (NGO) to manage the United States share of International Space Station (ISS) utilization, with a view toward upward compatibility to a global scale of operations with our international partners. The meeting will take place at the Kennedy Space Center the afternoon prior to the launch.

I encourage you to attend and offer your advice and recommendations on how the Agency can best structure an approach to this mission critical activity. With the U.S. Laboratory now successfully deployed on orbit and the first experiments just getting underway, it is imperative that we thoroughly explore the options for achieving the most productive possible research and development environment. Although physical and fiscal resources are currently very constrained, I am confident the ISS laboratories, observatories, and testbeds will become increasingly productive as the assembly proceeds.

Further details on the meeting will be provided through your local NGO team leads. If there remain any outstanding questions, please do not hesitate to contact me directly.

Kathie L Olsen

Kathie L. Olsen, Ph.D.

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SD10/Ms. R. Henderson

Executive Summary

Contents

- NASA Objectives
- Evolution of the NGO Concept
- Study Objectives and Products
- Study Team
- Legislative Context
- Findings & Recommendations
- Changes Since Study Completion
- Forward Actions
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NASA Objectives* [1]

- **To facilitate the pursuit of flight research and make the complex operating environment associated with ISS transparent to the end-user.**

- **To reduce the end-to-end cycle time associated with the announcement, selection, development, flight, and achievement of results for research and development endeavors on the ISS.**

- **To increase the long-range productivity of research and development by most effectively integrating and advocating academic, government, and industry utilization of the ISS.**

*** It is not envisioned that a non-government organization would manage the research; but, that it could integrate and most efficiently plan for broad-based utilization. Management of the research programs would remain as present.**

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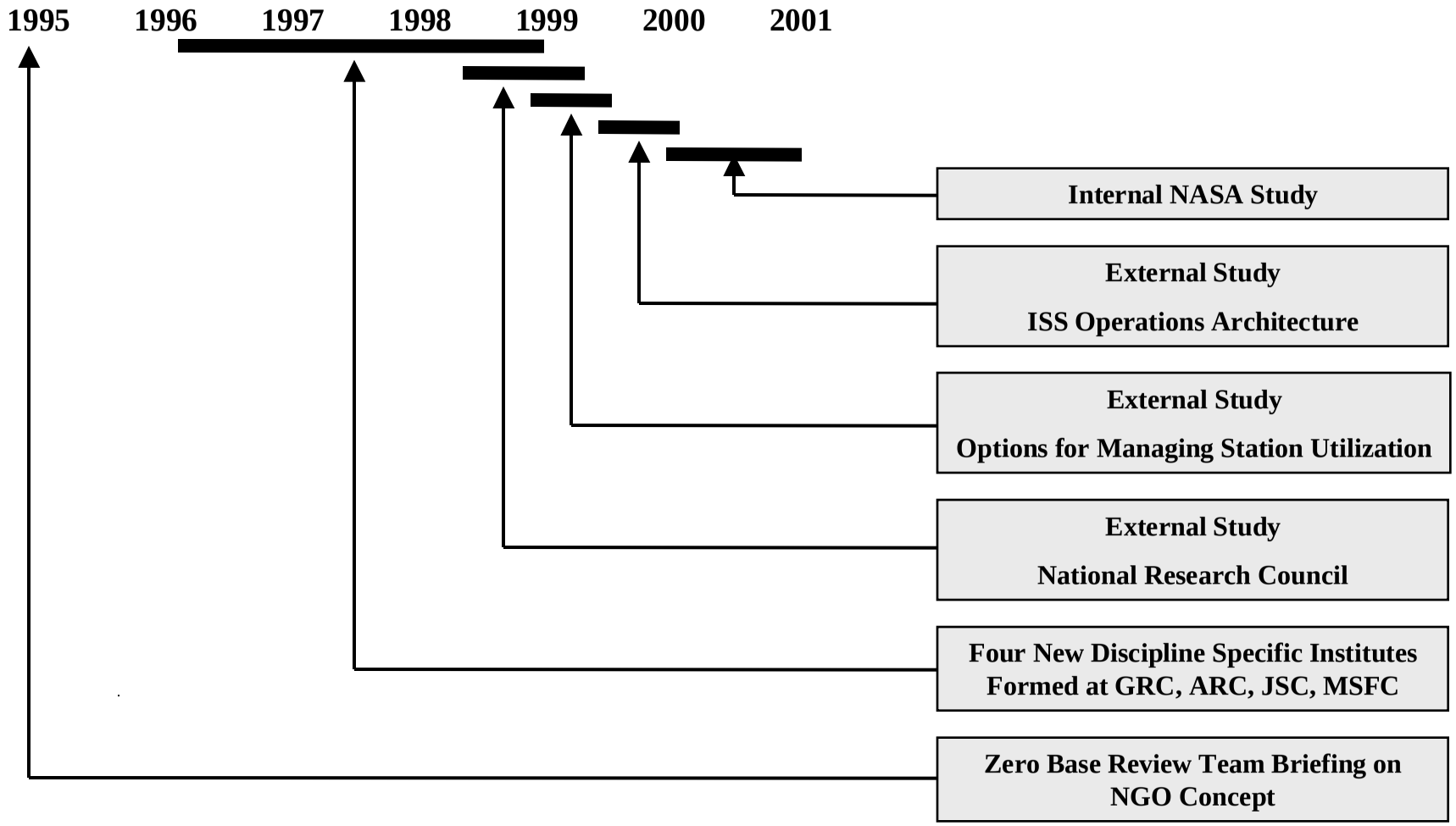
[1] As originally presented to NASA senior management prior to study initiation.

Evolution of the NGO Concept



Three external studies and internal study completed to date.

Study Objectives and Products

- **Internal NASA Study to provide a detailed definition of all ISS Utilization and Research Functions, followed by an assessment of which of these functions could be transitioned to an NGO, when the transition could occur and under what transition criteria.**
- **Report Content includes:**
  - **Tier 1: Top level set of functions common to all utilization organizations**
    - **Rolls-up to twenty principal functions with definitions.**
  - **Tier 1 includes:**
    - **Transition tables from each affected organization.**
      - No Transition
      - Transition to Support Role
      - Transition to Lead Role
    - **Summary of rationale with linkage to objectives.**
    - **Direct interface requirements.**

Tier 1 acts as a functional map for the report.

Study Objectives and Products

Tier 2: One-page lists of functions unique to each of the nine organizations:

- **No organization made recommendations regarding another's functions.**
- **Functions were developed prior to Tier 1 and vary widely across the organizations according to the unique and independent roles and processes of each.**
- **Functions were transitioned either aggressively or conservatively depending upon the assumptions made by the organization regarding management and budget authority of the NGO.**
- **"Inherently Governmental" was interpreted and applied uniquely by each organization and such functions were not considered for transition.**

Tier 2 includes:

- **Map to Tier 1 functions.**
  - **Many Tier 2 functions do not map well to Tier 1 functions or map to multiple Tier 1 functions.**
- **Rationales for, or against, transitions with linkage to objectives.**
- **Criteria to be achieved prior to transition.**
- **Time-phasing of transitions addressed by each organization.**

FY 2000 Current Baseline	**FY 2010 Evolution Option**
FY 2005 Assembly Complete	**FY 2020 End-State Option**

For a comprehensive understanding of the recommended transitions and rationale, it is necessary to fully consider the Tier 2 functions, transitions, and criteria.

Study Objectives and Products

Tier 3: WBS/SOW level of detail for functions unique to each organization.

Tier 3 includes:

- **Trace to Tier 1 twenty principal functions.**
- **Detailed budget data based on POP 2000 marks.**
- **Civil service and contractor workforce estimates.**

Study team also produced:

- **Total Costs Associated with Functions of ISS Utilization and Research Program Management, by center, by function.**
- **Budget data-roll-up based on Tier 3 inputs**

The "functional workbook" in Appendix D represents a comprehensive statement of the scope and depth of functionality associated with ISS utilization.

Study Team

- **Nine affected organizations participated in NGO concept development exercises (workshops and teleconferences) during CY 2000.**

Space Station Operations Offices

- JSC/Space Station Program Office (POC: J. Kite)
- MSFC/Flight Projects Directorate (POC: I. Taylor)
- KSC/ISS/Payload Processing Directorate (POC: M. Smith)

Research Program Offices

- HQ/Office of Biological and Physical Research (Study Manager: M. Uhran)
- HQ/Office of Biological and Physical Research (POC: E. Trinh)
- JSC/Biomedical Research & Countermeasures (POC: C. Stegemoeller)
- JSC/Code M (POC: W. Williams)
- MSFC/Microgravity Research & Space Product Development (POC: R. Henderson)
- ARC/Fundamental Biology (POC: G. Jahns)
- GSFC/Offices of Earth and Space Science (POC: B. Park)

Each POC was responsible for coordinating communications within their respective organizations.

Legislative Context

- **NASA is directed to submit a plan to Congress prior to 30 September, 2001 which includes:**
  (1) a description of the respective roles and responsibilities of the Administration and the non-government organization;
  (2) a proposed structure for the non-government organization;
  (3) a statement of the resources required;
  (4) a schedule for the transition of responsibilities; and
  (5) a statement of the duration of the agreement.

- **NASA is directed to submit a plan which identifies various management options for the management of research utilization and commercialization activities on the ISS.**
  – Funds may not be used to finalize any agreement prior to 1 December, 2001.

Full Legislative Text is provided in Appendix G.

Study Findings

- **Since an NGO is mandated, NASA can implement; however the following must be taken into consideration:**
  - International agreements and integrated processes;
  - Integrated multi-platform and ground science infrastructure;
  - Already existing NGO's (e.g. NSBRI) and their performance;
  - Operational integrity of the ISS system (process, ground and on-orbit);
  - Operational risk during assembly timeframe.

- **Issues Outstanding:**
  - Whether NASA could achieve all but one of the three objectives, Advocacy, without outsourcing;
  - When an NGO is required in order to achieve stated objectives has not been adequately assessed;
  - NGO cannot be applied uniformly due to variability and complexity of functions performed across Agency in ISS Utilization and Research;
  - It is not certain that an NGO would have the capability to achieve measurable success at achieving Agency objectives beyond that which NASA and its contractor teams can provide.

Recommendations

- **The open areas for consideration and the diversity of the users and aspects of the ISS warrant a detailed and definitive assessment prior to initiation.**

- **This assessment should be pursued as a Phase A competition by potential implementing organizations (companies, academic institutions) to provide specific implementation targets/objectives and challenges.**

- **Suggested template:**

- 12 Month RFP Process	October 2001 - October 2002
- 18 Month Phase A Study	April 2002 - March 2004
- 12 Month Assessment/Next RFP	May 2004 - March 2005
- Award of New RFP (if required)	12 Months prior to 6 member crews allows transition

Phase A study and assessment leads to NGO Transition

Changes Since Study Completion

- **Current ISS budgeting reflects an ~ 37% reduction in the overall ISS research budget for FY 02 through FY 06.**
  - Some research programs reflect a budget reduction of over 70%, due to the high fixed cost overhead associated with payload operations and integration.

- **Decreasing research funds and limited crew availability (3 person versus 6 person crews) are driving reductions in the complexity of research planned during the assembly period.**

- **Scope and depth of selected research programs are becoming severely limited during the assembly period.**
  - e.g. Fundamental Biology, Combustion Science, Advanced Human Support Technology, and Engineering Research

Forward Actions

- **Prior to 30 September, 2001:**
  - Principal NASA Program Office Associate Administrators for the ISS program coordinate internal/external policy discussions with affected organizations.
  - Brief NASA Advisory Council (including supporting committees and subcommittees), National Research Council, White House and Congressional Staff, and International partners.

- **In the event of a consensus to proceed with an NGO:**
  - Designate a senior Agency official responsible for leadership;
  - Establish team and conduct acquisition strategy meeting to determine;
    - phases, schedule and milestones
    - source evaluation board (SEB)composition
    - source selection factors
    - legislative strategy for required products (i.e., mandated reports)
    - procurement products
    - source selection authority
    - strategy for enabling legislation (i.e., civil service benefits mobility)
  - Final scope of work to be determined by SEB subsequent to broad RFI.

- **In the event of a consensus to not proceed with an NGO:**
  - Develop legislative strategy for required products (i.e., mandated reports).

Appendices

A: Definitions of Common Functions for the ISS Utilization and Research Program (Tier 1).

B: Headquarters and Center Reports (Tier 2) and Inputs to the Transition Models:

- **B1. JSC Space Station Program Office;**
- **B2. KSC ISS/Payload Processing Directorate;**
- **B3. MSFC Flight Projects Directorate and Microgravity Research Program Office;**
- **B4. ARC Fundamental Biology Research Program Office;**
- **B5. GSFC/Office of Earth and Space Sciences;**
- **B6. JSC Human Life Sciences Research Program Office;**
- **B7. JSC Engineering Research and OSF Projects Research Program Office;**
- **B8. HQ Office of Biological and Physical Research.**

C: Conservative and Aggressive Models Derived from Center Inputs.

D: Functions Associated with ISS Utilization and Research Program Management (Tier 3 Functional Workbook).

E: ROM Costs Associated with Current Organization and Content for ISS Utilization and Research Program Management.

F: Definition of Inherently Governmental Functions.

G: Full text of applicable Congressional Legislation and excerpts from the White House "Budget Blueprint".

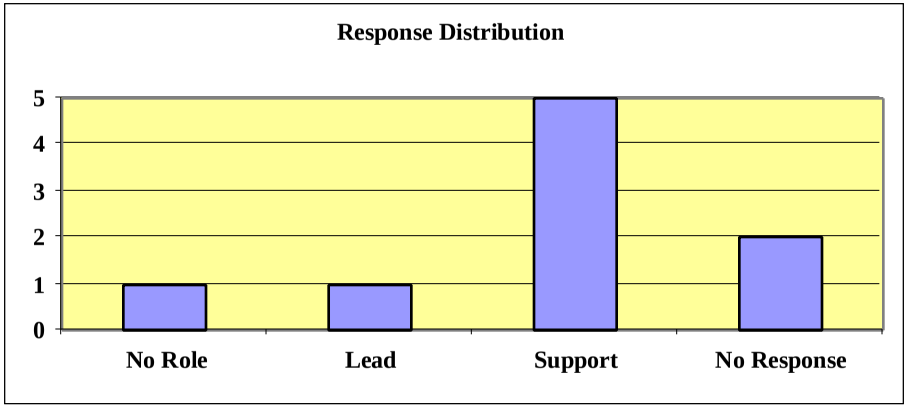
H: Memorandum of 6 November 1998 (with attached reference model) from the Associate Administrators, Human Exploration and Development of Space Enterprise on "Non-Government Organization for Space Station Utilization".

Appendix A:
Definitions of Common Functions for the ISS Utilization and Research Programs
(Tier 1)

Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program

1. Defining and Implementing Policy and Strategic Plans

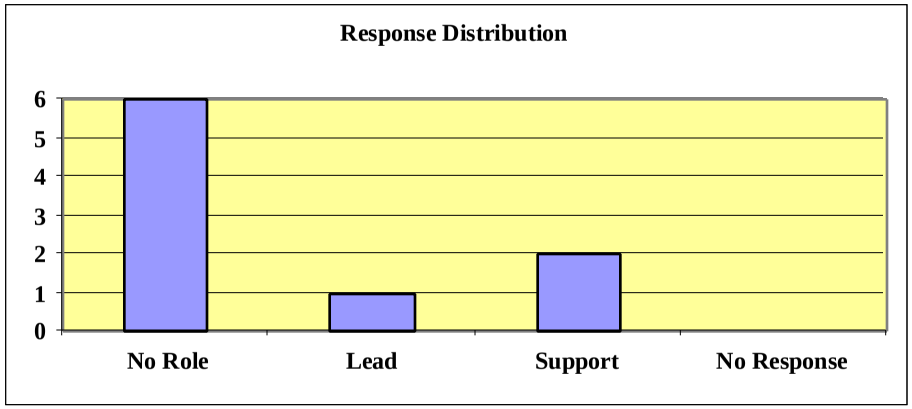
This function includes the development, definition and documentation of public policies and strategic plans related to the ISS research and utilization program, including the operation of all boards, panels and working groups and advisory committees involved in the process and responsible for approvals, concurrence, or recommendations. Policy and plan implementation is distributed across both headquarters and field center organizations. This function also includes international coordination, research program cooperation, and the associated forums for planning the research program on a strategic global scale within public policy.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program

2. Preparing and Allocating Budgets

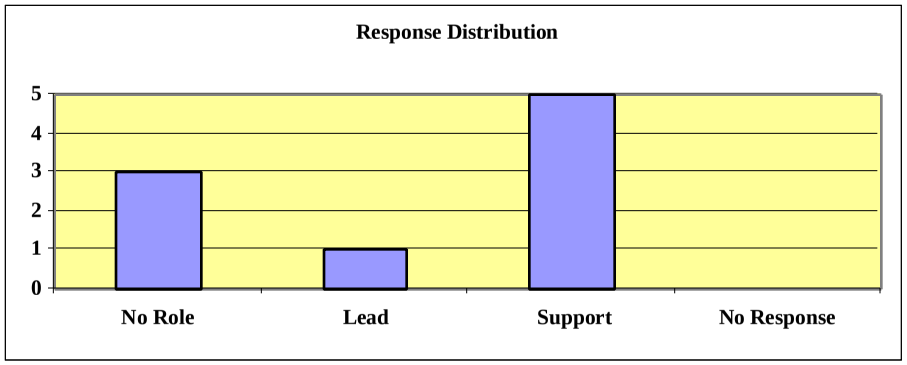
This function includes the development of guidelines, preparation and evaluation of recommendations, issue of allocations, analysis of impacts, re-planning activities, submission of formal budget requests, advocacy for appropriations, and all related tasks associated with the ISS utilization and research program in the area of fiscal planning and budgeting at the headquarters and field center levels.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

3. Selecting and Prioritizing Research

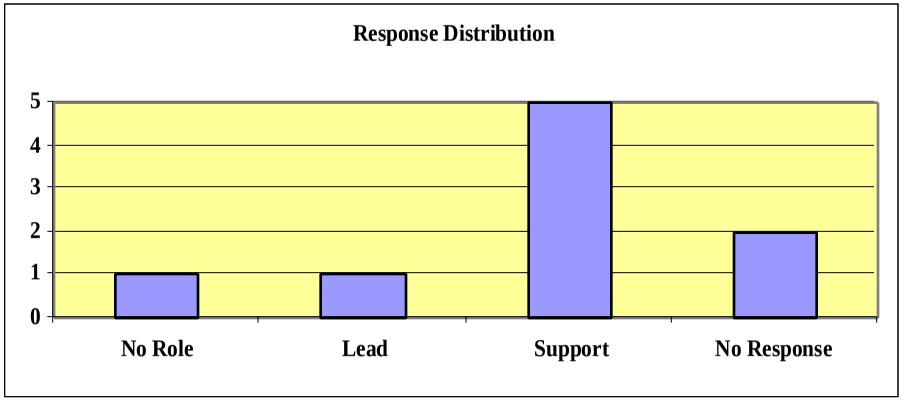
This function includes the announcement of research opportunities; operation of peer review panels in science and corresponding review bodies for technological or commercial projects; programmatic or other evaluations associated with the selection process; and selection/ prioritization of experiments, tests, demonstrations, or other research activities on the ISS. This function includes both the investigations and the associated payload manifests at the corresponding levels of detail associated with headquarters and field center prioritization and queuing processes.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

4. Establishing Experiment Requirements and Feasibility

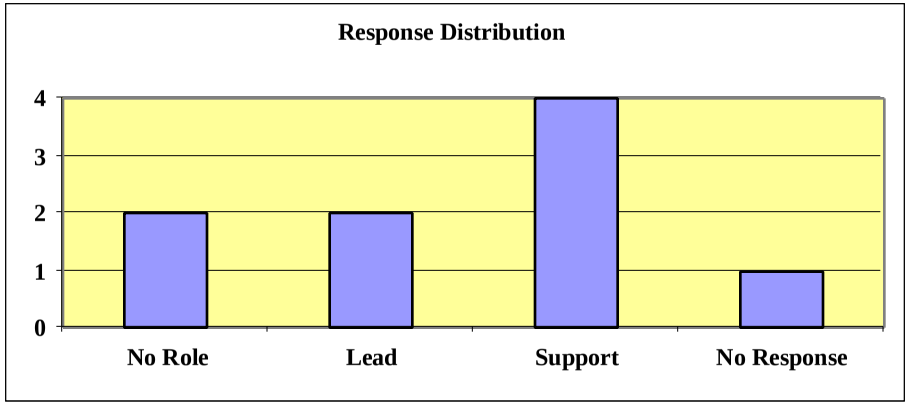
This function includes the definition of flight experiment, or research facility requirements in the form of design and performance specifications, as well as physical and functional accommodation assessments of proposed flight projects, including impacts associated with changes to plan in cost, schedule, or technical performance.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

5. Developing and Qualifying Research Flight Systems (non-recurrent)

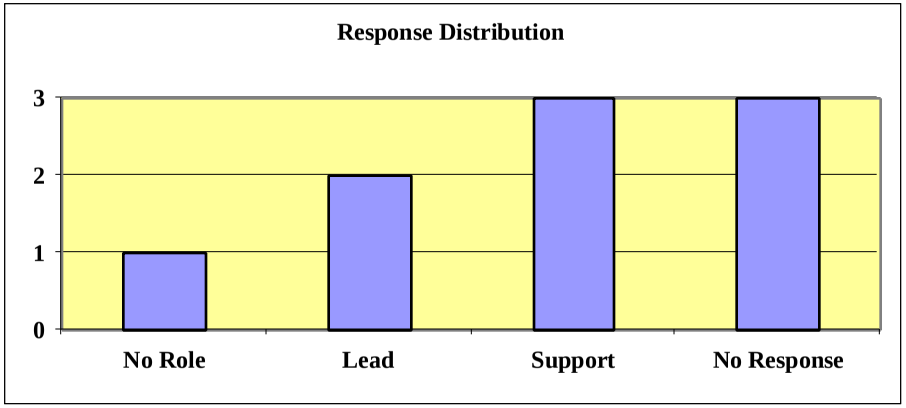
This function represents the design, development, test and evaluation of flight research equipment used in the transportation, accommodation or operation of research payloads on the ISS, including the preparation of all necessary documentation and conduct of qualification testing and acceptance procedures, protocols and processes. It is limited to major developments which represent a one-time, non-recurrent cost, regardless of whether future replacements are anticipated.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

6. Maintaining and Sustaining Research Flight Systems (recurrent)

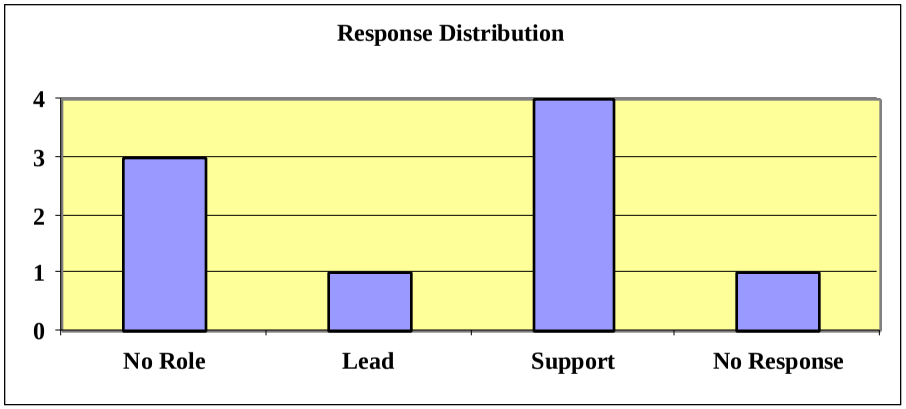
This function represents the maintenance, operations and sustaining of research flight systems through upgrades, replacements, spares, or the use of experiment-unique equipment on a mission-by-mission basis. It represents the recurring costs associated with item (5) above.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

7. Developing and Qualifying Research Ground Systems (non-recurrent)

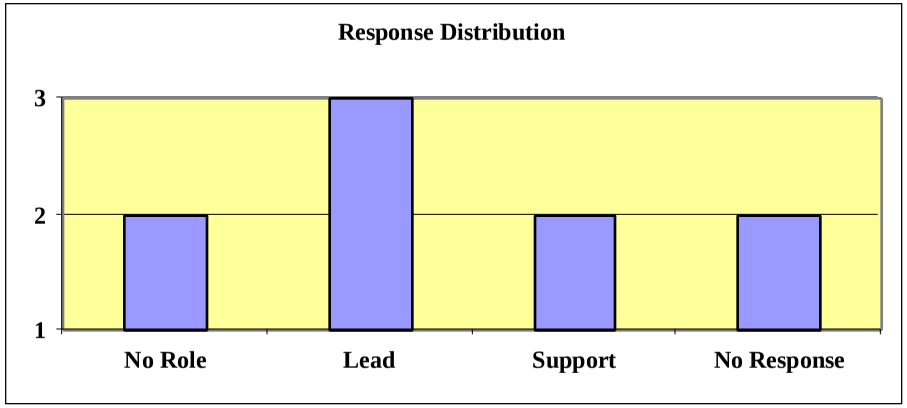
This function represents the counterpart to (5) above for research ground systems and includes all associated systems, subsystems, components or other related items necessary to the ground program in order to support flight research. Communications, data processing, payload control and processing centers, and sample/specimen handling systems are illustrative, but not exhaustive, of the scope. This function represents those major systems which have a non-recurrent cost.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

8. Maintaining and Sustaining Research Ground Systems (recurrent)

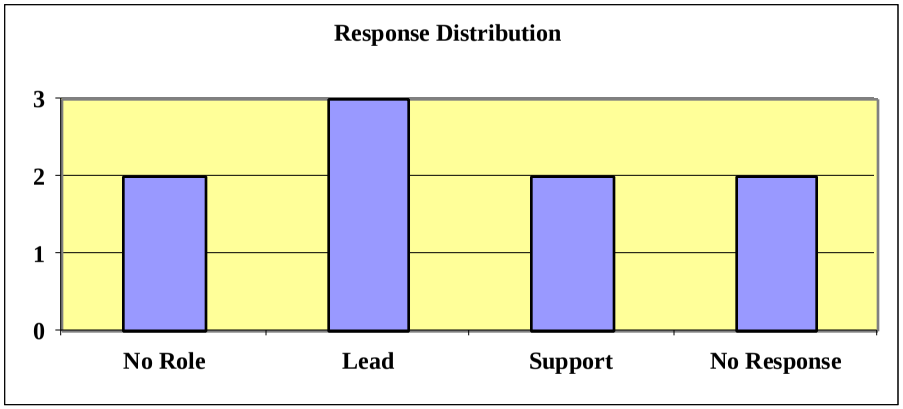
This function represents the counterpart to (6) above for research ground systems which require maintenance, operation, and sustaining activities on a recurrent cost basis.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

9. Constructing Ground Facilities (non-recurrent)

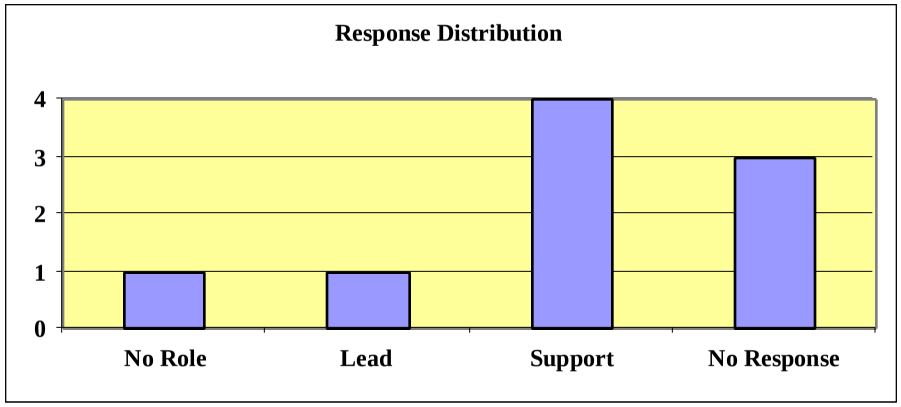
This function represents major acquisitions in terms of buildings, laboratories and test facilities associated with the research program and nominally funded through the Construction of Facilities (COF) process on a non-recurrent basis.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

10. Maintaining and Sustaining Ground Facilities (recurrent)

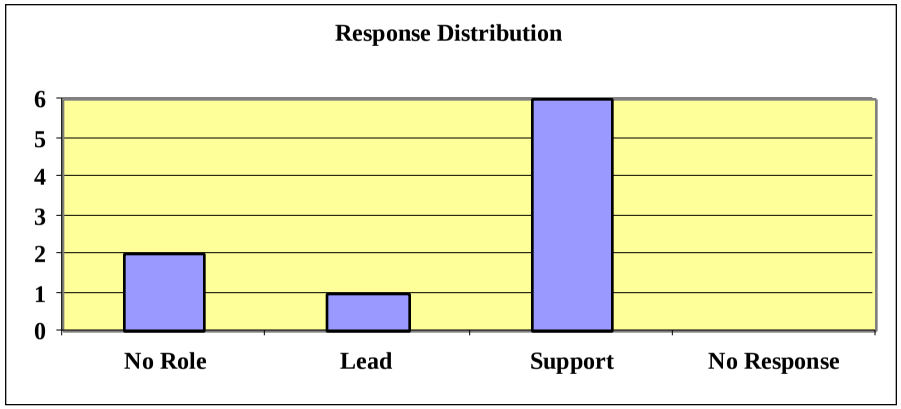
This is the corresponding function to (9) above for the recurrent functions associated with major buildings, laboratories, and test facilities for research.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

11. Certifying Safety of Research Flight Systems and Components

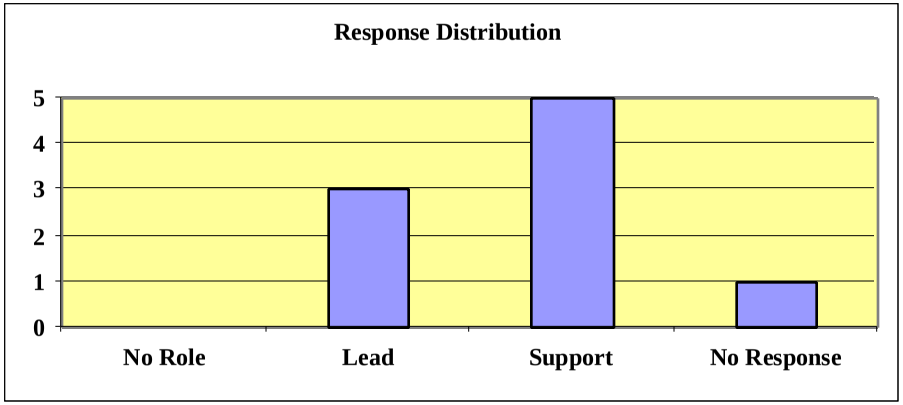
This function represents the certification of flight readiness and payload safety at the system, subsystem, component, and sample/specimen levels, including the safety of procedures, protocols and processes associated with payload, or experiment, transportation, accommodation or operations.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

12. Mission Management and Allocation of Services to Users

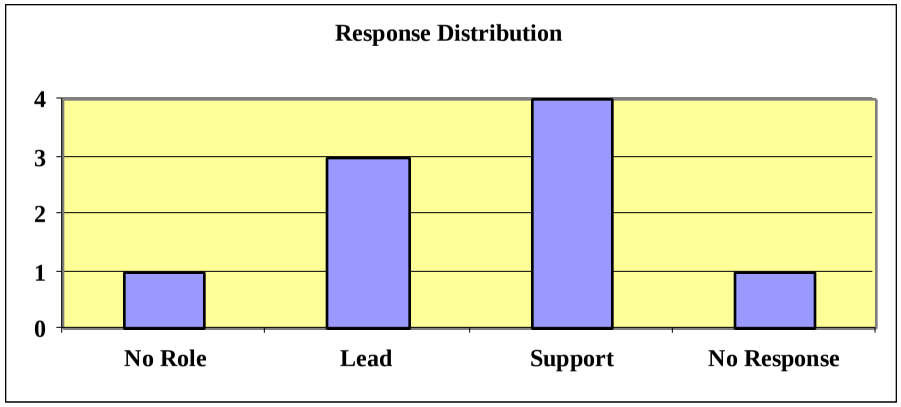
This function includes the negotiation of services between the end-user, or payload developer, and the Agency in order to ensure timely delivery of all payload data and equipment in accordance with agreed milestones. This function also includes the planning and scheduling of payload/experiment requested services (e.g. transportation, accommodations or operating resources) necessary for successful operations in flight or on the ground in pre and post-flight periods. The multilateral integration of utilization products and schedules across all participating organizations is included in this function.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

13. Integrating User Missions - Analytical

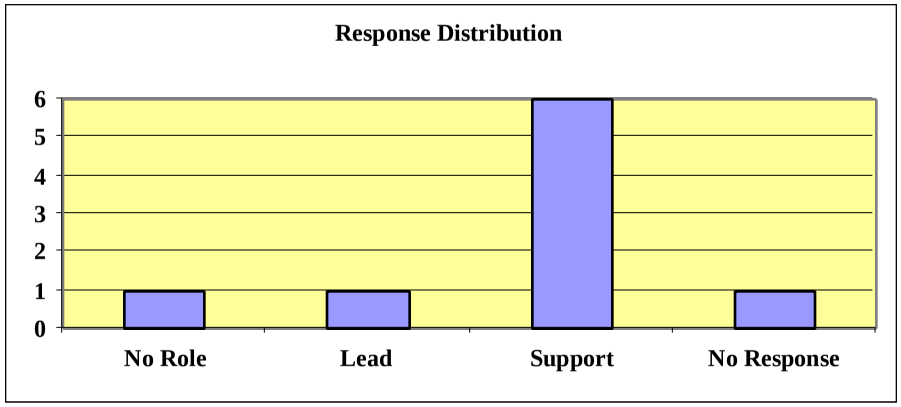
Analytical integration includes the application of mathematical models to integrate experiments, payloads, or payload complements at the rack, pallet, lab, or partner levels for the purposes of transportation, accommodation or operations. The function includes data collection, compatibility analysis, impact assessments and all associated analyses related to the planning and scheduling process for ISS utilization.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

14. Integrating User Missions - Physical

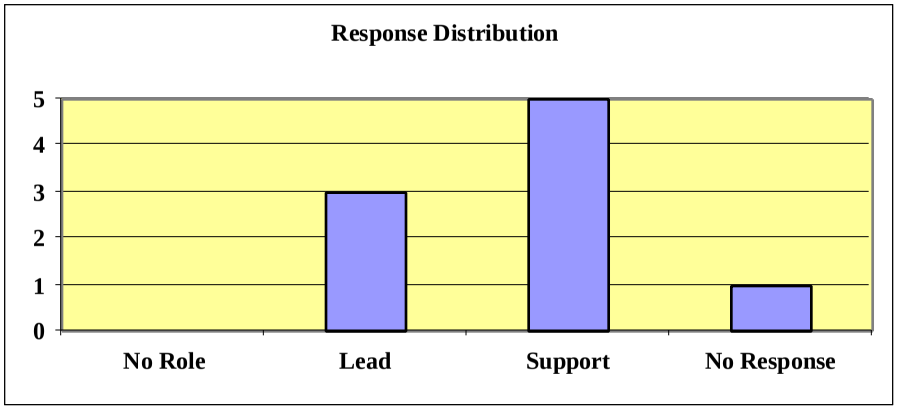
Physical integration includes the physical buildup, testing and loading of experiments, payloads, or payload complements during the ground phase in preparation for launch to the ISS.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

15. Integrating User Missions - Operations

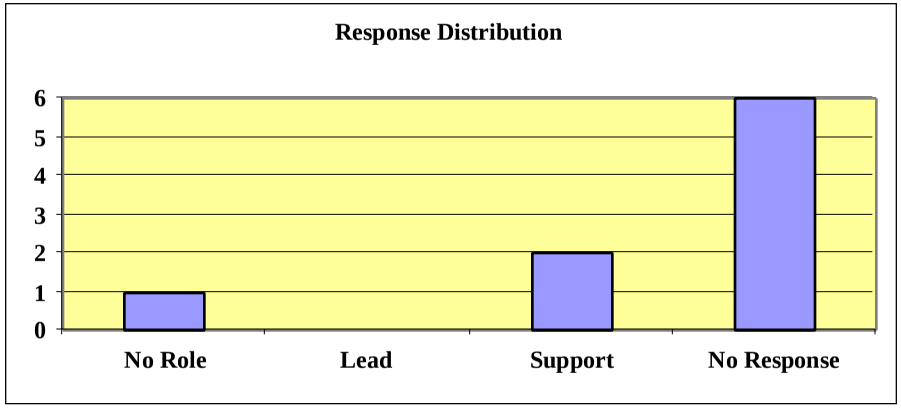
Operations integration includes the near real-time activity conducted at payload and station operations centers, including short term planning and re-planning, contingency planning, and response to unplanned events associated with or otherwise affecting the ISS research program at all levels. The payload training program is included in the operations integration function.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

16. Selecting Research Crew

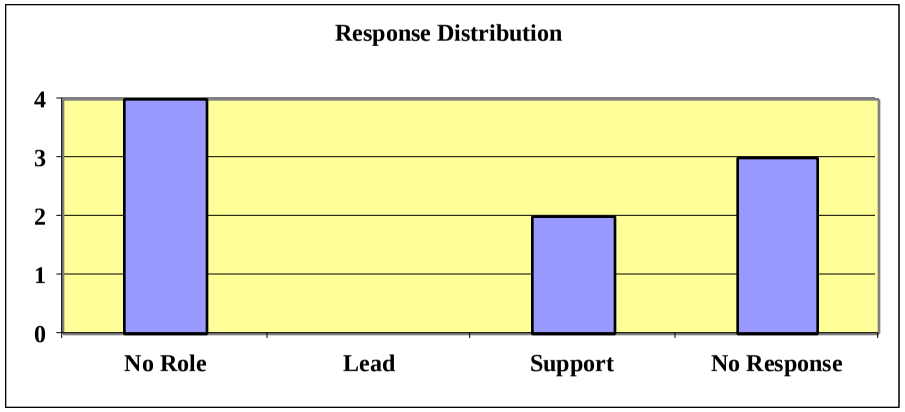
This function addresses the recruitment, qualification, and selection of crew associated with the ISS user operations.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

17. Conducting Research, Analyzing Data, and Publishing Results

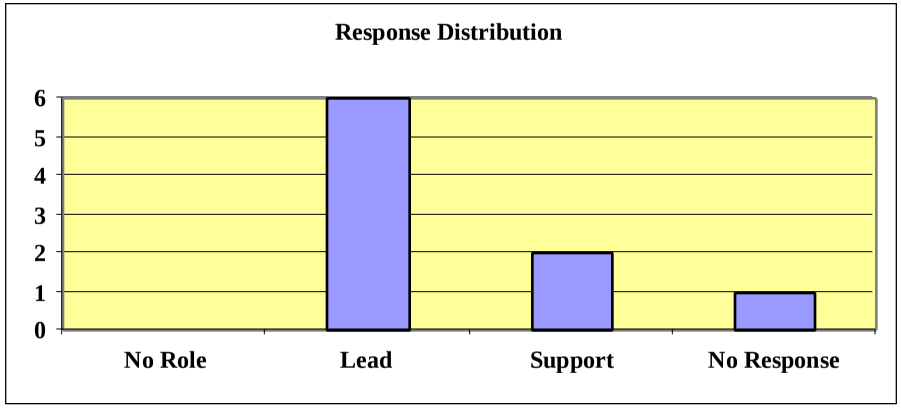
This function represents the work of the principle investigator in scientific endeavors, or the project leader in technological or commercial endeavors, that is directed toward the achievement of project objectives, as well as the post flight analysis and reporting of project results.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

18. Educating and Reaching Out to the Public

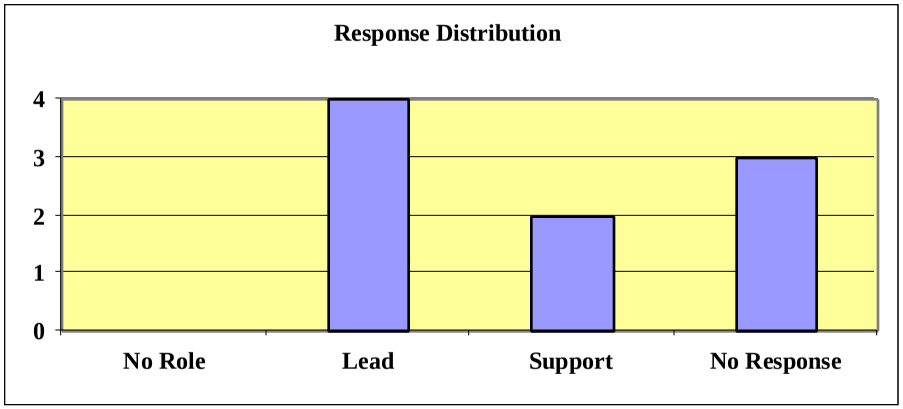
This function includes the dissemination of information to the public through a wide variety of means in order to educate and broaden general awareness of the ISS utilization program and associated benefits.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, continued

19. Recommending ISS System Pre-Planned Product Improvements (P3I)

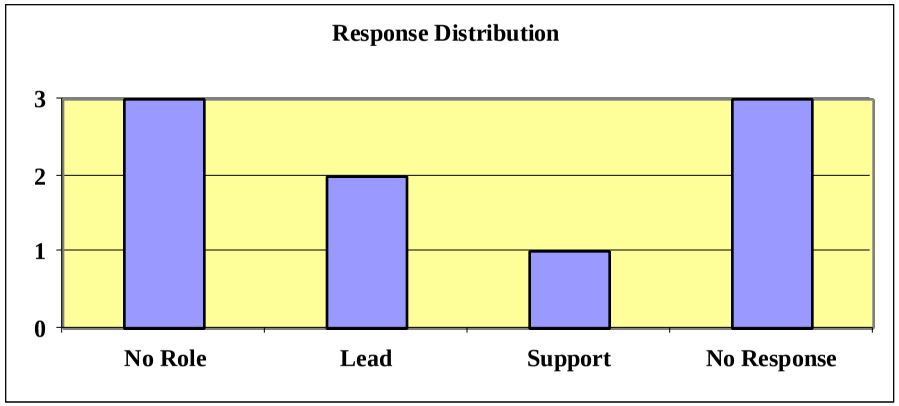
This function represents the user community recommendations on how to improve ISS productivity through upgrades, changes, or additions to the ISS spacecraft systems and elements which improve quality or quantity of user accommodations or operations.



Appendix A: Definitions of Common Functions for the ISS Utilization and Research Program, concluded

20. Archiving Research Samples, Data, and Results

This function represents the ground archiving of research products for future use in an accessible manner which ensures preservation of information.



Appendix B:
Headquarters and Center Reports (Tier 2) and Inputs to the Transition Models

Appendix B1:
JSC Space Station Program Office

B1. JSC ISS Program Office Functions - Rationale

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	SUPPORT	Potential to meet objectives 1, 2.	NASA HQs/RPO
2	Preparing and Allocating Budgets	LEAD	Potential to meet objectives 1, 2.	NASA HQs/RPO
3	Selecting and Prioritizing Research	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
4	Establishing Experiment Requirements and Feasibility	LEAD	Potential to meet objectives 1, 2	IP/RPO/PD
5	Developing and Qualifying Research Flight Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
6	Maintaining and Sustaining Research Flight Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
7	Developing Research Ground Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
8	Maintaining Research Ground Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
9	Constructing Ground Facilities	SUPPORT	Potential to meet objectives 1, 2.	KSC/MSFC
10	Maintaining Ground Facilities	SUPPORT	Potential to meet objectives 1, 2.	KSC/MSFC
11	Certifying Safety of Research Flight Systems	NO	Inherently Government Function	SSPO
12	Mission Management and Allocation of Services	SUPPORT	Potential to meet objectives 1, 2,.	IP/RPO/PD
13	Integrating User Missions - Analytical	NO	Inherently Government Function	
14	Integrating User Missions - Physical	SUPPORT	Potential to meet objectives 1, 2..	KSC
15	Integrating User Missions - Operations	SUPPORT	Potential to meet objectives 1, 2.	POIC/POIF
16	Selecting Research Crew		*Not addressed.*	
17	Research, Analysis and Results Publication		*Not addressed.*	
18	Educating and Reaching out to the Public	LEAD	Potential to meet objective 3.	HQ/F
19	Recommending ISS System P3I Improvements	LEAD	Potential to meet objective 3.	SSPO
20	Archiving Research Samples, Data, and Results		*Not addressed.*	

- **In all cases, the "LEAD" option applies to management of the function on the behalf of the user community, not necessarily performance.**
- **"SUPPORT" indicates support to NASA**
- **In cases where a single tier one function has multiple corresponding tier 2 functions, the predominant option is shown**
- **In cases where the NGO evolved from support to lead most aggressive case is shown**
- **Direct interfaces to performing International, NASA, or contract, organizations are essential**
- **Existing NASA organizations (e.g., SSPO, POIC/POIF, KSC, HQ) would continue in current roles with responsibility for managing the station side interface**
- **NGO role is limited to user side of the interface in all cases.**

JSC ISS Program Office

- The ISSPO maintains that to achieve the objectives as outlined by the HEDS leadership
- The ISSPO must retain functions that:
  - Require safety certification
  - Require ISS systems expertise and analysis
    - Defining and implement hardware and software interfaces
    - Providing systems analytical engineering support for operations implementation
  - Require ISS to User Integration agreements to provide government services, including commercial proposals
    - Both at the on-orbit interface and with the ground infrastructure
  - Have been integrated with the ISS Program vehicle/operations system infrastructure to optimize payload processes

JSC ISS Program Office, continued

- Evolution of the NGO
  - Initially NGO will perform " true" research investigation planning and priority development functions
    - Organization will define and implement the research investigation requirements
    - Support to Strategic Planning, Tactical Planning and Manifesting, Prioritizing real time research mission operations
  - Provide research guidance on ISS improvements
  - Report research results in the form of outreach and education to the research community and the public
- NGO will evolve to obtain additional functions
  - Managing the Technical, cost and schedule for the sustaining and evolution of research hardware, including those developed by IPs (w/NASA oversight)
  - Integrating User Missions (Increment and Flight)
- A subset of functions could still be performed by a NASA/contractor host but paid for by the NGO
  - Manage program budget and requirements for operations infrastructure
    - Payload Operations Integration Function and Facilities
  - Provide technical, cost and schedule oversight to physical integration and testing
    - Payload Processing and Launch Services

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Subject: JSC ISSPO input to NGO report
Date: Fri, 1 Dec 2000 15:01:35 -0600
MIME-Version: 1.0

<<Tier 1.xls>> <<ISSPO_Tier 2_Draft_1.doc>> <<ISSPO_Tier 3.xls>>
<<Budget Summary_ISSPO changes.xls>>

Hello all,
attached you will find the complete set of ISSPO deliverables for the NASA Internal task team assessment of the NGO concept.
A)
Tier 1 has one change regarding the naming and definition of tactical planning to Mission Mgt and allocation of services to research users. I felt this title and the associated definition more clearly captured all of the functions including but not limited to tactical planning.
B)
Tier 2 is a complete deliverable
C)
Tier 3 has been changed to include the mapping to tier 1 functions and the accurate reporting of civil servant cost at JSC.
D)
The budget summary has been changed to reflect the JSC accounting of civil servants

Mark, please let me know the up coming schedule for review and presentation of this material,
thank you,

Jessica Kite
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to the ISS Program Manager
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tel - 281-483-0329

Attachment converted: Macintosh HD:Tier 1.xls (XLS4/XCEL) (2096A40D)
Attachment converted: Macintosh HD:ISSPO_Tier 2_Draft_1.doc (WDBN/MSWD) (2096A40E)
Attachment converted: Macintosh HD:ISSPO_Tier 3.xls (XLS4/XCEL) (2096A40F)
Attachment converted: Macintosh HD:Budget Summary_ISSPO changes.xl (XLS4/XCEL) (2096A410)

DRAFT SUBMISSION TO THE NASA INTERNAL TASK TEAM for DETAILED DEFINITION OF AN ISS NGO CONCEPT AND FUNCTIONS

This report is the draft submission by the International Space Station Program Office/JSC to the NASA internal task team for the detailed definition of an ISS NGO concept and functions. This submission does not in any way constitute a commitment of funds nor an intent to commit funds on the part of the NASA ISSPO.

Prepared By: Jessica Kite, Technical Assistant to the Program Manager, ISS Program Office

This detailed response captures the JSC findings with respect to the efforts of the NASA task team. In May of 2000 both Code M and Code U delineated the objectives of forming a potential contractual relationship to perform ISS utilization and the attendant research. The letter (Clarifications Regarding Studies Related to ISS Utilization and Operations, May 23, 2000) made clear that the NASA task team efforts were not to be construed as an agency mandate. It was to be taken as an action to more fully define the detailed requirements necessary to support ISS research and utilization. Following senior management review and approval, NASA could then proceed with an evaluation of the proposed NGO options prior to procurement decisions.

The findings and response are three-fold:

1) The *threshold issue* of whether and when an NGO is required by NASA, in order to achieve the stated objectives, has not been adequately assessed;
2) It is not certain if NASA pursues an NGO architecture based on the findings of the three reports completed (i.e., the National Research Council (NRC) report, "Alternative Institutional Arrangements for Space Station Research", the John Cox report, "International Space Station Operations Architecture Study" and NASA Internal Task Team report), that the NGO will have the capability to achieve measurable success of the stated objectives beyond that which the established NASA and contractor teams can provide;
3) Though it was not within the team's charter to address workforce issues, e.g., the impact to civil servant and contractor performance, critical skills retention, etc., with respect to overall research development and mission success, these issues should be addressed, especially as they would be impacted during the current critical assembly phase.

NASA has constructed an approach to an ISS NGO based on a set of assumptions stemming from the successful implementation of the Hubble Space Telescope Science Institute. The Institute's performance in the scheduling of research on a single discipline platform is noteworthy, and the lessons from this experience should be applied to ISS. However, NASA should be circumspect in applying the HST model to a complex multi-variable (research disciplines, International Partners, research platforms) system. Applying the HST model only to those applicable ISS variables (single partner, single platform), if not carefully constructed, would result in an additional layer in an already complicated ISS and Shuttle infrastructure. A successful application of the institute model must address the multi-discipline, multi-platform and multi-national environment of the ISS.

The NASA task team found reviewed the objectives as defined by Code M and Code U and found that 3 of the 4, i.e. 1) ISS transparency to the end-user, 2) reduction of end-to-end cycle time, and 3) effective integration, could be successfully achieved within the current government/contractor infrastructure and actions are already in place to address these ISS Program priorities. The team did agree that the outstanding objective of effectively advocating government and industry utilization of the ISS should be an objective of our customer base and should be organized and sustained by the users of the ISS. The team also concluded that establishing an external bureaucracy in order to fulfill

a single objective would put the other objectives and the mission of the ISS system and its processes under additional stress during the current critical assembly phase.

For NASA to fairly evaluate the NGO benefits versus risk to the ISS infrastructure an in-depth discussion is required regarding the *threshold issue*: Does NASA require an NGO to accomplish the agency's objectives regarding ISS research? All of the assessment teams, (i.e. the NRC, the John Cox Team, the NASA Internal Task Team) studying the NGO concept to date were instructed to *assume the requirement* of an NGO solution (skipping the threshold issue) and to simply organizationally define the NGO and the functions it could perform within a measure of success as defined by each assessment team. Each team performed a vertical analysis of the organizations currently performing all utilization functions and then drew the "appropriate" lines of demarcation between the NGO and the ISS depending on the internal or external pressures as perceived by the team.

All of the assessment teams addressed the organizational benefits, risks, and costs of the NGO; and did not investigate the end-to-end systemic challenges that we have within NASA HQ, the ISS Program and its International Partners, or the associated agency Research Programs. Before a decision is made to pursue an NGO solution, there should be a full "systems engineering" analysis of the number and complexity of transactions from the point in time at which a Principal Investigator formulates an experiment to the point of data retrieval, analysis, and archival. In order to pursue this systems analysis approach it is recommended that NASA develop a competitive phase A contract directing the bidders to perform such an analysis and propose the appropriate organizational arrangements that would best implement the results of their analysis.

The findings of a detailed systems analysis and the associated recommendations regarding NASA's organizational infrastructure, understanding the burden of change during a development and operations program, would provide a proper basis for such an organizational re-alignment. JSC strongly recommends that NASA not accept any additional burden to crew or vehicle safety, to the operational integrity of the ISS systems, or to the development of the Research Programs, especially during the critical assembly timeframe. These baseline tenets were used in assessing those ISS Program functions that could be transitioned to an NGO over the evolution of the ISS Program.

The input to the report does not assume a specific organizational position for the NGO regarding its leadership or budget accountability. An NGO, like the NASA organizations currently striving to achieve these objectives, should be able to succeed if it is:

- Provided the resources and authority to manage the research processes from science selection through operations implementation and data retrieval
- Provided the resources and authority to manage research across a multilateral, multi-platform and multi-discipline infrastructure
- Provided the resources and authority, in the case of human research, to integrate with the crew medical operations infrastructure and the National Space Biomedical Research Institute

Since the NASA task team did not address these structural elements of the potential NGO, it is extremely difficult to render a conclusive judgment on the NGO's likelihood of success or risk of failure.

The report input does transition certain functions to the NGO over the lifetime of the ISS. These functions should only be transitioned once it has been demonstrated that the transition will minimally impact the workforce's efforts to ensure crew and vehicle safety, the operational integrity of the ISS system, and the development of the Research Programs. The selected NGO should demonstrate a measurable improvement in the functions performed, during a structured evaluation phase prior to transition, in order to justify the additional burdens of having two organizations perform the same function for some time during the transition. Those functions that will not transition to an NGO are those defined as inherently governmental, those that require an organization external to the payload developer in order to maintain a "check and balance" accountability paradigm, and those functions that are analogous to those performed for systems integration and are therefore more efficiently performed by the ISS system.

In summary, during this critical phase of assembly, while we are developing research hardware, defining and implementing the integration processes, and performing investigations on-orbit, we remain vigilant in our pursuit of the agency's objectives. To further ensure our complete success in achieving these objectives we recommend a meeting, or series of meetings, with all of the stakeholders, (i.e. Center Directors, Program Management, Research and Human Exploration Enterprises), be held to formulate agency direction and ensure an agency consensus on the *threshold issue* of proceeding with an NGO.

Evolutionary Option Set #n

Map #		FY-2000 Current Baseline	FY-2005 Assembly Complete	FY-2010 Evolution Option	FY-2020 End-State Option	Rationale & Transition Criteria
1	Provide support to Strategic Planning	ISSPO Cr	NGO Cr	NGO Cr	NGO Cr	Page6
1	Develop and implement partner barters, contracts and implementing arrangements	ISSPO FC	ISSPO FC	ISSPO NGO	ISSPO NGO	Page6
4	Define and implement multi-discipline research hardware requirements	ISSPO FC	ISSPO FC	NGO Cr	NGO Cr	Page6
2, 4, 5, 6, 7, 8	Manage technical, cost, schedule for the development/evolution of ISS multi-use and discipline specific research hardware (recurrent and non-recurrent)	ISSPO FC	ISSPO FC	NGO NGO/FC	NGO NGO/FC	Page7
3, 12	Perform tactical planning and payload manifesting	ISSPO Cr	NGO ISSPO/Cr	NGO ISSPO/Cr	NGO ISSPO/Cr	Page7
3, 12	Prioritize research objectives - during increment integration and real-time	ISSPO Cr	NGO Cr	NGO Cr	NGO Cr	Page7
1, 3, 12, 13, 14, 15	Evaluate and implement Commercial proposals (resource and interface evaluation and payload integration)	ISSPO Cr	ISSPO Cr	ISSPO NGO/Cr	ISSPO NGO/Cr	Page8
12	Integrating Multilateral User Missions - Increment and flight	ISSPO Cr	ISSPO Cr	NGO Cr	NGO CR	Page8
. 13, 14, 15	Develop ISS to user research agreements	ISSPO Cr	ISSPO Cr	ISSPO NGO	ISSPO NGO	Page8
7, 12, 13	Define and implement ISS to Payload Hardware and software interfaces	ISSPO Cr	ISSPO Cr	ISSPO Cr	ISSPO Cr	Page9
4, 12, 13	Perform payload analytical integration (payload facility to ISS)	ISSPO Cr	ISSPO Cr	ISSPO Cr	ISSPO Cr	Page9
11, 13	Provide engineering support for Safety certification	ISSPO Cr	ISSPO Cr	ISSPO Cr	ISSPO Cr	Page9
7, 8, 9, 10, 11, 12, 15	Provide cost, technical and schedule oversight for payload operations infrastructure [1]	ISSPO Cr	ISSPO Cr	ISSPO NGO/Cr	ISSPO NGO/Cr	Page9
7, 8, 9, 10, 14	Provide cost, technical and schedule oversight to physical integration and testing [1] (passive/cold stowage, payload to ISS)	ISSPO Cr	ISSPO Cr	ISSPO NGO/Cr	ISSPO NGO/Cr	Page9
18	Educating and Reaching Out to the Research community and Public	ISSPO Cr	NGO Cr	NGO Cr	NGO Cr	Page9
19	Develop and integrate research recommendations for pre-planned product improvements	ISSPO Cr	NGO Cr	NGO Cr	NGO Cr	Page10

KEY

NHQ: NASA Headquarters
Field Center: Field Center = CivilServants
ISSPO: ISS Program Office
CR: Contractors
NGO: Non-Government Organization
[1] NGO support refers to requirement and funding provision to a gov'thost facility

Changes

Responsibility
Support

Transition Criteria and Rationale

Provide support to Strategic Planning **Transition Responsibility**

- Rationale: Objective 1 and 2
- Transition Criteria
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting processes and constraints
  - Demonstrate thorough understanding of payload development processes and unique requirements
  - Demonstrate understanding of and plan to meet Enterprise scientific and strategic goals and objectives as documented in the Enterprise strategic plans
  - Demonstrate process improvement by 10 % as measured in either template reduction or transactions required of the customer

Develop and implement partner barters, contracts and implementing arrangements **Transition Support**

- Rationale: Objective 3
- Transition Criteria
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners
  - Demonstrate thorough knowledge of research requirements and International agreements governing those requirements
  - Demonstrate capability to create and implement resource (fiscal, on-orbit, skills) sharing plans with IPs, commercial entities, academic institutions
  - Demonstrate thorough understanding of payload development processes and unique requirements

Define and implement multi-discipline research hardware requirements **Transition Responsibility**

- Rationale: Objective 1 and 3
- Transition Criteria
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners
  - Demonstrate thorough knowledge of research requirements and the International agreements governing those requirements
  - Demonstrate thorough understanding of all payload interfaces including technical, requirements, documentation, programmatics, safety, and schedules
  - Demonstrate thorough understanding of payload development processes and unique requirements

Manage technical, cost, schedule for the development/evolution of ISS multi-use and discipline specific research hardware (recurrent and non-recurrent) — **Transition Responsibility**

- Rationale: Objective 1 and 2
- Transition Criteria
  - Payload development baseline established with first generation flight payloads on-orbit prior to transitioning
  - Demonstrate ability to effectively prioritize resources across multiple NASA centers and Research programs
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners, for bartered hardware
  - Demonstrate thorough understanding of all payload interfaces including technical, requirements, documentation, programmatics, safety, and schedules
  - Demonstrate thorough understanding of payload development processes and unique requirements
  - Demonstrate knowledge of NASA Research programs, processes, and funding paths and limitations

Perform tactical planning and payload manifesting — **Transition Responsibility**

- Rationale: Objective 1 and 2
- Transition Criteria
  - Demonstrate measured success in performing Support to strategic planning function
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting processes and constraints
  - Demonstrate process improvement by 10 % as measured in either template reduction or number of transactions required of the customer

Prioritize research objectives during increment integration and real-time — **Transition Responsibility**

- Rationale: Objective 1 and 2
- Transition Criteria
  - Demonstrate measured success in performing tactical planning and payload manifesting function
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting processes and constraints
  - Demonstrate process improvement by 10 % as measured in either template reduction or number of transactions required of the customer

Evaluate and implement Commercial proposals (resource/interface evaluation and payload integration) **Transition Support**

- Rationale: Objective 1, 2 and 3
- Transition Criteria
  - Demonstrate measured success in performing Support to strategic planning function
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with Commercial customers
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting and integration processes and constraints
  - Demonstrate thorough understanding of all payload interfaces including technical, requirements, documentation, programmatics, safety, and schedules
  - Demonstrate process improvement by 10 % as measured in either template reduction or number of transactions required of the customer

Integrating Multilateral User Missions - Increment and flight **Transition Responsibility**

- Rationale: Objective 1 and 2
- Transition Criteria
  - Demonstrate measured success in performing tactical planning and payload manifesting function
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting processes and constraints
  - Demonstrate thorough understanding of all payload interfaces including technical, requirements, documentation, programmatics, safety, and schedules
  - Demonstrate process improvement by 10 % as measured in either template reduction or number of transactions required of the customer

Develop ISS to user research agreements **Transition Support**

- Rationale: Objective 1 and 2
- Transition Criteria
  - Demonstrate measured success in performing tactical planning and payload manifesting function
  - Provide resources and demonstrate authority to negotiate on NASA's behalf with International Partners
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting processes and constraints
  - Demonstrate thorough understanding of all payload interfaces including technical, requirements, documentation, programmatics, safety, and schedules
  - Demonstrate process improvement by 10 % as measured in either template reduction or number of transactions required of the customer

Define and implement ISS to Payload Hardware and software interfaces — **No Transition**

- Rationale: ISS System has skill base and final authority to determine vehicle interfaces to the payload

Perform payload analytical integration (payload facility to ISS) — **No Transition**

- Rationale: ISS System has skill base and final authority to determine vehicle interfaces to the payload

Provide engineering support for Safety certification — **No Transition**

- Rationale: ISS System has skill base and final authority to determine the safety of payload interfaces to the vehicle

Provide cost, technical and schedule oversight for payload operations infrastructure — **Transition Support**

- Rationale: Objective 1and 2
- Caveat: NASA retains Payload Operations and Integration Function and Facilities as a support service to the NGO. NGO provides funding and requirements for NASA implementation. NASA retains accountability for operations safety with the vehicle system
- Transition Criteria
  - Demonstrate understanding of payload operations practices, methodology, and procedures
  - Demonstrate knowledge of operations processes, funding paths and limitations

Provide cost, technical and schedule oversight to physical integration and testing (passive/cold stowage, payload to ISS) — **Transition Support**

- Rationale: Objective 1and 2
- Caveat: NASA retains physical integration and test function and facilities as a support service to the NGO. NGO provides funding and requirements for NASA implementation.
- Transition Criteria
  - Demonstrate understanding of payload physical integration and test practices, methodology, and procedures
  - Demonstrate knowledge of physical integration and test processes, funding paths and limitations

Educating and Reaching Out to the Research community and Public — **Transition Responsibility**

- Rationale: Objective 3
- Transition Criteria
  - Develop outreach plan in accordance with NASA goals & objectives as documented in all the Enterprise's strategic plans
  - Demonstrate ability to produce varied outreach materials including but not limited to brochures, publications, websites, and educational materials

Develop and integrate research recommendations for pre-planned product improvement **Transition Responsibility**

- Rationale: Objective 3
- Transition Criteria
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS processes and constraints
  - Demonstrate thorough understanding of payload development processes and unique requirements
  - Demonstrate understanding of and plan to meet Enterprise scientific and strategic goals and objectives as documented in the Enterprise strategic plans and the Research Requirements Document

Defintions for
Common Functions for the ISS Utilization and Research Program

Map #

1 **Defining and Implementing Policy and Strategic Plans**

This function includes the development, definition and documentation of public policies and strategic plans related to the ISS research and utilization program, including the operation of all boards, panels and working groups and advisory committees involved in the process and responsible for approvals, concurrences, or recommendations. Policy and plan implementation is distributed across both headquarters and field center organizations. This function also includes international cooordination, research program cooperation, and the associated forums for planning the research program on a strategic global scale within public policy.

2 **Preparing and Allocating Budgets**

This function includes the development of guidelines, preparation and evaluation of recommendations, issue of allocations, analysis of impacts, re-planning activities, submission of formal budget requests, advocacy for appropriations, and all related tasks associated with the ISS utilization and research program in the area of fiscal planning and budgeting at the headquarters and field center levels.

3 **Selecting and Prioritizing Research**

This function includes the announcement of research opportunities; operation of peer review panels in science and corresponding review bodies for technological or commercial projects; programmatic or other evaluations associated with the selection process; and prioritization of experiments, tests, demonstrations, or other research activities on the ISS. This function includes both the investigations and the associated payload manifests at the corresponding levels of detail associated with headquarters and field center prioritization and queuing processes.

4 **Establishing Experiment Requirements and Feasibility**

This function includes the definition of flight experiment, or research facility requirements in the form of design and performance specifications, as well as physical and functional accommodation assessments of proposed flight projects, including impacts associated with changes to plan in cost, schedule, or technical performance.

5 **Developing and Qualifying Research Flight Systems (non-recurrent)**

This function represents the design, development, test and evaluation of flight research equipment used in the transportation, accommodation or operation of research payloads on the ISS, including the preparation of all necessary documentation and conduct of qualification testing and acceptance procedures, protocols and processes. It is limited to major developments which represent a one-time, non-recurrent cost, regardless of whether future replacements are anticipated.

6 **Maintaining and Sustaining Research Flight Systems (recurrent)**

This function represents the maintenance, operations and sustaining of research flights systems through upgrades, replacements, spares, or the use of experiment-unique equipment on a mission-by-mission basis. It represents the recurring costs associated with item (5) above.

7 **Developing and Qualifying Research Ground Systems (non-recurrent)**

This function represents the counterpart to (5) above for research ground systems and includes all associated systems, subsystems, components or other related items necessary to the ground program in order to support flight research. Communications, data processing, payload control and processing centers, and sample/specimen handling systems are illustrative, but not exhaustive, of the scope. This function represents those major systems which have a non-recurrent cost.

8 **Maintaining and Sustaining Research Ground Systems (recurrent)**

This function represents the counterpart to (6) above for research ground systems which require maintenance , operation, and sustaining activities on a recurrent cost basis.

9 **Constructing Ground Facilities (non-recurrent)**

This function represents major acquisitions in terms of buildings, laboratories and test facilities associated with the research program and nominally funded through the Construction of Facilities (COF) process on a non-recurrent basis.

10 **Maintaining and Sustaining Ground Facilities (recurrent)**

This is the corresponding function to (9) above for the recurrent functions associated with major buildings, laboratories, and test facilities for research.

11 **Certifying Safety of Research Flight Systems and Components**

This function represents the certification of flight readiness and payload safety at the system, subsystem, component, and sample/specimen levels, including the safety of procedures, protocols and processes associated with payload, or experiment, transportation, accommodation or operations.

12 **Mission Management and allocation of services to research users**

This function includes: Providing the single point of contact for the negotiation of services between the Payload Developer (PD) and the ISSP/RPO to ensure timely delivery of all payload integration data products to the ISSP and launch vehicle.within the constraints of the agreed to integration milestones. And then the planning and scheduling of payload/experiment requested services e.g. transportation, crewtime, power, upmass, telecommunications capacity, or other consumable resources necessary to effective research operations in flight or on the ground in pre and prost-flight periods. Lastly, providing multilateral integration of utilization products and schedules (with payload developers, engineering integration, launch processing, and operations teams) necessary to ensure flight readiness for a safe and successful mission.

13 **Integrating User Missions - Analytical**

Analytical integration includes the application of mathematical models to integrate experiments, payloads, or payload complements at the rack, pallet, lab, or partner levels for the purposes of transportation, accommodation or operations. The function includes data collection, compatibility analysis, impact assessments and all associated analyses related to the planning and scheduling process for ISS research.

14 **Integrating User Missions - Physical**

Physical integration includes the physical buildup, testing and loading of experiments, payloads, or payload complements during the ground phase in preparation for launch to the ISS.

15 **Integrating User Missions - Operations**

Operations integration includes the near real-time activity conducted at payload and station operations centers, including short term planning and re-planning, contingency planning, and response to unplanned events associated with or otherwise affecting the ISS research program at all levels.

16 **Selecting Research Crew [2]**

This function addresses the recruitment, qualification, and selection of crew associated with the ISS research operations.

17 **Conducting Research, Analyzing Data, and Publishing Results**

This function represents the work of the principle investigator in scientific endeavors, or the project leader in technological or commercial endeavors, that is directed toward the achievement of research project objectives, as well as the post flight analysis and reporting of research results.

18 **Educating and Reaching Out to the Public**

This function includes the dissemination of information to the public through a wide variety of means in order to educate and broaden general awareness of the ISS research program and associated benefits.

19 **Recommending ISS System Pre-Planned Product Improvements (P3I)**

This function represents the research community recommendations on how to improve ISS productivity through upgrades, changes, or additions to the ISS spacecraft systems which increase research quality or quantity.

20 **Archiving Research Samples, Data, and Results**

This function represents the ground archiving of research products for future use in an accessible manner which ensures preservation of information.

Functions Associated with
International Space Station Utilization & Research Program Management

NASA JSC (Contracted)		PAYLOAD OPS & FACILITY ENGINEERING SUPPORT (USA Contract #_____; UPN 496-51)
WBS 1.7.9.6	12,13,14,15	**TASK DESCRIPTION:** 1. **Payload Integration Manager (PIM) - Includes PIA Blank Book Develop., P/L Data Set BB develop., P/L unique PIAs, & P/L unique Integration schedules** (1) POC for coordination of integration activities between Payload Developer (PD) and the ISSP (2) Coordinate delivery of all P/L integration products as specified by the P/L-unique PIM Schedule (3) Responsible for integration of a P/L into the launch vehicle and the ISS (4) Support major PD reviews (PDR, CDR, Ground Ops Reviews, Safety Reviews, SAR, etc.) (5) Support major ISSP reviews (SCIR, IOR, CoFR, etc.) (6) Develop & maintain the Payload Blank Books (BB) (7) EXPRESS Rack & EXPRESS Pallet integration function, unique to EXPRESS systems
	12,13,14,15	2. **Payload Mission Integration (PMI) - Facilitate the integration of multiple PD requirements into the ISSP. Includes flight integration, flight CoFR coordination, increment definition develop., detailed manifest tracking, logistics & maintenance, cargo integration assessments, & schedule development & assessments** (1) Flight Payload Managers (FPM's) provide FPM function to NASA-assigned flights (2) Payload Increment Definition (3) Payload Detailed Manifest (4) Payload Logistics and Maintenance (L&M) (5) Payload Cargo Integration
	7,8,9,10,11,15	3. **Payload Operations - Oversee the implementation of ISSP requirements by the Payload Operations & Integration groups. Includes ground systems & facilities, training, execute planning, & operations** (1) Ensure definition & integration of interfaces between MSFC P/L Ops & Integration, ISSP, JSC Mission Ops Directorate, & the ISS Partners & Participants are consistent with requirements definition documentation & flight products (2) Evaluate & status schedules for process definition, data delivery, hardware development, & documentation delivery (3) Facilitate identification & resolution of issues and risks related to ISS payload operations reviews, & Technical Interchange Meetings

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	3.34	3.53	3.71	3.81	3.98

Basis of Estimate:
1) POP 2000 Lead Center Recommend

NASA JSC (Contracted)		PAYLOAD ENGINEERING & INTEGRATION (Boeing Contract#_____; UPN 479-21)
WBS 1.4.1	4,11,12,13	**TASK DESCRIPTION** 1. **UAIT Management and Administrative Functions** (1) Provide overall management & administration for Prime Utilization functions (2) Conduct payload vehicle safety task functions (3) Support program reviews (4) Complete CoFR tasks and endorsements
1.4.2 & 1.4.5	4,11,12,13	2. **Payload Engineering & Integration** (1) Maintain & update Pressurized Payload Interface Requirements Doc. (IRD) & Interface Control Doc. (ICD) (2) Maintain & update Attached P/L Interface Requirements Doc (IRD) & Interface Control Doc. (ICD) (3) Complete & maintain Pressurized P/L and Attached P/L Accommodations Handbooks (2) (4) Maintain & update Pressurized P/L and Attached P/L Verification Plans GPVP & GAPVP (2) (5) Maintain & update P/L Verification Program Plan (PVPP) (6) Develop, maintain, & update Unique Pressurized and Attached P/L ICDs (7) Maintain & update fault tolerance requirements document (8) Develop, maintain, & update systems and stage configuration data sets (9) Maintain & update Standard Program Implementation Plan (SPIP) Vol 4 (10) Maintain & update P/L Engineering Integration Plan - Completed (11) Provide technical review forum and resolve interface issues via PIRNs (12) Perform & develop stage engineering analysis, payload verification compliance, operations guideline and constraints (13) Review & provide support to the P/L Integration Agreements (PIAs) (14) Review U.S. payloads design data packages - See 1.4.3 (15) Review & support payload safety review panel and related activities - See 1.4.1 (16) Review & assess station suitability studies and provide research accommodations for independent reviews (17) Review & support payload planning activities including support to PMIT, IDRD, IPMM, topologies, etc. (18) Provide real-time console support & payload anomaly resolution support during mission (19) Provide engineering support & analysis in resolving of the unique payload waivers/exceptions as submitted (20) Provide task management of 1.4.2 & 1.4.5 activities - See 1.4.1 (21) Provide engineering support to the off-site reviews for TIMs, PDRs, CDRs, etc. - Travel (22) Administrative/technical documentations support

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	24.66	20.56	15.22	10.52	13.87

Basis of Estimate:
1) POP 2000 Lead Center Recommend

Tier 1 MAP

NASA JSC (In-House)		SPACE STATION PROGRAM MANAGEMENT, PLANNING, SCHEDULING AND DIRECTION
	2,4,5,6,7,8	1. Provide an ombudsman function for the ISSP Manager, overseeing primarily the Program-level cost, schedule, and technical aspects and agreements of U. S. Payload development.
	2,4,5,6,7,8	2. Ensure delivery of payload hardware and software to support the requirements of the research user community and the approved ISS assembly sequence.
	1-15,17-19	3. Provide the processes and infrastructure within the ISS Partnership necessary to integrate and operate payloads and experiments, and obtain and return research data.
	12	4. Ensure multilateral integration of utilization products and schedules (with payload developers, engineering integration, launch processing, and operations teams)necessary to ensure flight readiness for a safe and successful mission.
	3,12	5. Ensure integration across increments for all U. S. and IP payloads and real-time mission support to the Mission Management Team on matters associated with payload/research requirements, operations, and anomaly investigation and resolution.
	12,13,14,15	6. Provide the single point of contact between the Payload Developer (PD) and the ISSP including ensuring timely delivery of all payload integration data products to the ISSP and launch vehicle, and the negotiation of requirements, services, and integration milestones.
	2,4,5,6,7,8	7. Manage the development of payload multi-use hardware (EXPRESS Rack, WORF, MELFI, CRYO, Middeck Lockers, ISIS, PARIS, ARIS, ARIS ICE, MCOR/HCOR) including the design, development, verification, customer integration, delivery, on-orbit checkout, sustaining engineering, and hardware/software upgrades.
	13,14	8. Manage the development and use of ISS Program Distributed Payload Interface Verification Tools, including the budgets and schedules of the responsible organizations and schedules for use of the tools after delivery.
	13	9. Perform ISS to Payload and EXPRESS Rack/Pallet to Payload Hardware and Software Engineering Integration. This includes payload integration into the LAB, JEM, APM, and CAM and onto the Truss attach sites and JEM EF.
	3,12	10. Manage the Research Planning Working Group to produce research plans, priorities, and trades across disciplines and IP's from the multi-increment to tactical to execution timeframes.
	3,12	11. Manage the allocations for Code M payloads (DoD, Barter agreement payloads, Education payloads, etc.).
	18	12. Develop processes and products to communicate ISS research capability to the research community and general public and ensure research community representation to the ISS Program.
	1,3,12	13. Develop and implement Payloads Office strategies to ensure ISS commercialization.
	4,12,13	14. Ensure research requirements are adequately flowed down into the ISS specifications.
	7-11,15	15. Manage the budget, schedule, and technical performance of the operations implementing organizations (MSFC, JSC, and TSC's) who are developing the capabilities and processes required to perform end-to-end payload operations integration, crew training, cadre training, and real-time payload operations.
	7,8,9,10	16. Develop and sustain HOSC and TSC facility hardware and software to provide telescience capability to remote user sites, POIC command and control capability for payload and payload support systems, and secure network distribution of payload commands, telemetry, and applicable ancillary core systems telemetry.
		17. Ensure MSFC payload operations procedures and facilities are integrated with the JSC system operations procedures and facilities.
	7-11,15	18. Develop and implement Payloads Office strategies to ensure payload inputs to ISS Pre-Planned Program improvement activities.
		CROSSCUTTING FUNCTIONS (Not dedicated to utilization and not included in workforce projections)
	11	1. Payload Safety Review Panel
	13,14	2. Cargo Analytical Integration (contract definitions still required)

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	30	30	30	30	30
USG Cost	(est. $M)	3.33	3.33	3.33	3.33	3.33

Basis of Estimate:

1) Assumes 30 JSC/OZ FTEs in FY-01. FY-02 through FY-05 ISS tasks will balance workforce demand during assembly

2) Assumes 1 FTE = $110,000 + 15% (overhead) = $111,000

1.4.3	4,5,13	**3. Facility Payload Design Evaluation & Hardware Tracking** (1) Review US payload design review data packages (2) Manage delivery of Vehicle provided hardware for payloads (3) Ensure availability of data and models for vehicle provided hardware for payloads (4) Perform integrated payload rack structural analyses (5) Develop rack structure design enveloping parameters (6) Provide status of Vehicle provided hardware for payloads (7) Develop ISPR Structural Integrator's Handbook (8) Develop ARIS User's Handbook (9) Develop ARIS to Payload ICD (10) Provide ISPR Structural Systems Integration (11) Vacuum exhaust gas compatibility analysis (12) Provide ARIS integration support to integrated payload rack developers. Provide microgravity support. (13) Provide the USL Kneebrace Bolt Action Replacement (KBAR) kits (14) Provide ARIS/EXPRESS Installation & Maintenance Trainer (15) Develop ARIS/EXPRESS Installation & Maintenance Trainer PIDS in accordance with DRD FP07 (16) Install labels per Crew documented instructions on loose ARIS parts (17) Provide the ARIS ISS Characterization Equipment (ICE) in accordance with ARIS ICE Specification (DR FP10) (18) Provide Payload Crew Aids Kit in accordance with DR FP08 (19) Develop PaRIS specification in accordance with DRD FP09 (20) Conduct the Mil-Std-1553B RT testing for up to 10 Payload Racks (8 in the USA, 1 in Germany, and 1 in France) at the rack to module interface
1.4.4	4,7,13,14	**4. Payload Software Integration and Verification** (1) Provide Houston-based management for PSIV projects (2) Develop hardware and software deliverables for the Payload Software Integration & Verification Facility (PSIVF) as outlined in SSCN 438 Rev B (3) Develop Payload Rack Checkout Unit hardware & software as outlined in SSCN 438 Rev B. (4) Perform task authorized under SSCN 1233 Rev A, to address update of P/L verification rqmts as defined in SSP 57000. Perform update of development specification requirements. Develop, test & deliver a PRCU Modification Kit (5) Perform task authorized under SSCN 2052 WBS 1.4.4 to modify the baseline configuration of the PRCU No. 4 installation to accommodate the unique facility layout at KSC (6) Perform tasks authorized under SSCN 2054, WBS 1.4.4: 1) Develop PRCU Training & Certification Plans; 2) Perform training & certification of PRCU operators at JSC, KSC, LeRC and MSFC; 3) Perform recurring training of PRCU operators; 4) Perform task outlined in SSCN 2703, to calibrate or replace PRCU #2 thermal system sensor as required (7) Develop the Suitcase Test Environment for Payloads (STEPs) hardware & software as outlined in SSCN 438 Rev B (8) Perform task authorized under SSCN 1694 to address modifications and development of new code required per the addition of the STEP to STFx Interface Spec. Perform required mods to the STEP software to accommodate the addition of SSP 52050, Payload Software Interface Specification
1.4.5	13	**5. Payload Software Integration (PEI)** (1) Manage, control, & develop payload unique software ICDs for payloads integrated into the USOS and MPLM, DR PA17, Unique Pressurized & Attached Payload Software Interface Control Documents and ensure payloads are compatible with the system requirements & constraints (2) Develop a Payload MDM User's Manual (3) Perform S/W integration activities: Assignment & tracking of APIDs, Subset IDs, & PUIs; Providing data inputs to P/L Data Library; Coordination of PSIV-developed P/L-related S/W products; Assisting payload developers in resolving interface issues & providing interface clarifications; Providing rqmts for P/L Ancillary Data to the Mission Build Facility

NASA JSC (Contracted)		SSPO PAYLOAD OFFICE SUPPORT (Lockheed-Martin Contract # _____; UPN 496-51
		TASK DESCRIPTION
	1,3,12	**1. Support Research Planning Working Group (RPWG) Processes** (1) Integrates & manages ISS research resource requirements and objectives of the ISS Research Program (2) Generates the Integrated Payload Mission Model (IPMM) yearly (3) Generates the Tactical Resource Allocation Letter at PP-30 (4) Coordinates tactical inputs to the Increment Definition & Requirements Document Planning Letter at PP-24 (5) Generates the Payload Tactical Plan (PTP) at I-22 (6) Approves any changes to the baselined PTP that impacts research and/or research resource across several increments
	3,12,15	**2. Support Lead Increment Scientist Processes** (1) Integrates & manages ISS research resource requirements and objectives starting at I-22 until the completion of postflight activities for a specific increment (2) Serves as the point of contact for providing an integrated research status of on-orbit research activities (3) Prioritize increment research when consensus cannot be reached (4) Provide integrated research input to the POIC cadre for planning, replanning, and nominal and off-nominal operations

Contract Cost (NOA $M)	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
	1.10	1.58	1.60	1.60	1.60

Basis of Estimate:
1) POP 2000 Lead Center Recommend

NASA JSC (Contracted)		SSPO SUPPORT (Science Applications Int'l Contract #_____; UPN 479-80)
		TASK DESCRIPTION
2.0	2,4,5,6,7,8	**Space Station Payloads Office Support**
3.0	2,4,5,6,7,8	**Payload Program Management and Engineering Support**
3.1		ISS Research Program Manager Support
3.2		Engineering Support (ISS Window Observational Research Facility (WORF) & Fleet Resource Management (FRM))
4.0	1,4,18,19	**Research Integration Support**
4.1.2		Book manage the Research Requirements Document (RRD)
4.1.4		Maintenance and regular update of the ISS Research Capability Metrics document (See DR 14)
4.1.5		Produce ISS research capability and status briefings for internal ISS use, external NASA outreach activities, and in response to specific questions & actions from various government oversight and advocacy committees
4.1.7		Organize & participate in conference and meetings for a variety of NASA technical interchange meetings, working groups, workshops, and advisory & independent review panels
4.2	1,4,5,12	**Discipline Management support**
4.2.1.1		Work with user sponsors, payload developers & users appropriate to this discipline to develop an integrated set of requirements on Space Station capabilities and processes which are needed by this discipline
4.2.1.3		Represent the ISS Payloads Office to the various science and programmatic working groups within the Research Discipline
4.2.3.4		Work with user sponsors, payload developers & users appropriate to the discipline to develop integrated payload data necessary for inclusion into the payload strategic planning process
4.2.5		Commercialization
4.2.5.3		Assist in development of processes and policy for commercialization initiatives within NASA

Contract Cost (NOA $M)	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
	1.30	1.30	1.40	1.40	1.40

Basis of Estimate:

1) POP 2000 Lead Center Recommend

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based on wkbk inputs
09/07/00 MSFC
09/26/00 KSC
10/22/00 JSC
09/07/00 HQs

Total Costs Associated with Functions of International Space Station Utilization and Research Program Management

	FY 01	FY 02	FY 03	FY 04	FY 05
Functions of Headquarters					
- In House Workforce	2.5	5.0	7.5	10.0	12.5
- In House Costs	0.35	0.70	1.05	1.40	1.75
- Contract Costs	19.57	39.33	42.15	42.67	48.39
-- Global Science & Technology (Peer Review)	0.42	0.83	1.25	1.67	2.09
-- Flight Principle Investigator Grants	19.15	38.50	40.90	41.00	46.30
total cost of function:	**19.92**	**40.03**	**43.20**	**44.07**	**50.14**
Functions of JSC/Space Station Program Office					
- In House Workforce	30	30	30	30	30
- In House Costs	3.33	3.33	3.33	3.33	3.33
- Contract Costs	30.40	26.97	21.93	17.33	20.85
-- United Space Alliance (Research mission management and Facility Integration)	3.34	3.53	3.71	3.81	3.98
-- Boeing (Payload Engineering & Integration)	24.66	20.56	15.22	10.52	13.87
-- Lockheed-Martin (Research analysis, tactical and execute)	1.10	1.58	1.60	1.60	1.60
-- Science Applications Int'l (Program Office Support)	1.30	1.30	1.40	1.40	1.40
total cost of function:	**33.73**	**30.30**	**25.26**	**20.66**	**24.18**
Functions of MSFC/Flight Projects Office					
- In House Workforce	185	151	134	129	117
- In House Costs	25.90	21.14	18.76	18.06	16.38
- Contract Costs	86.15	66.19	69.18	69.66	69.23
-- Boeing (Payloads Utilization, EXPRESS development and integration)	61.15	48.43	49.60	49.44	49.09
-- Lockheed-Martin (Utilization & Mission Support)	25.00	17.76	19.58	20.22	20.14
total cost of function:	**112.05**	**87.33**	**87.94**	**87.72**	**85.61**
Functions of KSC/Payload Processing					
- In House Workforce	33	32	32	32	32
- In House Costs	4.62	4.48	4.48	4.48	4.48
- Contract Costs	8.99	7.79	8.48	10.18	12.74
-- Boeing (Utilization Support)	6.81	5.58	6.04	7.52	10.06
-- Dynamac (Life Science Support)	2.18	2.21	2.44	2.66	2.68
total cost of function:	**13.61**	**12.27**	**12.96**	**14.66**	**17.22**
Functions of MSFC/Research Program Office					
- In House Workforce (MSFC + GRC)	423	445	448	453	453
- In House Costs (MSFC+GRC)	46.37	48.78	49.11	49.66	49.66
- Contract Costs (MSFC + GRC)	185.86	199.27	224.78	245.15	242.65
-- Teledyne Brown	1.363	1.39	1.42	1.447	1.476
-- P&W	3.62	3.742	3.864	3.986	4.208
-- Boeing	1.535	1.572	1.609	1.656	1.693
-- CST	1.547	1.584	1.622	1.659	2.011
-- University of Alabama-Huntsville	0.23	0.237	0.244	0.251	0.259
-- Sverdrup	9.975	11.803	14.551	17.469	17.473
-- Computer Sciences Corp.	0.55	0.57	0.59	0.61	0.63
-- Unspecified Contract Cost	2.48	2.56	2.75	3.3	3.75
-- Unspecified Contract Cost	56.43	51.81	53.85	59.7	57.85
-- Unspecified Contract Cost	32.59	25.08	21.99	13.17	4.33
-- Unspecified Contract Cost	5.71	7.55	9.22	15.96	18.89
-- Unspecified Contract Cost	18.12	19.18	22.65	30.58	34.64
-- Hernandez Engineering	0.5	0.52	0.54	0.56	0.58
-- Science Applications International Corp.	0.125	0.13	0.135	0.14	0.145
-- ASRI	1.25	1.3	1.35	1.4	1.45
-- University Space Research Associates	9.875	11.7	14.445	17.36	17.36
-- Tennessee Valley Authority	0.125	0.13	0.135	0.14	0.145
-- New Contract	4.5	4.55	4.725	5.04	5.04
-- Contract C	11.873	22.179	32.33	32.49	32.49
-- Jet Propulsion Laboratory	6.674	7.852	14.996	15.451	15.451
-- Unspecified Contract Cost		8.837	7.448	9.008	9.008

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based on wkbk inputs
09/07/00 MSFC
09/26/00 KSC
10/22/00 JSC
09/07/00 HQs

-- Commercial Space Centers	16.786	14.991	14.313	13.774	13.774
total cost of function:	**232.23**	**248.05**	**273.89**	**294.81**	**292.31**

Functions of JSC/Research Program Office

- In House Workforce	16	16	15	13	13
- In House Costs	2.24	2.24	2.1	1.82	1.82
- Contract Costs	20.18	19.23	29.13	29.01	29.01
-- Lockheed-Martin (Program/Project Mgmt Support)	20.18	19.23	29.13	29.01	29.01
total cost of function:	**22.42**	**21.47**	**31.23**	**30.83**	**30.83**

Functions of ARC/Research Program Office

- In House Workforce	32.55	28.65	26.95	25.05	24.15
- In House Costs	2.73	2.52	2.27	1.76	1.52
- Contract Costs	67.02	67.02	61.55	32.65	37.24
-- Lockheed-Martin (Project Support)	28.17	28.74	25.85	13.39	18.65
-- Orbitec (Plant Research Unit)	9.94	12.47	15.38	8.56	6.11
-- STAR (Advanced Animal Habitat)	12.25	11.23	10.77	7.06	12.01
-- Payload Systems, Inc (Cell Culture Unit)	5.21	5.53	5.60	3.28	0.00
-- Hernandez Engineering (Safety & Mission Assurance)	0.73	0.85	0.76	0.26	0.48
-- Boeing (Habitat Holding Rack)	10.71	8.20	3.20	0.10	
total cost of function:	**69.75**	**69.54**	**63.82**	**34.41**	**38.76**

Functions of GSFC/Research Program Office

- In House Workforce
- In House Costs
- Contract Costs

****** not reported ******

total cost of function:

Functions of OSF/Research Program Office

- In House Workforce	2.0	2.5	3.0	3.0	3.5
-- OSF Payloads	1.0	1.0	1.0	1.0	1.0
-- Engineering Research	1.0	1.5	2.0	2.0	2.5
- In House Costs	0.28	0.35	0.42	0.42	0.49
-- OSF Payloads	0.14	0.14	0.14	0.14	0.14
-- Engineering Research	0.14	0.21	0.28	0.28	0.35
- Contract Costs	0.81	1.11	1.14	1.48	1.48
-- OSF Payloads	0.56	0.84	0.84	0.98	0.98
-- Engineering Research	0.25	0.27	0.3	0.5	0.5
total cost of function:	**1.09**	**1.46**	**1.56**	**1.90**	**1.97**

TOTAL IN-HOUSE WORKFORCE:	**724**	**710**	**696**	**695**	**685**
TOTAL IN-HOUSE COSTS:	**85.8**	**83.5**	**81.5**	**80.9**	**79.4**
TOTAL CONTRACT COSTS:	**419.0**	**426.9**	**458.3**	**448.1**	**461.6**
GRAND TOTAL COST:	**504.8**	**510.4**	**539.9**	**529.1**	**541.0**

Appendix B2:
KSC ISS/Payload Processing Directorate

B2. KSC ISS/Payload Processing Functions - Rationale

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans		*Not addressed.*	
2	Preparing and Allocating Budgets	NO	Lead inherently governmental.	
3	Selecting and Prioritizing Research		*Not addressed.*	
4	Establishing Experiment Requirements and Feasibility		*Not addressed.*	
5	Developing and Qualifying Research Flight Systems		*Not addressed.*	
6	Maintaining and Sustaining Research Flight Systems		*Not addressed.*	
7	Developing Research Ground Systems	**NO**	Shared resources between ISS, Utilization, and Shuttle Payloads.	
8	Maintaining Research Ground Systems	**NO**	Shared resources between ISS, Utilization, and Shuttle Payloads.	
9	Constructing Ground Facilities		*Not addressed.*	
10	Maintaining Ground Facilities		*Not addressed.*	
11	Certifying Safety of Research Flight Systems	**SUPPORT**	Potential to meet objectives 1, 2.	**PD/KSC**
12	Mission Management and Allocation of Services		*Not addressed.*	
13	Integrating User Missions - Analytical		*Not addressed.*	
14	Integrating User Missions - Physical	NO	Shared resources between ISS, Utilization, and Shuttle Payloads.	
15	Integrating User Missions - Operations			
16	Selecting Research Crew		*Not addressed.*	
17	Research, Analysis and Results Publication		*Not addressed.*	
18	Educating and Reaching out to the Public		*Not addressed.*	
19	Recommending ISS System P3I Improvements		*Not addressed.*	
20	Archiving Research Samples, Data, and Results		*Not addressed.*	

- **"SUPPORT" indicates that the NGO will assist the PD in submitting data to KSC for evaluation and compliance with KSC policies and procedures for ground processing safety.**

- **Existing NASA organizations (e.g., SSPO, POIC/POIF, KSC, HQ) would continue in current roles with responsibility for managing the station side interface**

- **NGO role is limited to user side of the interface in all cases.**

KSC ISS/Payload Processing

- ISS Utilization and Research Common Functions were evaluated with corresponding KSC sub-functions. Evaluation was made of each sub-function as to whether it would be a candidate for transition to an NGO.
- Majority of functions provided by KSC involve workforce and Ground Support Equipment that are shared resources between the ISS Element, ISS Utilization, as well as Shuttle Payloads.
  - As a result, sub-allocation of these functions to an NGO is not possible.
  - KSC will provide these functions as a service to the NGO.
- Support to S&MA is strictly to assist the PD in submitting data to KSC for evaluation and compliance with NASA/KSC policies and procedures for ground processing safety.
  - As the Ground Safety functions performed by KSC are a shared resource between ISS Element, ISS Utilization, and Shuttle Payload entities, the responsibility for this function is retained by KSC.

KSC Submit to the NASA Internal Task Team for Detailed Definition of an NGO Concept and Functions

Maynette Smith
NASA/KSC
November 2000

From: "Smith-1, Maynette" <Maynette.Smith-1@ksc.nasa.gov>
To: muhran@hq.nasa.gov, jessica.r.kite1@jsc.nasa.gov,
Irene.taylor@msfc.nasa.gov, Maynette.Smith-1@ksc.nasa.gov
Subject: KSC NGO Input
Date: Mon, 13 Nov 2000 11:03:08 -0500
MIME-Version: 1.0

Attached please find the final KSC NGO Input (Tier II items). There has been one change since the DRAFT regarding Hangar L and the corresponding allocated support for Hangar L. All Tier III items were submitted previously. Any questions, please contact the undersigned.

Maynette
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"If you think you're too small to make a difference, you've never been in bed with a mosquito."
- Anita Roddick

KSC Submit to the NASA Internal

FUNCTIONS of UTILIZATION SUPPORT at KSC for the INTERNATIONAL SPACE STATION

	FY-2000 Current Baseline	FY-2005 Assembly Complete	FY-2010 Evolution Option	FY-2020 End-State Option	Rationale & Transition Criteria
Integrating User Missions - Physical					
(1) Program and Institutional Suppt	FC CR	FC CR	FC CR	FC CR	**Page #3**
Developing & Qualifying Grd Systems					
(1) Support Equipment/Facility Design/Development Support	FC CR	FC CR	FC CR	FC CR	**Page #3**
Tactical Planning & Scheduling of Research Operations					
(1) Schedule and Manifest Assessment	FC CR	FC CR	FC CR	FC CR	**Page #3**
Integrating User Missions - Physical					
(1) Mission Direct and Advanced Planning	FC CR/PD	FC CR/PD	FC CR/PD	FC CR/PD	**Page #3**
Certifying Safety					
(2) Safety and Mission Assurance	FC CR/PD	FC CR/PD/NGO	FC CR/PD/NGO	FC CR/PD/NGO	**Page #3**
Preparing & Allocating Budgets					
(1) Allocated Support	FC CR	FC CR	FC CR	FC CR	**Page #3**
Maintaining/Sustaining Ground Systems					
(1) PTCS and POIC On-Line O&M	FC CR	FC CR	FC CR	FC CR	**Page #3**
Maintaining/Sustaining Ground Systems					
(1) PRCU Verification Operations	FC CR/PD	FC CR/PD	FC CR/PD	FC CR/PD	**Page #3**
Integrating User Missions - Physical					
(1) Utilization Hangar L Support	FC CR	FC CR	FC CR	FC CR	**Page #3**

KEY

NHQ: NASA Headquarters
FC: Field Centers
PD: Payload Developer
PI: Principal Investigators
CR: Support Contractors
NGO: Non-Government Organization

Changes

Responsibility
Support

Rationale

- The items defined on Page 2 of this submittal reflect the ISS Utilization and Research Common Functions along with the corresponding KSC sub-functions. Evaluation was made of each KSC sub-function as to whether it would be a candidate for transition to an NGO. Rationale for transition/non-transition is as noted below.

- The items noted by a (1) are functions which involve workforce and Ground Support Equipment that are shared resources between the ISS Element, ISS Resupply and Return, and ISS Utilization, as well as Shuttle Payloads. As a result, sub-allocation of these functions to the NGO is not possible. KSC will provide these functions as a service to the NGO.

- The item noted by a (2), Safety and Mission Assurance (S&MA), reflect the NGO as a supporting entity to KSC in the FY 2005 timeframe. In this capacity, it is envisioned that the NGO will assist the Payload Developer in submitting data to KSC for evaluation and compliance with NASA/KSC policies and procedures for ground processing safety. It is anticipated that the NGO will play a role in the oversight of development of ground and flight safety packages and participate as required with the Payload Developer in safety panels, reviews, and other S&MA forums. As the Ground Safety functions performed by

KSC are a shared resource between ISS Element, ISS Resupply and Return, ISS Utilization, and Shuttle Payload entities, the responsibility for this function is retained by KSC.

From: "Smith-1, Maynette" <SmithME@kscems.ksc.nasa.gov>
To: "'Mark Uhran'" <muhran@hq.nasa.gov>, jessica.r.kite1@jsc.nasa.gov, Irene.taylor@msfc.nasa.gov, Maynette.Smith-1@kmail.ksc.nasa.gov
Cc: charles.stegemoeller1@jsc.nasa.gov, Robin.Henderson@msfc.nasa.gov, gjahns@arc.nasa.gov, elizabeth.a.park.1@gsfc.nasa.gov, carlos.g.parra1@jsc.nasa.gov, willie.b.williams1@jsc.nasa.gov, dshortz@hq.nasa.gov, estigber@hq.nasa.gov, etrinh@mail.hq.nasa.gov, jrobey@hq.nasa.gov, pahlf@hq.nasa.gov, gfoglema@hq.nasa.gov, bkreyken@hq.nasa.gov, jemond@hq.nasa.gov, wvjones@mail.hq.nasa.gov, mcleave@mail.hq.nasa.gov, kolsen@mail.hq.nasa.gov, jswain@mail.hq.nasa.gov, khavens@hq.nasa.gov, rcrouch@hq.nasa.gov, dtomko@hq.nasa.gov, todd.r.sampsel1@jsc.nasa.gov, dennis.j.grounds1@jsc.nasa.gov, mike.hawes@hq.nasa.gov, robert.soltess@hq.nasa.gov, richard.w.nygren1@jsc.nasa.gov, jbartoe@ems.jsc.nasa.gov, bhaworth@mail.hq.nasa.gov, rirving@hq.nasa.gov, "Stoddard-1, Grant" <StoddGW@kscems.ksc.nasa.gov>, "Keith-1, Bryant" <KeithJB@kscems.ksc.nasa.gov>
Subject: KSC Inputs Tier III Functions
Date: Tue, 26 Sep 2000 10:39:38 -0400
MIME-Version: 1.0

Attached please find list of KSC Tier III Functions for the Functional Workbook. This includes the latest budget data. The list of cross-cutting functions (Resupply/Return, Logistics, etc.) have been deleted in order to avoid confusion as these are not included in the Utilization Functions assessment. Other than the budget data and the Cross-Cutting functions, there are no changes to the KSC list. Tier II Functional Allocations and Criteria will be sent out on Thursday after I have had a chance to review with my management. I expect few changes. We won't be able to meet with our Center Director until next week. Maynette

KSCUtilizationCoreFunctions.xls

09 AFT

NASA-KSC (In-House)		UTILIZATION SUPPORT
		1. Launch site support management. 2. Project and operations management. 3. Hands-on system engineering for ISS payloads processing at launch and landing sites. 4. COTR for Life Science Support Contract and oversight of Hangar L operations & maintenance. 5. Payload processing advanced planning. 6. Requirements development, integration and implementation. 7. Manifest and capability analysis. 8. Budget development and administration. 9. Procedure development and implementation.

	FY 2001	FY 2002	FY 2003	FY 2004
USG W/F (FTEs)	33	32	32	32
USG Cost (est. $M)	4.62	4.48	4.48	4.48

Basis of Estimate
1) Assumes 1 FTE = $100,000 + 40% overhead.

NASA KSC (Contracted)		UTILIZATION SUPPORT - PGOC (Boeing Contract # NAS10-11400; UPN 479-70)
1.4.08.03		**Utilization Ground Processing - UPN 479-70** Provide a capability at the launch/landing site for limitied physical integration and staging, perform payload-to-Space Station and EXPRESS payload-to-Facilility Interface Testing using the Launch Site payload integration and checkout facilities for customer payloads integrated into ISPR's operating in the US Lab, US ISPR's operating in the IP Labs, and attached payload s operating off the truss/EF.
1.4.08.03.01		**Program and Institutional Support** Provides for performing Program driven actions, status reviews, and development of KSC's portion of the ground integration process and planning. Identified activities include support to the Payloads Planning Working Group, Common Schedule Data Base Updates, Payload Design Reviews, Stage Integration Reviews, Refrigerator/Freezer requirements definition and TEMs, Program Documentation updates, and Implementation Planning Reviews.
1.4.08.03.02		**Support Equipment/Facility Design/Development Support** Provide for the support to flight hardware and GSE design, including Payload Developer's hardware design reviews. Identified products include support to the development and act/val of the Payload Test and Checkout System and POIC.
1.4.08.03.03		**Schedule and Manifest Assessment** Provides for the planning capability to provide long range analysis of flows and manifests. Identifed products include the Standard Flow for various payload types and development, maintenance of standard schedules as a planning tool, and the initial process planning with the user prior to mission assignment. Also included is support to KSC ISS Schedule Integration Forums, multi-flow, and fleet resource management.
1.4.08.03.04		**Mission Direct and Advanced Planning** Provides the mission manpower for PGOC and NASA that perform 'hands-on' tasks associated with ground processing. Identifed roles include engineering lead roles, ground and flight systems engineering, technicians, schedule publication, comm support, and Work Authorization Document (WAD) production. Also includes Refrigerator/Freezer on-line O&M for MELFI and Cryo freezers, middeck processing planning, and offline lab coordination.
1.4.08.03.21		**Safety and Mission Assurance** Provides support to include milestone and readiness reviews; participating in design reviews and configuration control boards; support ground and flight safety reviews. Identified products include providing witness/verification/surveillance for the certification of launch and landing site GSE and for the launch and landing site processing of Space Station Utilization hardware. This Task Element includes S&MA support for NASA and contractor utilization efforts.
1.4.08.03.22		**Allocated Support** Allocation support consists of activities in support of the entire PGOC contract: contract financial reporting and budgeting; CCN/WBS management; and computation services including personal computer maintenance and mainframe systems operations.
1.4.08.03.05		**Payload Test and Checkout System (PTCS) and POIC On-Line O&M** Includes O&M (including S/W) for Comm and Avionics, Fluid Systems, USICU, middeck GSE, POIC and other hardware that primarility support the Utilization Ground Processing IPT. Also included is POIC sustaining engineering, scheduled upgrade and maintenance contracts.
1.4.08.03.05		**Payload Rack Checkout Unit (PRCU) Verification Operations**

	FY 2001	FY 2002	FY 2003	FY 2004
Contract Cost (NOA $M)	6.81	5.58	6.04	7.52

Basis of Estimate:

1) Post ISS POP-00 Mark.

		PGOC direct test support of ISPR, EXPRESS and Attached Payloads in the PRCU.
NASA KSC (Contracted)		**LIFE SCIENCE SUPPORT - LSSC (Dynamac Contract #NAS10-12180; UPN479-71)**
1.4		**Utilization Hangar L Support** Includes launch and landing site laboratories for all ISS experiment requiring intensive scientific processing capability. Assesses ISS manifest to ensure launch/landing site capabilities are adequate for Agency needs. Provides assessment of launch site processing requirements, procures necessary supplies/equipment. Processes bilogical shipment to domestic and international sites pre and post mission. Maintains applicable accreditations (facility and personnel) for laboratory facility including the Animal Care Section. Provides for O&M of the Hangar L Complex.

09 RAFT

		FY 2001	FY 2002	FY 2003	FY 2004
Contract Cost	(NOA $M)	2.18	2.21	2.44	2.66

Basis of Estimate:

1) Post ISS POP-00 Mark.

09 RAFT

FY 2005
32
4.48

FY 2005
10.06

09 RAFT

FY 2005
2.68

09 RAFT

Appendix B3:
MSFC Flight Projects Directorate
and Microgravity Research Program Office

B3. MSFC Flight Projects Functions - Rationale

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans		*Not addressed*	
2	Preparing and Allocating Budgets	NO	Inherently Government Function	
3	Selecting and Prioritizing Research		*Not addressed*	
4	Establishing Experiment Requirements and Feasibility		*Not addressed*	
5	Developing and Qualifying Research Flight Systems	SUPPORT	Potential to meet objectives 1, 2	MSFC/RPO
6	Maintaining and Sustaining Research Flight Systems	LEAD	Potential to meet objectives 1, 2	MSFC/RPO
7	Developing Research Ground Systems	SUPPORT	Potential to meet objectives 1, 2	MSFC/RPO
8	Maintaining Research Ground Systems	LEAD	Potential to meet objectives 1, 2	MSFC/RPO
9	Constructing Ground Facilities	SUPPORT	Potential to meet objectives 1, 2	MSFC
10	Maintaining Ground Facilities	SUPPORT	Potential to meet objectives 1, 2	MSFC
11	Certifying Safety of Research Flight Systems	SUPPORT	Potential to meet objectives 1, 2	SSPO/MSFC
12	Mission Management and Allocation of Services	LEAD	Potential to meet objectives 1, 2	SSPO/MSFC
13	Integrating User Missions - Analytical	SUPPORT	Potential to meet objectives 1, 2	SSPO/MSFC
14	Integrating User Missions - Physical		*Not addressed*	
15	Integrating User Missions - Operations	SUPPORT	Potential to meet objectives 1, 2	MSFC
16	Selecting Research Crew		*Not addressed*	
17	Research, Analysis and Results Publication		*Not addressed*	
18	Educating and Reaching out to the Public	LEAD	Potential to meet objective 3	HQ/FC's
19	Recommending ISS System P3I Improvements	SUPPORT	Potential to meet objective 3	SSPO/MSFC
20	Archiving Research Samples, Data, and Results		*Not addressed*	

- **In all cases, the "LEAD" option applies to management of the function on the behalf of the user community, not necessarily performance.**
- **"SUPPORT" indicates support to NASA**
- **In cases where the NGO evolved from support to lead most aggressive case is shown**
- **Direct interfaces to performing International, NASA, or contract, organizations are essential**
- **Existing NASA organizations (e.g., SSPO, MSFC, KSC, HQ) would continue in current roles with responsibility for managing the vehicle side interface**
- **NGO role is limited to user side of the interface in all cases.**

MSFC Flight Projects

- MSFC participated fully in the study, searching for an integrated approach which would benefit NASA, the ISS Program, and the research/commercial community.
  - Considerable amounts of data was provided to the study team to support the development of an organizational structure and functional responsibilities for which a NGO would be well suited and compatible with the inherently governmental functions.
  - By the end of the study period, the team had met for one face-to-face working session. During this session the 20 functions were developed, but without:
    - Correlation of those functions to the detailed data provided by the Centers and RPOs
    - Resolution of an organizational structure for the NGO or the NGO's relationship to the governmental organizations
  - Subsequent discussions/work did not drive towards an integrated solution or concept

- MSFC FD believes the government must retain responsibility for significant functions:
  - Control of on-orbit ISS vehicle systems that support payload operations
  - Assuring International Partner commitments are met
  - Developing and qualifying multi-use payload support systems with direct interface to the ISS vehicle systems.
  - Involve ISS vehicle or payload safety and certification

- CSOC Agency-wide responsibilities should remain as currently planned (MCC & POIC systems, ground network, etc.)

MSFC Microgravity Research Program Office Functions - Rationale

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	SUPPORT	Potential to meet objectives 1, 2	
2	Preparing and Allocating Budgets	NO	Potential to meet objectives 1, 2	
3	Selecting and Prioritizing Research	NO	Potential to meet objectives 1, 2	
4	Establishing Experiment Requirements and Feasibility	NO	Potential to meet objectives 1, 2	
5	Developing and Qualifying Research Flight Systems	SUPPORT	Potential to meet objectives 1, 2	
6	Maintaining and Sustaining Research Flight Systems	SUPPORT	Potential to meet objectives 1, 2	
7	Developing Research Ground Systems	SUPPORT	Potential to meet objectives 1, 2	
8	Maintaining Research Ground Systems	SUPPORT	Potential to meet objectives 1, 2	
9	Constructing Ground Facilities	SUPPORT	Potential to meet objectives 1, 2	
10	Maintaining Ground Facilities	SUPPORT	Potential to meet objectives 1, 2	
11	Certifying Safety of Research Flight Systems	SUPPORT	Potential to meet objectives 1, 2	
12	Mission Management and Allocation of Services	LEAD	Potential to meet objectives 1, 2	
13	Integrating User Missions - Analytical	LEAD	Potential to meet objectives 1, 2	
14	Integrating User Missions - Physical	LEAD	Potential to meet objectives 1, 2	
15	Integrating User Missions - Operations	LEAD	Potential to meet objectives 1, 2	
16	Selecting Research Crew	SUPPORT	Potential to meet objectives 1, 2	
17	Research, Analysis and Results Publication	NO	Potential to meet objective 3	
18	Educating and Reaching out to the Public	LEAD	Potential to meet objective 3	
19	Recommending ISS System P3I Improvements	LEAD	Potential to meet objective 3	
20	Archiving Research Samples, Data, and Results	LEAD	Potential to meet objectives 1, 2	

- **In all cases, the "LEAD" option applies to management of the function on the behalf of the user community, not necessarily performance.**
- **"SUPPORT" indicates support to NASA**
- **In cases where the NGO evolved from support to lead most aggressive case is shown**
- **Direct interfaces to performing International, NASA, or contract, organizations are essential**
- **Existing NASA organizations (e.g., SSPO, MSFC, KSC, HQ) would continue in current roles with responsibility for managing the vehicle side interface**
- **NGO role is limited to user side of the interface in all cases.**

MSFC Microgravity Research Program Office (MRPO)

- The MRPO participated in the study to the extent that requested data was submitted.
- MRPO, in conjunction with the Flight Projects Directorate at Marshall, is proposing an alternate concept for an NGO which has been presented to Mssrs. Holloway, Nygren and Stephenson. We expect to present to Mr. Rothenberg within the next week or two for "official endorsement".

National Aeronautics and
Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

Reply to Attn of: DA01

DEC 1 1 2000

TO: NASA Headquarters
Attn: M/Joseph H. Rothenberg

FROM: DA01/A. G. Stephenson

SUBJECT: Action for "Evolution Options for Management of the ISS Utilization And Research Program"

The Marshall Space Flight Center (MSFC) input to the "Evolutionary Options for Management of the ISS Utilization and Research Program" is enclosed. MSFC Flight Projects Directorate and the Microgravity Research Program Office (RPO) products are included. This input meets the requested products for the NASA-internal study task team, led by Mark Uhran.

Based upon the process followed by the study team, the output from the team will be a compilation of separate inputs from NASA Centers and the RPO's. The team has not met to discuss or draw any conclusions from the integrated set of data. MSFC requests participation in the development of any study conclusions.

As you know, Marshall is in the process of developing a proposed Non-Governmental Organization (NGO) concept, which is intended to be the most beneficial NGO concept for NASA as a whole. This concept will address the objectives from the NASA-internal study team, as well as incorporating additional input from the Payload community. We are working with other NASA Centers and are also canvassing the science community. I intend to bring this proposed concept to you by the end of January 2001. Marshall's January 2001 report will represent this Center's official endorsement of a viable NGO model.

Thank you for the opportunity for Marshall to participate in the definition of an NGO for Space Station Utilization. I look forward to discussing our NGO model in late January.

A. G. Stephenson
Director

Enclosure

Mission Success Starts with Safety

cc:
DD01/C. Griner
DE01/S. Saucier
FD01/A. Roth
FD01/J. Davis
SD01/F. Rose
SD01/A. Whitaker
SD10/R. Henderson
HQ/U/K. Olsen (Acting)
HQ/UM/M. Uhran

Marshall Space Flight Center Concept for an ISS NGO

April 9, 2001

Outline

- Objective
- Approach/Strategy
- Solicited Inputs
- MSFC Concept
- NGO Transition
- Conclusions
- Backup

Objective

» Recommend a NASA strategy that would result in a successful transition from current ISS utilization and operations to an organizational approach which leverages privatization via an ISS research and commercialization non-government organization (NGO), which would:

- Assure research community inputs have been solicited and incorporated
- Maximize access to ISS for utilization
- Provide additional opportunities for NASA to leverage resources
- Attract commercial investment
- Efficiently enable the diverse outcome returns to the academic, government, and commercial research communities

Approach/Strategy

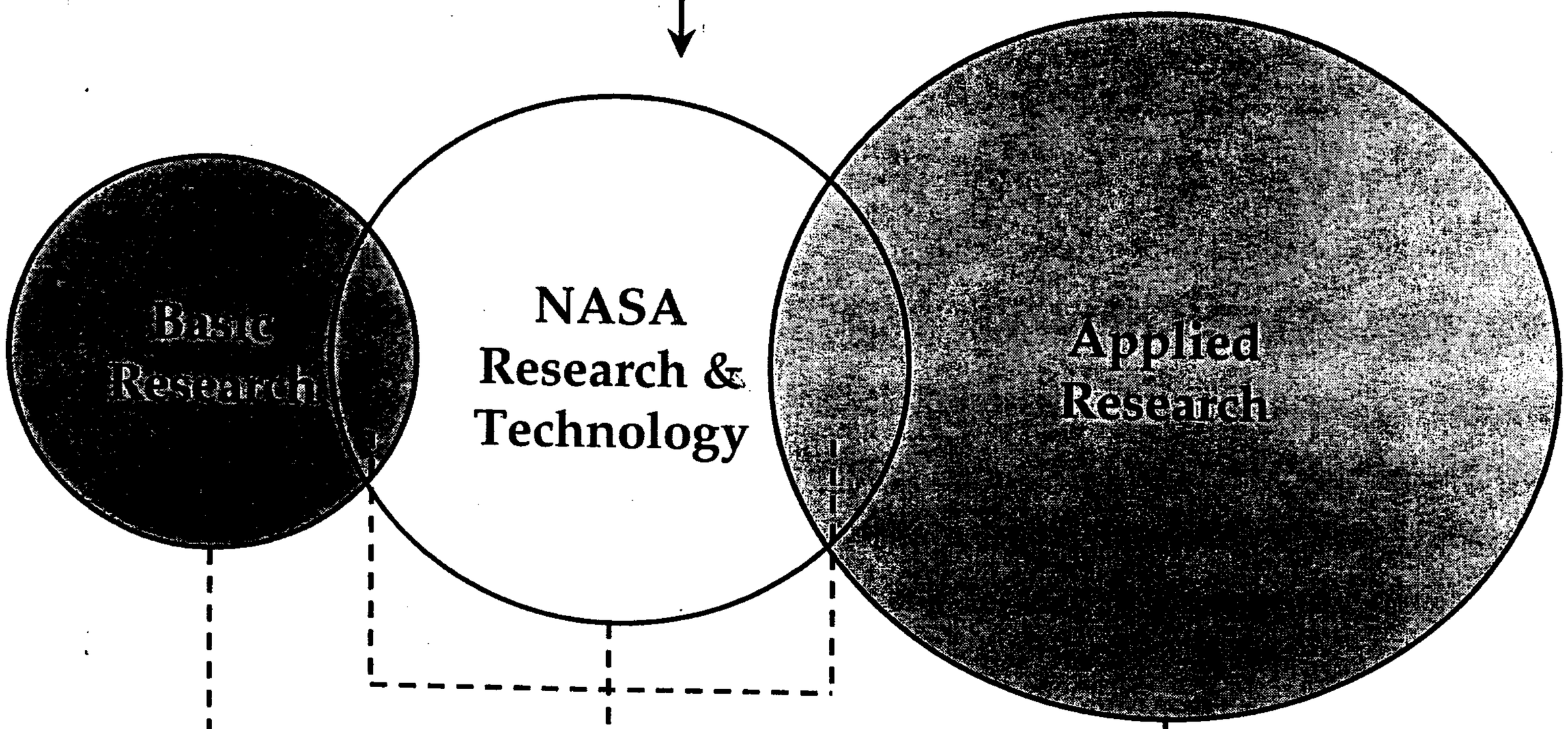
- Obtain additional inputs from the research community, investment community, other NASA centers, and Headquarters to incorporate into a coordinated concept for ISS research utilization and commercialization
- Evaluate and incorporate results of previous NGO studies, relevant "lessons learned" and related documents to capture key elements
- Define the role and nature of the NGO relative to ISS research utilization and commercialization, that responds to the research and investment community comments concerning complex processes, number of interfaces, cycle time, reliable access to space, and Agency commitment
- Define an orderly and effective approach for the transition of the ISS research utilization and commercialization management responsibilities from NASA to a NGO which continues to meet current mission requirements and maximizes the potential for success in accomplishing the NGO objectives

Solicited Inputs

- Microgravity scientists and payload developers
- 1999 Survey of users and scientists
- Presentation at NSSTC retreat
- NASA Chief Scientist
- ISS Chief Scientist
- KSC Space Station Hardware Integration Office
- JSC ISS Program Office
- NASA Headquarters, Code U
- Microgravity RPO Consultant
- Assistant to Director, National Institutes for Health
- Chandra Operations Center
- Space Telescope Science Institute
- National Space Biomedical Research Institute
- SpaceVest Inc.
- OBPR Physical Sciences Division

Research Context

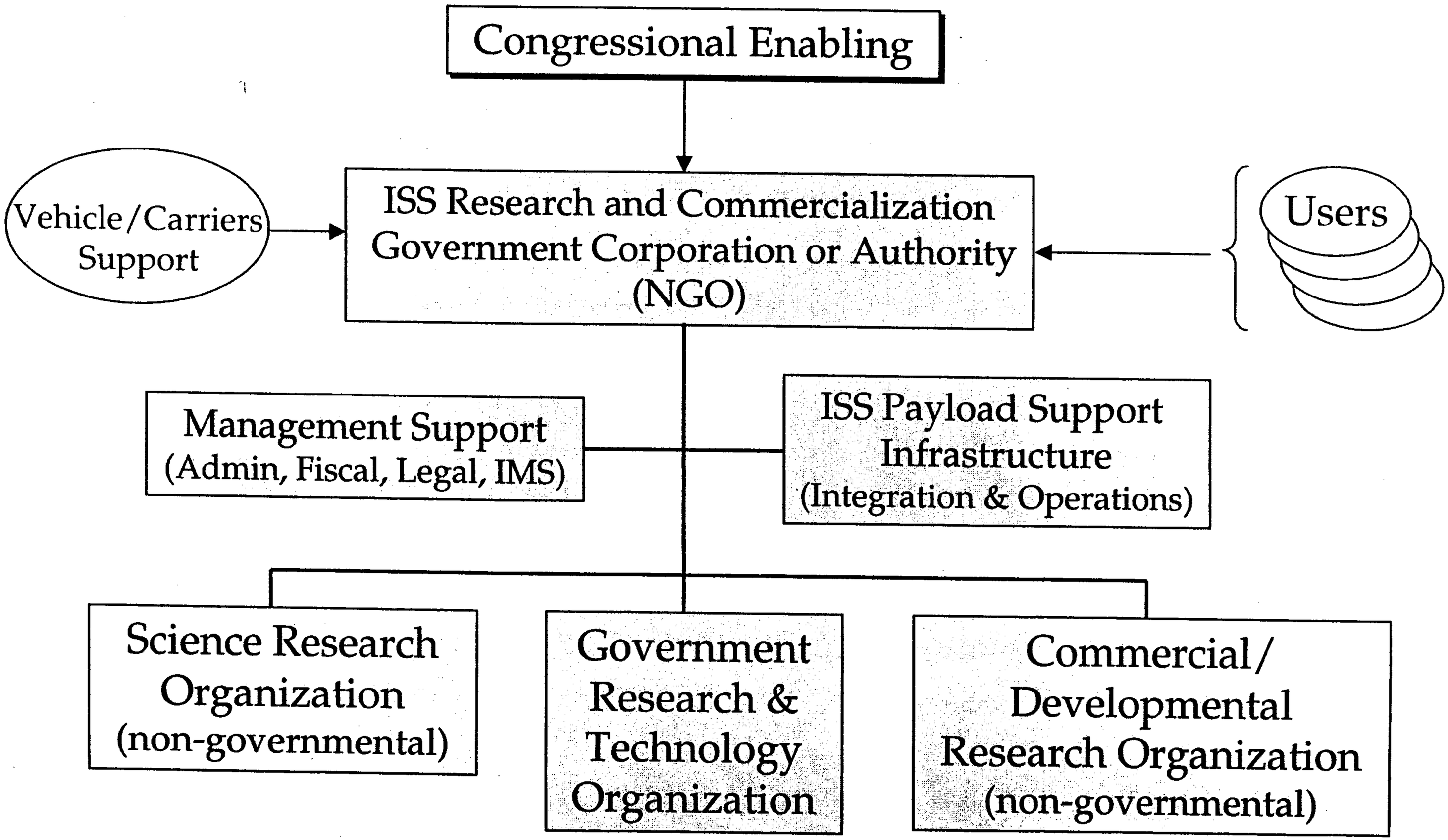
Sources:
NSF Science and Technology Indicators 2000
"Unlocking the Future," House of Representatives Science Committee, 1998



MSFC Concept

- Creates a "one-stop-shop" NGO in the form of a Government Corporation or Authority, outside of NASA, which incrementally assumes the ISS research utilization and commercialization management functions
- Creates high-level visibility and independence for ISS research utilization and commercialization management activities
- Establishes a "process-driven" organizational structure to accomplish the diverse nature of "best practices" in delivering academic, government, and commercial research
- Establishes a single NASA ISS research utilization and commercialization management organization to consolidate functions and manage the transition of functions to the NGO
- Establishes a 3-phase Transition approach: consolidation, privatization, and privatization/commercialization
- Allows the NGO to build upon established infrastructure to ensure safe and effective migration of ISS operations and utilization capabilities
- Provides capability for assumption/creation/deletion of contracts on an as-needed basis

NGO Organizational Model



Transition of Responsibilities

Consolidation Phase	Privatization Phase	Privatization/ Commercialization Phase
NASA Accountability		**NGO Accountability**
• Create NASA consolidation Office • Streamline/mature existing processes • Create NGO Charter and Governance • NGO defines core development team • NGO begins advocacy and outreach • NGO begins staffing • Incrementally establish NGO support functions • Consolidate existing support agreements	• NGO establishes agreements with research organizations • Streamline/mature processes • Incrementally establish NGO support services agreements and single customer interface • NGO establishes non-NASA interfaces and agreements • NASA begins to shift resource focus to "enabling" functions	• NASA becomes research customer • NGO maximizes commercialization activities • NGO establishes "best buy" support agreements • NGO establishes investment capital fund • NGO enables utilization of emerging technology • NGO contributes to National "knowledge & technology banks"

NASA continues ISS vehicle and carrier responsibilities

NGO Functions

- Government Corporation or Authority Functions:
  - » Customer Support Agreements
  - » Performance Outcome Delivery
  - » Safety and Intellectual Property
  - » Manifest & Schedule
  - » Strategic Planning & Management
  - » Cross-functional Research Support Teams Leaders
  - » Capital Investment
  - » Education & Outreach
- ISS Payload Support Infrastructure Functions:
  - » Integrated Payload Manifesting
  - » Payload Safety
  - » Payload Engineering & Integration
  - » Payload Support Flight Systems Development
  - » Integrated Payload Training
  - » Integrated Payload Operations
  - » Integrated Payload Ground Systems Requirements
  - » Data Distribution

NGO Functions (cont.)

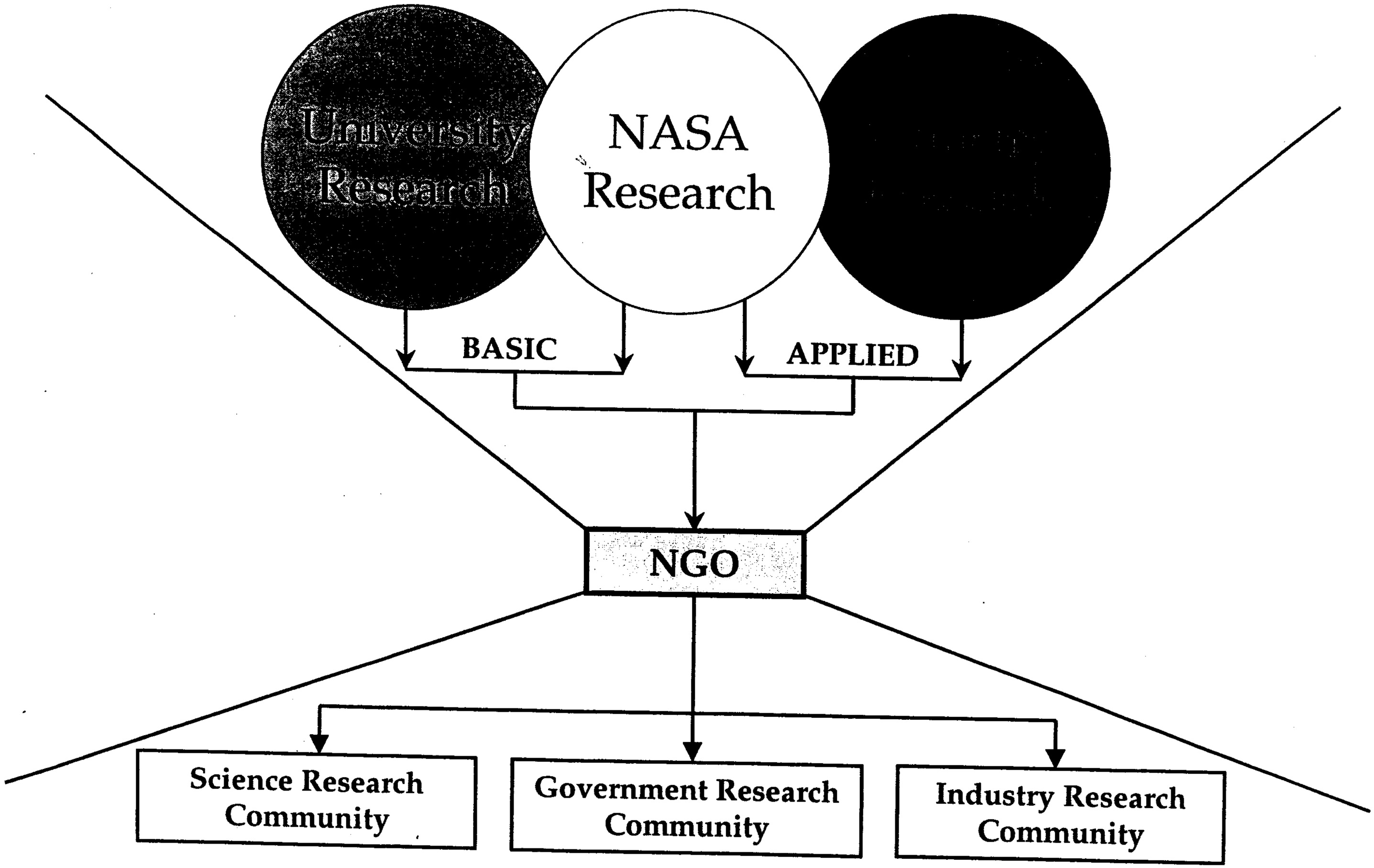
- Management Support:
  - » Administrative
  - » Business/Fiscal
  - » Legal
  - » Information Management (including Data Archiving)
- Research Organizations (Science, Government R&T, Commercial/Developmental):
  - » Customer fulfillment and execution
  - » Experiment Design, Development & Operations (as required)
  - » Experiment Support to Physical & Analytical Integration
  - » Compliance & Compatibility
  - » Facilities (Ground & Flight)
  - » Experiment Training (as required)
  - » Schedule/Budget/Process Commitment
  - » Cross-functional Research Team Members

Conclusions

Concept incorporates key aspects of previous NGO approaches and:

- Assures research and investment community inputs have been solicited and incorporated
- Incorporates lessons learned from the STSCI, SFOC, Chandra and CSOC activities with respect to the implementation approaches and the desired outcomes.
- Establishes a single NASA ISS utilization transition organization to consolidate ISS research utilization and manage the transition to the NGO.
- Creates a NGO in the form of a Government Corporation or Authority outside of NASA as the "one stop shop" which can incrementally assume ISS research utilization and commercialization management functions through flexible and performance outcome driven agreements
- Ensures National stewardship of ISS assets and effectively executes the inherently governmental responsibilities.
- Incorporates the organizational capability to implement the appropriate "best practices" processes offered by one of the three diverse contract research operating agents: (1)Academic (non governmental), (2) Governmental, and (3) Industry (non governmental)
- Highlights the Agency's commitment to promoting research and creation of marketplace investment opportunities in space-based activities.

ISS Research Context



Background Charts

Team Members

- Jan Davis; team leader

- Irene Taylor; lead, Flight Projects Directorate
  - » Tom Inman
  - » Paul Gilbert
  - » Mike Kearney
  - » Teresa Vanhooser
  - » Ann McNair

- Ann Whitaker; lead, Science Directorate
  - » Robin Henderson, Microgravity RPO
  - » Joe Casas
  - » Ann Trausch
  - » Bill Ramage
  - » Todd Mullins
  - » Dorothy Hubbard
  - » Blair Herren

General Responses from PL Community

- Inconsistent funding and contract management
- Too many interfaces (and different answers from JSC and MSFC)
- Same process for complex or simple payloads
- Too many reviews and too much documentation required
- Too many turf battles within NASA; thus the government is unwilling to change its processes
- Different processes/procedures for different carriers
- Template for payload integration is too long
- Reflight process (if not initially approved) is cumbersome

TOP 20 COMMON FUNCTIONS of the UTILIZATION AND RESEARCH PROGRAM
for the INTERNATIONAL SPACE STATION

Marshall Space Flight Center Flight Projects Input

Nov 27, 2000

	FY-2000 Current Baseline	FY-2005 Assembly Complete	FY-2010 Evolution Option	FY-2020 End-State Option*
2. Preparing and Allocating Budgets	FC CR	FC CR	FC CR	NHQ NGO
5. Developing and Qualifying Research Flight Systems (non-recurring)	FC CR	FC CR	FC CR/NGO	NGO CR
6. Maintaining and Sustaining Research Flight Systems (recurring)	FC CR	FC CR/NGO	NGO CR	NGO CR
7. Developing and Qualifying Research Ground Systems (non-recurring)	FC CR	FC CR/NGO	FC CR/NGO	NGO CR
8. Maintaining and Sustaining Ground Systems (recurring)	FC CR	FC CR	NGO [CSOC]	NGO [CSOC]
9. Constructing Ground Facilities (CoF) (non-recurring)	FC CR	FC CR/NGO	FC CR/NGO	NGO CR
10. Constructing Ground Facilities (CoF) (recurring)	FC CR	FC CR/NGO	FC CR/NGO	NGO CR
11. Certifying Safety of Research Flight Systems and Components	FC CR/PI	FC CR/PI	FC NGO/CR/PI	NGO CR/PI
12. Tactical Planning & Scheduling of Research Operations	FC CR/PI	FC CR/PI	NGO CR/PI	NGO CR/PI
13. Integrating User Missions - Analytical	FC CR/PI	FC CR/PI	FC NGO/CR/PI	NGO CR/PI
15. Integrating User Missions - Operations	FC CR/PI	FC NGO/CR/PI	FC NGO/CR/PI	NGO CR/PI
18. Educating and Reaching Out to the Public	FC CR/NGO/PI	FC CR/NGO/PI	NGO CR/PI	NGO CR/PI
19. Recommending ISS System Pre-Planned Product Improvements (P3I)	FC CR	FC CR	FC CR/NGO	NGO PI/CR

* = End-State Option assumes NASA has determined that ISS is at end of life & will be deorbited unless barter/sell arrangement has been made with NGO .

KEY

NHQ: NASA Headquarters
FC: Field Centers/Disc.Offices/RPOs/CSCs
PI: Principal Investigators
CR: Support Contractors
NGO: Non-Government Organization

Responsibility
Support

Enclosure

MSFC Flight Projects
Transition Criteria and Rationale

Function #	Function Description/Transition Criteria/Rationale
2	**Preparing and Allocating Budgets** Description: Suballocate funds to EXPRESS Projects, POIF, and POIC Systems contractors Transition Criteria: Dependent upon funding path to NGO. MSFC Flight Projects currently performs this function as a delegated responsibility from ISSPO. Rationale: For the functions with NGO as primary responsibility (ref.: Score card), the NGO should have control of suballocation of the budget associated with that function, concurrent with the transition timing. For functions that remain as Field Center primary responsibility, the associated budget control should remain with Civil Service.
5	**Developing and Qualifying Research Flight Systems (non-recurring)** Description: Develop and qualify multi-use payload support hardware (EXPRESS Rack derivatives, EXPRESS Pallet) support their on-orbit installation, checkout, calibration, and initial operation Transition Criteria: Primary responsibility for new development of Flight Systems is retained by the Field Center. [EXPRESS Pallet is being developed by Brazil.] Rationale: Multi-use payload support systems have direct interface to ISS vehicle hardware and software control systems in U.S. and International Partner modules, and will complete development by early FY02.
6	**Maintaining/Sustaining Research Flight Systems (recurring)** Description: Perform maintenance and sustaining engineering of multi-use payload support systems (EXPRESS Projects) Transition Criteria: The logistics and support activities for EXPRESS Racks have already been imbedded into the existing ISS vehicle plans. Therefore the activity would best be transitioned into the ISS Payload Integration function (whether that function is performed by NASA or the NGO). Rationale: The ISS Depot function can consolidate the EXPRESS Rack Systems logistics support. [Brazil will perform sustaining engineering of the EXPRESS Pallet].
7	**Developing and Qualifying Research Ground Systems (non-recurring)** Description: Define requirements, design, build, test, and verify POIC ground systems. Develop and implement next-generation ground systems architecture. Transition Criteria: The Field Center retains primary responsibility for the multi-project ground systems. Rationale: The POIC ground systems are based upon multi-project systems architecture.
8	**Maintaining and Sustaining Research Ground Systems (recurring)** Description: Monitor operation and performance of ground systems. Perform scheduled maintenance of ground systems. Implement upgrades of ground systems, within the current system architecture. Transition Criteria: Following completion of operational check-out period for completed ground systems capability, the CSOC is planned to perform this function. Rationale: CSOC should maintain the POIC system and ground network interfaces consistent with other NASA ground systems supporting ISS (such as MCC).
9	**CoF (Constructing Ground Facilities) (non-recurring)** Description: Design, development and fabrication of ground facilities. Integrate system with existing infrastructure. Transition Criteria: Field Center retains primary responsibility of onsite facility construction. Rationale: No new construction of facilities planned for MSFC Flight Projects ISS functions.

10 **CoF (Sustain/Maintain Ground Facilities) (recurring)**
Description: Monitor operation and performance of ground facilities. Perform scheduled maintenance of ground facilities.
Transition Criteria: Field Center retains primary responsibility of onsite facility building maintenance for POIF functions.
Rationale: This facility supports multiple projects, not dedicated to ISS.

11 **Certifying Safety**
Description: Certify that Flight Hardware is safe for shipment, integration, launch, and on-orbit activities. Provide operations integration payload safety support and realtime safety assurance of payloads operational control.
Transition Criteria: Primary responsibility for certification of safety will remain with the Field Center.
Rationale: NGO can perform multiple support functions including development of hazard analyses, participation in safety review panels, and operational safety assurance.

12 **Tactical Planning and Scheduling of Research Operations**
Description: Develop planning and scheduling of multi-lateral payload resource utilization of on-orbit and ground resources. Perform assessments to support payload manifesting.
Transition Criteria: Demonstrate detailed knowledge of on-orbit payload systems and interfaces, resources and scheduling constraints, and performance of planning analyses to support manifesting assessments.
Rationale: NGO can perform these functions, consistent with the knowledge/expertise necessary for transition of realtime operations.

13 **Integrating User Missions-Analytical**
Description: Develop and Maintain Integration Documentation. Conduct EXPRESS Rack and EXPRESS Pallet Payload Developer and integrated compliment analytical integration processes. Conduct EXPRESS Rack/Pallet Systems Payload Verification processes. Support the CoFR process.
Transition Criteria: The EXPRESS Rack analytical integration function should be transitioned into the ISS Payload Integration function.
Rationale: The interfaces for deliverables and coordination would be reduced if this function transitions into the ISS Payload Integration function.

15 **Integrating User Missions - Operational**
Description: Develop Integrated Mission Payload Timelines and associated products. Execute Integrated Mission Multi-lateral Payload Timelines; make and coordinate real-time Timeline changes
Transition Criteria: Demonstrate ability to develop and integrate pre-mission products consistent with operational capabilities, resources, and procedures. Demonstrate thorough understanding of console operations and certify flight readiness of cadre to perform the duties of each console position (except Payload Operations Director).
Rationale: POD remains Civil Service due to International Partner agreements, and retains primary responsibility for control of on-orbit ISS vehicle systems that support payload operations. NGO can perform remainder of functions after demonstration of capabilities, with transition timed to allow maturity of the processes and on non-interference basis with on-going support to payloads.

18 **Educating and Reaching Out to the Public**

Description: Generate educational and outreach materials including websites, brochures, papers, and presentations. Plan and coordinate media relations and public awareness activities.

Transition Criteria: Demonstrate understanding of goals and values that drive the education and outreach objectives. Demonstrate ability to plan, coordinate, and produce materials for electronic and print media to service the general public resource needs.

Rationale: NGO can begin planning and performing in this function at time of contract award. Primary responsibility can transition in the post-assembly phase, when the primary objective of ISS is to conduct research.

19 **Recommending ISS System Pre-Planned Product Improvement Upgrades**

Description: Make recommendations on how to improve ISS productivity through upgrades, changes, or additions to the ISS spacecraft systems

Transition Criteria: Field Center retains primary responsibility for recommending upgrades to ISS systems. NGO can provide support and recommendations concerning possible upgrades.

Rationale: Funding concerns and conflict-of-interest issues may be avoided.

TOP 20 COMMON FUNCTIONS of the UTILIZATION AND RESEARCH PROGRAM for the INTERNATIONAL SPACE STATION

MRPO INPUT November 27, 2000

	FY-2000 Current Baseline	FY-2005 Assembly Complete	FY-2010 Evolution Option	FY-2020 End-State Option
1. Defining and Implementing Policy and Strategic Plans	NHQ RPO/FC	NHQ RPO/FC/NGO	NHQ RPO/FC/NGO	NHQ RPO/FC/NGO
2. Preparing and Allocating Budgets	RPO FC	RPO FC	RPO FC/NGO	RPO FC/NGO
3. Selecting and Prioritizing Research	NHQ RPO/FC	NHQ RPO/FC	NHQ RPO/FC	NHQ RPO/FC
4. Establishing Experiment Requirements & Feasibility	FC PIs	FC PIs	FC PIs	FC PIs
5. Developing and Qualifying Research Flight Systems (non-recurring)	FC CR	FC CR/NGO	FC CR/NGO	FC CR/NGO
6. Maintaining and Sustaining Research Flight Systems (recurring)	FC CR	FC CR/NGO	FC CR/NGO	FC CR/NGO
7. Developing and Qualifying Research Ground Systems (non-recurring)	FC CR	FC CR/NGO	FC CR/NGO	FC CR/NGO
8. Maintaining and Sustaining Ground Systems (recurring)	FC CR	FC CR/NGO	FC CR/NGO	FC CR/NGO
9. Constructing Ground Facilities (CoF) (non-recurring)	FC CR	FC CR/NGO	FC CR/NGO	FC CR/NGO
10. Constructing Ground Facilities (CoF) (recurring)	FC CR	FC CR/NGO	FC CR/NGO	FC CR/NGO
11. Certifying Safety of Research Flight Systems and Components	FC CR/PIs	FC NGO/CR/PIs	FC NGO/CR/PIs	FC NGO/CR/PIs
12. Tactical Planning & Scheduling of Research Operations	RPO FC/CR	RPO NGO/FC/CR	[illegible] RPO/FC/CR	[illegible] RPO/FC/CR
13. Integrating User Missions - Analytical	FC CR/PIs	FC NGO/CR/PIs	[illegible] FC/CR/PIs	[illegible] FC/CR/PIs
14. Integrating User Missions - Physical	FC CR/PIs	FC NGO/CR/PIs	[illegible] FC/CR/PIs	[illegible] FC/CR/PIs
15. Integrating User Missions - Operations	FC CR/PIs	FC NGO/CR/PIs	[illegible] FC/CR/PIs	[illegible] FC/CR/PIs
16. Selecting Research Crew	NHQ NHQ	NHQ NGO/FC/PIs	NHQ NGO/FC/PIs	NHQ NGO/FC/PIs
17. Conducting Research, Analyzing Data, and Publishing Results	PI FC	PI FC	PI FC	PI FC
18. Educating and Reaching Out to the Public	RPO FC/CR/PIs	RPO NGO/FC/CR/PIs	[illegible] RPO/FC/CR/PIs	[illegible] RPO/FC/CR/PIs
19. Recommending ISS System Pre-Planned Product Improvements (P31)	FC RPO/PIs	FC RPO/PIs/NGO	[illegible] RPO/FC/PIs	[illegible] RPO/FC/PIs
20. Archiving Research Samples, Data, and Results	RPO FC/CR/PIs	[illegible] FC/CR/PIs	[illegible] FC/CR/PIs	[illegible] FC/CR/PIs

KEY

NHQ: NASA Headquarters
RPO: Research Program Office
FC: Field Centers/CSCs
PI: Principal Investigators
CR: Support Contractors
NGO: Non-Government Organization

Support Role
Support

Top 20 Co[illegible]nctions
Utilization and Research Progra[illegible]ternational Space Station R&D Program
[illegible]nctions

NASA NGO Objectives

1. To facilitate the pursuit of flight research and make the complex operating environment associated with the International Space Station transparent to the end-user
2. To reduce the end-to-end cycle time associated with the announcement, selection, development, flight, and achievement of results for research and development endeavors on the International Space Station.
3. To increase the long-range productivity of research and development by most effectively integrating and advocating government and industry utilization of the International Space Station.

	TASK DESCRIPTION	Could NGO perform *lead* function?	Could NGO perform *support* function?	IF YES, RATIONALE FOR TRANSITIONING TO NGO (Include NGO Objective Number 1,2,or 3)	IF NO, RATIONALE FOR NOT TRANSITIONING TO NGO	IF YES, TRANSITION CRITERIA
1.	**Defining and Implementing Policy and Strategic Plans** (ISSLSWG, IMSPG)				Policy decisions are inherently government and cross-carrier. Development of policy and strategic plans are inherently and directly related to budget formulation and allocation of funds; thus, an activity which would present a conflict of interest to an NGO.	
	Includes Research Discipline Priorities/Integrated Road Map	No	No		ISS decisions must be balanced across multiple carriers.	
	Determine Enterprise position on utilization of ISS for research	No	No		ISS decisions must be balanced across multiple carriers.	
	Establish long term plans for ISS utilization including allocations, solicitation strategies	No	Yes	GOAL 1. Integration support role by providing projections for resources and requirements.		
	Member of the Space Station Utilization Board (SSUB) & associated Working Groups (NGO role would be as executive secretary/support contractor.)		Yes	GOAL 1. NGO could only be an ad hoc or non-voting member of the SSUB.		
2.	**Preparing & Allocating Budgets**					
	Administering Funds	No	No		Funds administration is an inherently government function. NGO can serve as a bookkeeper only; it cannot administer Government funds.	
	Advocate appropriations for Microgravity Research programs which may include ISS payloads to OMB, Congress, staffers, etc.	No	No		Could conflict with Agency level funding priorities and adversely effect other non-ISS NASA programs.	
	Sub-allocate funds to payload programs and projects	No	No		Funds administration is an inherently government function. NGO can serve as a bookkeeper only; it cannot administer Government funds.	
3.	**Selecting and Prioritizing Research**				Policy decisions are inherently government. Selecting and prioritizing research is inherently and directly related to budget formulation and allocation of funds; thus, an activity which would present a conflict of interest to an NGO.	
	Generate NRA & AO in line with Program budgets and schedules	No	No		NRAs and AOs are not carrier dependent.	
	Oversee and conduct science peer reviews of NRA & AO proposals		No		Not carrier dependent.	
	Oversee and conduct Technical, Cost, Management, and Other (TMCO) reviews of NRA & AO proposals	No	No		Not carrier dependent.	
	Recommend program selections to the OLMSA AA	No	No		Not carrier dependent.	
	Select program missions (may or may not include ISS payloads)	No	No		Not carrier dependent.	
4.	**Establishing Experiment Requirements & Feasibility**				Requirements definition is an inherently governmental function. Government involvement in these types of activities is a critical enabler to maintain core capabilities (skills, tools, facilities) that will enable future NASA missions and technology efforts.	
	Conduct Phase A and sufficient Phase B development to define experiment functional/operational requirements	No	No		Not carrier dependent. Activities are funded from non-ISS source. To ensure a seemless transition to Phase B and beyond, function should continue to be performed by field centers working with PIs.	
	Establish science feasibility	No	No		Not carrier dependent. Activities are funded from non-ISS source.	
	Conduct experiment design, definition and documentation to prepare for and request authority to proceed to implementation	No	No		Not carrier dependent. Activities are funded from non-ISS source.	

	RIPTION	Could NGO perform *lead* function?	Could NGO perform *support* function?	IF YES, TIONALE FOR SITIONING TO NGO (Include NGO Objective Number 1,2,or 3)	IF NO, RATIONALE FOR NOT TRANSITIONING TO NGO	IF Y TRANSITIO
	Grant authority to proceed to the implementation phase	No	No		Not carrier dependent. Activities are funded from non-ISS source.	
5.	**Developing and Qualifying Research Flight Systems (non-recurring)**					
	Develop and qualify facility class research hardware and the subrack payloads for the initial operational capability of ISS and support their on-orbit installation, checkout, calibration, and initial operation	No	Yes	GOAL 1. Maintaining ISS facility requirements and projections for resources and making available to developers.	Expertise developed during non-ISS funded definition activities must maintain lead to ensure successful implementation. Government involvement in these types of activities is a critical enabler to maintain core capabilities that will enable future NASA missions and technology efforts.	
6.	**Maintaining/Sustaining Research Flight Systems (recurring)**					
	Develop and qualify upgrades to facility class research hardware	No	Yes, Starting at Assembly complete	GOAL 1. Maintaining ISS facility requirements and projections for resources and making available to developers.	Expertise developed during non-ISS funded definition activities must maintain lead to ensure successful implementation.	Demonstrated skills, facilities and processes
	Perform maintenance, and sustaining engineering of facility class research hardware	No	Yes, Starting at Assembly complete	GOAL 1. Maintaining ISS facility requirements and projections for resources and making available to developers.	Expertise developed during non-ISS funded definition activities must maintain lead to ensure successful implementation.	Demonstrated skills, facilities and processes
	Develop and qualify facility class research hardware post initial operational capability of ISS and support their on-orbit installation, checkout, calibration, and initial operation	No	Yes, Starting at Assembly complete	GOAL 1. Maintaining ISS facility requirements and projections for resources and making available to developers.	Expertise developed during non-ISS funded definition activities must maintain lead to ensure successful implementation.	Demonstrated skills, facilities and processes
	Develop, qualify, maintain, and upgrade subrack payloads to meet the requirements of individual or groups of Pis	No	Yes, Starting at Assembly complete	GOAL 1. Maintaining ISS facility requirements and projections for resources and making available to developers.	Expertise developed during non-ISS funded definition activities must maintain lead to ensure successful implementation.	Demonstrated skills, facilities and processes
7.	**Developing and Qualifying Research Ground Systems (non-recurring)**	No	Yes		NASA management investment decision which can meet both current and future Agency needs. It is not appropriate for an NGO to lead this activity, but one could perform some supporting roles.	
	Define requirements for permanent ground systems	No	Yes	GOAL 1 & 2. Make projections for ISS resources available to developers.		While requirements definition is an inherently government function, upon demonstration of technical expertise in telescience centers, an NGO could assist NASA and its qualified contractors in this role.
	Develop preliminary design for ground systems	No	Yes	GOAL 1 & 2. Yes, but hardware design, fabrication, and test is best performed by the Centers and contractors with this expertise.		
	Perform final design and fabrication of ground systems	No	Yes	GOAL 1 & 2. Yes, but hardware design, fabrication, and test is best performed by the Centers and contractors with this expertise.		
	Test, verify, and deliver the operational system	No	Yes	GOAL 1 & 2. Yes, but hardware design, fabrication, and test is best performed by the Centers and contractors with this expertise.		
	Integrate system with existing infrastructure	No	Yes	GOAL 1 & 2. Yes, but existing infrastructure is managed by Centers who can best ensure integration is seemless.		
8.	**Maintaining and Sustaining Research Ground Systems (recurring)**	No	Yes		It is not appropriate for an NGO to lead this activity, but one could perform some supporting roles.	
	Monitor operation and performance of ground systems	No	Yes	GOAL 1 & 2.		With proper training and supervision, an NGO could provide operations monitoring
	Provide reporting on performance of ground systems	No	Yes	GOAL 1 & 2		With proper training and supervision, an NGO could provide operations performance reporting
	Perform scheduled maintenance of ground systems	No	Yes	Yes, but hardware maintenance and upgrade is best performed by the Centers and contractors with this expertise.		

	RIPTION	Could NGO perform *lead* function?	Could NGO perform *support* function?	IF YES, TIONALE FOR ITIONING TO NGO (Include NGO Objective Number 1,2,or 3)	IF NO, RATIONALE FOR NOT TRANSITIONING TO NGO	IF Y TRANSITIO
	Develop and implement upgrades of ground systems	No	Yes	Yes, but hardware maintenance and upgrade is best performed by the Centers and contractors with this expertise.		
9.	**CoF (Constructing Ground Facilities) (non-recurring)**	No	Yes		NASA management investment decision which can meet both current and future Agency needs. It is not appropriate for an NGO to lead this activity, but one could perform some supporting roles.	
	Define requirements for permanent ground facilities	No	Yes, in part	GOAL 2.		While requirements definition is an inherently government function, upon demonstration of technical expertise in requirements on ground facilities, an NGO could assist NASA and its qualified contractors in this role.
	Develop preliminary design for ground facilities	No	Yes	Yes, but design, fabrication, and test is best performed by the Centers and contractors with this expertise.		
	Perform final design and fabrication of ground facilities	No	Yes	Yes, but design, fabrication, and test is best performed by the Centers and contractors with this expertise.		
	Integrate system with existing infrastructure	No	Yes	Yes, but existing infrastructure is managed by Centers who can best ensure integration is seemless.		
10.	**CoF (Sustain/Maintain Ground Facilities) (recurring)**	No	Yes		It is not appropriate for an NGO to lead this activity, but one could perform some supporting roles.	
	Monitor operation and performance of ground facilities	No	Yes	GOAL 2.		NGO, with proper training and supervision, could provide facilities monitoring
	Provide reporting on performance of ground facilities	No	Yes	GOAL 2.		Upon familiarity with the facilities, NGO could assist in reporting
	Perform scheduled maintenance of ground facilities	No	Yes	Yes, but hardware maintenance and upgrade is best performed by the Centers and contractors with this expertise.		
	Develop and implement upgrades of ground facilities	No	Yes	Yes, but hardware maintenance and upgrade is best performed by the Centers and contractors with this expertise.		
11.	**Certifying Safety**					
	Safety Packages Preparation	No	Yes	Best performed by hardware developers. NGO could provide a supporting role.		
	Payload Safety Reviews	No	No		Best performed by hardware developers.	
	Integrated Payload Safety Reviews	No	Yes	GOAL 1. One stop shopping facilitates process.		
	Hazard Verification, submittal, Review, Closure, and Tracking	No	No		Best performed by hardware developers.	
	Certify that Flight Hardware is safe for shipment, integration, launch, and on-orbit activities	No	No		There is a need for a NASA review panel to assess this work.	
12.	**Tactical Planning and Scheduling of Research Operations**					
	Baseline research on a given increment	No			Science content is an inherently government function.	
	Allocate resources on a flight, stage, or increment basis	No				
	Develop and maintain a planning database that includes PI resource requirements and resource allocations	Yes, by 2010	Yes	GOAL 1 & 3. One stop shopping facilitates process.		Sufficient, Adequate Staffing
	Perform assessment and analysis to support payload manifesting	Yes, by 2010	Yes	GOAL 1 & 3. One stop shopping facilitates process.		Processes and Templates Defined and Documented
	Represent Payloads to ISS Research Planning Working Group (RPWG)	No	Yes	GOAL 1 & 3. One stop shopping facilitates process.		Demonstrate Proficiency of Roles and Responsibilities
	Develop and maintain an integrated traffic model	Yes, by 2010	Yes	GOAL 1 & 3. One stop shopping facilitates process.		Received Certification of Readiness by NGO Implementation Board
13.	**Integrating User Missions-Analytical**	Yes, by 2010		GOAL 1 & 3. Does not require NASA program management decisions. One stop shopping facilitates process.		

	RIPTION	Could NGO perform *lead* function?	Could NGO perform *support* function?	IF YES, TIONALE FOR ITIONING TO NGO (Include NGO Objective Number 1,2,or 3),	IF NO, RATIONALE FOR NOT TRANSITIONING TO NGO	IF Y TRANSITIO
	Develop and Maintain Integration Documentation		Yes			Sufficient, Adequate Staffing
	Support Payload Developers		Yes			Processes and Templates Defined and Documented
	Systems Payload Verification Process		Yes			Software and Tools Developed and Operational
	Support the CoFR Process		Yes			
14.	**Integrating User Missions - Physical**	Yes, by 2010		GOAL 1 & 3. Does not require NASA program management decisions. One stop shopping facilitates process.		
	Support Payload to Rack, Rack to Module Utilization		Yes			
	Integrated Testing		Yes			
	Integrated Verification Process		Yes			
15.	**Integrating User Missions - Operational**	Yes, by 2010	Yes	GOAL 1 & 3. Does not require NASA program management decisions. One stop shopping facilitates process.		Transition by 2010 when NGO has been brought up to speed by working with FC
	Develop Integrated Mission Payload Timelines and associated products					
	Execute Integrated Mission Payload Timelines; make and coordinate real-time Timeline changes					
16.	**Selecting Research Crew**					
	Making Payload Specialist (PS) Recommendations	No	Yes			
	Approving Research Crew Selections	No	No		Inherently government function. Selection of flight crew personnel involves many factors including safety of crew and of a national resource. Decision t fly non-NASA personnel requires a NASA program management decision.	
17.	**Conducting Research, Analyzing Data, Publishing Results**	No	No		Responsibility of the PI. NGO does not have technical expertise to make PI conclusions or interpret science data. PI's do the research, etc.	
	Process science and engineering data for analysis					
	Analyze data					
	Publish Results					
18.	**Educating and Reaching Out to the Public**	Yes, by 2010	Yes			
	Generate outreach materials including websites, brochures, papers, and presentations		Yes	NGO could best procure necessary skills.		
	Plan and coordinate media relations and public awareness activities		Yes	NGO could best procure necessary skills.		
	Communicate the significance of research results to the public		Yes	NGO could best procure necessary skills.		
	Manage the website development and maintenance		Yes	NGO could best procure necessary skills.		
	Oversee the development & maintenance of educational and outreach reference material		Yes	NGO could best procure necessary skills.		
19.	**Recommending ISS System Pre-Planned Product Improvement Upgrades**					
	Make recommendations on how to improve ISS productivity through upgrades, changes, or additions to the ISS spacecraft systems	Yes	Yes	GOAL 3. NGO can perform integrating function for this activity. One stop shopping.		
20.	**Archiving Research Samples/Data/Results**	Yes	Yes	GOAL 3. NGO could lead this function supported by the field centers.		
	Develop and Implement science data archiving system	Yes				
	Archive and maintain data for historical and reprocessing purposes	Yes				

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To: "'muhran@hq.nasa.gov'" <muhran@hq.nasa.gov>
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"Mullins, Todd" <todd.mullins@msfc.nasa.gov>,
"Ramage, William" <william.ramage@msfc.nasa.gov>
Subject: Revised Cost Roll-Ups
Date: Thu, 30 Nov 2000 13:40:11 -0600
MIME-Version: 1.0

Mark, you had asked us to review your summary of the MRPO ISS cost numbers provided to you back during the summer. During our review, we found that the budget figures did not match our POP funding marks. We have now corrected the numbers and rolled those up for the summary that you needed. Please use the attached as the "official" corrected cost data for the MRPO ISS input.

Also, MRPO has provided Irene Taylor our input to the NGO/Internal NASA Team effort. This is being coupled to the MSFC Flight Projects input and given to Art to be signed out under a single cover letter from the Center. I do know that Art was reviewing it today while at KSC so you should have an input from the Center shortly.

> <<10.6.R-Total Functions-Uhran.xls>>

Attachment converted: Macintosh HD:10.6.R-Total Functions-Uhran.xl (XLS4/XCEL) (2096A31C)

Functions Associated with International Space Station R&D Program

(Research Program Office Worksheet)

MRPO Level II — **ISS/MICROGRAVITY**

	FY01	FY02	FY03	FY04	FY05
Total C/S W/F	416.6	432.7	436.5	447.4	443.1
Total C/S $	50.378	60.671	76.007	73.916	75.673
Total Contractor W/F	394.0	483.0	617.0	634.0	579.0
Total Contractor $	135.437	130.632	156.353	172.790	168.152

SUBTOTALS — **PROGRAM LEVEL MANAGEMENT AND INTEGRATION**

	FY01	FY02	FY03	FY04	FY05
Total C/S W/F	18	19	20	20	20
Total C/S $	0.958	1.131	1.286	1.435	1.035
Total Contractor W/F	27	27	27	27	27
Total Contractor $	3.070	3.088	3.110	3.138	3.160
Total MRPO	4.028	4.219	4.396	4.573	4.195

A — PROGRAM LEVEL MANAGEMENT AND INTEGRATION

TASK DESCRIPTION

1. **System Integration**
   - (a) Develop and implement MRPO CM Procedure for ISS controlled Documentation and Change Evaluation OWI
   - (b) Perform Level 2 configuration management for MRPO inputs to ISS
   - (c) Consolidate technical evaluations for Space Station Change Requests (CRs), Payload Interface Revision Notices (PIRNs), action items, and provide feedback to implementing Centers and SPD

	FY01	FY02	FY03	FY04	FY05
CS W/F	4	4	4	4	4
CS $	0.958	1.131	1.286	1.435	1.035

2. **Payload Planning & Manifesting**
   - (a) Act as the MRPO single-point-of-contact with the ISS Research Planning Working Group (RPWG), being a strong advocate for MRPO Research.
   - (b) Support the development of the ISS RPWG manifest planning process
   - (c) Develop, document, and implement an MRPO manifest planning process
   - (d) Develop MRPO strategic and tactical manifesting inputs to HQ and JSC

	FY01	FY02	FY03	FY04	FY05
C/S W/F	4	5	6	6	6
TBE FTE	5	5	5	5	5
TBE Costs	0.527	0.528	0.531	0.532	0.534
P&W FTE	6	6	6	6	6
P&W Cost	0.620	0.622	0.624	0.626	0.628
Boeing FTE	2	2	2	2	2
Boeing Costs	0.33	0.33	0.33	0.34	0.34

3. **Mission Integration**
   - (a) Works with SSPO in developing, revising and refining the generic payload integration process
   - (b) Assist implementing Centers and SPD in working integration issue resolution as required
   - (c) Participate on Payload Mission Integration Team

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1	1	1	1	1
CST FTE	2	2	2	2	2
CST Costs	0.290	0.291	0.292	0.293	0.294

4. **Operations/Utilization**
   - (a) Provides technical expertise related to the definition of payload operations processes to support microgravity science research
   - (b) Serves as MRPO representative on NPOCB
   - (c) Establish MRPO positions on key payload operations and utilization functions such as the development of flight rules, crew procedures, ground and on-board displays, crew timelines, training concepts, payload command and control concepts

	FY01	FY02	FY03	FY04	FY05
C/S W/F	3	3	3	3	3
TBE FTE	2	2	2	2	2
TBE Costs	0.211	0.212	0.214	0.215	0.217

5. **Science Operations Integration**
   - (a) Definition/development of Science Operations Plan
     - Science operations planning/replanning approach
   - (b) Recommend resource allocation over-subscription resolutions
   - (c) Assess overall MRPO status/impacts during the mission
   - (d) Recommend solutions for MRPO Payload conflicts

	FY01	FY02	FY03	FY04	FY05
C/S W/F	2	2	2	2	2
Boeing FTE	1	1	1	1	1
Boeing Costs	0.165	0.166	0.167	0.168	0.169
CST FTE	3	3	3	3	3
CST Costs	0.382	0.383	0.385	0.386	0.387

6. **Data Management and Archiving**
   - (a) Develop and implement science data archiving system

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1.5	1.5	1.5	1.5	1.5
Boeing FTE	1	1	1	1	1
Boeing Costs	0.165	0.166	0.167	0.168	0.169

7. **Resources Management**
   - (a) Integrated planning and analysis of ISS Microgravity Research Program
   - (b) Works with other centers to identify and appropriately plan funding and workforce requirements to adequately support programmatic and technical tasks

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1	1	1	1	1
UAH FTE	3	3	3	3	3
UAH Costs	0.23	0.237	0.244	0.251	0.259
Sverdrup W/F	1	1	1	1	1
Sverdrup Costs	0.1	0.103	0.106	0.109	0.113

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1.5	1.5	1.5	1.5	1.5
CSC FTE	1	1	1	1	1
CSC Costs	0.05	0.05	0.05	0.05	0.05

SUBTOTALS — **Microgravity Research Program Management (RPO): GRC Microgravity Science Division**

	FY01	FY02	FY03	FY04	FY05
Total C/S W/F	175	175	175	180	180
Total C/S $	15.230	15.100	14.060	13.850	13.940
Total Contractor W/F					
Total Contractor $	2.690	2.760	2.850	3.300	3.750
Total GRC	17.920	17.860	16.910	16.950	17.690

GRC (In-House) — **Microgravity Research Program Management (RPO): GRC Microgravity Science Division**

		FY01	FY02	FY03	FY04	FY05
USG W/F	(FTEs)	175	175	175	180	180
USG Cost	(est. $M)	15.23	15.10	14.06	13.85	13.94

Basis of Estimate:
1) Negotiated GRC Civil servant workforce to support these task

2) Assumes 1 FTE = $87,000 + 26% overhead.
plus Carrier accounts charges, $16.13/ hrs. ODIN .Program support
.G Hardware procurements, and inflation

A. Program and Project Management

1. **Program/Discipline Management**
   - Lead the Development and Implementation of Long Range Strategic Plans for ISS Fluids & Combustion Discipline Research
   - Lead the Development and Implementation of Short Term Tactical Plans to Maximize Cost Effectiveness/Timeliness of ISS Fluids & Combustion Discipline Research Return
   - Plan, Advocate, and Defend the Research Discipline ISS Content, Budget, and Milestone Schedules
   - Conduct Flight Hardware Concept and System Studies to Increase Research Return Within Available Resources
   - Conduct System Studies to Maximize Flight Hardware Common Systems/Reuse and to Identify hardware Upgrades
   - Provide Information and Support to the Enterprise and Discipline Program Scientists in All Phases of Project Development
   - Define Near Term Program Content and Utilization Traffic Model Based upon Resource Availability
   - Provide Oversight and Guidance to the Phase B Phases of Project Development
   - Provide Oversight and Guidance to Execution Phase Projects on Technical, Financial and Schedule Performance
   - Certify that Flight Hardware is Ready for Shipment, Integration, Launch and On-Orbit Operations
   - Approve Science Requirements Documents, Science Requirements Envelope Document, and Project Plans and Recommend ATP Approval
   - Assure System Level Requirements are Defined, Coordinated, Appropriately Allocated, and Verified
   - Collaborate and Liaison with International Partners and Commercial Entities to Further Fluids & Combustion Research on ISS
   - Define, Coordinate and Implement Make-Buy Decisions
   - Provide Contract Technical Management and Direction (COTR)
   - Provide Discipline Advocacy and Upward Reporting
2. **Project Management/Project Execution**

		FY01	FY02	FY03	FY04	FY05
Contract Cost	(NOA $M)	2.690	2.760	2.850	3.300	3.750

Basis of Estimate:
1) 2002 Congressional Budget.

Perform Project Planning and Direction; Develop Project Plans
Flow Down Science Requirements to Functional/Engineering Requirements
Provide Project Management for all Phase B/C/D/E efforts; Provide Contract Management (TR Level)
Conduct Those Phase B Requirements Definition Efforts That Involve a Significant Amount of Requirements Definition
Conduct Selected, Limited Phase C/D/E Development Efforts Enabled by Unique In-House Core Competency/Capabilities
Conduct Surveillance and Management of Contracted Activities
Perform Independent Verification and Validation as Warranted
Perform Independent Trade-Off Studies to Guide Technical Approaches and Technology Selections
Provide Technical Management to the Flight Hardware Development Functions
Provide Mission Integration and Management Function for Facility Class Flight Hardware
Manage the Development of Government Furnished Equipment and Government Owned Ground Support Equipment
Manage the Utilization of the Ground Based Microgravity Research Facilities and Laboratories
Provide Technical Management to the Increment Management (Integration and Operations) Functions
Coordinate GRC Planning, Development and Integration Activities with MRPO and ISSPO
Manage the Development and Operation of the GRC Telescience Support Center
Manage Data Archiving and Dissemination
Educate Principal Investigators on ISS Acceleration Environment and Potential Effects/Impact on Research Results
Advise Principal Investigators on Establishing Acceleration measurement Requirements
Interpret Facility/Payload Data for Principal Investigators (Real-Time and Post Flight)
Provide Project Advocacy and Upward Reporting

B. **Science and Technology Management**

1. **Science Management**
   - Guide PI in Refining Science Requirements and Finalizing and Maintaining a Science Requirements Document
   - Provide PI Access to and Assistance in Utilizing Unique Government Facilities/Capabilities (e.g., drop towers)
   - Provide Unique Hardware Capabilities (e.g., Diagnostics for Use at PI Home Institution)
   - Assist Principal Investigator in Evaluating /Selecting Experiment Concepts, Designs, and Operating Procedures
   - Identify, Develop and Advocate New Research Thrusts in Microgravity Research
   - Manage, Develop and Maintain ISS Discipline Research Plan and Facility Science Requirements Envelope Document
   - Verify Experiment Hardware/Software Performance Satisfies Science Requirements
   - Support PI During Experiment Planning and Operations
   - Develop Experiment Data Management Plans
   - Facilitate Research Data Analysis/Interpretation
   - Communicate the Significance of Research Results to the Public
   - Represent the Research Program to Domestic/International Conferences, Symposia and Media
2. **Advance Technology Management**
   - Conceive and Conduct Leading Edge Research and Technology Development to Enhance Future Experiment Hardware Capabilities
   - Prioritize Advance Technology Development Needs in Support of Ground-Based and Spaceflight Experiments
   - Conduct Advanced Technology Development Studies
   - Collaborate with Other Microgravity Disciplines and Enterprises on New and Enabling Technology
   - Review and Evaluate for Technical Content Science and ATD/ITD Proposals

C. **Business and Outreach Management**

1. **Systems Management**
   - Establish and Maintain System Policies, Procedures and Engineering Standards Applicable to Flight Hardware Development (ie., ISO)
   - Develop Short and Long Term Plans for Ground Facilities Utilization and Support
   - Provide Information Technology Services and Support, Including IT Security Requirements
   - Manage and Administer the Division Management, Change and Surveillance Board Activities
   - Provide the Configuration Management Function at the Division Level
2. **Resource Management**
   - Provide Budgeting, PR Control, Financial Synthesis and Reporting and Financial Analysis
   - Provide Financial Interface with MRPO and ISSPO to Coordinate NOA, POP, ITA and Other Financial Transactions
   - Coordinate and Negotiate Resource (Staffing, In-House Support, Training and Travel) Requirements
   - Provide Project Cost and Schedule Support and Assist in Developing Budget Submittals and Project Reporting
   - Coordinate Procurement Activities, Including the Initiation and Renewal of Grants
3. **Advocacy**
   - Establish Liaisons with Academia, Industry and Other Organizations to Jointly Develop Programs to Advance Microgravity Science
   - Plan and Coordinate Media Relations and Public Awareness Activities
   - Communicate the Significance of Research Results to the Public
   - Manage the Division Websites Development and Maintenance
   - Oversee the Development and Maintenance of Educational and Outreach Reference Material
   - Provide "InReach" to Center and Program Organizations to Develop Outreach Synergy Across Disciplines

SUBTOTALS

Microgravity Research Program Management (RPO): GRC Microgravity Science Division

	FY01	FY02	FY03	FY04	FY05
Total C/S W/F					
Total C/S $					
Total Contractor W/F					
Total Contractor $	56.420	51.810	53.850	59.710	57.860
Total GRC	56.420	51.810	53.850	59.710	57.860

GRC (Contractor)

Microgravity Research Program Management (RPO): GRC Microgravity Science Division

		FY01	FY02	FY03	FY04	FY05
Contract Cost	(NOA $M)	56.43	51.81	53.85	59.70	57.85

Basis of Estimate:
1) 2002 Congressional Budget.

Contract #

Microgravity Research, Development and Operations Contract (FDC)

(Federal Data Corporation - NAS3 99155)

A

FLUIDS AND COMBUSTION FACILITY PRODUCTION, DEPLOYMENT AND INITIAL OPERATION

TASK DESCRIPTION

1. **Provide the Management Function to Monitor, Control and Report the FCF Effort**
   - (a) Provide NASA with Information Necessary to Implement Government Surveillance
   - (b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
   - (c) Maintain an Inventory of all Government Furnished Property and Items Purchased
   - (d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews
2. **Plan, Implement and Maintain a Product Assurance System**
   - (a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
   - (b) Develop a Safety Plan and Work in Accordance to that Plan
   - (c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
   - (d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
   - (e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process
   - (f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation
3. **Develop a Preliminary Design of the FCF System**
   - (a) Develop and Document the Preliminary Design-to-Specifications
   - (b) Develop a Preliminary Hardware and Software Design
   - (c) Produce Mock-Ups, Breadboards, brassboards and subsystem Prototype Hardware to Establish Feasability and Reduce Risk
   - (d) Provide Assurance that the Preliminary Design will meet ISS Safety and Verification Requirements
   - (e) Develop Preliminary Versions of the PIA and ICD for Each rack
   - (f) Update the Contractor Project Plan
   - (g) Provide a Product Assurance Plan
4. **Incrementally Complete the Design to Meet the Performance and Functional Requirements**
   - (a) Generate Complete System Build-to-Specifications
   - (b) Perform System Level Analyses and Trade Studies to Optimize the Design
   - (c) Develop an Overall Detailed Flight Design
   - (d) Develop Final Software Design and Perform Code Development

		FY01	FY02	FY03	FY04	FY05
Contract Cost	(NOA $M)	32.59	25.08	21.99	13.17	4.33

Basis of Estimate:
1) 2002 Congressional Budget.

(e) Minimize development Risk Through Development of Engineering Model Hardware
(f) Perform Required Testing and Integration
(g) Develop a Comprehensive Final Verification Plan
(h) Perform the Analysis and Implementation Planning for Long Term Payload Operations

5. **Fabricate Assemble, Test, Verify and Deliver an Operational FCF System per Requirements**
   (a) Fabricate, Assemble Test, Verify and Deliver the FCF
   (b) Perform the Mission and Technical Integration Necessary to Assure delivery of a Fully Functional FCF System
   (c) Incrementally Fabricate, Assemble, and Test FCF Flight Ground and Other Hardware and Software
   (d) Conduct Installation, Assembly and Checkout Activities with the ISS
   (e) Conduct Qualification, Acceptance and Verification Activities on all Components, Subsystems and Combined Assemblies
   (f) Concur Acceptance testing of Flight and Ground Racks and Overall FCF System
   (g) Provide Assurance that the Experiment System Meets all ISS Safety and Verification Requirements
   (h) Develop Procedures for Crew Tended, Untended and Off-Nominal Operations
   (i) Develop the Payload Training Center Unit (PTCU)
   (j) Provide all ground Servicing at KSC to Ensure Successful Integration with the ISS Transportation System
   (k) Provide Support for Six Experiment development Teams for Initial On-Orbit Operations
6. **Provide for Initial Installation, Checkout, Calibration and Operation of the FCF System to Include the Initial Experiment**
   (a) Provide for Initial Installation, Checkout, Calibration and Operation of the FCF Racks and Experiments
   (b) Verify Post-Launch Performance and State-of-Health of FCF System
   (c) Perform On-Orbit Performance Verification Program

B **PAYLOAD ENGINEERING, INTEGRATION and OPERATIONS**

TASK DESCRIPTION

1. **Mission Integration & Planning Functions**
   (a) Develop processes that Facilitate the Strategic and Tactical Planning of GRC Investigations
   (b) Facilitate Efforts to Maximize Science Return and Research Opportunities on ISS
   (c) Develop and Maintain a Planning Database that Includes PI Resource Requirements and Resource Allocations
   (d) Support Development of the Mission Evaluation Requests (MERs)
   (e) Develop and Maintain an Integrated GRC Traffic Model
   (f) Develop and End-to-End PI Integration Process for FCF PIs into FCF
   (g) Provide Generic PI Specific Documentation Required for Integration into the FCF
   (h) Develop any Tools required to Facilitate the PI Integration Process and to be Compatible with the ISS Program
2. **FCF Increment Engineering and Execution**
   (1) **General**
   (a) Provide the Engineering Integration (Physical, Analytical and Operation) of Experiments into the FCF
   (b) Provide Engineering Integration of FCF and PI Complement into ISS
   (c) Provide for Continuous Operation of the FCF on an Increment and/or Multi-Increment Basis
   (d) Coordinate with the ISS Program and PI Specific Development Teams to Develop and Document Increment Specific Requirements to be Certified at the Increment Readiness Review
   (e) Perform the Integration Activities for FCF and PI Specific Experiments (Analytical compatibility, FCF/PI verification, ISS/FCF verification, Mission Planning, Training, etc.)
   (g) Perform Structural, thermal, power, operations, Command and Data Management, Safety and Diagnostics Integration and Engineering Functions
   (h) Manage the PI Specific and ISS Data Products and Documentation Requirements
   (i) Perform Transportation Options Analysis and Recommendations on FCF Manifesting
   (j) Verify All Requirements for a Specific Increment at Increment Acceptance Review
   (2) **PI to FCF Integration**
   (a) Develop PI Specific Hardware and Software for use in FCF System
   (b) In Conjunction with the PI Development Teams, Develop the PI Specific Integration Agreement (IA)
   (c) In Conjunction with the PI Development Teams, Develop the PI Specific Interface Control Document
   (d) Provide a Liaison to the PI Specific Development Teams to Facilitate the Integration Process
   (e) Provide an Updated FCF Accommodations Handbook
   (f) In Conjunction with the PI Development Teams, Develop an Integration Schedule
   (g) Book Manage all PI Specific to FCF Integration Documentation
   (3) **FCF to ISS Integration**
   (a) Integrate all Relevant Inputs from the PI Development Teams
   (b) Maintain and Update all Required Documents and Data Deliverables for the ISS Program on an Increment Basis (PIA, ICD, Verification Plan, Flight & Ground Safety Packages)
   (c) Assist the PI Development Teams in Presenting to the ISS Safety Panels
   (d) Provide Engineering Products Required by ISS, Including PI Specific Experiment Information
   (4) **FCF Verification**
   (a) Develop and Maintain the FCF Test Equipment for Early Development Testing and Final Verification & Test
   FCF - PI System
   (c) Provide Sufficient Personnel Support, Training and Training Materials on the Use of FCF to the PI Specific Development Teams
   (d) Provide All Interface and Verification Tests between FCF and the PI Specific Hardware
   (e) Provide Scheduling, Installation, Check-Out and Verification of the PI Specific Experiment Hardware and Software into the Ground Integration Unit (GIU)
   (f) Perform the Integrated FCF/PI Verification and Validation Tests
   (g) Provide Support for Installation and Initial Check-Out of PI Specific Experiment Hardware and Software into the FCF Engineering Development Unit (EDU)
   (5) **FCF Training**
   (a) In Conjunction with the PI Specific Development Teams, Develop and Present all Integrated Training Materials for use
   (b) Support the Installation of the PI Specific Experiment's Training Unit in the FCF Payload Training Center (PTC) at JSC
   (c) Develop the Integrated Training Requirements (ISS, ISS Crew, FCF, PI Specific)
   (d) Implement the Training Requirements for the PTC, the Computer-Based Training, the Part-Task Trainers and the On-Orbit Training
   (e) Provide Training to the PI Specific Development Cadre
   (6) **Increment Execution**
   (a) Provide Real-Time Operations and Supporting Activities During ISS Increment Operations
   (b) Coordinate Real-Time Operational Requirements
   (c) Acquire and Process Real-Time Data
   (d) Support the Correlation of Scientific Data with FCF and ISS Mission Events
   (e) Prepare FCF Performance Reports and Maintain FCF Performance Databases
   (f) Plan and Schedule all FCF On-Orbit Operations, in Conjunction with PI Specific Development Teams
   (g) Support Post-Launch PI Specific Hardware Check-Out on ISS (Integration, Activation, Calibration, System Characterization and Operational Procedure Verification)
   (h) Provide Trained Cadre of Console Operators
   (i) Be on Console when FCF is Active
   (j) Respond to Requests from ISS Crew, Ground Team or any Off-Nominal Situation
   (k) Develop Standard Procedures for On-Orbit Problems or Anomalies
3. **FCF System/Sustaining Engineering**
   (1) Maintain the Flight Unit During its 15 Year Deployment on ISS
   (2) Track FCF System and Component Level Performance
   (3) Identify FCF Components for Replacement
   (4) Design, Fabricate Assemble and Test FCF Replacement Components
   (5) Maintain and Implement FCF Spares and Logistics
4. **FCF Upgrades**
   (1) Develop Deferred or Evolving Combustion and Fluids Element Components
   (2) Integrate New and Emerging Technologies into the FCF Configuration
5. **Telescience Development**
   (1) Develop and Implement a Ground System for Telescience Operations per SSP54500, 50305 & 50304
   (2) TSC must be capable of supporting all GRC Space Operations Activities
   System
   (4) Locate the TSC at GRC and Support Remote User Locations

		FY01	FY02	FY03	FY04	FY05
Contract Cost	(NOA $M)	5.71	7.55	9.22	15.96	18.89

Basis of Estimate:
1) 2002 Congressional Budget.

RAFT

(5) Maximize the Use of Commercially available Hardware and Software
(6) Incorporate Trek Work Stations and the Remote Copy of the Enhanced HOSC (EHS) into the Design and Development of the TSC

6. **Telescience Operations**
   (1) Perform Ground Operations from the TSC and from Remote Sites Where Principal Investigators are Located
   (2) Provide Operational Support Systems Required to Plan, Monitor and Control On-Orbit Experiments
   (3) Coordinate Real-Time FCF and Experiment Commanding Requirements
   (4) Perform TSC Facility Operations during On-Orbit, Simulation and Training Activities
   (5) Simulate On-Orbit Operations for Ground Verification and Ground Operations Training
   (6) Operate and Maintain the TSC Facility and Support Systems
   (7) Coordinate with Experiment Teams to Develop Increment Specific Telescience Requirements
   (8) Store, Distribute, Retrieve and Archive Telemetry Data
   (9) Ensure the Physical and Automated Information Systems Security for the TSC Facility and all Users
   (10) Provide Experimenters with a Remote Capability to Control and Monitor their Experiment On-Orbit and Communicate with the GRC TSC and other Ground Systems
   (11) Conduct Simulations and Training Sessions for the TSC Cadre and all Users to Assure Proficiency Throughout all Phases of Operations
   (12) Certify the Readiness of the TSC, its Systems and Cadre at each Increment ORR
7. **Acceleration Measurement Operations**
   (1) Perform Mission Operations of the Microgravity Acceleration Measurement Hardware (STS/ISS)
      (a) Coordinate Real-Time Operational Requirements
      (b) Acquire, Process and Distribute Real-Time Acceleration Measurement Data
      (c) Support the Correlation of Scientific Data with Acceleration Data and ISS Mission Events
      (d) Prepare Acceleration Hardware Performance Summary Reports and Maintain Performance Databases
      (e) Monitor Acceleration Measurement Hardware When Activated
      (f) Respond to Crew and Ground Team Communications and Off-Nominal Situations
   (2) Plan and Schedule all Microgravity Acceleration Measurement Hardware On-Orbit Operations
      (a) Develop and Maintain Mission Timelines
      (b) Obtain all Necessary Ground and On-Orbit Resources
      (c) Train Staff for Console Operations
      (d) Develop Standard Procedures to Resolve On-Orbit Problems or Anomalies

Contract # — **Microgravity Research, Development and Operations Contract (FDC & Zin Technologies)**
(Federal Data Corporation - NAS3 99155; Zin Technologies - NAS3 99154)

C — **DEVELOPMENT OF PI SPECIFIC EXPERIMENTS, ACCELERATION MEASUREMENT INSTRUMENTS AND DIAGNOSTICS**

TASK DESCRIPTION

1. **Provide the Management Function to Monitor, Control and Report the FCF Effort**
   (a) Provide NASA with Information Necessary to Implement Government Surveillance
   (b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
   (c) Maintain an Inventory of all Government Furnished Property and Items Purchased
   (d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews
2. **Plan, Implement and Maintain a Product Assurance System**
   (a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
   (b) Develop a Safety Plan and Work in Accordance to that Plan
   (c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
   (d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
   (e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process
   (f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation
3. **Experiment Definition**
   (a) Provide Initial System Level Experiment Concept for SCR
   (b) Provide Top-Level Engineering Requirements that Address the PIs Science Requirements
   (c) Conduct System Design and Mission Analyses to Evaluate Potential Carrier Options
   (d) Formulate a Preliminary Engineering Plan for Development of the Experiment Concept
4. **Requirements Definition**
   (a) Define the Fundamental System Requirements (Science, Carrier, Safety, Operations and Quality)
   (b) Determine Overall feasibility of Candidate Experiment Concepts
   (c) Design and Develop Breadboards to Reduce Risk and Evaluate Functional Performance
   (d) Develop and Integrated Concept (Experiment to Carrier)
   (e) Formulate an Engineering Plan to be Presented at RDR
5. **Preliminary Design**
   (a) Develop a Preliminary Design-to-Specification
   (b) Develop preliminary Hardware and Software design
   (c) Design, Develop and Fabricate Engineering Mockups, Breadboards, Brassboards and Prototype Hardware
   (d) Provide Assurance that the Preliminary Design will Meet Carrier Safety and Verification Requirements
   (e) Develop Preliminary versions of the PIA and ICD
   (f) Develop a Detailed Project Plan
   (g) Provide a Product Assurance Plan
6. **Design and Development**
   (a) Generate System Build-to-Specifications
   (b) Develop a Comprehensive Flight design
   (c) Design, Develop and Fabricate an Engineering Model
   (d) Develop a Comprehensive Verification Plan
   (e) Provide Assurance that Final Design will Meet all Carrier Safety and Verification Requirements
7. **Carrier Integration, Operations and Training Planning**
   (a) Perform Analyses and Implement Planning Necessary to Define, Prepare for and Conduct Experiment Operations
   (b) Prepare Training Requirements and Plan
   (c) Perform Integrated Logistics Analyses
   (d) Develop a Detailed Assembly, Integration and Test Plan
8. **Fabrication, Assembly and Test**
   (a) Perform Mission and Technical Integration Efforts Necessary to Assure Delivery of a Fully Functional System
   (b) Fabricate, Assemble and Test Flight Unit
   (c) Fabricate, Assemble and Test Qualification Unit
   (d) Fabricate, Assemble and Test Ground Unit (if required)
   (e) Develop, Verify, Validate and Maintain all Software Necessary to Control and Utilize the Flight Hardware
9. **Installation, Assembly and Checkout (IACO)**
   (a) Integrate the Experiment Hardware and Software with the Carrier
   (b) Conduct qualification, Acceptance and Verification Activities
   (c) Provide Assurance that the Experiment System Meets all Carrier Safety and Verification Requirements
   (d) Develop procedures for Crew tended, Untended and Off-Nominal Operations
   (e) Conduct Logistics Support Analyses
   (f) develop all training materials for the Experiment
   (g) Provide for all Ground Servicing Activities at KSC to Ensure Successful Integration of Experiment Hardware with the Carrier or Transportation System
10. **Operations**
   (a) Support On-Orbit Integration Activities with the Carrier and ISS
   (b) Provide t Real-Time Experiment Operations
   (c) Provide PI Mission Operations Support
   (d) Provide Post Mission Operations
   (e) Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software

SUBTOTALS — **Microgravity Research Program Management (RPO): MSFC Microgravity Science & Application Dept**

Contract Cost (NOA $M)	FY01	FY02	FY03	FY04	FY05
	18.12	19.18	22.65	30.58	34.64

Basis of Estimate:
1) 2002 Congressional Budget

	FY01	FY02	FY03	FY04	FY05
Total C/B W/F	194	209	211	211	211
Total C/B $	27.341	36.413	45.490	43.190	43.771
Total Contractor W/F	257	276	312	346	366
Total Contractor $	34.645	38.920	45.240	52.050	56.885

MSFC	Microgravity Research Program Management (RPO): MSFC Microgravity Science & Application Dept
A	**Program and Project Management**
	1. **Program Management**
	Plan, advocate, and defend the research discipline content, budget, and milestone schedules
	Lead the Development and Implementation of Long Range Materials Science and Macromoecular Biotechnology Strategic Plans
	Lead the Development and Implementation of Short term Tactical Plans
	Provide Management of the Ground-Based Experiments Program
	Provide Information and Support to the Enterprise and Discipline Program Scientists in All Phases of Project Development
	Define Program Content and Utilization Traffic Model Based upon Resource Availability
	Provide Oversight and Guidance to the Phase A/B Phases of Project Development
	Provide Oversight and Guidance to Execution Phase Projects on Technical, Financial and Schedule Performance
	Approve Project Plans and Recommend ATP Approval
	Assure System Level Requirements are Defined, Coordinated, Appropriately Allocated, and Verified
	Collaborate and Liaison with International Partners and Commercial Entities to Further Materials Science and Macromolecular Biotechnology Research on ISS
	Define, Coordinate and Implement Make-Buy Decisions
	Provide Contract Technical Management and Direction (COTR)
	Provide Discipline Advocacy and Upward Reporting
	2. **Project Management**
	Perform Project Planning and Direction
	Conduct all Phase A experiment concept and requirements definition efforts
	Provide Project Management for all Phase B/C/D/E efforts; Provide Contract Management at TR Level
	Conduct those Phase B requirements definition efforts that involve a significant amount of requirements definition
	Conduct Selected, Phase C/D/E Efforts for Skill Development/Retention in the CS Workforce (including MSRF)
	Conduct Surveillance and Management of Contracted Activities
	Perform Independent Verification and Validation as Warranted
	Provide Technical Management to the Flight Hardware Development Functions
	Provide Mission Integration and Management Function for Facility Class Flight Hardware
	Provide Technical Management to the Increment Management (Integration and Operations) Functions
	Coordinate MSFC Development and Integration Activities with MRPO and ISSPO
	Manage Discipline Data Archiving and Dissemination
	Provide Project Advocacy and Upward Reporting
B	**Science and Technology Management**
	1. **Science Management**
	Guide PI in Refining Science Requirements and Finalizing and Maintaining a Science Requirements Document
	Provide PI Access to and Assistance in Utilizing Unique Government Facilities/Capabilities (e.g., drop towers)
	Support PI in Evaluating /Selecting Experiment Concepts, Designs, and Operating Procedures
	Identify, Develop and Advocate New Research Thrusts in Microgravity Research
	Manage PI Grants/Cooperative Agreements/Contracts
	Assure Reporting of PI Research Efforts/Progress
	Conduct PI research (in-house PI's)
	Manage, Develop and Maintenance of Discipline Research Plan and Science Requirements Envelope Document
	Verify Experiment Hardware/Software Performance Satisfies Science Requirements
	Support PI During Experiment Planning and Operations
	Communicate the Significance of Research Results to the Public
	Facilitate Data Analysis/Interpretation
	Represent the Research Program to Domestic/International Conferences, Symposia and Media
	2. **Advance Technology Management**
	Identify and Prioritize Advance Technology Development Needs in Support of Ground-Based and Spaceflight Experiments
	Conduct Advanced Technology Development Studies
	Conceive and Conduct Leading Edge Research and Technology Development to Enhance Future Experiment Hardware Capabilities
	Collaborate with Other Microgravity Disciplines and Enterprises on New and Enabling Technology
	Review and Evaluate for Technical Content Science and ATD/ITD Proposals
C	**Business Management and Advocacy**
	1. **Systems Management**
	Establish and Maintain System Policies, Procedures and Engineering Standards Applicable to Flight Hardware Development (ie., ISO)
	Develop Short and Long Term Plans for Ground Facilities Utilization and Support
	Provide InformationTechnology Services and Support, Including IT Security Requirements
	Manage and Administer the Division Management, Change and Surveillance Board Activities
	Provide the Configuration Management Function at the Division Level
	2. **Resource Management**
	Provide Budgeting, PR Control, Financial Synthesis and Reporting and Financial Analysis
	Provide Financial Interface with MRPO and ISSPO to Coordinate NOA, POP, ITA and Other Financial Transactions
	Coordinate and Negotiate Resource (Staffing, In-house Support, Training and Travel) Requirements
	Provide Project Cost and Schedule Support and Assist in Developing Budget Submittals and Project Reporting
	Coordinate Procurement Activities, Including the Initiation and Renewal of Grants
	3. **Advocacy**
	Establish Liaisons with Academia, Industry and Other Organizations to Jointly Develop Programs to Advance Microgravity Science
	Plan and Coordinate Media Relations and Public Awareness Activities
	Communicate the Significance of Research Results to the Public
	Manage the Division Websites Development and Maintenance
	Oversee the Development and Maintenance of Educational and Outreach Reference Material
	Provide "InReach" to Center and Program Organizations to Develop Outreach Synergy Across Disciplines
MSFC (Contracted)	**Microgravity Research Program Management (RPO): MSFC Microgravity Science & Application Department**
Contract #	**Microgravity Science & Applications Department (MSAD), Support Contracts**
	(TBE, H0031329); (P&W, NAS8-40831); (CSC, NAS8-60000); (Boeing, NAS8-50000); (Hernandez, NAS8-40364); (Sverdrup, NAS8-40836); (SAIC, NAS8-99060), (CST, NAS8-98001); (ASRI, NAS8-97330); (USRA, NCC8-68); (TVA, H30565D); & (New Contract, TBD)
	Material Science Research Facility (MSRF) - Includes Definition, Development, Integration, Test, Experiment Integration, and Mission Operation. MSRF is
A	**an in-house project. The following activities are conducted in a support mode to responsible CS.**
	TASK DESCRIPTION
	1. **Provide the Management Function to Monitor, Control and Report the Effort**
	(a) Provide NASA with Information Necessary to Implement Government Surveillance
	(b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
	(c) Maintain an Inventory of all Government Furnished Property and Items Purchased
	(d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews
	2. **Plan, Implement and Maintain a Product Assurance System**
	(a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
	(b) Develop a Safety Plan and Work in Accordance to that Plan
	(c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
	(d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
	(e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process
	(f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation
	3. **Develop a Preliminary System**
	(a) Develop and Document the Preliminary Design-to-Specifications
	(b) Develop a Preliminary Hardware and Software Design
	(c) Produce Mock-Ups, Breadboards, brassboards and subsystem Prototype Hardware to Establish Feasibility and Reduce Risk
	(d) Provide Assurance that the Preliminary Design will meet ISS Safety and Verification Req'ts

Total MSFC	61.986	75.333	80.730	95.2

Basics of Table Locations:
> Table locations are not meant to match a task description.
> Tables show MSAD CS and Contractor FTE's and $

Total		FY01	FY02	FY03	FY04	FY05
CS W/F	(FTEs)	194	209	211	211	211
CS Cost ($M)		27.341	36.413	45.49	43.19	43.771

	FY01	FY02	FY03	FY04	FY05
TBE W/F (FTEs)	5	5	5	5	5
TBE Cost ($M)	0.625	0.700	0.725	0.750	0.775

Basics of Estimate (CM/DM Support):
> Based on $135K in FY2001 and ramping $5K in the out years

	FY01	FY02	FY03	FY04	FY05
P&W W/F (FTEs)	43	43	43	43	43
P&W Cost ($M)	3.240	3.360	3.480	3.600	3.720

Basics of Estimate (Engineering&Consulting Support):
> Based on $135K in FY2001 and ramping $5K in the out years

	FY01	FY02	FY03	FY04	FY05
CSC W/F (FTEs)	4	4	4	4	4
CSC Cost ($M)	0.540	0.560	0.580	0.600	0.620

Basics of Estimate (Program Support):
> Based on $135K in FY2001 and ramping $5K in the out years

	FY01	FY02	FY03	FY04	FY05
Boeing W/F (FTEs)	7	7	7	7	7
Boeing Cost ($M)	0.945	0.980	1.015	1.050	1.085

Basics of Estimate (ISS Hardware Support):
> Based on $135K in FY2001 and ramping $5K in the out years

(e) Develop Preliminary Versions of the PIA and ICD for Each rack
(f) Provide a Produce Assurance Plan

4. **Incrementally Complete the Design to Meet the Performance and Functional Requirements**
   (a) Generate Complete System Build-to-Specifications
   (b) Perform System Level Analyses and Trade Studies to Optimize the Design
   (c) Develop an Overall Detailed Flight Design
   (d) Develop Final Software Design and Perform Code Development
   (e) Minimize development Risk Through Development of Engineering Model Hardware
   (f) Perform Required Testing and Integration
   (g) Develop a Comprehensive Final Verification Plan
   (h) Perform the Analysis and Implementation Planning for Long Term Payload Operations
5. **Fabricate, Assemble, Test, Verify and Deliver an Operational Requirements**
   (a) Fabricate, Assemble, Test, Verify and Deliver
   (b) Perform the Mission and Technical Integration Necessary to Assure delivery a Fully Functional System
   (c) Incrementally Fabricate, Assemble, and Test Flight Ground and Other Hardware and Software
   (d) Conduct Installation, Assembly and Checkout Activities with the ISS
   (e) Conduct Qualification, Acceptance and Verification Activities on all Components, Subsystems and Combined Assemblies
   (f) Conduct Acceptance testing of Flight and Ground Racks Plus Overall System
   (g) Provide Assurance that the Experiment System Meets all ISS Safety and Verification Requirements
   (h) Develop Procedures for Crew Tended, Untended and Off-Nominal Operations
   (i) Develop the Payload Training Center Unit (PTCU)
   (j) Provide all ground Servicing at KSC to Ensure Successful Integration with the ISS Transportation System
   (k) Provide Support for Six Experiment Development Teams for Initial On-Orbit Operations
6. **Provide for Initial Installation, Checkout, Calibration and Operation Including the Initial Experiment**
   (a) Provide for Initial Installation, Checkout, Calibration and Operation of the Racks and Experiments
   (b) Verify Post-Launch Performance and State-of-Health
   (c) Perform On-Orbit Performance Verification Program

B **PAYLOAD ENGINEERING, INTEGRATION and OPERATIONS - Material Science Research Facility (MSRF) and Material Science Glovebox (MSG) are currently in-house led efforts with significant number of support contractors reporting to responsible C8.**

TASK DESCRIPTION

1. **Mission Integration & Planning Functions**
   (a) Develop processes that Facilitate the Strategic and Tactical Planning of MSFC Investigations
   (b) Facilitate Efforts to Maximize Science Return and Research Opportunities on ISS
   (c) Develop and Maintain a Planning Database that Includes PI Resource Requirements and Resource Allocations
   (d) Support Development of the Mission Evaluation Requests (MERs)
   (e) Develop and Maintain an Integrated MSFC ISS Utilization Traffic Model
   (f) Develop and End-to-End PI Integration Process for PIs into MSRF and MSG
   (g) Provide Generic PI Specific Documentation Required for Integration
   (h) Develop any Tools required to Facilitate the PI Integration Process and to be Compatible with the ISS Program
2. **Increment Engineering and Execution**
   (1) General
   (a) Provide the Engineering Integration (Physical, Analytical and Operation) of Experiments on the ISS
   (b) Provide Engineering Integration and PI Complement into ISS
   (c) Provide for Continuous Operation of the on an Increment and/or Multi-Increment Basis
   (d) Coordinate with the ISS Program and PI Specific Development Teams to Develop and Document Increment Specific Requirements to be Certified at the Increment Readiness Review
   (e) Perform the Integration Activities for and PI Specific Experiments (Analytical compatibility, PI verification, verification, Mission Planning, Training, etc.)
   (g) Perform Structural, thermal, power, operations, Command and Data Management, Safety and Diagnostics Integration and Engineering Functions
   (h) Manage the PI Specific and ISS Data Products and Documentation Requirements
   (i) Perform Transportation Options Analysis and Recommendations on Manifesting
   (j) Verify All Requirements for a Specific Increment at Increment Acceptance Review
   (2) PI Integration
   (a) In conjunction with PI Development Teams, Develop PI Specific Hardware and Software
   (b) In Conjunction with the PI Development Teams, Develop the PI Specific Integration Agreement (IA)
   (c) In Conjunction with the PI Development Teams, Develop the PI Specific Interface Control Document
   (d) Provide a Liaison to the PI Specific Development Teams to Facilitate the Integration Process
   (e) Provide an Updated Accommodations Handbook
   (f) In Conjunction with the PI Development Teams, Develop an Integration Schedule
   (g) Book Manage all PI Specific to Integrated Documentation
   (3) ISS Integration
   (a) Integrate all Relevant Inputs from the PI Development Teams
   (b) Maintain and Update all Required Documents and Data Deliverables for the ISS Program on an Increment Basis (PIA, ICD, Verification Plan, Flight & Ground Safety Packages)
   (c) Assist the PI Development Teams in Presenting to the ISS Safety Panels
   (d) Provide Engineering Products Required by ISS, Including PI Specific Experiment Information
   (4) Verification
   (a) Develop and Maintain the Test Equipment for Early Development Testing and Final Verification & Test System
   (c) Provide Sufficient Personnel Support, Training and Training Materials to the PI Specific Development Teams
   (d) Provide All Interface and Verification Tests between MSRF or MSG and the PI Specific Hardware
   (e) Provide Scheduling, Installation, Check-Out and Verification of the PI Specific Experiment Hardware and Software into the Ground Integration Unit (GIU)
   (f) Perform the Integrated PI Verification and Validation Tests
   (g) Provide Support for Installation and Initial Check-Out of PI Specific Experiment Hardware and Software into the Engineering Development Unit (EDU)
   (5) Training
   (a) In Conjunction with the PI Specific Development Teams, Develop and Present all Integrated Training Materials for use
   (b) Support the Installation of the PI Specific Experiment's Training Unit in the Payload Training Center (PTC) at JSC
   (c) Develop the Integrated Training Requirements (ISS, ISS Crew, and PI Specific)
   (d) Implement the Training Requirements for the PTC, the Computer-Based Training, the Part-Task Trainers and the On-Orbit Training
   (e) Provide Training to the PI Specific Development Cadre
   (6) Increment Execution
   (a) Provide Real-time Operations and Supporting Activities During ISS Increment Operations
   (b) Coordinate Real-time Operational Requirements
   (c) Acquire and Process Real-time Data
   (d) Support the Correlation of Scientific Data with ISS Mission Events
   (e) Prepare Performance Reports and Maintain Performance Databases
   (f) Plan and Schedule all On-Orbit Operations, in Conjunction with PI Specific Development Teams
   (g) Support Post-Launch PI Specific Hardware check-out on ISS (integration, Activation, Calibration, System Characterization and Operational Procedure Verification)
   (h) Provide Trained Cadre of Console Operators
   (i) Be on Console when Active
   (j) Respond to Requests from ISS Crew, Ground Team or any Off-Nominal Situation
   (k) Develop Standard Procedures for On-Orbit Problems or Anomalies
3. **System/Sustaining Engineering**
   (1) Maintain the Flight Unit During its 15 Year Deployment on ISS
   (2) Track System and Component Level Performance
   (3) Identify Components for Replacement
   (4) Design, Fabricate Assemble and Test Replacement Components
   (5) Maintain and Implement Spares and Logistics
4. **Upgrades**
   (1) Develop Deferred or Evolving Combustion and Fluids Element Components

DRAFT

	FY01	FY02	FY03	FY04	
Hernandez W/F (FTEs)	4	4	4	4	4
Hernandez Cost ($M)	0.540	0.560	0.580	0.600	0.620

Basics of Estimate (S&MA Support):
> Based on $135K in FY2001 and ramping $5K in the out years

	FY01	FY02	FY03	FY04	FY05
Sverdrup W/F (FTEs)	79	90	107	124	134
Sverdrup Cost ($M)	10.665	12.600	15.515	18.600	20.770

Basics of Estimate (Core Engineering&Services Support):
> Based on $135K in FY2001 and ramping $5K in the out years

	FY01	FY02	FY03	FY04	FY05
SAIC W/F (FTEs)	1	1	1	1	1
SAIC Cost ($M)	0.135	0.140	0.145	0.150	0.155

Basics of Estimate (MIS Support):
> Based on $135K in FY2001 and ramping $5K in the out years

	FY01	FY02	FY03	FY04	FY05
CST W/F (FTEs)	7	7	7	7	7
CST Cost ($M)	0.945	0.980	1.015	1.050	1.085

Basics of Estimate (Scheduling&Graphics Support):

> Based on $135K in FY2001 and ramping $5K in the out years

	FY01	FY02	FY03	FY04	FY05
ASRI W/F (FTEs)	10	10	10	10	10
ASRI Cost ($M)	1.350	1.400	1.450	1.500	1.550

Basics of Estimate (Manufacturing Support):
> Based on $135K in FY2001 and ramping $5K in the out years

(2) Integrate New and Emerging Technologies into the Configuration

Telescience Development

(1) Develop and Implement a Ground System for Telescience Operations per SSP54500, 50305 & 50304
(2) TSC must be capable of supporting all MSFC Ground Support Operations Activities
System
(4) Locate the TSC at MSFC and Support Remote User Locations
(5) Maximize the Use of Commercially available Hardware and Software
(6) Incorporate Trek Work Stations and the Remote Copy of the Enhanced HOSC (EHS) into the Design and Development of the TSC

6. **Telescience Operations**

(1) Perform Ground Operations from the TSC and from Remote Sites Where Principal Investigators are Located
(2) Provide Operational Support Systems Required to Plan, Monitor and Control On-Orbit Experiments
(3) Coordinate real-time and Experiment Commanding Requirements
(4) Perform TSC Facility Operations during On-Orbit, Simulation and Training Activities
(5) Simulate On-Orbit Operations for Ground Verification and Ground Operations Training
(6) Operate and Maintain the TSC Facility and Support Systems
(7) Coordinate with Experiment Teams to Develop Increment Specific Telescience Requirements
(8) Store, Distribute, Retrieve and Archive Telemetry Data
(9) Ensure the Physical and Automated Information Systems Security for the TSC Facility and all Users
(10) Provide Experimenters with a Remote Capability to Control and Monitor their Experiment On-Orbit and Communicate with the MSFC TSC and other Ground Systems
(11) Conduct Simulations and Training Sessions for the TSC Cadre and all Users to Assure Proficiency Throughout all Phases of Operations
(12) Certify the Readiness of the TSC, its Systems and Cadre at each Increment ORR

USRA W/F (FTEs)	FY01 79, FY02 90, FY03 107, FY04 124, FY05 134
USRA Cost ($M)	FY01 10.665, FY02 12.600, FY03 15.515, FY04 18.600, FY05 20.770

Basics of Estimate (Science Support):
> Based on $135K in FY2001 and ramping $5K in the out years

Contract # C — **Microgravity Research, Development and Operations**

DEVELOPMENT OF Material Science, Macromolecular Biotechnology, and Glovebox Investigations are currently in-house led activities with support contractors providing the following services on responsible CS.

TASK DESCRIPTION

1. **Provide the Management Function to Monitor, Control and Report the Effort**
   (a) Provide NASA with Information Necessary to Implement Government Surveillance
   (b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
   (c) Maintain an Inventory of all Government Furnished Property and Items Purchased
   (d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews
2. **Plan, Implement and Maintain a Product Assurance System**
   (a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
   (b) Develop a Safety Plan and Work in Accordance to that Plan
   (c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
   (d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
   (e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process
   (f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation
3. **Experiment Definition**
   (a) Provide Initial System Level Experiment Concept for SCR
   (b) Provide Top-Level Engineering Requirements that Address the Pis Science Requirements
   (c) Conduct System Design and Mission Analyses to Evaluate Potential Carrier Options
   (d) Formulate a Preliminary Engineering Plan for Development of the Experiment Concept
4. **Requirements Definition**
   (a) Define the Fundamental System Requirements (Science, Carrier, Safety, Operations and Quality)
   (b) Determine Overall feasibility of Candidate Experiment Concepts
   (c) Design and Develop Breadboards to Reduce Risk and Evaluate Functional Performance
   (d) Develop and Integrated Concept (Experiment to Carrier)
   (e) Formulate an Engineering Plan to be Presented at RDR
5. **Preliminary Design**
   (a) Develop a Preliminary Design-to-Specification
   (b) Develop preliminary Hardware and Software design
   (c) Design, Develop and Fabricate Engineering Mockups, Breadboards, Brassboards and Prototype Hardware
   (d) Provide Assurance that the Preliminary Design will Meet Carrier Safety and Verification Requirements
   (e) Develop Preliminary versions of the PIA and ICD
   (f) Develop a Detailed Project Plan
   (g) Provide a Product Assurance Plan
6. **Design and Development**
   (a) Generate System Build-to-Specifications
   (b) Develop a Comprehensive Flight design
   (c) Design, Develop and Fabricate an Engineering Model
   (d) Develop a Comprehensive Verification Plan
   (e) Provide Assurance that Final Design will Meet all Carrier Safety and Verification Requirements
7. **Carrier Integration, Operations and Training Planning**
   (a) Perform Analyses and Implement Planning Necessary to Define, Prepare for and Conduct Experiment Operations
   (b) Prepare Training Requirements and Plan
   (c) Perform Integrated Logistics Analyses
   (d) Develop a Detailed Assembly, Integration and Test Plan
8. **Fabrication, Assembly and Test**
   (a) Perform Mission and Technical Integration Efforts Necessary to Assure Delivery of a Fully Functional System
   (b) Fabricate, Assemble and Test Flight Unit
   (c) Fabricate, Assemble and Test Qualification Unit
   (d) Fabricate, Assemble and Test Ground Unit (if required)
   (e) Develop, Verify, Validate and Maintain all Software Necessary to Control and Utilize the Flight Hardware
9. **Installation, Assembly and Checkout (IACO)**
   (a) Integrate the Experiment Hardware and Software with the Carrier
   (b) Conduct qualification, Acceptance and Verification Activities
   (c) Provide Assurance that the Experiment System Meets all Carrier Safety and Verification Requirements
   (d) Develop procedures for Crew tended, Untended and Off-Nominal Operations
   (e) Conduct Logistics Support Analyses
   (f) develop all training materials for the Experiment
   (g) Provide for all Ground Servicing Activities at KSC to Ensure Successful Integration of Experiment Hardware with the Carrier or Transportation System
10. **Operations**
   (a) Support On-Orbit Integration Activities with the Carrier and ISS
   (b) Provide Ir real-time Experiment Operations
   (c) Provide PI Mission Operations Support
   (d) Provide Post Mission Operations
   (e) Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software

TVA W/F (FTEs)	FY01 1, FY02 1, FY03 1, FY04 1, FY05 1
TVA Cost ($M)	FY01 0.135, FY02 0.140, FY03 0.145, FY04 0.150, FY05 0.155

Basics of Estimate (Schedulling&Integration Support):
> Based on $135K in FY2001 and ramping $5K in the out years

New Contract W/F (FTEs)	FY01 17, FY02 16, FY03 16, FY04 16, FY05 16
New Contract Cost ($M)	FY01 4.860, FY02 4.900, FY03 5.075, FY04 5.400, FY05 5.580

Basics of Estimate (Microgravity Prime Support):
> Based on $135K in FY2001 and ramping $5K in the out years

SUBTOTALS — **Microgravity Research: Cellular Biotechnology**

	FY01	FY02	FY03	FY04	FY05
Total C/S W/F	6	6	6	6	6
Total C/S $	0.000	0.000	0.000	0.000	0.000
Total Contractor W/F	110	178	278	261	186
Total Contractor $	10.850	10.730	26.380	29.300	23.096
Total JSC	10.850	10.730	26.380	29.300	23.096

JSC (In-House) — **Microgravity Research: Cellular Biotechnology**

Provide surveillance and contract management of contracted activities
Provide technical management of all contracted activities for the entire research and development effort
Report discipline metrics
Develop, manage and maintain research plans and science requirements documents

USG W/F (FTEs)	FY01 6, FY02 6, FY03 6, FY04 6, FY05 6

Perform project planning and direction
Provide project management for all Phase B/C/D/E efforts
Provide representation at various ISS boards, panels, meetings and reviews
Coordinate JSC integration activities with MRPO and ISSPO
Represent the research program to domestic/international conferences, symposia and media
Generate management reports that reflect the status of ISS payload and planning operations
Communicate the significane of research results to the public
Develop informational and educational materials targeted at technical professionals, educators, students and the public
Conduct advanced technology development studies to enhance future experiment hardware capabilities
Manage data archiving/dissemination
Plan, advocate and defend research discipline content, budget and milestone schedules
Administer and manange PI grants/cooperative agreements/contracts
Assure reporting of PI research efforts/progress
Guide PI in refining science requirements, and experiment procedures
Support PI during experiment planning and operations
Dfacilitate experiment data analysis and interpretation
Verify experiment hardware meets science requirements

NASA JSC (Contracted)

Contracted Support for Cellular Biotechnology
Wyle/Cellular Biotechnology Program Contract/JSC/SD12 (Contract #NAS9-97114; UPN 398)

1. **Hardware development**
(a) Design, fabricate, test and flight certify the necessary equipment and subsystems for operation on the ground and aboard the ISS.
(b) Design and develop hardware in accordance and compliance with ISO 9001
(c) Establish a configuration management process to control critical hardware, software and documentation
(d) Establish and maintain a verification program for flight hardware
(e) Develop and document requirements and design specifications
(f) Develop preliminary hardware and software designs
(g) Conduct all design and requirements reviews
(h) Provide assurance that preliminary design will meet ISS safety and verification requirements
(i) Perform system level analyses and trade studies to optimize designs
(j) Perform required testing and verification
(k) Develop engineering model hardware to minimize development risk
(l) Perform engineering design and drafting for required components and systems
2. **Sensor technology development**
(a) Develop online, rapid, selective sensors and real-time process control technologies for measurement and regulation of the concentration of substrates, cell products, and dissolved gases, as well as biomass in bioreactors, leading to fully-automated bioreactor systems.
(b) Develop functional requirements documents
(c) Develop, evaluate and deliver operational breadboard technologies that meet functional req'ts
(d) Provide designs, experimental data and reports to NASA
(e) Develop and implement an annual sensor technology development plan
(f) Submit original findings for publication to peer-reviewed scientific and technical journals
(g) Identify emergent, novel, or mature technologies that have the potential to meet requirements
(h) Perform cell-based experiments in relevant bioreactor environments
(i) Provide theoretical, concept and prototype technology models to NASA
(j) Track and record performance of technologies that are developed into flight hardware
3. **Facility development**
(a) Define, design, develop, test and flight certify a rack-level facility to support experiments in cellular biotechnology.
(b) Develop and maintain a BTF master schedule
(c) Prepare and conduct BTF status meetings
(d) Plan for and conduct a Requirements Definition Review (RDR)
(e) Develop and provide a set of metrics on BTF development to NASA
4. **Cell Science Support**
(a) Develop and utilize special methodologies for predicting and modeling the responses of cells to microgravity; perform all preflight, flight and postflight operations for each flight experiment.
(b) Iteratively conduct ground-based cell and tissue culture experiments
(c) Perform pre-flight, flight, and post-flight operations
(d) Optimize PI experiment parameters (e.g., protocols, materials, culture media formulation, etc.)
(e) Evaluate flight experiment hardware performance in ground-based culture experiments
(f) During a flight, conduct simultaneous control experiments on the ground
(g) Assemble lab procedures, protocols, documents and records for publication by the PI
(h) Collect all PI experiment data and communicate these data to NASA
(i) Maintain pre-flight, flight, and post-flight records of experiments
5. **Payload and Facility Integration**
(a) Define, consolidate and document the requirements, capabilities and interfaces for cellular biotechnology payloads for EXPRESS Rack and BTF
(b) Ensure that all flight documentation accurately reflects requirements
(c) Facilitate and coordinate all Level IV, III/II, and I tests, acceptance and functional test, and integrated testing
(d) Maintain current databases on changes in the ISS and ground support facilities
(e) Participate in ISS teleconferences, meetings, AITs, IPTs and working groups
(f) Provide integration at multiple levels to transition experiment hardware to space operations
(g) Provide flight project management and experiment integration for ISS missions
(h) Meet ISS mission milestones, and develop implementation plans for support of each mission
(i) Prepare acceptance data packages
(j) Ensure required test procedures have been developed, reviewed, and delivered to testing facilities
(k) Schedule and assist in the conduct of acceptance and certification of all experiment hardware
(l) Perform integrated analyses of experiment systems and EXPRESS and BTF
(m) Participate in all required safety reviews, design reviews, and requirements reviews
(n) Develop all required documents and presentations to the various ISS panels and boards
(o) Submit flight specific data and review applicable documentation, such as PIPs, PDL, etc.
(p) Develop inflight procedures in accordance with the Crew Procedures Management Plan
(q) Ensure inflight procedures are compatible with safety, biocontainment, and inflight activities
(r) Develop a plan and schedule, coordinate, and provide crew training for each flight investigation
(s) Maintain detailed databases to track major milestones and actions
6. **Mission Operations Support**
(a) Provide real-time support during on-orbit operations
(b) Conduct capability assessments to optimize ISS resource envelopes to meet user requirements
(c) Update and review all flight procedures and flight documenatation
(d) Perform flight simulation support
(e) Perform operations procedures modifications resulting from simulations or in real-time
(f) Review operations requirements to ensure on-orbit mission profiles are realistic and optimized
(g) Support mission operations reviews
(h) Maintain and update flight schedules and mission timelines, identifying key issues
(i) Support and coordinate all processes required for PI support during real-time operations
(j) Develop and maintain a traffic model
(k) Develop and implement a ground system for telescience
(l) Perform TSC operations during on-orbit, simulation and training activities
7. **Outreach**
(a) Plan, develop, update and maintain publications such as videos, news articles, PAO briefings and web pages
(b) Provide personnel and logistics support for outreach activities, including special projects, demos, displays, seminars and presentations
(c) Interface with existing and future PIs, and with institutes and centers
(d) Provide status updates on outreach and education activities
(e) Develop and maintain a database of PIs
(f) Develop materials and content for exhibits on- and off-site

		FY01	FY02	FY03	FY04	FY05
Contract Cost	(NOA $M)	10.85	10.73	26.38	29.30	23.10

Basis of Estimate:
1) 2000 Congressional budget.

		FY01	FY02	FY03	FY04	FY05
Contractor W/F	(FTEs)	110	178	278	261	186

General

(a) Become ISO 9000 certified and maintain an effective quality management program
(b) Provide NASA with information necessary to implement government surveillance
(c) Establish a configuration management process to control critical hardware, software and documentation
(d) Develop and implement a safety and health plan and work in accordance to that plan
(e) Provide packing/crating, shipping, and receiving government- and contractor-provided equipment
(f) Coordinate all relevant program activites aboard the KC-135 and DC-9 aircraft
(g) Conduct internal audits to ensure contract requirements are fully complied with
(h) Establish and maintain a system to ensure identification of all materials/products for appropriate traceability
(i) Assist in the preparation of research proposals, reports, and peer-reviewed papers in professional journals
(j) Contribute experiment data and information to the archival databases at MSFC
(k) Plan, coordinate conduct and document workshops and conferences for the formulation of new programs
(l) Develop and implement risk management techniques
(m) Provide routine calibration, certification and maintenance support and records thereof for instrumentation
(n) Provide specialized training and qualification of personnel as necessary

SUBTOTALS

Research Management: Microgravity Fundamental Physics (JPL)

	FY01	FY02	FY03	FY04	FY05
Total C/B W/F	18.6	18.6	19.5	25.4	21.1
Total C/B $	6.674	7.852	14.996	15.451	16.737
Total Contractor W/F					
Total Contractor $	8.837	7.448	9.008	6.577	4.701
Total JPL	15.511	15.300	24.004	22.028	21.436

JPL (In-House)

Research Management: Microgravity Fundamental Physics (JPL)

		FY01	FY02	FY03	FY04	FY05
JPL total W/F	(FTEs)	18.6	18.6	19.5	25.4	21.1
JPL total cost	(est. $M)	6.674	7.852	14.996	15.451	16.737

Basis of Estimate:

1) Workforce costs are on an actual, full-cost basis.
2) Basis is POP-2001 Lead Center Recommend as of 6/23/2000.
3) JPL cost includes JPL labor with all associated direct costs, as well as procurements and hardware purchased by JPL and used in experiment definition, assembly, integration, test, and operations.

1. **Utilization Program Management**

1. **Consolidated Program Integration Management:** Provides for a single JPL point-of-contact for the flight planning and integration of all Fundamental Physics microgravity experiments deployed on the International Space Station. Specific activities include:

a) Coordination with flight projects (Low Temperature Microgravity Physics Experiments and Laser Cooling and Atomic Physics Experiments) to ensure requirements for resources, logistics and accommodations are documented and recognized by ISS planners
b) Review of ISS change documentation for impacts to Fundamental Physics activities
c) Coordination and execution of payload accommodation tradeoff studies
d) Coordination of Fundamental Physics flight planning with the MFSC Microgravity Research Program Office.
e) Representation of Fundamental Physics discipline at ISS reviews
f) Development of requirements and planning for operational activities, e.g., telescience support
g) Facilitation of Fundamental Physics participation in Glovebox Investigator program
h) Generation of management reports that reflect status of ISS payload planning and operations
i) Benchmarking of Fundamental Physics processes against those of other MRP and ISS disciplines
j) Representation of Fundamental Physics interests at, and assurance of appropriate project representation for, numerous ISS boards, panels, forums and working groups

2. **Telescience Support Center:** Planning and implementation of a Telescience Support Center at JPL to facilitate engineering operations and science activities in both multi-user facilities and experiment-unique payloads. Specific functions to be incorporated include:

a) Connectivity between JPL and ISS payload operations center
b) Monitoring of instrument and facility health and status by engineering staff at JPL
c) Archiving and backup of science data at JPL
d) Provision of science data to Principal Investigators at their home institutions
e) End-to-end simulation and testbedding for verification, checkout, procedure development, training, and simulation

3. **Outreach:** Development and propagation of informational and educational materials targeted at other technical professionals, the general public, and students to promote awareness of, convey information about, and build support for Fundamental Physics experiments. Specific functions include:

a) Formal Education modules on fundamental physics research for K-5 grade levels, including teacher training
b) Informal education institutes sponsored by OLMSA or JPL, including traveling exhibits, with necessary ancillary materials (slides, pictures, video) for presentations and public talks
c) Website content, including artwork and on-line educational materials emphasizing the value and benefit of fundamental physics research

2. **Flight Experiments Utilization (Low Temperature Microgravity Physics Experiments and Laser Cooling and Atomic Physics Experiments [PARCS and RACE]): Definition, development, test, integration, launch preparation, and operations support of investigation-unique experiment hardware and software.**

1. **Translation of investigation science requirements into instrument functional requirements:** Peer-reviewed and selected science objectives are analyzed to determine their optimal implementation by feasible experimental hardware, including tradeoff studies, technology availability assessments, fabrication methods, and risk management. Various instrumentation and implementation approaches are considered interactively with the Principal Investigator to determine optimum performance.
2. **Development of required instrumentation technologies:** Specific technologies and tools required to build and operate instrumentation for fundamental physics experiments are developed. These include high-fidelity laser systems, precise magnetic field control, milli-Kelvin thermal control, ultra-high vacuum technologies, cryogenic management systems, quantum interferometry, and others.
3. **System engineering of integrated experiment:** Specification of purchased/contracted components, maintenance of experiment performance requirements and their verification, and assurance that science requirements are satisfied.
4. **Experiment hardware assembly and integration:** Fabrication of ultra-high precision and/or highly unique instrumentation components, assembly and integration of in-house and purchased components, final packaging of complete instrument, all qualification, test, and verification activities.
5. **Launch campaign and flight operations:** Preparation and certification of integrated experiment for shipping, launch vehicle integration, and launch. Engineering and scientific monitoring of experiment during launch, operations, and recovery phases. Interface with RPO and ISS organizations for all accommodations, resource, and operations issues.
6. **Risk management and mission assurance:** Overall management of development, performance, cost, and schedule risk during definition, development, test, and operations. Assurance of full science return during flight activities.

3. **Low Temperature Microgravity Physics Facility Development:**

1. **Develop Science Requirements Envelope Document (SRED):** Identify requirements from selected, candidate, and typical flight investigations. Determine "best-return" superset of requirements for facility capabilities. Perform trade-off analyses on various requirements sets to determine optimum set.

2. **Mission Integration & Planning Functions:** Develop processes that facilitate the strategic and tactical planning of fundamental physics investigations. Facilitate efforts to maximize science return and research opportunities on ISS. Develop and maintain a planning database that includes PI resource requirements and resource allocations. Support development of the mission evaluation requests (MERS). Develop and maintain an integrated Fundamental Physics traffic model. Develop and end-to-end PI integration process for LTMPF PI's into LTMPF. Provide generic PI specific documentation required for integration into the LTMPF. Develop any tools required to facilitate the PI integration process and to be compatible with the ISS program.
3. **Management and Engineering Support:** Perform Contractor Technical Management oversight of LTMPF contract. Negotiate deliveries and schedule milestones with contractor. Continuously evaluate contractor performance and take early action in case of any discrepancies. Ensure that the contractor designs, builds, tests, and delivers the facility consistent with the SRED requirements.
4. **Mission Integration, Testing, and Launch Support:** Integrate the instruments to be flown on the first flight with the facility and verify that all functional and performance requirements are being met. Work closely with the principal investigators to calibrate and optimize their instruments prior to delivery for the launch campaign. Run nominal Sequence of Events testing of the entire system and use to train the mission operations personel. Perform system environmental testing on the fully integrated flight system and verify that the equipment survived functionally as well as performance wise. Use special containers to ship equipment cold to launch site while not jeopardizing the vacuum and cryogenic integrity of the experiments. Support the processing flow at the launch site. Support launch and mission operations
5. **LTMPF Verification:** Develop and Maintain the LTMPF Test Equipment for Early Development Testing and Final Verification & Test. Provide Sufficient Access of LTMPF Hardware and Software to the PI Specific Development Teams to Ensure Successful Operation of the Final Integrated LTMPF - PI System. Provide Sufficient Personnel Support, Training and Training Materials on the Use of LTMPF to the PI Specific Development Teams. Provide All Interface and Verification Tests between LTMPF and the PI Specific Hardware. Provide Scheduling, Installation, Check-Out and Verification of the PI Specific Experiment Hardware and Software into the Ground Integration Unit (GIU). Perform the Integrated LTMPF/PI Verification and Validation Tests. Provide Support for Installation and Initial Check-Out of PI Specific Experiment Hardware and Software into the LTMPF Engineering Development Unit (EDU).

LTMPF Training: In Conjunction with the PI Specific Development Teams, Develop and Present all Integrated Training Materials for us[illegible] egrated Training Requirements (ISS, ISS Crew, LTMPF, PI Specific). Implement the Training Requirements for the PTC, the Computer-Based Trai[illegible] Task Trainers and the On-Orbit Training.

7. **Increment Execution:** Provide Real-Time Operations and Supporting Activities During ISS Increment Operations. Coordinate Real-Time Operational Requirements. Acquire and Process Real-Time Data. Support the Correlation of Scientific Data with LTMPF and ISS Mission Events. Prepare LTMPF Performance Reports and Maintain LTMPF Performance Databases. Plan and Schedule all LTMPF On-Orbit Operations, in Conjunction with PI Specific Development Teams. Support Post-Launch PI Specific Hardware Check-Out on ISS (Integration, Activation, Calibration, System Characterization and Operational Procedure Verification). Provide Trained Cadre of Console Operators. Be on Console when LTMPF is Active. Respond to Requests from ISS Crew, Ground Team or any Off-Nominal Situation. Develop Standard Procedures for On-Orbit Problems or Anomalies.

8. **LTMPF System/Sustaining Engineering:** Maintain the Flight Unit During Its 15 Year Deployment on ISS. Track LTMPF System and Component Level Performance. Identify LTMPF Components for Replacement. Design, Fabricate Assemble and Test LTMPF Replacement Components. Maintain and Implement LTMPF Spares and Logistics.

JPL (Contracted)

Contracted Support for Microgravity Fundamental Physics

Contract #

1. **Contract Title and Performing Organization**
Flight Experiments Components:
GENERIC INSTRUMENT DEVELOPMENT FUNCTIONS:
Preliminary Design: Develop a Preliminary Design-to-Specification. Develop preliminary Hardware and Software design. Design, Develop and Fabricate Engineering Mockups, Breadboards, Brassboards and Prototype Hardware. Provide Assurance that the Preliminary Design will Meet Carrier Safety and Verification Requirements. Develop Preliminary versions of the PIA and ICD. Develop a Detailed Project Plan. Provide a Product Assurance Plan.
Design and Development: Generate System Build-to-Specifications. Develop a Comprehensive Flight design. Design, Develop and Fabricate an Engineering Model. Develop a Comprehensive Verification Plan. Provide Assurance that Final Design will Meet all Carrier Safety and Verification Requirements.
Carrier Integration, Operations and Training Planning: Perform Analyses and Implement Planning Necessary to Define, Prepare for and Conduct Experiment Operations. Prepare Training Requirements and Plan. Perform Integrated Logistics Analyses. Develop a Detailed Assembly, Integration and Test Plan.
Fabrication, Assembly and Test: Perform Mission and Technical Integration Efforts Necessary to Assure Delivery of a Fully Functional System. (Fabricate, Assemble and Test Flight Unit. Fabricate, Assemble and Test Qualification Unit. Fabricate, Assemble and Test Ground Unit (if required). Develop, Verify, Validate and Maintain all Software Necessary to Control and Utilize the Flight Hardware.
Installation, Assembly and Checkout (IACO): Integrate the Experiment Hardware and Software with the Carrier. Conduct qualification, Acceptance and Verification Activities. Provide Assurance that the Experiment System meets all Safety and Verification Requirements. Develop procedures for nominal and Off-Nominal Operations. Develop all training materials for the Experiment. Provide for all Ground Servicing Activities at launch site to Ensure Successful Integration of Experiment Hardware with the Carrier or Transportation System.
Operations: Support On-Orbit Integration Activities with the Carrier and ISS. Provide Real-Time Experiment Operations. Provide PI Mission Operations Support. Provide Post Mission Operations. Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software. Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software.
INSTRUMENT-SPECIFIC CONTRACTS:
1. University of New Mexico - DYNAMX: Develop the physics package for the DYNAMX instrument and verify that it will meet all science requirements. Provide science, engineering, software, and operations support during integration and test activities at JPL, launch campaign activities at the launch site, and mission operations during the flight of the experiment.

2. Stanford University - SUMO: Develop the physics package for the SUMO instrument and verify that it will meet all science requirements. Provide science, engineering, software, and operations support during integration and test activities at JPL, launch campaign activities at the launch site, and mission operations during the flight of the experiment.

3. University of California at Santa Barbara - BEST: Develop the physics package for the BEST instrument and verify that it will meet all science requirements. Provide science, engineering, software, and operations support during integration and test activities at JPL, launch campaign activities at the launch site, and mission operations during the flight of the experiment.

2. **Low Temperature Microgravity Physics Facility (Ball Aerospace)**

1. **Project management:** Provide NASA with information necessary to implement government surveillance. Establish a configuration management process to control critical hardware, software and documentation. Maintain an inventory of all government-furnished property and items purchased. Conduct milestone reviews, safety reviews and other NASA defined reviews. Develop a materials assurance process for documenting the materials and processes associated with the final design hardware. Assure the reliability, availability and maintainability of the flight and ground segment. Assure the management, safety and control of all flight-related software/firmware and the software development process. Develop a risk management process to control critical flight hardware, software and documentation.
2. **Develop a Preliminary Design of the LTMPF:** Develop and document the preliminary design-to-specifications. Develop a preliminary hardware and software design. Produce mock-ups, breadboards, brassboards and subsystem prototype hardware to establish feasibility and reduce risk. Provide assurance that the preliminary design will meet ISS safety and verification req'ts. Develop preliminary versions of required documentation. Update the contractor project plan. Provide a product assurance plan.
3. **Incrementally complete the design to meet performance and functional requirements:** Generate complete system build-to-specifications. Perform system-level analyses and trade studies to optimize the design. Develop an overall detailed flight design. Develop final software design and perform code development. Minimize development risk through development of engineering model hardware. Perform required testing and integration. Develop a comprehensive final verification plan. Perform the analysis and implementation planning for long term payload operations.
4. **Fabricate, assemble, test, verify and deliver an operational LTMPF system per requirements.** Perform the mission and technical integration necessary to assure delivery of a fully functional LTMPF system. Incrementally fabricate, assemble, and test LTMPF flight ground and other hardware and software. Conduct installation, assembly and checkout activities with the ISS and launch carrier. Conduct qualification, acceptance and verification activities on all components, subsystems and combined assemblies. Conduct acceptance testing of flight and ground racks and overall LTMPF system. Provide assurance that the experiment system meets all ISS safety and verification requirements. Develop procedures for nominal and off-nominal operations. Develop the payload training center unit (PTCU). Provide all ground servicing to ensure successful integration with the transportation system. Provide support for experiment development teams for initial on-orbit operations. Provide all requisite documentation and procedures so that the combined JPL and PI teams can operate the facility without risk to personnel and hardware. Provide
5. **Provide for initial installation, checkout, calibration and operation of the LTMPF system to include the initial experiments:** Provide for initial installation, checkout, calibration and operation of the LTMPF racks and experiments. Verify post-launch performance and state-of-health of LTMPF system. Perform on-orbit performance verification program.

Contract total cost	($M)	FY01	FY02	FY03	FY04	FY05
		8.837	7.448	9.008	6.577	4.701

SUBTOTALS

SPACE PRODUCT DEVELOPMENT OFFICE ISS UTILIZATION PLANNING AND ADMINISTRATION

	FY01	FY02	FY03	FY04	FY05
Total C/S W/F	5	5	5	5	5
Total C/S $	0.175	0.175	0.175	0.190	0.190
Total Contractor W/F					
Total Contractor $	18.925	15.876	15.915	18.715	18.710
Total SPD	19.100	16.051	16.090	18.905	18.900

MSFC SPD (Inhouse)

SPACE PRODUCT DEVELOPMENT OFFICE ISS UTILIZATION PLANNING AND ADMINISTRATION

Develop and Implement SPD ISS utilization program plans.
Develop ISS flight proposals and traffic model.
Develop flight selection decision package considering technical, business, and flight accommodation request.
Represent SPD payload user requirements to the ISS Program.
Assist PD's in developing and implementing their ISS utilization plans.
Manage SPD ISS user operations.
Provide input to ISS Program and develop consolidated utilization budgets.
Provide SPD ISS utilization advocacy.
Formulate utilization metrics and monitor PD performance against them.
Manage authorized budget and resources.
ISS utilization status reporting to HQ.
Program Outreach (Industry/Public).

		FY01	FY02	FY03	FY04	FY05
USG W/F	(FTEs)	5	5	5	5	5
USG Cost	(est. $M)	0.18	0.18	0.18	0.19	0.19

Basis of Estimates
1) Assumes 1 FTE = $100,000 + 40% overhead.

MSFC SPD (Contracted)

Space Product Development Program Services (bd Systems Contract #NAS8-99065);UPN___)

WBS

3.1 **SPD Program Payload Development and Requirements Integration Support**
Maintain documentation and schedules to reflect the status of the payload development activities for SPD payload development projects.
Develop schedules to reflect payload development activities for the SPD Program Office.
Disseminate SPD payload planning manifest information to NASA Headquarters, other NASA centers, Commercial Space Centers, other government agencies, universities and companies, and the ISS payload integration teams

3.2 **SPD Program Research Integration Support**
Represent SPD payload requirements and overall research goals in the ISS Research Mission Management activities to such forums as the Multidiscipline Working Group and the Increment Research Working Group.

Contract Cost	(NOA $M)	FY01	FY02	FY03	FY04	FY05
		1.866	0.985	1.602	2.941	3.138

3.5 3.5.1 3.5.2	SPD Payload Operations Support Maintain necessary documentation to properly represent SPD Program manifest planning and research goals. Develop and maintain payload operations requirements for SPD payload projects Represent SPD payload operations requirements in the proper ISS program forums SPD Program Projects Support Develop schedules and documentation to reflect SPD payload operations requirements. Develop and maintain documentation to reflect the performance and goals of SPD research projects. Develop, prepare and maintain documentation, briefing materials, reports, and other related information on SPD Program and commercial research projects. Research, recommend and coordinate with the microgravity science program, International Space Station (ISS) Program Office, Commercial Space Centers (CSC's), independent commercial payload developers, universities, private companies, NASA Headquarters and Field Centers to develop the SPD Program documentation. Develop the agenda, coordinate dates, perform all logistics planning and communicate plans to all participants in Program reviews, meetings and telecons.
MSFC SPD (Contracted)	**ISPR Common Hardware Contract (Boeing Contract # NAS8-50000**
	Produce common ISPR hardware items (AAA's, coldplates, connectors, etc.)
MSFC SPD (Cooperative Agreements)	**Commercial Space Center Funding**
	Develop payloads and experiments including design, development, test, training, operations, and post-flight analysis. **Identify Products.** **Generate proposals and business plans.** **Develop industry partnerships.** **Develop ISS product roadmaps.** **Provide input to long term plans and program direction** **Provide advocacy input.** **Project metrics reporting** **Project planning and direction.**

	(NOA $M)	FY01	FY02	FY03	FY04	FY05
Contract Cost		0.23				

Contract Cost	(NOA $M)	FY01	FY02	FY03	FY04	FY05
WCSAR NCC8-129		1.733	1.218	1.184	1.184	1.184
BIOSERVE NCC8-131		1.480	1.270	1.220	1.750	1.790
UAB NCC8-126		6.891	5.743	5.489	3.901	4.370
SDC NCC8-128		1.400	0.760	0.760	0.760	0.800
UAH NCC8-132		1.087	1.080	0.928	0.400	0.400
CCACS NCC8W-0098		2.973	3.800	3.200	3.300	3.300
CAMMP NCC8-130		1.448	1.060	0.776	0.400	0.880
Center for Space Power		0.400	0.400	0.400	0.500	0.600
New Commercial Centers					3.589	2.216

NASA-MSFC (In-House)	TACTICAL SPACE UTILIZATION MANAGEMENT
	Perform Project Management and Systems Engineering functions for the EXPRESS Projects; EXPRESS Development and Engineering Integration; Project Management for POIF; Payload Operations Directors for each ISS Increment; Payload Display Review Panel Chairman; ARIS Operations Development; EXPRESS Rack and payloads operations support; Overall Management of POIC cadre, ground personnel training, mission planning, data management, command and control of payloads and payload support systems; Management of the Ground Systems development and operations to support telemetry & command processing, voice & video services, local & remote user interfaces; TReK development; Safety; Quality; Procurement; Program Analysts; Managerial Support

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F (FTEs)	185	151	134	129	117
USG Cost (est. $M)					

NASA MSFC (Contracted)	SPACE STATION PAYLOADS UTILIZATION (Boeing Contract # NAS8-50000 ; UPN 479 & 496)
WBS 1.4.4.1.2	**Payload Planning System (PPS):** **UPN 479-43** **Software Systems Engineering, Development, and Test** 1) Software Management Plans 2) Software Development Environment (SDE) Development and Maintenance 3) Functional Requirements Maintenance: maintain System Spec 4) Detailed software requirements and interface definition 5) Design: derive, document and maintain the software design for PPS in the Software Design Document, the design for external systems interfaces, and the Software Development Folders 6) Code, debug , and unit test the PPS software functions 7) Inetgration and verification testing of the PPS functions 8) Create and run Validation Test Procedures, publish Validation Test Report 9) Validation Test Support to fix software problems which, if not fixed, could prevent successful completion 10) Integration Test Support 11) Delivery and Installation 12) Provide technical support Operations and Maintenance of the PPS functions and documentation through the life of the contract
1.4.5.4.1	**EXPRESS Rack System** **UPN 496-10** Define, design, develop, manufacture, test, qualify, deliver, and maintain EXPRESS Rack System including: EXPRESS Flight Rack EXPRESS Transportation Racks EXPRESS Rack Trainers EXPRESS Rack Functional Check-out Units EXPRESS Rack Suitcase Simulators SIR Drawers
1.4.5.4.3	**ISIS Drawer Design and Development** **UPN 496-86** Provide Engineering, manufacturing, and materials to design, develop, fabricate, assemble, test/verify, qualify, and deliver ISIS payload drawers Perform sustaining engineering
1.4.5.4.4	**Consolidated Payload Logistics and Maintenance** **UPN 496-87**
1.4.5.4.4.1	Consolidated Payload Logistics and Maintenance Support Analysis 1) Define, develop, manage, track, and status the capability to implement the Consolidated Payload Logistics and Maintenance Support Analysis 2)Perform the data collection, system, and equipment level analysis for supportability and maintenance, validating analysis results, creating/updating LSAR database, and deliver analysis reports. 3)Perform data collection, operations and maintenance analysis, development of operations and maintenance manuals, and validation of developed manuals. 4)Perform the Failure Modes and Effects Analysis, failure rate predictions, limited life item identification, preventative maintenance analysis, and maintenance timeline analysis necessary to support the LSA activity.
1.4.5.4.4.2	Consolidated Payload Spares/Provisioning 1) Perform the data collection, provisioning analysis, validating analysis results, creating/updating recommended spares lists, and delivery of recommended spares lists

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	61.15	48.43	49.60	49.44	49.09

Basis of Estimate:
1)POP 00 Mark.

2)Initial procurement (within funding limitations) of obsolescence spares, Spares Acquisition in Production (SAIP), and designated connectors for users. Procurement of two spare kits for BRP HHR flight racks, and two Avionics Air Assemblies as specified in the Deliverable Items List. Laptop spares for BRP are included as part of the GFE list for inclusion in the BRP spares kit; 2 total.

3) Spares management and warehousing

1.4.5.4.6 **EXPRESS Pallet Oversight** **UPN 496-70**

1) Project Management

2) Generation/derivation of inputs to NASA program requirements; review of Project derived requirements and requirements traceability; and coordination of comments and inputs; development of the System Development Specifications and specifications for the PTC Trainer, KSC Simulator, and NBL Trainer.

3) Review and review coordination of design review plans, drawings/documentation, trades, analysis, and initiation of Review Item Discrepancies.

4) Integration and Verification Test: Review coordination of integration/verification plans and procedures, integration/verification test oversight, and review of final test reports. The task also includes sampling of verification analyses results.

5) Manufacturing: Review of manufacturing plans and procedures, support of quality sampling of manufacturing, and review of manufacturing schedules/reports

6) Integration/Operations: Coordination and facilitation of operations and integrationinputs.

1.4.5.5.1.1 **EXPRESS Rack Payload Analytical Integration** **UPN 496-10**

1) Define, develop, manage, track and status the capability to implement the EXPRESS Rack payload and integrated EXPRESS Rack compliment payload analytical integration process. Contractor developed models, tools and equipment necessary to implement these tasks shall be appropriately documented and delivered. Develop & deliver EXPRESS Rack Payload Accommodations Handbook (PAH), EXPRESS Rack Payload Interface Definition Document (IDD), EXPRESS Rack Payloads Generic Payload Verification Plan

2) Provide engineering support to EXPRESS RACK Payload Developers.(1) prepare and deliver EXPRESS Rack Payload specific ICDs and associated EXPRESS Rack Payload Verification Plans (2) assist in collecting experiment and operations data and requirements, via the PDL, necessary for engineering and operations integration planning and execution, (3) provide issueresolution associated with ICDs, PVPs and payload data files, (4) provide payload verification planning, tracking, and statusing, and (5) support development of individual sub-rack payload EXPRESS Integration Agreements (EIA).

3) Implement the EXPRESS payload/experiment engineering integration and verification process at the EXPRESS payload-to-Rack and the EXPRESS payload compliment level. Collect payload integration requirements and data, coordinate, establish, and maintain agreements with payload developers regarding interfaces, schedules, accommodations, resources requirements, operations support, and physical integration/test/checkout services to be provided. Develop, analyze, and synthesize EXPRESS Rack payload compliment integration data and requirements for the EXPRESS facilities and ground systems which result in products used by other ISS integration elements for EXPRESS payload verification, ground physical integration test and checkout, payload logistics planning and flight operations planning and implementation. Conduct compatibility analyses of the integrated EXPRESS Rack with the ISS in the following areas: Structures, dynamics, microgravity, mass properties, command and data handling, communications and tracking, thermal,electrical power, EMI/EMC, safety, and system engineering.

1.4.5.5.1.2 **EXPRESS Rack Payload Software Integration and Verification** **UPN 496-10**

Perform synthesis and analysis of individual EXPRESS Rack payload software requirements; definition, development, integration, verification, and sustaining of integrated payload flight software products for EXPRESS Rack Interface Controller (RIC) and EXPRESS Rack Laptop and verification activities to ensure compatibility of integrated EXPRESS Rack. Develop the EXPRESS Rack PSIV capability and process including the EXPRESS Rack software development environment and software verification environment.

1.4.5.5.2.1 **EXPRESS PALLET PAYLOAD ANALYTICAL INTEGRATION** **UPN 496-70**

1) Define, develop, manage, track and status of the capability to implement the EXPRESS Pallet payload and integrated EXPRESS Pallet compliment payload analytical integration process. Contractor developed models, tools and equipment necessary to implement these tasks shall be appropriately documented and delivered. An EXPRESS Pallet Payload Accommodations Handbook (PAH) shall be prepared and delivered. An EXPRESS Pallet Payload Interface Definition Document (IDD) shall be developed, updated, and maintained. An EXPRESS Pallet Payloads Generic Payload Verification Plan (PVP) shall be developed, updated, and maintained

2) Provide engineering support to EXPRESS Pallet Payload Developers, including:: (1) prepare and deliver EXPRESS Pallet Payload specific ICDs and associated EXPRESS Pallet Payload Verification Plans, (2) assist in collecting experiment and operations data and requirements, via the PDL, necessary for engineering and operations integration planning and execution, (3) provide issue resolution associated with ICDs, PVPs and payload data files, (4) provide payload verification planning, tracking, and statusing, and (5) support development of individual sub-pallet payload EXPRESS Integration Agreements (EIA).

3) Implement EXPRESS payload/experiment engineering integration and verification process at the EXPRESS payload-to-Pallet adapter and the EXPRESS payload compliment level. Collect payload integration requirements and data, coordinate, establish, and maintain agreements with payload developers regarding interfaces, schedules, accommodations, resources requirements, operations support, and physical integration/test/checkout services. Develop, analyze, and synthesize EXPRESS Pallet payload complement integration data and requirements for the EXPRESS facilities and ground systems. Conduct compatibility analyses of the integrated EXPRESS Pallet with the ISS in: structures, dynamics, microgravity, mass properties, command and data handling, communications and tracking, thermal,electrical power, EMI/EMC, safety, and system engineering

1.4.5.5.2.2 **EXPRESS Pallet Payload Software Integration and Verification** **UPN 496-70**
Perform synthesis and analysis of individual EXPRESS pallet payloadsoftware requirements; definition, development, integration, verification, and sustaining of integrated payload flight software products for EXPRESS pallet controller and EXPRESS pallet displays/applications, and verification activities to ensure compatibility of integrated EXPRESS pallets. Develop the EXPRESS pallet PSIVcapability and process including the EXPRESS pallet software development environment and software verification environment. This WBS also include the activities associated with the STEP EP development effort.

1.4.6.2 **Payload Operations Integration Function (POIF)** **UPN 479-22**
Provide the overall operations engineering and integration for the development and maintenance of requirements, plans, schedules, processes, procedures, and resource analyses required for the definition and coordination of U.S. and International Partner payload operations integration and the conduct of those operations. The POIF includes development, payload operations integration, execution preparation, and operations execution tasks.

1) **POIF Development**: Includes the Early Payload Accommodation (EPA) and Full Operations Capability (FOC) development tasks required for the integration of payload operations planning, requirements, procedures, processes, interfaces and tools related to ground and onboard systems, the development of the integrated payload operations processes, and the integration of these activities with the MCC-H, users and International Partners.
a)Program requirements and architecture for utilization operations and training (includes end-to-end user operations concept
b)Payload operations process definition and management (includes USOC implementation process definition)
c)Systems operations integration, standard interfaces, and responsibilities d)User operations functionality and standard interfaces, includes collection and definition of functional requirements and UOF Interface Services requirements.
e)International partner operations integration, standard interfaces, and responsibilities
f) Payload training plans, processes, and standard tools.
g) Flight systems functionality and payload operations development
h) Ground systems functionality and payload operations development.
i) Definition of the payload operations and training requirements needed and methodology for collecting and assessing the requirements.
2) **Operations Preparation:** Includes the tasks for the preparation and management of payload ground support requirements, payload operations information, payload training requirements, and payload operations constraints definition, and payload operations supportproducts. Included in this category are those tasks related to:
a) Payload resources planning, operations compatibility, and crew utilization planning.
b) Payload operations management, including increment operations management and payload operations technical management
c) Establish specifications for collecting and integrating operations and training requirements from payload users and International partners in the areas of payload planning, payload operations support, ground data services and payload training.
d) Ground support requirements, including data satellite utilization planning inputs (e.g. TDRSS, DRS, etc.), NASA network payload requirement inputs for ground networks
e) Payload operations information management, including increment operations plan information control, payload information management system administration and operations document configuration management
f) Inputs to payload training requirements and plans, training strategy teams, and payload operations integrated training plans
g) Payload operations integration, including payload operations management planning, payload operations constraints definition, and payload software requirements definition
h) Integration and implementation of payload requirements for the increments, including, but not limited to, mission rules; systems assessments; ground network and facility requirements.
I) Preparing increment specific operations planning products and schedules, including: Increment Operation Plan; Weekly Planning Products; Payload Regulations; Payload Operations Handbook and POIC Console Handbooks; Verification Plan; operations procedures and reference information (Payloads, TV & Photo Ops, PLSS, LSE, systems/Payloads), Payload Systems Manual, ground ops displays, special computations, scripts for Payload monitoring and control.
j) Participating in the simulations of operations activities with the overall mission operations team
k) Preparing standard procedures and plans for use by USOC hosted users.

l) Preparing procedures and handbooks for EXPRESS Operations.
m) Increment training planning preparation, including TST support, Payload Training Requirements, and Payload Training Support Products.
n) Simulation development.
o) Training scheduling support.
p) Preparation of training products for training USOC-hosted users (DR UO05).

Payload Training Operations: Includes the effort to conduct increment independent and increment dependent payload operations training for crew, POIF personnel, USOC user personnel. Included in this category are those tasks related to conducting simulations.

Realtime, Non-Realtime, and Post Operations: Includes the tasks necessary to execute real-time Payload Operations Integration Center (POIC) Cadre operations and the distributed operations IP cadre during real-time operations, perform payload operations real-time planning, manage payload data/video operations, and control and coordinate operation of the payload complement and payload support systems. Included in this category are those tasks related to:

a)Mission Planning, including weekly planning and developing necessary planning products to support payload and payload support systems operations execution onboard and on the ground
b) Data Management, including the control and coordination of onboard data generation, routing, and recording of payload data/video, the coordination of the Ku-band space-to-ground data communications content, the coordination of the ground distribution of downlinked payload data/video to the end users, and the replanning of data/video systems operations
c) Operations Control, including coordination of POIC tasks required to support the execution of integrated station plans, operation of payload support systems, EXPRESS racks/pallets, coordination of payload operations via crew and ground control, and safety assurance of payload operations. Also includes coordination of response to system/payload anomalies and changes to the onboard executable plans.
d) Post Increment Support, including the preparation of lessons learned, and post-increment reports. Includes coordination of the post-mission video processing, duplication and distribution activities.
e) Operations integration, including payload safety support, configuration management, anomaly resolution, and offline special support.

1.4.6.3 **Payload Data Library** **UPN 479-20**

Contractor management, technical and clerical effort necessary to develop, update, operate and maintain a Payload Data Library (PDL) to collect, manage, and distribute payload requirements and data from Payload Developers. This shall include providing the capability to electronically process payload data collected via remote electronic access by Payload Developers through a single interface and support electronic transfer to Program systems/organizations/databases needing this data. A PDL Users Guide shall be developed and maintained. A PDL Requirements document shall be developed and maintained. Interface Agreement Documents (IAD) shall be developed as required to identify, document, and control the PDL design interfaces with the appropriate NASA and IP databases.

1.4.7.1 **Utilization Project Management** **UPN 496-85**

Utilization Systems Engineering and Integration: Development, documentation, and control of top level derived system level requirements and flight system verification Programs for Science and Utilization flight hardware, station integration, operations, and utilization processes.

1.4.7.2 Safety and Mission Assurance: Definition, implementation, and maintenance of a S&MA program for all elements of the S&U projects. These efforts include: management, planning, S&U analyses and S&MA support to contract end-items and analytical tasks for Safety, Reliability, Maintainability, and Quality Assurance. Also included are; evaluations of the safety, reliability, maintainability, and quality of hardware; software and operations through analyses, test, reviews, and assessments; timely status reporting/documentation of S&MA effort; and establishing compatible assurance requirements among Manufacturing, test, launch and ground operation sites.

1.4.7.3

1.4.8 **Payload Operations and Training** **UPN 479-22**

Payload Operations: Provide labor to develop the on-orbit operations procedures for the EXPRESS Rack systems and EXPRESS Pallet systems. The contractor shall conduct appropriate systems analyses and review schematics provided by the payload developer in support of this task. This effort also provides for the contractor to perform Payload Display development tasks including developing 1) a Payload style guide, 2) a Payload display rapid-prototyping tool, and 3) the Payload Display Review Panel (PDRP) Management Plan.

1.4.8.1

Payload Training: Provide labor to develop individual EXPRESS payload simulator requirements, support payload developers in installing EXPRESS simulators into the Payload Training Capability (PTC) and conduct individual payload training as requested by payload developers.

1.4.8.2

NASA MSFC (Contracted) **UTILIZATION AND MISSION SUPPORT - UMS (Lockheed-Martin Contract # NAS8-44000 ; UPN 479-41 & -44)**

WBS

2.1 **Program Management**
2.2 **Systems Engineering**

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	25	17.76	19.58	20.22	20.14

Basis of Estimate:

POP 00 Mark

2.2.1	Huntsville Operations Support Center (HOSC)
2.2.1.1	HOSC Requirements Development: Development and implementation of systems operations concepts, interface definitions, and planned systems capabilities
2.2.1.2	HOSC Systems Analysis: Assessing ECRs, conduct trade studies, perform risk assessments
2.2.1.3	HOSC Integration and Planning: Operations integration, systems coordination with external facilities, integrated scheduling
2.2.1.4	HOSC Systems Sustaining Engineering: Perform studies to resolve problems and recommend HOSC improvements, documentation of changes, perform capacity analyses and technology assessments
2.3	**Design and Development**
2.3.1	HOSC Design and Development
2.3.1.1	HOSC System Design
	1) HOSC system upgrade design
	2) HOSC existing systems design associated with maintenance of HDRS, DDS, CPS, OMIS/PMIS, SDFS, MPS, MIPS Cluster, POCC Graphics, TDS, HASA, OCMS, HTAL, desktop systems, and HOSC communications
	3) EHS systems design
	4) EMCS systems design
	5) PDSS systems design
	6) MGL systems design
	7) MSIL systems design
2.3.1.2	HOSC Hardware Design and Development
	1) Hardware design and development for system upgrades
	2) Hardware design and development for existing systems
	3) EHS Hardware design and development
	4) EMCS hardware design and development
	5) PDSS hardware design and development
	6) MGL hardware design and development
	7) MSIL hardware design and development
2.3.1.3	HOSC Software Design and Development
	1) Software design and development for systems upgrades
	2) EHS System Services Application software design and development
	3) EHS Command and Script Application software design and development
	4) EHS Database Applications software design and development
	5) EHS SMAC Application software design and development
	6) EHS Telemetry and Network Application software design and development
	7) EHS Networks software design and development
	8) EHS FEP software design and development
	9) EHS PIMS software design and development
	10) Utilities Application software design and development
	11) EHS Enhanced OCMS software design and development
	12) EHS Test software design and development
	13) EMCS software design and development
	14) PDSS software design and development
	15) MSIL software design and development
2.3.1.4	HOSC Acquisition Specifications: Develop comprehensive acquisition specifications and documentation for products acquired from manufacturers
2.3.1.5	HOSC Installation and Integration
	1) System upgrade installation and integration
	2) Existing systems software installation and integration
	3) Existing systems hardware installation and integration
	4) EHS Software installation and integration
	5) EHS Hardware installation and integration
	6) EMCS Software installation and integration
	7) EMCS Hardware installation and integration
	8) PDSS Software installation and integration
	9) PDSS Hardware installation and integration
	10) MGL Software installation and integration
	11) MGL Hardware installation and integration
	12) MSIL installation and integration
2.4.1	**HOSC Activity Preparation**
2.4.1.1	HOSC Operations Preparation
2.4.1.2	HOSC Product Population/Preparation
2.4.1.3	HOSC Facilities Preparation
2.5.1	**HOSC Operations**

Computer operations, communications systems operations, monitoring/tracking change requests and problem reports, system reconfigurations

1) Marshall Operations Controller
2) Marshall Data Controller
3) Systems Configuration Controller
4) Payload Command Controller
5) Data Control Engineer
6) Operations Analyst
7) Marshall Communications Controller
8) Payload Administrative Support
9) HOSC User Assistance
10) MIDDS Controller

Appendix B4:
Fundamental Biology Research Program Office

B4. Fundamental Biology Program Office Functions - Rationale

	Principal Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	NO	Inherently governmental.	
2	Preparing and Allocating Budgets	NO	Inherently governmental.	
3	Selecting and Prioritizing Research	SUPPORT	NASA Headquarters position to lead. Potential to meet objectives 1&2	RPO/HQ
4	Establishing Experiment Requirements and Feasibility	NO	improvement by transitioning function	
5	Developing and Qualifying Research Flight Systems	SUPPORT	Potential to meet objective 1.	RPO/PI
6	Maintaining and Sustaining Research Flight Systems	SUPPORT	Potential to meet objective 1.&2	RPO
7	Developing Research Ground Systems	SUPPORT	Potential to meet objective 1.	RPO
8	Maintaining Research Ground Systems	SUPPORT	Potential to meet objectives 1&2.	RPO
9	Constructing Ground Facilities	NO	C of F procedure	
10	Maintaining Ground Facilities	SUPPORT	Potential to meet objective 1.	RPO/PI
11	Certifying Safety of Research Flight Systems	SUPPORT	Potential to meet objective 1.	RPO/SSPO
12	Mission Management and Allocation of Services	SUPPORT	Potential to meet objectives 1,2,&3.	RPO/SSPO
13	Integrating User Missions - Analytical	SUPPORT	Potential to meet objectives 1,2,&3.	RPO/SSPO/MSFC
14	Integrating User Missions - Physical	SUPPORT	Potential to meet objectives 1,2,&3.	RPO/SSPO/MSFC
15	Integrating User Missions - Operations	LEAD	Potential to meet objectives 1,2,&3.	RPO/SSPO/MSFC
16	Selecting Research Crew		*Not addressed.*	
17	Research, Analysis and Results Publication	SUPPORT	Potential to meet objectives 1,2,&3.	RPO/PI
18	Educating and Reaching out to the Public	LEAD	Potential to meet objectives 1& 3.	HQ/U
19	Recommending ISS System P3I Improvements	LEAD	Potential to meet objectives1& 3.	SSPO
20	Archiving Research Samples, Data, and Results	SUPPORT	Potential to meet objective 1,2,&3.	RPO/PI

- **Represents end state of transition post assembly complete(2008+)**
- **NGO must demonstrate ability to support function prior to transition**
- **"SUPPORT" indicates support to FB RPO**

Fundamental Biology Program Office

•We recommend following implementation strategies should an NGO become a management imperative:

- Conduct a serious Phase A/B study (systems engineering approach) to: identify the major areas in need of process improvement, i.e., the tall poles, the pacing items; implement process improvements. Baseline the current process, including customer satisfaction, against which NGO performance can be evaluated. Until such a study is done, we see little value in identifying criteria for such NGO performance evaluation.
- Assure that the ISS utilization process and templates are stable and under configuration control before attempting to transfer functions to an NGO.
- Make one Center a pilot program. Establish an NGO at one center focused on assuming one to several functions/responsibilities that are identified as candidates for transition. The intent of this program is to verify that an NGO could meet the stated objective on a small scale before embarking on a global change with a concomitant loss of current personnel and capabilities.
- Once the model pilot NGO is deemed successful, establish a single NGO with distributed functional centers; i.e., avoid simply renaming current utilization support contracts, “NGO” resulting in no ownership of the entire process. We support a “prime” NGO with offices/organizations at the appropriate field locations, (ARC, MSFC, JSC…) The local organizations should be monitored by local NASA employees with appropriate contractual responsibility and authority.

Appendix B5:
GSFC/Office of Earth and Space Sciences

B5. Office of Earth Science & Office of Space Science -Rationale

	Principal Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	SUPPORT	Lead inherently governmental.	
2	Preparing and Allocating Budgets	NO	Independent Programs.	
3	Selecting and Prioritizing Research	NO	NASA Headquarters position.	
4	Establishing Experiment Requirements and Feasibility	SUPPORT	Potential to meet objective 1.	
5	Developing and Qualifying Research Flight Systems	SUPPORT	Potential to meet objective 1.	
6	Maintaining and Sustaining Research Flight Systems		*Not addressed.*	
7	Developing Research Ground Systems	SUPPORT	Potential to meet objective 1.	
8	Maintaining Research Ground Systems		*Not addressed.*	
9	Constructing Ground Facilities		*Not applicable.*	
10	Maintaining Ground Facilities		*Not applicable.*	
11	Certifying Safety of Research Flight Systems	SUPPORT	Potential to meet objective 1.	
12	Mission Management and Allocation of Services	SUPPORT	Potential to meet objective 1.	
13	Integrating User Missions - Analytical	**LEAD**	Potential to meet objectives 1,2.	**SSPO**
14	Integrating User Missions - Physical	SUPPORT	Potential to meet objective 1.	
15	Integrating User Missions - Operations	SUPPORT	Potential to meet objective 1.	
16	Selecting Research Crew		*Not addressed.*	
17	Research, Analysis and Results Publication	NO	Inherently PI function.	
18	Educating and Reaching out to the Public	SUPPORT	Potential to meet objective 3.	
19	Recommending ISS System P3I Improvements		*Not addressed.*	
20	Archiving Research Samples, Data, and Results	NO	Inherently PI function.	

- **OSS and OES study results assume the NGO functions as the utilization expert organization supporting the Payload Programs.**
- **The NGO is not assumed to be limited to either side of the interface.**

Office of Earth Science & Office of Space Science

OES and OSS support the NGO concept, but seek recognition of the complexities

- Strategic Planning, solicitation, peer review, selection, and funding of science experiments remain with the Earth and Space Science organizations
- Engineering and utilization interfaces are not fully known and are likely to evolve

POSITION

- OES and OSS payloads are selected, funded, and developed through Enterprise Announcements of Opportunity, independent of the ISS or any platform specific programs.
- Research selection and prioritization is the purview of the Earth and Space Science Enterprises.
  - Per the Minutes of the January 8, 2001 Meeting of the SSUB, “Dr. Olsen reconfirmed that the NASA Science Enterprises would continue with their science prioritization and solicitations. While the NGO would manage research operations, it would not set the research agenda and prioritization.”
- Preparing and allocating budgets is also not transitioned as this function is handled from the Enterprises to the funding programs, independent of ISS.

Office of Earth Science & Office of Space Science, continued

- Preparing and allocating budgets is also not transitioned as this function is handled from the Enterprises to the funding programs, independent of ISS.
- Payload requirements and hardware development are the responsibility of the PI in “PI mode” missions and managed by payload projects within the funding programs. The NGO could support the payload project as its interface to ISS and provide expertise on ISS systems.
- Payload operations are the responsibility of the PI but could be supported by an NGO. OES and OSS payloads will not be using a centralized Telescience Support Center.

X-Sender: rhornste@mail.hq.nasa.gov
X-Priority: 2 (High)
Date: Mon, 25 Jun 2001 09:42:30 -0400
To: kolsen@mail.hq.nasa.gov
From: Rhoda Hornstein <rhoda.hornstein@hq.nasa.gov>
Subject: NGO response from Offices of Earth and Space Science
Cc: kerickso@mail.hq.nasa.gov, muhran@mail.hq.nasa.gov,
gasrar@mail.hq.nasa.gov, eweiler@mail.hq.nasa.gov,
mcleave@mail.hq.nasa.gov, jkaye@mail.hq.nasa.gov,
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Good Morning, Kathie

Per your request from June 19, we are attaching the combined response from the Offices of Earth and Space Science. The first three pages contain our transition/no transition position on the 20 principal functions, with rationale. The final three pages contain our detailed list of Earth and Space Science functions with responsibilities delineated between NASA and the NGO.

If I correctly understood the outcome of the NGO meeting last week, then our four "no transition" functions will be taken off the table. If this is the case, we would appreciate your views on Codes S and Y attending the next scheduled NGO meeting at KSC on July 11.

Thanks.

Rhoda

Mime-Version: 1.0
X-Sender: bpark@pop400.gsfc.nasa.gov
Date: Fri, 22 Sep 2000 16:31:39 -0400
To: muhran@hq.nasa.gov
From: Betsy Park <elizabeth.a.park.1@gsfc.nasa.gov>
Subject: Cost roll-up
Cc: rhornste@mail.hq.nasa.gov, wvjones@mail.hq.nasa.gov

Mark,

I think the best thing to do for the cost roll-up for S & Y is to put a bottom line budget of $500K for each year. The workbook will then at least appear more complete. The budget is split across enterprises, so it doesn't count against any estimate of ISSP research costs.

Betsy
****
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DRAFT SUBMISSION TO THE NASA INTERNAL TASK TEAM for DETAILED DEFINITION OF AN ISS NGO CONCEPT AND FUNCTIONS

This report is the draft submission by the OSS and OES Research Program Office/GSFC to the NASA internal task team for the detailed definition of an ISS NGO concept and functions. This submission does not in any way constitute a commitment of funds nor an intent to commit funds on the part of the NASA Office of Earth Science or the NASA Office of Space Science.

Prepared By: Betsy Park, Research Program Manager, OSS & OES Research Program Office

Submitted By: Dr. Mary Cleave, Deputy Associate Administrator (Advanced Planning), Office of Earth Science

Dr. Vernon Jones, Senior Science Program Executive/Suborbital, Office of Space Science

Mary Kicza, Associate Director, GSFC

TOP FUNCTIONS of the OSS AND OES RESEARCH PROGRAM
for the INTERNATIONAL SPACE STATION

Function	FY-2000 Current Baseline	FY-2005 Assembly Complete	FY-2010 Evolution Option	FY-2020 End-State Option	Rationale & Transition Criteria
1.Defining & Implementing Policy & Strategic Plans					
(3)Long Term Strategic Planning	NHQ RPO	NHQ RPO/NGO	NHQ RPO/NGO	NHQ RPO/NGO	Page #5
(4)Payload Planning & Manifesting	RPO NHQ	RPO NHQ	RPO NHQ	RPO NHQ	Page #5
(10)Enterprise Support	RPO 	RPO 	RPO NGO	RPO NGO	Page #8
2.Preparing & Allocating Budgets					
(1)Sub-Allocating Appropriations	NHQ PP	NHQ PP	NHQ PP	NHQ PP	Page #5
3.Selecting & Prioritizing Research					
(2)Solicitation, Peer Review, Selection	NHQ CR/RPO/PP	NHQ CR/RPO/PP	NHQ CR/RPO/PP	NHQ CR/RPO/PP	Page #5
5.Developing & Qualifying Research Flight Systems (non-recurrent)					
(5)Payload Development	PI PP/RPO	PI PP/NGO	PI PP/NGO	PI PP/NGO	Page #6
(16)Resources Management	RPO PP	RPO PP/NGO	RPO PP/NGO	RPO PP/NGO	Page #11

13.Integrating User Missions - Analytical

(6)Payload Engineering& Integration	RPO	RPO	NGO	NGO	Page #6
	PP/PI	NGO/PP/PI	RPO/PP/PI	RPO/PP/PI	
(9)Payload Retrieval	RPO	RPO	NGO	NGO	Page #8
	PI	PI/NGO	PI/RPO	PI/RPO	
(11)System Integration	RPO	NGO	NGO	NGO	Page #9
	PI	RPO/PI	RPO/PI	RPO/PI	
(12)Mission Integration Support	RPO	NGO	NGO	NGO	Page #9
	PI	RPO/PI	PI	PI	
(13)Payload Site Analytical Integration	RPO	RPO	NGO	NGO	Page #10
	PP	NGO/PP	RPO/PP	RPO/PP	

15.Integrating User Missions - Operations

(7)Payload Operations	PI	PI	PI	PI	Page #7
	RPO	NGO	NGO	NGO	
(14)Operations/ Utilization	RPO	NGO	NGO	NGO	Page #10
		RPO	RPO	RPO	
(15)Science Operations Integration	RPO	RPO	RPO	RPO	Page #11
	NHQ/PI	NHQ/NGO /PI	NHQ/NGO /PI	NHQ/NGO /PI	

17.Conducting Research, Analyzing Data, & Publishing Results
20.Archiving Research Samples, Data, & Results

(8)Data Analysis &Archive	PI	PI	PI	PI	Page #7

18.Educating & Reaching Out to Public

(17)Integrated Outreach	NHQ	NHQ	NHQ	NHQ	Page #11
	RPO/PI	RPO/PI/ NGO	RPO/PI/ NGO	RPO/PI/ NGO	

KEY		
NHQ: NASA Headquarters		
FC: Field Centers		
RPO: OSS & OES RPO		
PP: Payload Programs & Projects		
PI: Principal Investigators		Responsibility
CR: Support Contractors	Changes	Support
NGO: Non-Government Organization		

Transition Criteria and Rationale

(1) Sub-Allocating Appropriations No Transition

- Rationale: OSS & OES funds are suballocated to ISS payloads via their funding programs, independent of ISS

(2) Solicitation, Peer Review, Selection No Transition

- Rationale: Mission solicitation, management of proposal peer review, and mission selection are inherently government functions
- Rationale: OSS & OES carry out these functions in forums independent of ISS in which science competes without regard to flight platform

(3) Long Term Strategic Planning Transition support

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting processes and constraints
  - Demonstrate understanding of and plan to meet Enterprise scientific and strategic goals and objectives as documented in the Enterprise strategic plans

(4) Payload Planning and Manifesting Transition support

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate thorough knowledge of ISS development, payload integration, and ISS/STS manifesting processes and constraints

- Demonstrate understanding of OSS & OES research requirements
- Demonstrate ability to manage manifesting and resource allocation process for payloads

(5) Payload Development Transition Support

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate thorough understanding of all payload interfaces including technical, requirements, documentation, programmatics, safety, and schedules
  - Demonstrate thorough understanding of external payload development processes and unique requirements
  - Demonstrate ability to work effectively with OSS & OES payload programs
  - Demonstrate knowledge of OSS & OES programs, processes, and funding paths and limitations
  - Payload development baseline established with flight payloads through the RPO prior to transitioning

(6) Payload Engineering & Integration Transition Responsibility

- Rationale: Objective 1
- Caveat: CoFR responsibility remains with the RPO
- Transition Criteria
  - Demonstrate a TBD% (15% minimum) reduction in cost associated with OSS & OES payload integration
  - Demonstrate a TBD% (10% minimum) reduction in PI interfaces associated with OSS & OES payload integration

- Demonstrate thorough understanding of all payload interfaces including technical, requirements, documentation, programmatics, safety, and schedules
- Demonstrate thorough understanding of external payload development processes and unique requirements
- Demonstrate ability to work effectively with OSS & OES payload programs
- Demonstrate knowledge of OSS & OES programs, processes, and funding paths and limitations

(7) Payload Operations Transition Support

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate capability to operate payloads through ISS systems
  - Demonstrate ability to establish operations systems for new payloads
  - Demonstrate understanding of Earth and space science payload operations practices, methodology, and procedures
  - Establish working relationships with the Earth and space science PI science communities
  - Establish NGO ownership of ISS payload operations

(8) Data Analysis & Archive No Transition

- Rationale: Within OSS & OES, data analysis and archive are strictly the purview of the PI led team and are funded through ISS independent programs

- Rationale: Reporting of research results and data archive must conform to existing Enterprise requirements and standards, independent of ISS

(9) Payload Retrieval Transition Responsibility

- Rationale: Objective 1
- Caveat: CoFR responsibility remains with the RPO
- Transition Criteria
  - Demonstrate the ability to effectively manage support of payload development, interface engineering, and integration
  - Demonstrate understanding of retrieval requirements, particularly safety
  - Demonstrate capability to support PIs with data management of required data throughout operations, required retrieval documentation, and the retrieval safety process
  - Demonstrate a TBD% (10% minimum) reduction in PI interfaces associated with payload retrieval
  - Demonstrate a TBD% (10% minimum) reduction in documentation required for retrieval
  - Demonstrate a TBD% (15% minimum) reduction in costs to the PI/payload program for retrieval

(10) Enterprise Support Transition Support

- Rationale: Objective 3
- Transition Criteria
  - Demonstrate understanding of Enterprise goals, objectives, processes, methodology, and organizations

- Demonstrate thorough knowledge of ISS payloads and their interfaces, requirements, constraints, and limitations
- Demonstrate ability to respond to Enterprise requests within 12 hours

(11) System Integration Transition Responsibility

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate thorough understanding of OSS & OES payload requirements, interfaces, constraints, limitations, issues, and concerns
  - Demonstrate thorough understanding of OFF & OES research requirements and goals
  - Demonstrate the ability to manage payload interfaces and requirements for attached and WORF payloads
  - Demonstrate a TBD% (10% minimum) reduction in response time to change notices
  - Demonstrate the ability to coordinate change reviews with payload developers

(12) Mission Integration Support Transition Responsibility

- Rationale: Objectives 1 and 2
- Transition Criteria
  - Demonstrate thorough knowledge of OSS & OES payload development processes, issues, and concerns
  - Demonstrate ability to represent OSS & OES unique payload integration concerns
  - Demonstrate ability to work issue resolution with payload implementing centers

- Demonstrate ability to represent payloads to the PMIT with a TBD% (10% minimum) reduction in payload developer interfaces

(13) Payload Site Analytical IntegrationTransition Responsibility

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate thorough understanding of OSS & OES payload requirements, interfaces, constraints, limitations, issues, and concerns
  - Demonstrate a TBD% (15% minimum) reduction in payload developer interfaces
  - Demonstrate a TBD% (15% minimum) reduction in payload developer interactions with ISS site developers
  - Establish working interface with International Partners (IPs) for IP sites
  - Demonstrate capability to manage interface to IPs and IP sites
  - Demonstrate capability to manage interface to NASA sites

(14) Operations/Utilization Transition Responsibility

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate thorough understanding of payload operations processes as they relate to OSS & OES payloads

- Demonstrate a TBD% (10% minimum) reduction in payload developer interfaces for payload operations and utilization functions

(15) Science Operations Integration Transition Support

- Rationale: Objective 1
- Transition Criteria
  - Demonstrate understanding of cross-discipline operations and resource allocation issues
  - Demonstrate thorough knowledge of ISS resources and capabilities for payload accommodations
  - Demonstrate capability to resolve resource conflicts

(16) Resources Management Transition Support

- Rationale: Objective
- Caveat: An NGO supporting this function may not partner on a proposal for an ISS payload
- Transition Criteria Transition Support
  - Demonstrate ability to define scope of payload developer interactions with ISS
  - Demonstrate ability to define payload developer resources required to support interactions scope

(17) Integrated Outreach Transition Support

- Rationale: Objective 3
- Caveat: Outreach activity plans in earth science must be approved by the Earth Science Education Program Office at GSFC
- Transition Criteria

- Develop outreach plan in accordance with OSS & OES goals & objectives as documented in their strategic plans
- Demonstrate ability to produce varied outreach materials including but not limited to brochures, publications, websites, and educational materials

Functions Associated with
International Space Station R&D Program
(Research Program Office Worksheet)

OSS & OES Level II	Tier I Function	ISS/OSS & OES
		TASK DESCRIPTION
1.	2.	Sub-allocating Appropriations (a) Sub-allocate funds to payload programs and projects
2.	3.	Solicitation, Peer Review, Selections (a) Generate Announcements of Opportunity in line with Program budgets and schedules (b) Oversee and conduct science peer reviews of AO proposals (c) Oversee and conduct Technical, Cost, Management, and Other (TMCO) reviews of AO proposals (d) Recommend program selections to the OSS or OES AA (e) Select program missions (may or may not include ISS payloads)
3.	1.	Long Term Strategic Planning (a) Determine Enterprise position on utilization of ISS for research (b) Establish long term plans for ISS utilization including allocations, solicitation strategies (c) Member of the Space Station Utilization Board and associated Working Groups
4.	1.3.12. 1. 3. 3.&12.	Payload Planning & Manifesting (a) Act as the OSS & OES RPO single-point-of-contact with the ISS Research Planning Working Group (RPWG), being a strong advocate for OSS & OES Research. (b) Support the development of the ISS RPWG manifest planning process (c) Develop OSS & OES strategic and tactical manifesting inputs to HQ and JSC
5.	4.5.13.14. &7 15.	Payload Development (a) Design, fabricate, integrate, and test payload (b) Comply with all STS and ISS interface requirements (c) Comply with all STS and ISS safety requirements (d) Comply with Payload Program, STS, and ISS programmatic requirements (e) Support launch operations
6.	4.5.13.14 11&7 11.	Payload Engineering & Integration (a) Provide guidance and support to payload design, development, fabrication, integration & test, and launch operations (b) Provide integration management for payloads, acting as primary payload interface to ISS Program (c) Work resolutions of payload interface issues (d) Support program and peer reviews (e) Assist payloads with safety processes, interface documentation, schedules, and deliverables (f) Complete CoFR tasks and endorsements (g) Generate working agreements between OSS & OES RPO and payload funding programs and implementing centers
7.	15.	Payload Operations (a) Command and control payload in the STS bay, during transition to ISS, while integrated to ISS, and during retrieval (b) Monitor payload health and safety (c) Work contingency resolution
8.	17. & 20. 17. 17. 20.	Data Analysis & Archive (a) Process science and engineering data for analysis (b) Analyze data (c) Archive and maintain data for historical and reprocessing purposes
9.	13.	Payload Retrieval (a) Work with SSPO in developing requirements for unpressurized payload retrieval (b) Manage individual OSS & OES payload retrieval (c) Complete payload retrieval CoFR process
10.	1.& 3. 1. 1. 1. 3. 1. 1. 1.	Enterprise Support (a) Represent OSS & OES ISS interests to domestic and international conferences, symposia, and other forums (b) Support attached Space Station Utilization Board Working Group (c) Assist with developing cost sharing, data sharing and other barter agreements at inter-agency and international levels (d) Support preparation of Enterprise solicitation Announcements (e) Assist with Enterprise strategic planning regarding ISS utilization (f) Generate RPO Program Plan compliant with NPG 7120.5A (g) Integrated planning and analysis of ISS OSS & OES Research Program
11.	13.	System Integration (a) Develop and implement OSS & OES CM Procedure for ISS controlled Documentation and Change Evaluation (b) Perform Level 2 configuration management for OSS & OES inputs to ISS (c) Provide technical evaluations for Space Station Change Requests (CRs), Payload Interface Revision Notices (PIRNs), and action items (d) Act as the OSS & OES RPO single-point-of-contact with the ISS Payload Control Board (PCB), being a strong advocate for OSS & OES Research.
12.	13.	Mission Integration Support (a) Works with SSPO in developing, revising and refining the generic payload integration process (b) Assist Implementing Centers in working integration issue resolution as required (c) Participate on Payload Mission Integration Team
13.	13.	Payload Site Analytical Integration (EXPRESS Pallet, JEM-EF, Columbus EPF, WORF) (a) Review appropriate documentation including requirements, definition, verification, integration, and supporting tools, models, and equipment (b) Provide support to payload developers: (1) review payload specific ICDs and verification plans (2) review data and requirements necessary for engineering and operations integration planning and execution (3) participate in issue resolution (4) support payload verification planning, tracking, and statusing, and (5) support development of payload integration agreements

		(c) Support the payload engineering integration and verification process at the site/carrier to payload level. Review payload integration requirements and data. Review agreements with payload developers regarding interfaces, schedules, accommodations, resources requirements, operations support, and physical integration/test/checkout services to be provided.
14.	15.	Operations/Utilization (a) Provides technical expertise related to the definition of payload operations processes to support earth and space science research (b) Establish OSS & OES RPO positions on key payload operations and utilization functions such as the development of flight rules, crew procedures, ground and on-board displays, crew timelines, training concepts, payload command and control concepts
15.	15.	Science Operations Integration (a) Recommend resource allocation over-subscription resolutions (b) Assess overall OSS & OES RPO status/impacts during the mission (c) Recommend solutions for OSS & OES RPO Payload conflicts (c) Provide Increment Scientist support for continuing operations
16.	5.	Resources Management (b) Works with payload funding Programs to identify and appropriately plan funding and workforce requirements to adequately support programmatic and technical tasks
17.	18.	Integrated Outreach (a) Generate outreach materials including websites, brochures, papers, and presentations for Enterprise activities on ISS

Appendix B6:
JSC Human Life Sciences Research Program Office

B6. JSC HLS Program Office Functions - Rationale

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	Support	Inherently governmental.	HQ/SSPO
2	Preparing and Allocating Budgets	No	Lead inherently governmental.	
3	Selecting and Prioritizing Research	No	NASA Headquarters position.	
4	Establishing Experiment Requirements and Feasibility	Support	Potential to meet objectives 1, 2, 3	RPO
5	Developing and Qualifying Research Flight Systems	No	RPO function	
6	Maintaining and Sustaining Research Flight Systems	No	RPO function	
7	Developing Research Ground Systems	No	RPO function	
8	Maintaining Research Ground Systems	No	RPO function	
9	Constructing Ground Facilities	No	RPO function	
10	Maintaining Ground Facilities	No	RPO function	
11	Certifying Safety of Research Flight Systems	Support	Potential to meet objectives 1, 2, 3	SSPO/RPO
12	Mission Management and Allocation of Services	Support	Potential to meet objectives 1, 2, 3.	POIC/POIF/RPO
13	Integrating User Missions - Analytical	Support	Potential to meet objectives 1, 2, 3	POIC/POIF/RPO
14	Integrating User Missions - Physical	Support	Potential to meet objectives 1, 2, 3	POIC/POIF/RPO
15	Integrating User Missions - Operations	Support	Potential to meet objectives 1, 2, 3	POIC/POIF/RPO
16	Selecting Research Crew	No	*Not advised*	
17	Research, Analysis and Results Publication	No	Inherently PI function; industrial proprietary.	
18	Educating and Reaching out to the Public	Support	Potential to meet objective 3.	HQ/F
19	Recommending ISS System P3I Improvements	Support	Potential to meet objective 3.	SSPO
20	Archiving Research Samples, Data, and Results	No	RPO function.	

- **JSC HLS RPO study results assume the NGO functions as the utilization expert organization supporting the Payload Programs.**
- **JSC HLS RPO includes the NSBRI. The NSBRI is part of the RPO and is an NGO. The Program NGO will recognize the NSBRI as an interface.**
- **"SUPPORT" indicates support to HLS RPO and ISS.**

JSC HLS Program Office

- The Human Life Sciences Research Program Office is supportive of the NGO concept, but seek recognition of the complexities
  - Strategic Planning, solicitation, peer review, selection, and funding of science experiments is linked with the implementation of crew health and safety requirements which are inherently NASA requirements.
  - The HLS RPO is focused on the systematic risk reduction for ensuring space flight crew safety, health and performance and is an integrated element of the Agency medical responsibilities.
  - The HLS RPO has had an NGO present in its implementation plans – the National Space Biomedical Research Institute (NSBRI)
    - NGO function incorporated in original 1996 Cooperative Agreement Notice
    - The NSBRI and the HLS RPO act as a singular team in implementing the research program.
    - The Program NGO must interface with this extant NGO in the implementation of HLS requirements
  - HLS RPO payloads are selected, funded, and developed through Enterprise Research Announcements and other peer reviewed approaches, independent of the ISS or any platform specific programs.

JSC HLS Program Office, continued

- The HLS RPO includes Principal Investigators and Payload Developers.
- The HLS RPO is responsible for the end to end development, flight, and data aspects of its research
- The HLS RPO has existing international agreements in the coordination, solicitation, selection, development, integration, operations, and post flight analysis for human research
- The HLS RPO is directly related to the Space Medicine requirements for flight and requires direct interaction for successful implementation of mission objectives.

• An external NGO will not support this model of integrated research and data management

- The HLS RPO is capable and willing to interface with the Program NGO for assuring successful implementation of the HLS RPO payloads with the vehicle and its systems.
- The Agency NGO solicitation and implementation should clearly reflect the HLS RPO implementation approach with the NSBRI

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"'jrobey@hq.nasa.gov'" <jrobey@hq.nasa.gov>,
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"'mcleave@mail.hq.nasa.gov'"
<mcleave@mail.hq.nasa.gov>,
"'kolsen@mail.hq.nasa.gov'"
<kolsen@mail.hq.nasa.gov>,
"'jswain@mail.hq.nasa.gov'"
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Subject: RE: NGO Internal Study Deliverables
Date: Fri, 1 Dec 2000 15:16:15 -0600
MIME-Version: 1.0

My apologies for clogging your email but it was brought to my attention that I erred in the table of responsibilities for Item 3: Selecting and Prioritizing Research. I had left out the HQ role as primary in such with RPO as supporting. The attached is an update to the table. Please include in your deliberations. Thanks and have a great weekend...Would this

submit count as a recount?

-----Original Message-----
From: STEGEMOELLER, CHARLES (CHARLIE) (JSC-SA)
Sent: Thursday, November 30, 2000 3:17 PM
To: 'Mark Uhran'; KITE, JESSICA R. (JSC-OZ); Irene.taylor@msfc.nasa.gov; Maynette.Smith-1@kmail.ksc.nasa.gov
Cc: Robin.Henderson@msfc.nasa.gov; gjahns@arc.nasa.gov; PARRA, CARLOS G. (JSC-EX); WILLIAMS, WILLIE B. (JSC-OZ); elizabeth.a.park.1@gsfc.nasa.gov; dshortz@hq.nasa.gov; estigber@hq.nasa.gov; etrinh@mail.hq.nasa.gov; jrobey@hq.nasa.gov; pahlf@hq.nasa.gov; gfoglema@hq.nasa.gov; bkreyken@hq.nasa.gov; jemond@hq.nasa.gov; wvjones@mail.hq.nasa.gov; mcleave@mail.hq.nasa.gov; kolsen@mail.hq.nasa.gov; jswain@mail.hq.nasa.gov; khavens@hq.nasa.gov; rcrouch@hq.nasa.gov; dtomko@hq.nasa.gov; SAMPSEL, TODD R. (JSC-LB); GROUNDS, DENNIS J. (JSC-SF2); mike.hawes@hq.nasa.gov; robert.soltess@hq.nasa.gov; NYGREN, RICHARD W. (RICK) (JSC-OZ); BARTOE, JOHN-DAVID F. (JSC-OZ); bhaworth@mail.hq.nasa.gov; rirving@hq.nasa.gov; muhran@hq.nasa.gov
Subject: RE: NGO Internal Study Deliverables

Attached below is the submittal for the Human Life Sciences Research Program Office. Thanks for the extra time to work and review this material. This submit was reviewed in context with the overall JSC input that is being submitted by Jessica. Please contact either Dennis Grounds or myself for more information.

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Subject: NGO Internal Study Deliverables

All,

At this date, final draft recommendations have been received from:

OBPR Research Divisions (G. Trinh)

SUBMITTAL TO THE NASA INTERNAL TASK TEAM
for DETAILED DEFINITION OF AN ISS NGO CONCEPT AND FUNCTIONS

This report is the submittal by the Human Life Sciences Research Program Office/JSC (HLSRPO) to the NASA internal task team for the detailed definition of an ISS NGO concept and functions.

The HLSPRO is the ISS research interface element for the JSC Bioastronautics Initiatives Office (BIO). The BIO is designated as the lead center for Agency Cross-cutting function of Space Medicine, and the Programs for Biomedical Research and Countermeasures and Advanced Human Support Technology. The BIO is focused on the systematic risk reduction for ensuring space flight crew safety, health, and performance.

In order to understand this submittal, it is imperative to understand that the Bioastronautics Initiatives Office is actively integrating its Biomedical Research and Space Medicine functions with a non-government institute, the National Space Biomedical Research Institute (NSBRI). Therefore, the functions of the HLSRPO and Payload Projects implicitly include the NSBRI The term, *RPO,* as used here, includes the NSBRI. Likewise, the term, *Payload Project*, includes the NSBRI.

The roles of NASA Headquarters and JSC Lead Center, with respect to the NSBRI, are still being actively defined and evolved. Similarly, criteria for transition of responsibility to the NSBRI are part of the current definition activity. It is, therefore, not possible to explicitly include delineations of lead and support roles and transition criteria in this submittal. It is our expectation that the RPO functions identified in 2005 will evolve to the NSBRI as lead implementer. Therefore, it is the plan for BIO that the NSBRI will be actively responsible for implementing its activities inclusive of the planned ISS research.

The HLSRPO is responsible for the coordination and implementation of all Biomedical Research related to the ISS. This role includes the research identified and coordinated by the International Partners via the International Space Life Sciences Working Group. The successful implementation of this research is dependent upon close coordination with the various ground research disciplines, the Space Medicine community and with the crew consent to participate as subjects. Therefore, for an NGO to be successful it must be engaged in all of these same areas with the authority to implement. Presently the BIO is responsible for all of these aspects and as such, the NSBRI is involved in the implementation for ground research and is evolving towards flight implementation integration as well.

The HLSRPO is also responsible for the coordination of ISS flight activities associated with Advanced Human Support Technology. The AHST targets advanced technologies in Life Support, Environmental Monitoring and Controls and Space Human Factors specifically to reduce space flight risk and improve vehicle and crew performance. These payloads are unique in complexity and potential application with respect to the Human Exploration and Development of Space Enterprise. As such, these payloads are selected and developed in accordance with the Agency mission. The work associated with these

technology developments includes ground development and test as well as flight demonstrations on short and long duration platforms. An ISS NGO could facilitate the implementation for flight payloads. The full concept of an NGO would need to take into account the total aspect of payloads development to prevent duplicative engineering and management practices in support of flight projects. Additionally, the NSBRI is directly involved with the Space Human Factors activities and may evolve to the level of responsibility of an NGO in this area of research for both ground and flight.

The concept and structure for an NGO that relates to other ISS research program offices and the ISS Payloads Office need to recognize and be compatible with Human Life Sciences and its non-government counterpart, the NSBRI.

Prepared By: Dennis Grounds,Manager, ISS HLS Research Program Office

Submitted By: Charles Stegemoeller, Manager, Human Space Life Sciences Programs Office

TOP FUNCTIONS of the HUMAN LIFE SCIENCES RESEARCH PROGRAM
for the INTERNATIONAL SPACE STATION
Updated December 1, 2000

Function	FY-2000 Current Baseline	FY-2005 Assembly Complete	FY-2010 Evolution Option	FY-2020 End-State Option	Rationale & Transition Criteria
1.Defining & Implementing Policy & Strategic Plans	NHQ	NHQ	NHQ	NHQ	
	RPO	RPO	RPO	RPO	
2.Preparing and Allocating Budgets	RPO	RPO	RPO	RPO	
	NHQ	NHQ	NHQ	NHQ	
3.Selecting and Prioritizing Research	NHQ	NHQ	NHQ	NHQ	
	RPO	RPO	RPO	RPO	
4. Establishing Experiment Requirements and Feasibility	RPO	RPO	RPO	RPO	
	PP	PP	PP	PP	
5.Developing and Qualifying Research Flight Systems (non-recurring)	PI/PP	PI/PP	PI/PP	PI/PP	
6.Maintaining and Sustaining Research Flight Systems (recurring)	PP	PP	PP	PP	
7.Developing and Qualifying Research Ground Systems (non-recurring)	PP/PI	PP/PI	PP/PI	PP/PI	

8.Maintaining and Sustaining Research Ground Systems (recurring)	PP/RPO	PP/RPO	PP/RPO	PP/RPO
9.Constructing Ground Facilities (non-recurrent)	RPO	RPO	RPO	RPO
10.Maintaining and Sustaining Ground Facilities (recurring)	RPO	RPO	RPO	RPO
11. Certifying Safety of Research Flight Systems and Components	PP	PP	PP	PP
12.Tactical Planning and Scheduling of Research Operations	RPO/PP	RPO/PP	RPO/PP	RPO/PP
13/14/15.Integrating User Missions – Analytical/ Physical/Operational	PP	PP	PP	PP
16 Selecting Research Crew (Not done currently)	NHQ	NHQ	TBD	TBD
17 Conducting Research, Analyzing Data, and Publishing Results	PI/PP/ RPO	PI/PP/ RPO	PI/PP/ RPO	PI/PP/ RPO
18.Educating and Reaching Out to the Public	RPO	RPO	RPO	RPO

19.Recommending ISS System Pre-Planned Product Improvements (P3I)	RPO	RPO	RPO	RPO
20.Archiving Research Samples, Data, and Results	RPO	RPO	RPO	RPO

KEY

NHQ: NASA Headquarters
FC: Field Centers
RPO: HLS RPO & NSBRI
PP: Payload Programs & Projects & NSBRI
PI: Principal Investigators
CR: Support Contractors
NGO: Non-Government Organization

Changes

Responsibility
Support

Appendix B7:
JSC Engineering Research
and OSF Projects Research Program Office

B7. JSC Code M Research Program Office Function- Rationale

	Principal Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	SUPPORT	Lead inherently governmental.	
2	Preparing and Allocating Budgets	NO	Independent Programs/government.	
3	Selecting and Prioritizing Research	NO	Independent Programs/RPO.	
4	Establishing Experiment Requirements and Feasibility	SUPPORT	Potential to meet objective 1.	
5	Developing and Qualifying Research Flight Systems	NO	Independent Programs.	
6	Maintaining and Sustaining Research Flight Systems		*Not addressed.*	
7	Developing Research Ground Systems	NO	Independent Programs.	
8	Maintaining Research Ground Systems		*Not addressed.*	
9	Constructing Ground Facilities		*Not applicable.*	
10	Maintaining Ground Facilities		*Not applicable.*	
11	Certifying Safety of Research Flight Systems	SUPPORT	Potential to meet objective 1.	
12	Mission Management and Allocation of Services	SUPPORT	Potential to meet objective 1.	
13	Integrating User Missions - Analytical	**LEAD**	Potential to meet objectives 1,2.	**SSPO**
14	Integrating User Missions - Physical	SUPPORT	Potential to meet objective 1.	
15	Integrating User Missions - Operations	SUPPORT	Potential to meet objective 1.	
16	Selecting Research Crew		*Not addressed.*	
17	Research, Analysis and Results Publication	NO	Inherently PI function.	
18	Educating and Reaching out to the Public	**LEAD**	Potential to meet objective 3.	**HQ**
19	Recommending ISS System P3I Improvements		*Not addressed.*	
20	Archiving Research Samples, Data, and Results	NO	Inherently PI function.	

- **Code M study results assume the NGO functions as the utilization expert organization supporting the Payload Programs.**
- **The NGO is not assumed to be limited to either side of the interface.**
- **"SUPPORT" indicates support to Code M RPO and ISS.**

JSC Code M Research Program Office

- Code M support the NGO concept, but seek recognition of the complexities
  - Strategic Planning, solicitation, peer review, selection, and funding of science experiments remain with the independent programs within Code M
  - Code M payloads are selected, funded, and developed through Barter Agreements and Announcements of Opportunity, independent of the ISSPO .
- Research selection and prioritization is the responsibility of the individual program and Code M .
- International Barter payload agreements resources are also allocated out of the Code M resources.

JSC Code M Research Program Office, continued

- Payload requirements and hardware development are the responsibility of the PI in “PI mode” missions and managed by payload projects within the funding programs. The NGO could support the payload project as its interface to ISS and provide expertise on ISS systems.
- Payload operations are the responsibility of the PI but could be supported by an NGO. Data archive is the sole responsibility of the PI.

Appendix B8:
HQ Office of Biological and Physical Research

B8. HQ/OBPR Recommended Functions Transition to NGO

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	Support	Governtment function	NASA HQ/RPO
2	Preparing and Allocating Budgets	Support	Bookeeping only function allowed	NASA HQ/RPO
3	Selecting and Prioritizing Research	Support	Government fucntion/conflict of interest	NASAHQ/RPO/IP
4	Establishing Experiment Requirements and Feasibility	Support	Conflict of interest/Expertise	RPO/ NASAHQ/PD/IP
5	Developing and Qualifying Research Flight Systems	Support	Expertise in flight systems.	RPO/PD/IP
6	Maintaining and Sustaining Research Flight Systems	LEAD	Potential final state if successful performance has been demonstrated	RPO/PD/IP
7	Developing Research Ground Systems	Support	Should not compete with remaining Scientific community	RPO/PD/Academia
8	Maintaining Research Ground Systems	LEAD	Would potentially facilitate research And lower cost.	RPO/PD/Academia
9	Constructing Ground Facilities	LEAD	Potential for increases efficiency And reduced cost	NASAHQ/RPO
10	Maintaining Ground Facilities	LEAD	Potential for reduced cost and Increased efficiency	RPO/Academia
11	Certifying Safety of Research Flight Systems	NO	Inherently Government Function	SSPO/RPO/PD
12	Mission Management and Allocation of Services	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD/NASAHQ
13	Integrating User Missions - Analytical	Support	Potential to meet objectives 1, 2.	RPO/PD/IP
14	Integrating User Missions - Physical	Support	Potential to meet objectives 1, 2..	RPO/PD/IP
15	Integrating User Missions - Operations	LEAD	Potential to meet objectives 1, 2.	RPO/ISSPO/IP/PD
16	Selecting Research Crew	Support	*Potential to meet objective 3*	NASAHQ/RPO/IP/PD
17	Research, Analysis and Results Publication	NO	*PI function. Conflict of interest*	
18	Educating and Reaching out to the Public	Support	Potential to meet objective 3.	NASAHQ/RPO
19	Recommending ISS System P3I Improvements	LEAD	Potential to meet objective 3.	SSPO/RPO/NASAHQ
20	Archiving Research Samples, Data, and Results	LEAD	*Potential to meet objectives 2,3.*	

- **"Support" and "LEAD" are suggested final transition states**
- **"SUPPORT" indicates support to NASA**
- **In cases where a single tier one function has multiple corresponding tier 2 functions, the predominant option is shown**
- **In cases where the NGO evolved from support to lead most aggressive case is shown**
- **Direct interfaces to performing International, NASA, or contract, organizations are essential**
- **NGO role is limited to user side of the interface in all cases.**

DRAFT

Rationale

- Functions 1,2,3: Policy decisions are inherently government functions
- Function 4: Conflict of interest must be avoided. The expertise must be developed and demonstrated. NASA HQ and RPOs represent PIs interests
- Function 5: Technology innovation would be an area for the NGO to contribute. However, experience and expertise in flight systems and operations must be demonstrated.
- Function 6: The NGO could be the ultimate contractor in charge of flight systems after effectiveness has been demonstrated
- Function 7: The NGO should not have any conflict of interest on research. It should not be placed in the position to compete unfairly with the remaining scientific community
- Function 8: Potential gain in efficiency could be obtained by having a consolidated NGO maintain ground research facilities allowing RPO and outside scientific communities to concentrate on conducting research
- Function 9 and 10: An NGO lead would potentially increase efficiency and reduce cost due to consolidation
- Function 11: Certification and safety should be the government responsibility

Rationale (continued)

- Function 12: The NGO could potentially increase the efficiency of on-orbit research by using less bureaucratic processes
- Functions 13,14: A support role is most likely to benefit the current process
- Function 15: Stronger advocacy on the behalf of the research community will benefit the overall effectiveness of the program
- Function 16: Stronger input from the research community will benefit on-orbit research
- Function 17: The NGO should not compete with the rest of the research community
- Function 18: Outside contribution to the NASA outreach effort will increase its effectiveness
- Functions 19,20: These are most appropriate areas where the NGO contributions would benefit the most

)_ September 28, 2000

p 20 Common Functions
Utilization and Research Program of the International Space Station R&D Program
Tier 2 Functions

NASA NGO Objectives

1. To facilitate the pursuit of flight research and make the complex operating environment associated with the International Space Station transparent to the end-user
2. Te reduce the end-to-end cycle time associated with the announcement, selection, development, flight, and achievement of results for research and development endeavors on the International Space Station.
3. To increase the long-range productivity of research and development by most effectively integrating and advocating government and industry utilization of the International Space Station.

	TASK DESCRIPTION	Could NGO perform *lead* function?	Could NGO perform *support* function?	IF YES, RATIONALE FOR TRANSITIONING TO NGO (Include NGO Objective Number 1,2,or 3)	IF NO, RATIONALE FOR NOT TRANSITIONING TO NGO
1.	**Defining and Implementing Policy and Strategic Plans** (ISSLSWG, IMSPG)				
	Includes Discipline Level Priorities/Road Map	No	No		Policy decisions are inherently government.
	Determine Enterprise position on utilization of ISS for research	No	No		
	Develop International Agreements	No	No		
	Establish long term plans for ISS utilization including allocations, solicitation strategies	No	Yes	#1. Integration support role by providing projections on resources and requirements.	
	Member of the Space Station Utilization Board (SSUB) & associated Working Groups (NGO role would be as executive secretary/support contractor.)		Yes	NGO could only be an ad hoc or non-voting member of the SSUB.	
2.	**Preparing & Allocating Budgets**				
	Administering Funds	No	Yes	#1. Bookkeeping function only.	NGO can serve as a bookkeeper only; it cannot administer Government funds.
	Advocate appropriations for Microgravity Research programs which may include ISS payloads to OMB, Congress, staffers, etc.	No	No		Not an NGO activity; for NASA to pay a contractor to lobby Congress would be violation of the law!
	Sub-allocate funds to payload programs and projects	No	No		
3.	**Selecting and Prioritizing Research**				
	Generate NRA & AO in line with Program budgets and schedules	No	No		Policy decisions are inherently government.
	Oversee and conduct science peer reviews of NRA & AO proposals		No		
	Oversee and conduct Technical, Cost, Management, and Other (TMCO) reviews of NRA & AO proposals	No	No		
	Recommend program selections to the OLMSA AA	No	No		
	Select program missions (may or may not include ISS payloads)	No	No		
18.	**Educating and Reaching Out to the Public**	No	Yes	#3. Outreach is everybody's responsibilty. NGO need to reach out in areas of its expertise.	
	Hq should develop the goals and objectives for Education and Outreach	No	No		Policy decisions are inherently government.
	Field Centers should develop the technical material from the program content	No	Yes		
	NGO could perform the liaison function based on HQ direction and Center data	Yes	Yes		
	Generate outreach materials including websites, brochures, papers, and presentations		Yes		
	Plan and coordinate media relations and public awareness activities		Yes		
	Communicate the significance of research results to the public		Yes		
	Manage the website development and maintenance		Yes		
	Oversee the development & maintenance of educational and outreach reference material		Yes		

Appendix C:
Conservative and Aggressive Models Derived from Center Inputs

Models Derived from Center Inputs

- **A conservative and an aggressive model were developed based solely on the inputs from the affected organizations; timeframe is Post-Assembly Complete.**
  - **Conservative Model:**
    - **Represents approach based on most conservative inputs from any team member.**
  - **Aggressive Model:**
    - **Represents approach based on most aggressive inputs from any team member.**

An NGO would "climb the learning curve" during ISS construction, with no functional hand over until assembly complete.

Conservative Model - Rationale

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	NO	Inherently governmental.	
2	Preparing and Allocating Budgets	NO	Lead inherently governmental.	
3	Selecting and Prioritizing Research	NO	NASA Headquarters position.	
4	Establishing Experiment Requirements and Feasibility	NO	RPO Function.	
5	Developing and Qualifying Research Flight Systems	NO	RPO Function.	
6	Maintaining and Sustaining Research Flight Systems	NO	RPO Function.	
7	Developing Research Ground Systems	NO	RPO Function.	
8	Maintaining Research Ground Systems	NO	RPO Function.	
9	Constructing Ground Facilities	NO	Inherently governmental..	
10	Maintaining Ground Facilities	NO	Inherently governmental..	
11	Certifying Safety of Research Flight Systems	NO	Inherently governmental.	
12	Mission Management and Allocation of Services	SUPPORT	Potential to meet objectives 1, 2, 3.	POIC/POIF
13	Integrating User Missions - Analytical	NO	Inherently Governmental.	
14	Integrating User Missions - Physical	NO	Shared resource between ISS, Utilization, and Shuttle Payloads.	
15	Integrating User Missions - Operations	SUPPORT	Potential to meet objectives 1, 2, 3.	POIC/POIF
16	Selecting Research Crew		*Not addressed.*	
17	Research, Analysis and Results Publication	NO	Inherently PI function; industrial proprietary.	
18	Educating and Reaching out to the Public	SUPPORT	Potential to meet objective 3.	HQ/F
19	Recommending ISS System P3I Improvements	SUPPORT	Potential to meet objective 3.	SSPO
20	Archiving Research Samples, Data, and Results	NO	Inherently RPO or PI Function..	

- **In all cases, the "LEAD" option applies to management of the function on the behalf of the user community, not necessarily performance.**
- **"SUPPORT" indicates support to NASA**
- **Direct interfaces to performing NASA, or contract, organizations are essential to success for functions involving the lead role.**
- **Existing NASA organizations (e.g., SSPO, POIC/POIF, KSC, HQ) would continue in current roles with responsibility for managing the station side interface.**
- **NGO role is limited to user side of the interface in all cases.**
- **Transition options do not affect contracts currently in place or those currently in procurement.**

Aggressive Model - Rationale

	Principle Functions	Option to Transition?	Summary of Rationales For/Against Transition	Direct Interface Requirements
1	Defining and Implementing Policy and Strategic Plans	SUPPORT	Inherently governmental.	NASA HQs/RPO
2	Preparing and Allocating Budgets	LEAD	Potential to meet objectives 1,2.	NASA HQs/RPO
3	Selecting and Prioritizing Research	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
4	Establishing Experiment Requirements and Feasibility	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
5	Developing and Qualifying Research Flight Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
6	Maintaining and Sustaining Research Flight Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
7	Developing Research Ground Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
8	Maintaining Research Ground Systems	LEAD	Potential to meet objectives 1, 2.	IP/RPO/PD
9	Constructing Ground Facilities	SUPPORT	Potential to meet objectives 1, 2.	
10	Maintaining Ground Facilities	SUPPORT	Potential to meet objectives 1, 2.	
11	Certifying Safety of Research Flight Systems	SUPPORT	Potential to meet objectives 1, 2.	
12	Mission Management and Allocation of Services	LEAD	Potential to meet objectives 1, 2, 3.	IP/RPO/PD
13	Integrating User Missions - Analytical	LEAD	Potential to meet objectives 1, 2.	SSPO
14	Integrating User Missions - Physical	SUPPORT	Potential to meet objectives 1, 2..	
15	Integrating User Missions - Operations	LEAD	Potential to meet objectives 1, 2, 3.	POIC/POIF RPO/SSPO
16	Selecting Research Crew		*Not addressed.*	
17	Research, Analysis and Results Publication	SUPPORT	Potential to meet objectives 1,2,3.	
18	Educating and Reaching out to the Public	LEAD	Potential to meet objective 3.	HQ/F
19	Recommending ISS System P3I Improvements	LEAD	Potential to meet objective 3.	SSPO
20	Archiving Research Samples, Data, and Results	SUPPORT	Potential to meet objective 3.	

- **In all cases, the "LEAD" option applies to management of the function on the behalf of the user community, not necessarily performance.**
- **"SUPPORT" indicates support to NASA**
- **Direct interfaces to performing NASA, or contract, organizations are essential to success for functions involving the lead role.**
- **Existing NASA organizations (e.g., SSPO, POIC/POIF, KSC, HQ) would continue in current roles with responsibility for managing the station side interface.**
- **NGO role is limited to user side of the interface in all cases.**
- **Transition options do not affect contracts currently in place or those currently in procurement.**

Criteria

Qualitative Criteria

Demonstrate knowledge of:	*Demonstrate ability to:*
• safety requirements	• meet safety requirements
• manifesting process	• manage manifesting processes
• station systems design	• meet station design constraints
• shuttle systems design	• meet shuttle design constraints
• international element designs	• meet element interfaces
• payload interfaces	• interface payloads with vehicles
• payload integration process	• integrate payloads
• payload development process	• develop payloads
• payload requirements	• specify payload requirements
• strategic plans, goals and objectives	• meet strategic plans, goals and objectives
• international agreements	• negotiate with international partners
• research programs	• work with research program offices
• funding mechanisms	• process task orders
• resource constraints	• prioritize resources across multiple users
• tactical planning process	• perform tactical planning
• resource sharing agreements	• create and implement resource sharing agreements
• payload operations integration practices	• operate payloads
• payload analytical integration practices	• analytically integrate payloads
• payload physical integration practices	• physically integrate payloads
• payload training practices	• train flight and ground personnel
• outreach plans, goals and objectives	• produce and implement outreach plans

Quantitative Criteria

Provide a cost reduction plan and demonstrate a ___% cost savings.

Provide a transaction model and demonstrate ___% reduction in organizational interfaces.

Provide a documentation plan and demonstrate a ___% reduction in documents.

Demonstrate a ___% reduction in response time to change notices.

Demonstrate staffing levels, skill mix and management infrastructure.

Obtain ISO 9001, or equivalent, certification in _____.

- **All respondents emphasized a need for demonstration of proficiency prior to function transition.**
- **All criteria require the equivalent of certification of proficiency.**
- **Customer satisfaction surveys, both NASA and end-users, recommended.**
- **Rigorous development of cost, schedule and performance criteria needed during the acquisition phase.**

Appendix D:
Functions Associated with ISS Utilization and Research Program Management (Tier 3 Functional Workbook)

08/09/00 DRAFT

Functions Associated with International Space Station Utilization and Research Program Management

Index to Functional Workbook

Section 1: Headquarters, Space Station Program Office, Space Station Project Offices
- **Functions of Headquarters**
- **Functions of JSC/Space Station Program Office**
- **Functions of MSFC/Payload Operations**
- **Functions of KSC/Payload Processing**

Section 2: Functions of MSFC Research Program Office (RPO) for Microgravity Research and Space Product Development

Section 3: Functions of JSC Research Program Office (RPO) for Biomedical Research and Countermeasures

Section 4: Functions of ARC Research Program Office (RPO) for Fundamental Biology

Section 5: Functions of GSFC Research Program Office (RPO) for Earth and Space Sciences

Section 6: Functions of OSF Research Program Office (RPO)

Description

This functional workbook was developed by the respective functional offices to describe both in-house and contracted functions over the FY 01 - 05 horizon. For in-house functions, civil service workforce plans are included with conversion to dollars based on local overhead rates in most cases. For contracted functions, budget plans are included. In most cases, the basis of estimate is cited. Efforts remain underway to establish uniformity across all sections; regardless, the current draft provides a level-of-deatil down to specific WBS, or SOW, elements and thus represents a comprehensive definition and reasonable estimate of the total scope of functionality.

NASA HQ (In-House)	STRATEGIC SPACE UTILIZATION ADVOCACY, ADMINISTRATION AND DIRECTION
	1. Advocating Appropriations (1) Preparation of NASA budget submit to OMB and collateral materials (e.g., working w/Capital Investment Council, Senior Management Council, Science Council, etc.). (2) Advising executive and legislative branch staff. (3) Preparing congressional testimony and collateral materials. (4) Managing and reporting to committees, subcommittees and task groups of the NAC and NRC. (5) Reponding to Congressional, White House and Press inquiries. (6) Representing R&D program to domestic conferences, symposia and media. **2. Allocating Appropriated Funds** (1) Defining existing programs and projects, and conceptualizing new initiatives (e.g., Program Commitment Agreements and Program Plans). (2) Conducting strategic trade studies across programs and projects. (3) Managing program and project research distributions and funds allocation (e.g.,Space Station Utilization Board and supporting Working Group). (4) Evaluate new and proposed space utilization policies originating in the executive and legislative branches, as well as foreign governments and agencies, and incorporate changes to NASA policies and plans. (5) Managing program restructuring, rephasing and reprioritization activities. (6) Preparing and issuing ISS Partner Utilization Plans, POP guidelines and reviewing center submits. (7) Conducting programmatic assessments and selecting grant, cooperative agreement, and space act agreement awardees. **3. Administering Appropriated Funds** (1) Administering grants, cooperative agreements and space act agreements for R&D projects. (2) Specifying and auditing annual cost, schedule and technical reporting requirements for R&D projects. (3) Developing cost sharing and data sharing agreements at the inter-agency and inter-center levels (e.g., NIH, DOE, NOAA, DARPA, etc. (4) Consolidating and reporting progress at the program and project levels. (5) Communicating the significance of public and private investments in programs and projects through public affairs and educational outreach. (6) Specifying, monitoring, consolidating and reporting performance metrics. (7) Cost Leveraging International Programs and Projects (a) Managing multilateral consultative working groups (e.g., MCWG-CP, ISLSSPWG, IMSPG) (b) Representing US in international forums (e.g., UOP, IFSUSS, conferences and symposia).
NASA HQ (Contracted)	**PEER REVIEW SUPPORT SERVICES (Global Science and Technology Contract# NASW-00017; UPN____)**
WBS	TASK DESCRIPTION
1.0	Preparation of Program Announcement Documentation and Solicitation
2.0	Notices of Intent to Propose
3.0	Proposal Receipt/Peer Review Processing/Logistics
4.0	Administration
5.0	Database
6.0	Electronic Commerce
7.0	Report generation
NASA HQ (Contracted)	**FLIGHT RESEARCH (Various Principle Investigators under Grant)**
WBS	TASK DESCRIPTION
Not Applicable	Flight research on selected topics

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	2.5	5	7.5	10	12.5
USG Cost	(est. $M)	0.35	0.70	1.05	1.40	1.75

Basis of Estimate:
1) Assumes 5% of OLMSA 50 FTE workforce in FY-01; ramping up to 25% by FY-05 (remaining 75% dedicated to ground-based program.)
2) Assumes negligible contribution from remaining HQ program and staff offices in area of ISS utilization.
3) Assumes 1 FTE = $100,000 + 40% overhead.

3.5 – 3.7M/yr (OLMSA Peer Review
~1.0

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost	($M)	0.42	0.83	1.25	1.67	2.09

Basis of Estimate:
1) Based on $41,730,000 OLMSA maximum ordering amount over 5 year term, with equal distribution per year.
2) Assumes 5% of OLMSA ordering amount in FY-01; ramping up to 25% by FY-05 (remaining 75% dedicated to ground-based program).
3) Assumes negligible contribution from remaining HQ program and staff offices in area of ISS utilization.

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Grant Cost	($M)	19.15	38.50	40.90	41.00	46.30

Basis of Estimate:
1) Based on OLMSA FY 2001 President's Budget Submit
2) Assumes 50% of flight PIs in FY 2001 will be station-based, and 100% for each year thereafter.

Distributed to RPOs.

NASA JSC (In-House)	SPACE STATION PROGRAM MANAGEMENT, PLANNING, SCHEDULING AND DIRECTION
	1. Provide an ombudsman function for the ISSP Manager, overseeing primarily the Program-level cost, schedule, and technical aspects and agreements of U. S. Payload development. 2. Ensure delivery of payload hardware and software to support the requirements of the research user community and the approved ISS assembly sequence. 3. Provide the processes and infrastructure within the ISS Partnership necessary to integrate and operate payloads and experiments, and obtain and return research data. 4. Ensure multilateral integration of utilization products and schedules (with payload developers, engineering integration, launch processing, and operations teams)necessary to ensure flight readiness for a safe and successful mission. 5. Ensure integration across increments for all U. S. and IP payloads and real-time mission support to the Mission Management Team on matters associated with payload/research requirements, operations, and anomaly investigation and resolution. 6. Provide the single point of contact between the Payload Developer (PD) and the ISSP including ensuring timely delivery of all payload integration data products to the ISSP and launch vehicle, and the negotiation of requirements, services, and integration milestones. 7. Manage the development of payload multi-use hardware (EXPRESS Rack, WORF, MELFI, CRYO, Middeck Lockers, ISIS, PARIS, ARIS, ARIS ICE, MCOR/HCOR) including the design, development, verification, customer integration, delivery, on-orbit checkout, sustaining engineering, and hardware/software upgrades. 8. Manage the development and use of ISS Program Distributed Payload Interface Verification Tools, including the budgets and schedules of the responsible organizations and schedules for use of the tools after delivery. 9. Perform ISS to Payload and EXPRESS Rack/Pallet to Payload Hardware and Software Engineering Integration. This includes payload integration into the LAB, JEM, APM, and CAM and onto the Truss attach sites and JEM EF. 10. Manage the Research Planning Working Group to produce research plans, priorities, and trades across disciplines and IP's from the multi-increment to tactical to execution timeframes. 11. Manage the allocations for Code M payloads (DoD, Barter agreement payloads, Education payloads, etc.). 12. Develop processes and products to communicate ISS research capability to the research community and general public and ensure research community representation to the ISS Program. 13. Develop and implement Payloads Office strategies to ensure ISS commercialization. 14. Ensure research requirements are adequately flowed down into the ISS specifications. 15. Manage the budget, schedule, and technical performance of the operations implementing organizations (MSFC, JSC, and TSC's) who are developing the capabilities and processes required to perform end-to-end payload operations integration, crew training, cadre training, and real-time payload operations. 16. Develop and sustain HOSC and TSC facility hardware and software to provide telescience capability to remote user sites, POIC command and control capability for payload and payload support systems, and secure network distribution of payload commands, telemetry, and applicable ancillary core systems telemetry. 17. Ensure MSFC payload operations procedures and facilities are integrated with the JSC system operations procedures and facilities. 18. Develop and implement Payloads Office strategies to ensure payload inputs to ISS Pre-Planned Program improvement activities. **CROSSCUTTING FUNCTIONS (Not dedicated to utilization and not included in resource projections)** 1. Payload Safety Review Panel 2. Cargo Analytical Integration (contract definitions still required)
NASA JSC (Contracted)	**PAYLOAD OPS & FACILITY ENGINEERING SUPPORT (USA Contract #_____; UPN 496-51)**
WBS **1.7.9.6**	**TASK DESCRIPTION:** 1. **Payload Integration Manager (PIM) - Includes PIA Blank Book Develop., P/L Data Set BB develop., P/L unique PIAs, & P/L unique integration schedules** (1) POC for coordination of integration activities between Payload Developer (PD) and the ISSP (2) Coordinate delivery of all P/L integration products as specified by the P/L-unique PIM Schedule (3) Responsible for integration of a P/L into the launch vehicle and the ISS (4) Support major PD reviews (PDR, CDR, Ground Ops Reviews, Safety Reviews, SAR, etc.) (5) Support major ISSP reviews (SCIR, IOR, CoFR, etc.) (6) Develop & maintain the Payload Blank Books (BB) (7) EXPRESS Rack & EXPRESS Pallet integration function, unique to EXPRESS systems 2. **Payload Mission Integration (PMI) - Facilitate the integration of multiple PD requirements into the ISSP. Includes flight integration, flight CoFR coordination, increment definition develop., detailed manifest tracking, logistics & maintenance, cargo integration assessments, & schedule development & assessments**

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	30	27	25	23	20
USG Cost	(est. $M)	4.20	3.78	3.50	3.22	2.80

Basis of Estimate:

1) Assumes 25 JSC/OZ FTEs in FY-01 with 10% per year reduction.

2) Assumes 1 FTE = $100,000 + 40% overhead.

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost	(NOA $M)	4.33	4.56	4.71	4.87	4.87

Basis of Estimate:
1) 2000 Congressional Budget.

(1) Flight Payload Managers (FPM's) provide FPM function to NASA-assigned flights
(2) Payload Increment Definition
(3) Payload Detailed Manifest
(4) Payload Logistics and Maintenance (L&M)
(5) Payload Cargo Integration

3. **Payload Operations - Oversee the implementation of ISSP requirements by the Payload Operations & Integration groups. Includes ground systems & facilities, training, execute planning, & operations**
(1) Ensure definition & integration of interfaces between MSFC P/L Ops & Integration, ISSP, JSC Mission Ops Directorate, & the ISS Partners & Participants are consistent with requirements definition documentation & flight products
(2) Evaluate & status schedules for process definition, data delivery, hardware development, & documentation delivery
(3) Facilitate identification & resolution of issues and risks related to ISS payload operations reviews, & Technical Interchange Meetings

NASA JSC (Contracted) — **PAYLOAD ENGINEERING & INTEGRATION (Boeing Contract#_____; UPN 479-21)**

WBS	TASK DESCRIPTION
1.4.1	**1. UAIT Management and Administrative Functions**
	(1) Provide overall management & administration for Prime Utilization functions
	(2) Conduct payload vehicle safety task functions
	(3) Support program reviews
	(4) Complete CoFR tasks and endorsements
1.4.2 & 1.4.5	**2. Payload Engineering & Integration**
	(1) Maintain & update Pressurized Payload Interface Requirements Doc. (IRD) & Interface Control Doc. (ICD)
	(2) Maintain & update Attached P/L Interface Requirements Doc (IRD) & Interface Control Doc. (ICD)
	(3) Complete & maintain Pressurized P/L and Attached P/L Accommodations Handbooks (2)
	(4) Maintain & update Pressurized P/L and Attached P/L Verification Plans GPVP & GAPVP (2)
	(5) Maintain & update P/L Verification Program Plan (PVPP)
	(6) Develop, maintain, & update Unique Pressurized and Attached P/L ICDs
	(7) Maintain & update fault tolerance requirements document
	(8) Develop, maintain, & update systems and stage configuration data sets
	(9) Maintain & update Standard Program Implementation Plan (SPIP) Vol 4
	(10) Maintain & update P/L Engineering Integration Plan - Completed
	(11) Provide technical review forum and resolve interface issues via PIRNs
	(12) Perform & develop stage engineering analysis, payload verification compliance, operations guideline and constraints
	(13) Review & provide support to the P/L Integration Agreements (PIAs)
	(14) Review U.S. payloads design data packages - See 1.4.3
	(15) Review & support payload safety review panel and related activities - See 1.4.1
	(16) Review & assess station suitability studies and provide research accommodations for independent reviews
	(17) Review & support payload planning activities including support to PMIT, IDRD, IPMM, topologies, etc.
	(18) Provide real-time console support & payload anomaly resolution support during mission
	(19) Provide engineering support & analysis in resolving of the unique payload waivers/exceptions as submitted
	(20) Provide task management of 1.4.2 & 1.4.5 activities - See 1.4.1
	(21) Provide engineering support to the off-site reviews for TIMs, PDRs, CDRs, etc. - Travel
	(22) Administrative/technical documentations support
1.4.3	**3. Facility Payload Design Evaluation & Hardware Tracking**
	(1) Review US payload design review data packages
	(2) Manage delivery of Vehicle provided hardware for payloads
	(3) Ensure availability of data and models for vehicle provided hardware for payloads
	(4) Perform integrated payload rack structural analyses
	(5) Develop rack structure design enveloping parameters
	(6) Provide status of Vehicle provided hardware for payloads
	(7) Develop ISPR Structural Integrator's Handbook
	(8) Develop ARIS User's Handbook
	(9) Develop ARIS to Payload ICD
	(10) Provide ISPR Structural Systems Integration
	(11) Vacuum exhaust gas compatibility analysis
	(12) Provide ARIS integration support to integrated payload rack developers. Provide microgravity support.
	(13) Provide the USL Kneebrace Bolt Action Replacement (KBAR) kits
	(14) Provide ARIS/EXPRESS Installation & Maintenance Trainer
	(15) Develop ARIS/EXPRESS Installation & Maintenance Trainer PIDS in accordance with DRD FP07

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost	(NOA $M)	14.12	13.82	9.42	9.87	0.00

Basis of Estimate:
1) 2000 Congressional Budget.

(16) Install labels per Crew documented instructions on loose ARIS parts

(17) Provide the ARIS ISS Characterization Equipment (ICE) in accordance with ARIS ICE Specification (DR FP10)
(18) Provide Payload Crew Aids Kit in accordance with DR FP08
(19) Develop PaRIS specification in accordance with DRD FP09
(20) Conduct the Mil-Std-1553B RT testing for up to 10 Payload Racks (8 in the USA, 1 in Germany, and 1 in France) at the rack to module interface

1.4.4 **4. Payload Software Integration and Verification**
(1) Provide Houston-based management for PSIV projects
(2) Develop hardware and software deliverables for the Payload Software Integration & Verification Facility (PSIVF) as outlined in SSCN 438 Rev B
(3) Develop Payload Rack Checkout Unit hardware & software as outlined in SSCN 438 Rev B.
(4) Perform task authorized under SSCN 1233 Rev A, to address update of P/L verification rqmts as defined in SSP 57000. Perform update of development specification requirements.
Develop, test & deliver a PRCU Modification Kit
(5) Perform task authorized under SSCN 2052 WBS 1.4.4 to modify the baseline configuration of the PRCU No. 4 installation to accommodate the unique facility layout at KSC
(6) Perform tasks authorized under SSCN 2054, WBS 1.4.4: 1) Develop PRCU Training & Certification Plans; 2) Perform training & certification of PRCU operators at JSC, KSC, LeRC and MSFC;
3) Perform recurring training of PRCU operators; 4) Perform task outlined in SSCN 2703, to calibrate or replace PRCU #2 thermal system sensor as required
(7) Develop the Suitcase Test Environment for Payloads (STEPs) hardware & software as outlined in SSCN 438 Rev B
(8) Perform task authorized under SSCN 1694 to address modifications and development of new code required per the addition of the STEP to STFx Interface Spec. Perform required
mods to the STEP software to accommodate the addition of SSP 52050, Payload Software Interface Specification

1.4.5 **5. Payload Software Integration (PEI)**
(1) Manage, control, & develop payload unique software ICDs for payloads integrated into the USOS and MPLM, DR PA17, Unique Pressurized & Attached Payload Software Interface
Control Documents and ensure payloads are compatible with the system requirements & constraints
(2) Develop a Payload MDM User's Manual
(3) Perform S/W integration activities: Assignment & tracking of APIDs, Subset IDs, & PUIs; Providing data inputs to P/L Data Library; Coordination of PSIV-developed P/L-related
S/W products; Assisting payload developers in resolving interface issues & providing interface clarifications; Providing rqmts for P/L Ancillary Data to the Mission Build Facility

NASA JSC (Contracted) — **SSPO PAYLOAD OFFICE SUPPORT (Lockheed-Martin Contract # _____; UPN 496-51**

TASK DESCRIPTION

1. Support Research Planning Working Group (RPWG) Processes
(1) Integrates & manages ISS research resource requirements and objectives of the ISS Research Program
(2) Generates the Integrated Payload Mission Model (IPMM) yearly
(3) Generates the Tactical Resource Allocation Letter at PP-30
(4) Coordinates tactical inputs to the Increment Definition & Requirements Document Planning Letter at PP-24
(5) Generates the Payload Tactical Plan (PTP) at I-22
(6) Approves any changes to the baselined PTP that impacts research and/or research resource across several increments

2. Support Lead Increment Scientist Processes
(1) Integrates & manages ISS research resource requirements and objectives starting at I-22 until the completion of postflight activities for a specific increment
(2) Serves as the point of contact for providing an integrated research status of on-orbit research activities
(3) Prioritize increment research when consensus cannot be reached
(4) Provide integrated research input to the POIC cadre for planning, replanning, and nominal and off-nominal operations

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	1.10	1.58	1.60	1.60	1.60

Basis of Estimate:
1) 2000 Congressional Budget.

NASA JSC (Contracted) — **SSPO SUPPORT (Science Applications Int'l Contract #_____; UPN 479-80)**

TASK DESCRIPTION

2.0 **Space Station Payloads Office Support**
3.0 **Payload Program Management and Engineering Support**
3.1 ISS Research Program Manager Support
3.2 Engineering Support (ISS Window Observational Research Facility (WORF) & Fleet Resource Management (FRM))

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	0.90	0.90	1.00	1.00	1.00

Basis of Estimate:

1) 2000 Congressional Budget.

4.0	**Research Integration Support**
4.1.2	Book manage the Research Requirements Document (RRD)
4.1.4	Maintenance and regular update of the ISS Research Capability Metrics document (See DR 14)
4.1.5	Produce ISS research capability and status briefings for internal ISS use, external NASA outreach activities, and in response to specific questions & actions from various government oversight and advocacy committees
4.1.7	Organize & participate in conference and meetings for a variety of NASA technical interchange meetings, working groups, workshops, and advisory & independent review panels
4.2	**Discipline Management support**
4.2.1.1	Work with user sponsors, payload developers & users appropriate to this discipline to develop an integrated set of requirements on Space Station capabilities and processes which are needed by this discipline
4.2.1.3	Represent the ISS Payloads Office to the various science and programmatic working groups within the Research Discipline
4.2.3.4	Work with user sponsors, payload developers & users appropriate to the discipline to develop integrated payload data necessary for inclusion into the payload strategic planning process
4.2.5	Commercialization
4.2.5.3	Assist in development of processes and policy for commercialization initiatives within NASA

NASA-MSFC (In-House)	TACTICAL SPACE UTILIZATION MANAGEMENT
	1. Flight Systems Utilization Management Perform Project Management and Systems Engineering functions for the EXPRESS Projects; EXPRESS Development and Engineering Integration; Project Management for POIF; Payload Operations Directors for each ISS Increment; Payload Display Review Panel Chairman; ARIS Operations Development; EXPRESS Rack and payloads operations support; Overall Management of POIC cadre, ground personnel training, mission planning, data management, command and control of payloads and payload support systems; Management of the Ground Systems development and operations to support telemetry & command processing, voice & video services, local & remote user interfaces; TReK development; Safety; Quality; Procurement; Program Analysts; Managerial Support **2. Ground Systems Utilization Managment** For major facility capabilities, the Civil Service staff in the development organization manages the prime contractor (both development and operations contractors) by providing to the contractor the project management of the overall effort, necessary technical guidance on critical design decisions, government-only functions such as intergovernmental negotiation and agreements with International Partners for both technical and project interfaces, inter-agency and inter-center negotiations for remote institutions and science users, and interfaces to other major programs (Shuttle, Chandra) for commitments which MSFC has made to those programs. Note that the facility is a multi-program facility. For other areas (smaller efforts), the Civil Service workforce also performs hands-on development for new technology initiatives, and production and deployment of the resulting products to NASA and outside remote users, including other agencies and internationals. Civil Service expertise grows from the hands-on areas, into the expertise required to manage the larger facility deliveries. Other external functions include multi-program requirements gathering for payload operations, including NISN comm. requirements and other HOSC facility support requirements for periodic new payload efforts (Shuttle, Station, and others).
NASA MSFC (Contracted)	**SPACE STATION PAYLOADS UTILIZATION (Boeing Contract #NAS8-50000; UPN 479 & 496)**
WBS **1.4.3.1**	**Payload Tactical Planning**: Develop and maintain the utilization portions of the IDRDs; perform assessments and analyses to support payload manifesting, planning, and groundrules and constraints documentation
1.4.4.1.2	**Payload Planning System (PPS)**: Software Systems Engineering, Development, and Test 1) Software Management Plans 2) Software Development Environment (SDE) Development and Maintenance 3) Functional Requirements Maintenance: maintain System Spec 4) Detailed software requirements and interface definition 5) Design: derive, document and maintain the software design for PPS in the Software Design Document, the design for external systems interfaces, and the Software Development Folders 6) Code, debug , and unit test the PPS software functions 7) Inetgration and verification testing of the PPS functions 8) Create and run Validation Test Procedures, publish Validation Test Report 9) Validation Test Support to fix software problems which, if not fixed, could prevent successful completion 10) Integration Test Support 11) Delivery and Installation 12) Provide technical support Operations and Maintenance of the PPS functions and documentation through the life of the contract
1.4.5.4.1	**EXPRESS Rack System** Define, design, develop, manufacture, test, qualify, deliver, and maintain EXPRESS Rack System including: EXPRESS Flight Rack EXPRESS Transportation Racks EXPRESS Rack Trainers EXPRESS Rack Functional Check-out Units EXPRESS Rack Suitcase Simulators

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	185	151	134	129	117
USG Cost	(est. $M)	25.90	21.14	18.76	18.06	16.38

Basis of Estimate:
1)

2) Assumes 1 FTE = $100,000 + 40% overhead.

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost	(NOA $M)	61.15	48.43	49.60	49.44	49.09

Basis of Estimate:
1) POP '00 Mark.

	SIR Drawers
1.4.5.4.3	**ISIS Drawer Design and Development**
	Provide Engineering, manufacturing, and materials to design, develop, fabricate, assemble, test/verify, qualify, and deliver ISIS payload drawers
	Perform sustaining engineering
1.4.5.4.4	**Consolidated Payload Logistics and Maintenance**
1.4.5.4.4.1	Consolidated Payload Logistics and Maintenance Support Analysis
	1) Define, develop, manage, track. and status the capability to implement the Consolidated Payload Logistics and Maintenance Support Analysis
	2)Perform the data collection, system, and equipment level analysis for supportability and maintenance, validating analysis results, creating/updating LSAR database, and deliver analysis reports.
	3)Perform data collection, operations and maintenance analysis, development of operations and maintenance manuals, and validation of developed manuals.
	4)Perform the Failure Modes and Effects Analysis, failure rate predictions, limited life item identification, preventative maintenance analysis, and maintenance timeline analysis necessary to support the LSA activity.
1.4.5.4.4.2	Consolidated Payload Spares/Provisioning
	1) Perform the data collection, provisioning analysis, validating analysis results, creating/updating recommended spares lists. and delivery of recommended spares lists
	2)Initial procurement (within funding limitations) of obsolescence spares, Spares Acquisition in Production (SAIP), and designated connectors for users. Procurement of two spare kits for BRP HHR flight racks, and two Avionics Air Assemblies as specified in the Deliverable Items List. Laptop spares for BRP are included as part of the GFE list for inclusion in the BRP spares kit; 2 total.
	3) Spares management and warehousing
1.4.5.4.6	**EXPRESS Pallet Oversight**
	1) Project Management
	2) Generation/derivation of inputs to NASA program requirements; review of Project derived requirements and requirements traceability; and coordination of comments and inputs; development of the System Development Specifications and specifications for the PTC Trainer, KSC Simulator, and NBL Trainer.
	3) Review and review coordination of design review plans, drawings/documentation, trades, analysis, and initiation of Review Item Discrepancies.
	4) Integration and Verification Test: Review coordination of integration/verification plans and procedures, integration/verification test oversight, and review of final test reports. The task also includes sampling of verification analyses results.
	5) Manufacturing: Review of manufacturing plans and procedures, support of quality sampling of manufacturing, and review of manufacturing schedules/reports
	6) Integration/Operations: Coordination and facilitation of operations and integrationinputs.
1.4.5.5.1.1	**EXPRESS Rack Payload Analytical Integration**
	1) Define, develop, manage, track and status the capability to implement the EXPRESS Rack payload and integrated EXPRESS Rack compliment payload analytical integration process. Contractor developed models, tools and equipment necessary to implement these tasks shall be appropriately documented and delivered. Develop & deliver EXPRESS Rack Payload Accommodations Handbook (PAH), EXPRESS Rack Payload Interface Definition Document (IDD), EXPRESS Rack Payloads Generic Payload Verification Plan
	2) Provide engineering support to EXPRESS RACK Payload Developers.(1) prepare and deliver EXPRESS Rack Payload specific ICDs and associated EXPRESS Rack Payload Verification Plans (2) assist in collecting experiment and operations data and requirements, via the PDL, necessary for engineering and operations integration planning and execution, (3) provide issueresolution associated with ICDs, PVPs and payload data files, (4) provide payload verification planning, tracking, and statusing, and (5) support development of individual sub-rack payload EXPRESS Integration Agreements (EIA).
	3) Implement the EXPRESS payload/experiment engineering integration and verification process at the EXPRESS payload-to-Rack and the EXPRESS payload compliment level. Collect payload integration requirements and data, coordinate, establish, and maintain agreements with payload developers regarding interfaces, schedules, accommodations, resources requirements, operations support, and physical integration/test/checkout services to be provided. Develop, analyze, and synthesize EXPRESS Rack payload compliment integration data and requirements for the EXPRESS facilities and ground systems which result in products used by other ISS integration elements for EXPRESS payload verification, ground physical integration test and checkout, payload logistics planning and flight operations planning and implementation. Conduct compatibility analyses of the integrated EXPRESS Rack with the ISS in the following areas: Structures, dynamics, microgravity, mass properties, command and data handling, communications and tracking, thermal,electrical power, EMI/EMC, safety, and system engineering.
1.4.5.5.1.2	**EXPRESS Rack Payload Software Integration and Verification**

Perform synthesis and analysis of individual EXPRESS Rack payload software requirements; definition, development, integration, verification, and sustaining of integrated payload flight software products for EXPRESS Rack Interface Controller (RIC) and EXPRESS Rack Laptop and verification activities to ensure compatibility of integrated EXPRESS Rack. Develop the EXPRESS Rack PSIV capability and process including the EXPRESS Rack software development environment and software verification environment.

1.4.5.5.2.1 **EXPRESS PALLET PAYLOAD ANALYTICAL INTEGRATION**

1) Define, develop, manage, track and status of the capability to implement the EXPRESS Pallet payload and integrated EXPRESS Pallet compliment payload analytical integration process. Contractor developed models, tools and equipment necessary to implement these tasks shall be appropriately documented and delivered. An EXPRESS Pallet Payload Accommodations
Handbook (PAH) shall be prepared and delivered. An EXPRESS Pallet Payload Interface Definition Document (IDD) shall be developed, updated, and maintained. An EXPRESS Pallet Payloads Generic Payload Verification Plan (PVP) shall be developed, updated, and maintained
2) Provide engineering support to EXPRESS Pallet Payload Developers, including:: (1) prepare and deliver EXPRESS Pallet Payload specific ICDs and associated EXPRESS Pallet Payload Verification Plans, (2) assist in collecting experiment and operations data and requirements, via the PDL, necessary for engineering and operations integration planning and execution, (3) provide issue resolution associated with ICDs, PVPs and payload data files, (4) provide payload verification planning, tracking, and statusing, and (5) support development of individual sub-pallet payload EXPRESS Integration Agreements (EIA).
3) Implement EXPRESS payload/experiment engineering integration and verification process at the EXPRESS payload-to-Pallet adapter and the EXPRESS payload compliment level. Collect payload integration requirements and data, coordinate, establish, and maintain agreements with payload developers regarding interfaces, schedules, accommodations, resources requirements, operations support, and physical integration/test/checkout services. Develop, analyze, and synthesize EXPRESS Pallet payload complement integration data and requirements for the EXPRESS facilities and ground systems. Conduct compatibility analyses of the integrated EXPRESS Pallet with the ISS in: structures, dynamics, microgravity, mass properties, command and data handling, communications and tracking, thermal,electrical power, EMI/EMC, safety, and system engineering

1.4.5.5.2.2 **EXPRESS Pallet Payload Software Integration and Verification**

Perform synthesis and analysis of individual EXPRESS pallet payloadsoftware requirements; definition, development, integration, verification, and sustaining of integrated payload flight software products for EXPRESS pallet controller and EXPRESS pallet displays/applications, and verification activities to ensure compatibility of integrated EXPRESS pallets. Develop the EXPRESS pallet PSIVcapability and process including the EXPRESS pallet software development environment and software verification environment. This WBS also include the activities associated with the STEP EP development effort.

1.4.6.1 PAYLOAD SOFTWARE INTEGRATION AND VERIFICATION (HISTORY

Provide synthesis and analysis of individual Payload Developer Software (PDS) requirements; definition of integrated payload flight software requirements for payload software including, but not limited to Payload Executive Software (PES), EXPRESS Controller Software (ECS), and Payload Support Data (PSD); and integration/verification activities to ensure compatibility with the ISS. Develop and maintainthe above software including, but not limited to, PES, ECS, and PSD. Develop a payloadsoftware integration and verification environment which will be used to support increment payload software integration and verification. Define, design, develop, maintain, and support payload software integration and verification capability. This capability includes, but is not limited to, the Payload Software Integration and Verification Facility (PSIVF), the Suitcase Test Environment for Payload (STEP) and the Payload Rack Checkout Unit (PRCU).

1.4.6.2 **Payload Operations Integration Function (POIF)**

Provide the overall operations engineering and integration for the development and maintenance of requirements, plans, schedules, processes, procedures, and resource analyses required for the definition and coordination of U.S. and International Partner payload operations integration and the conduct of those operations. The POIF includes development, payload operations integration, execution preparation, and operations execution tasks.

1) **POIF Development**: Includes the Early Payload Accommodation (EPA) and Full Operations Capability (FOC) development tasks required for the integration of payload operations planning, requirements, procedures, processes, interfaces and tools related to ground and onboard systems, the development of the integrated payload operations processes, and the integration of these activities with the MCC-H, users and International Partners.

a)Program requirements and architecture for utilization operations and training (includes end-to-end user operations concept
b)Payload operations process definition and management (includes USOC implementation process definition)
c)Systems operations integration, standard interfaces, and responsibilities d)User operations functionality and standard interfaces, includes collection and definition of functional requirements and UOF Interface Services requirements.
e)International partner operations integration, standard interfaces, and responsibilities
f) Payload training plans, processes, and standard tools.
g) Flight systems functionality and payload operations development
h) Ground systems functionality and payload operations development.
i) Definition of the payload operations and training requirements needed and methodology for collecting and assessing the requirements.
2) **Operations Preparation:** Includes the tasks for the preparation and management of payload ground support requirements, payload operations information, payload training requirements, and payload operations constraints definition, and payload operations supportproducts. Included in this category are those tasks related to:
a) Payload resources planning, operations compatibility, and crew utilization planning.
b) Payload operations management, including increment operations management and payload operations technical management
c) Establish specifications for collecting and integrating operations and training requirements from payload users and International partners in the areas of payload planning, payload operations support, ground data services and payload training.
d) Ground support requirements, including data satellite utilization planning inputs (e.g. TDRSS, DRS, etc.), NASA network payload requirement inputs for ground networks
e) Payload operations information management, including increment operations plan information control, payload information management system administration and operations document configuration management
f) Inputs to payload training requirements and plans, training strategy teams, and payload operations integrated training plans
g) Payload operations integration, including payload operations management planning, payload operations constraints definition, and payload software requirements definition
h) Integration and implementation of payload requirements for the increments, including, but not limited to, mission rules; systems assessments; ground network and facility requirements.
I) Preparing increment specific operations planning products and schedules, including: Increment Operation Plan; Weekly Planning Products; Payload Regulations; Payload Operations Handbook and POIC Console Handbooks; Verification Plan; operations procedures and reference information (Payloads, TV & Photo Ops, PLSS, LSE, systems/Payloads), Payload Systems Manual, ground ops displays, special computations, scripts for Payload monitoring and control.
j) Participating in the simulations of operations activities with the overall mission operations team
k) Preparing standard procedures and plans for use by USOC hosted users.
l) Preparing procedures and handbooks for EXPRESS Operations.
m) Increment training planning preparation, including TST support, Payload Training Requirements, and Payload Training Support Products.
n) Simulation development.
o) Training scheduling support.
p) Preparation of training products for training USOC-hosted users (DR UO05).
Payload Training Operations: Includes the effort to conduct increment independent and increment dependent payload operations training for crew, POIF personnel, USOC user personnel. Included in this category are those tasks related to conducting simulations.
Realtime, Non-Realtime, and Post Operations: Includes the tasks necessary to execute real-time Payload Operations Integration Center (POIC) Cadre operations and the distributed operations IP cadre during real-time operations, perform payload operations real-time planning, manage payload data/video operations, and control and coordinate operation of the payload complement and payload support systems. Included in this category are those tasks related to:
a)Mission Planning, including weekly planning and developing necessary planning products to support payload and payload support systems operations execution onboard and on the ground
b) Data Management, including the control and coordination of onboard data generation, routing, and recording of payload data/video, the coordination of the Ku-band space-to-ground data communications content, the coordination of the ground distribution of downlinked payload data/video to the end users, and the replanning of data/video systems operations
c) Operations Control, including coordination of POIC tasks required to support the execution of integrated station plans, operation of payload support systems, EXPRESS racks/pallets, coordination of payload operations via crew and ground control, and safety assurance of payload operations. Also includes coordination of response to system/payload anomalies and changes to the onboard executable plans.
d) Post Increment Support, including the preparation of lessons learned, and post-increment reports. Includes coordination of the post-mission video processing, duplication and distribution activities.

	e) Operations integration, including payload safety support, configuration management, anomaly resolution, and offline special support.
1.4.6.3	**Payload Data Library**
	Contractor management, technical and clerical effort necessary to develop, update, operate and maintain a Payload Data Library (PDL) to collect, manage, and distribute payload requirements and data from Payload Developers. This shall include providing the capability to electronically process payload data collected via remote electronic access by Payload Developers through a single interface and support electronic transfer to Program systems/organizations/databases needing this data. A PDL Users Guide shall be developed and maintained. A PDL Requirements document shall be developed and maintained. Interface Agreement Documents (IAD) shall be developed as required to identify, document, and control the PDL design interfaces with the appropriate NASA and IP databases.
1.4.7.1	**Utilization Project Management**
	Utilization Systems Engineering and Integration: Development, documentation, and control of top level derived system level requirements and flight system verification Programs for Science and Utilization flight hardware, station
1.4.7.2	integration, operations, and utilization processes.
	Safety and Mission Assurance: Definition, implementation, and maintenance of a S&MA program for all elements of the S&U projects. These efforts include; management, planning, S&U analyses and S&MA support to contract end-items and analytical tasks for Safety, Reliability, Maintainability, and Quality Assurance. Also included are; evaluations of the safety, reliability, maintainability, and quality of hardware; software and operations through analyses, test, reviews, and assessments; timely status reporting/documentation of S&MA effort; and establishing
1.4.7.3	compatible assurance requirements among Manufacturing, test, launch and ground operation sites.
1.4.8	**Payload Operations and Training**
	Payload Operations: Provide labor to develop the on-orbit operations procedures for the EXPRESS Rack systems and EXPRESS Pallet systems. The contractor shall conduct appropriate systems analyses and review schematics provided by the payload developer in support of this task. This effort also provides for the contractor to perform Payload Display development tasks including developing 1) a Payload style guide, 2) a Payload display rapid-
1.4.8.1	prototyping tool, and 3) the Payload Display Review Panel (PDRP) Management Plan.
	Payload Training: Provide labor to develop individual EXPRESS payload simulator requirements, support payload developers in installing EXPRESS simulators into the Payload Training Capability (PTC) and
1.4.8.2	conduct individual payload training as requested by payload developers.

NASA MSFC (Contracted)	UTILIZATION AND MISSION SUPPORT - UMS (Lockheed-Martin Contract #NAS8-44000; UPN 479, 441,444)
WBS	
2.1	**Program Management**
2.2	**Systems Engineering**
2.2.1	Huntsville Operations Support Center (HOSC)
	HOSC Requirements Development: Development and implementation of systems operations concepts, interface
2.2.1.1	definitions, and planned systems capabilities
2.2.1.2	HOSC Systems Analysis: Assessing ECRs, conduct trade studies, perform risk assessments
	HOSC Integration and Planning: Operations integration, systems coordination with external facilities, integrated
2.2.1.3	scheduling
	HOSC Systems Sustaining Engineering: Perform studies to resolve problems and recommend HOSC
2.2.1.4	improvements, documentation of changes, perform capacity analyses and technology assessments
2.3	**Design and Development**
2.3.1	HOSC Design and Development
2.3.1.1	HOSC System Design
	1) HOSC system upgrade design
	2) HOSC existing systems design associated with maintenance of HDRS, DDS, CPS, OMIS/PMIS, SDFS, MPS, MIPS Cluster, POCC Graphics, TDS, HASA, OCMS, HTAL, desktop systems, and HOSC communications
	3) EHS systems design
	4) EMCS systems design
	5) PDSS systems design
	6) MGL systems design
	7) MSIL systems design
2.3.1.2	HOSC Hardware Design and Development
	1) Hardware design and development for system upgrades
	2) Hardware design and development for existing systems
	3) EHS Hardware design and development
	4) EMCS hardware design and development
	5) PDSS hardware design and development
	6) MGL hardware design and development

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost	(NOA $M)	25	17.76	19.58	20.22	20.14

Basis of Estimate:
1) POP '00 Mark.

	7) MSIL hardware design and development
2.3.1.3	HOSC Software Design and Development
	1) Software design and development for systems upgrades
	2) EHS System Services Application software design and development
	3) EHS Command and Script Application software design and development
	4) EHS Database Applications software design and development
	5) EHS SMAC Application software design and development
	6) EHS Telemetry and Network Application software design and development
	7) EHS Networks software design and development
	8) EHS FEP software design and development
	9) EHS PIMS software design and development
	10) Utilities Application software design and development
	11) EHS Enhanced OCMS software design and development
	12) EHS Test software design and development
	13) EMCS software design and development
	14) PDSS software design and development
	15) MSIL software design and development
2.3.1.4	HOSC Acquisition Specifications: Develop comprehensive acquisition specifications and documentation for products acquired from manufacturers
2.3.1.5	HOSC Installation and Integration
	1) System upgrade installation and integration
	2) Existing systems software installation and integration
	3) Existing systems hardware installation and integration
	4) EHS Software installation and integration
	5) EHS Hardware installation and integration
	6) EMCS Software installation and integration
	7) EMCS Hardware installation and integration
	8) PDSS Software installation and integration
	9) PDSS Hardware installation and integration
	10) MGL Software installation and integration
	11) MGL Hardware installation and integration
	12) MSIL installation and integration
2.4.1	**HOSC Activity Preparation**
2.4.1.1	HOSC Operations Preparation
2.4.1.2	HOSC Product Population/Preparation
2.4.1.3	HOSC Facilities Preparation
2.5.1	**HOSC Operations**
	Computer operations, communications systems operations, monitoring/tracking change requests and problem reports, system reconfigurations
	1) Marshall Operations Controller
	2) Marshall Data Controller
	3) Systems Configuration Controller
	4) Payload Command Controller
	5) Data Control Engineer
	6) Operations Analyst
	7) Marshall Communications Controller
	8) Payload Administrative Support
	9) HOSC User Assistance
	10) MIDDS Controller

NASA-KSC (In-House)	UTILIZATION SUPPORT
	1. Launch site support management.
	2. Project and operations management.
	3. Hands-on system engineering for ISS payloads processing at launch and landing sites.
	4. COTR for Life Science Support Contract and oversight of Hangar L operations & maintenance.
	5. Payload processing advanced planning.
	6. Requirements development, integration and implementation.
	7. Manifest and capability analysis.

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	33	32	32	32	32
USG Cost	(est. $M)	4.62	4.48	4.48	4.48	4.48

Basis of Estimate
1) Assumes 1 FTE = $100,000 + 40% overhead.

8. Budget development and administration.
9. Procedure development and implementation.

NASA KSC (Contracted)	**UTILIZATION SUPPORT - PGOC (Boeing Contract # NAS10-11400; UPN 479-70)**
1.4.08.03	**Utilization Ground Processing - UPN 479-70** Provide a capability at the launch/landing site for limited physical integration and staging, perform payload-to-Space Station and EXPRESS payload-to-Facility Interface Testing using the Launch Site payload integration and checkout facilities for customer payloads integrated into ISPR's operating in the US Lab, US ISPR's operating in the IP Labs, and attached payload s operating off the truss/EF.
1.4.08.03.01	**Program and Institutional Support** Provides for performing Program driven actions, status reviews, and development of KSC's portion of the ground integration process and planning. Identified activities include support to the Payloads Planning Working Group, Common Schedule Data Base Updates, Payload Design Reviews, Stage Integration Reviews, Refrigerator/Freezer requirements definition and TEMs, Program Documentation updates, and Implementation Planning Reviews.
1.4.08.03.02	**Support Equipment/Facility Design/Development Support** Provide for the support to flight hardware and GSE design, including Payload Developer's hardware design reviews. Identified products include support to the development and act/val of the Payload Test and Checkout System and POIC.
1.4.08.03.03	**Schedule and Manifest Assessment** Provides for the planning capability to provide long range analysis of flows and manifests. Identifed products include the Standard Flow for various payload types and development, maintenance of standard schedules as a planning tool, and the initial process planning with the user prior to mission assignment. Also included is support to KSC ISS Schedule Integration Forums, multi-flow, and fleet resource management.
1.4.08.03.04	**Mission Direct and Advanced Planning** Provides the mission manpower for PGOC and NASA that perform 'hands-on' tasks associated with ground processing. Identifed roles include engineering lead roles, ground and flight systems engineering, technicians, schedule publication, comm support, and Work Authorization Document (WAD) production. Also includes Refrigerator/Freezer on-line O&M for MELFI and Cryo freezers, middeck processing planning, and offline lab coordination.
1.4.08.03.21	**Safety and Mission Assurance** Provides support to include milestone and readiness reviews; participating in design reviews and configuration control boards; support ground and flight safety reviews. Identified products include providing witness/verification/surveillance for the certification of launch and landing site GSE and for the launch and landing site processing of Space Station Utilization hardware. This Task Element includes S&MA support for NASA and contractor utilization efforts.
1.4.08.03.22	**Allocated Support** Allocation support consists of activities in support of the entire PGOC contract: contract financial reporting and budgeting; CCN/WBS management; and computation services including personal computer maintenance and mainframe systems operations.
1.4.08.03.05	**Payload Test and Checkout System (PTCS) and POIC On-Line O&M** Includes O&M (including S/W) for Comm and Avionics, Fluid Systems, USICU, middeck GSE, POIC and other hardware that primarility support the Utilization Ground Processing IPT. Also included is POIC sustaining engineering, scheduled upgrade and maintenance contracts.
1.4.08.03.05	**Payload Rack Checkout Unit (PRCU) Verification Operations** PGOC direct test support of ISPR, EXPRESS and Attached Payloads in the PRCU.

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	8.9	7.8	8.5	10.2	12.7

Basis of Estimate:

1) ISS POP-00 Program Recommend.

NASA KSC (Contracted)	**LIFE SCIENCE SUPPORT - LSSC (Dynamac Contract #NAS10-12180; UPN479-71)**
1.4	**Utilization Hangar L Support** Includes launch and landing site laboratories for all ISS experiment requiring intensive scientific processing capability. Assesses ISS manifest to ensure launch/landing site capabilities are adequate for Agency needs. Provides assessment of launch site processing requirements, procures necessary supplies/equipment. Processes biological shipment to domestic and international sites pre

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	0.98	0.81	1.04	1.16	0.05

Basis of Estimate:

	and post mission. Maintains applicable accreditations (facility and personnel) for laboratory facility including the Animal Care Section. Provides for O&M of the Hangar L Complex.	1) 2000 Congressional Budget
	CROSSCUTTING FUNCTIONS (Not dedicated to utilization and not included in resource projections)	
1.05.02.06.02	**KSC - LAUNCH SUPPORT RESUPPLY & RETURN (OPERATIONS) - UPN 585-82-06** **TASK DESCRIPTION** **Launch Support Resupply and Return IPT** Provides support to the integration, planning and execution of Resupply and Return mission processing. Perform planning for processing tasks and provide Launch Site planning for launch site services and support for each flight element and launch package. Mission Processing Teams will be formed to perform the hands-on processing tasks associated with MPLM, other Resupply/Return Carriers and its contents. The MPT will also perfrom Shuttle Integration Operations. Includes coordination of external dependenceis with the Prime, Design Organizations, and other program participants for each flight elements and launch package. Support other program organizations that affect the processing of flight elements for launch site/launch processing.	
1.05.02.04.02	**KSC - LOGISTICS GROUND SUPPORT - UPN 585-82-04** **TASK DESCRIPTION** **Logistics Ground Support** Provide logistics goods and services (including fluids and gases) in support of launch site IPT activites. Provide material acquisition, maintenance capability development, andlogistics sustaining support for KSC - developed hardware. Provide Hardware Dispoisition List implementation, technical training, packing, handling, storage and transportation, inventory management, budgeting, scheduleing and transition planning in support of Launch Site activities. Provide support services such as materials engineering and processes, chemical sampling and analysis, contamination, and hazardous waste handling. Provide host role support at the launch site. Provide repairs and sparing for all ground hardware that has been transitioned to KSC. Provide logistics repair, maintenance, fabrication, shop and lab support to ISS processing and on-line KSC O&M activities.	
1.05.03.01	**KSC -LOGISTICS FLIGHT SUPPORT (OPERATIONS) - UPN 575-13-01** **TASK DESCRIPTION** **Logistics Flight Support** Provides Logistics Flight Support to the Program Office for Flight Hardware and Product Group sites GSE. Activites include: Fleet Resource Management; packing, handling, storage, and transportation; inventory management.	
1.05.02.02.01	**KSC -SUPPORT EQUIPMENT IPT (OCC) - UPN 475-82-02** **TASK DESCRIPTION** Provide the launch site support equipment for pre-launch/post-landing processing of ISS elements (e.g. MPLM Support Vehicle, Cold Cargo Containers, Attached Payloads).	
1.05.02.02.02	**KSC -SUPPORT EQUIPMENT IPT (OPERATIONS) - UPN 575-82-02** **TASK DESCRIPTION** Provide the launch site support equipment O&M planning and sustaining for all support equipment to be runed over to the Support Equipment IPT. The IPT will perform oeprations support, maintenance planning, configuration accounting, and sustaining engineering for all assigned launch and landing site Support Equipment.	
1.05.02.03.02	**KSC -TEST CONTROL AND MONITOR SYSTEM (TCMS) & CHECKOUT SYSTEMS - UPN 575-82-03** **TASK DESCRIPTION** Consists of TCMS and Payload Test and Checkout System (PTCS) and associated GSE will be used for final pre-launch testing at the launch site and postlanding testing at the landing site of Resupply/Return missions and experiment interface testing. The systems can also be used to verify the compatibility between experiments and Space Station Services. TCMS provides set operations, maintenance, and sustaining engineering to accomplish Test and Checkout. PTCS provides sustaining engineering to accomplish Test and Checkout.	
1.05.02.01.02	**KSC - FACILITIES (OPERATIONS) - UPN 575-82-01** **TASK DESCRIPTION** Provide the Facilities and Facility Systems at KSC for pre-launch/postlanding processing of Space Station Elements. Organization will manage the operation and maintenace, configuration control and sustaining engineering tasks to meet program requirements (includes SSPF and O&C).	

08/09/00 DRAFT

Functions Associated with International Space Station Utilization and Research Program Management

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- Functions of JSC/Space Station Program Office
- Functions of MSFC/Payload Operations
- Functions of KSC/Payload Processing

Section 2: Functions of MSFC Research Program Office (RPO) for Microgravity Research and Space Product Development

Section 3: Functions of JSC Research Program Office (RPO) for Biomedical Research and Countermeasures

Section 4: Functions of ARC Research Program Office (RPO) for Fundamental Biology

Section 5: Functions of GSFC Research Program Office (RPO) for Earth and Space Sciences

Section 6: Functions of OSF Research Program Office (RPO)

Description

This functional workbook was developed by the respective functional offices to describe both in-house and contracted functions over the FY 01 - 05 horizon. For in-house functions, civil service workforce plans are included with conversion to dollars based on local overhead rates in most cases. For contracted functions, budget plans are included. In most cases, the basis of estimate is cited. Efforts remain underway to establish uniformity across all sections; regardless, the current draft provides a level-of-deatil down to specific WBS, or SOW, elements and thus represents a comprehensive definition and reasonable estimate of the total scope of functionality.

Functions Associated with International Space Station R&D Program

(Research Program Office Worksheet)

MRPO Level II | **ISS/MICROGRAVITY**

A PROGRAM LEVEL MANAGEMENT AND INTEGRATION

TASK DESCRIPTION

1. **System Integration**
   - (a) Develop and implement MRPO CM Procedure for ISS controlled Documentation and Change Evaluation OWI
   - (b) Perform Level 2 configuration management for MRPO inputs to ISS
   - (c) Consolidate technical evaluations for Space Station Change Requests (CRs), Payload Interface Revision Notices (PIRNs), action items, and provide feedback to Implementing Centers and SPD

	FY01	FY02	FY03	FY04	FY05
CS W/F	4	4	4	4	4

2. **Payload Planning & Manifesting**
   - (a) Act as the MRPO single-point-of-contact with the ISS Research Planning Working Group (RPWG), being a strong advocate for MRPO Research.
   - (b) Support the development of the ISS RPWG manifest planning process
   - (c) Develop, document, and implement an MRPO manifest planning process
   - (d) Develop MRPO strategic and tactical manifesting inputs to HQ and JSC

	FY01	FY02	FY03	FY04	FY05
C/S W/F	4	5	6	6	6
TBE FTE	5	5	5	5	5
TBE Costs	0.527	0.528	0.531	0.532	0.534
P&W FTE	6	6	6	6	6
P&W Cost	0.620	0.622	0.624	0.626	0.628
Boeing FTE	2	2	2	2	2
Boeing Costs	.33	.33	.32	.34	.34

3. **Mission Integration**
   - (a) Works with SSPO in developing, revising and refining the generic payload integration process
   - (b) Assist Implementing Centers and SPD in working integration issue resolution as required
   - (c) Participate on Payload Mission Integration Team

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1	1	1	1	1
CST FTE	2	2	2	2	2
CST Costs	0.290	0.291	0.292	0.293	0.294

4. **Operations/Utilization**
   - (a) Provides technical expertise related to the definition of payload operations processes to support microgravity science research
   - (b) Serves as MRPO representative on NPOCB
   - (c) Establish MRPO positions on key payload operations and utilization functions such as the development of flight rules, crew procedures, ground and on-board displays, crew timelines, training concepts, payload command and control concepts

	FY01	FY02	FY03	FY04	FY05
C/S W/F	3	3	3	3	3
TBE FTE	2	2	2	2	2
TBE Costs	0.211	0.212	0.214	0.215	0.217

5. **Science Operations Integration**
   - (a) Definition/development of Science Operations Plan
     - Science operations planning/replanning approach
   - (b) Recommend resource allocation over-subscription resolutions
   - (c) Assess overall MRPO status/impacts during the mission
   - (d) Recommend solutions for MRPO Payload conflicts

	FY01	FY02	FY03	FY04	FY05
C/S W/F	2	2	2	2	2
Boeing FTE	1	1	1	1	1
Boeing Costs	0.165	0.166	0.167	0.168	0.169
CST FTE	3	3	3	3	3
CST Costs	0.382	0.383	0.385	0.386	0.387

6. **Data Management and Archiving**
   - (a) Develop and implement science data archiving system

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1.5	1.5	1.5	1.5	1.5
Boeing FTE	1	1	1	1	1
Boeing Costs	0.165	0.166	0.167	0.168	0.169

7. **Resources Management**
   - (a) Integrated planning and anaysis of ISS Microgravity Research Program
   - (b) Works with other centers to identify and appropriately plan funding and workforce requirements to adequately support programmatic and technical tasks

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1	1	1	1	1
UAH FTE	3	3	3	3	3
UAH Costs	0.23	0.237	0.244	0.251	0.259
Sverdrup W/F	1	1	1	1	1
Sverdrup Costs	0.1	0.103	0.106	0.109	0.113

	FY01	FY02	FY03	FY04	FY05
C/S W/F	1.5	1.5	1.5	1.5	1.5
CSC FTE	1	1	1	1	1
CSC Costs	0.05	0.05	0.05	0.05	0.05

GRC (In-House)	Microgravity Research Program Management (RPO): GRC Microgravity Science Division
A.	**Program and Project Management**
1.	**Program/Discipline Management**
	Lead the Development and Implementation of Long Range Strategic Plans for ISS Fluids & Combustion Discipline Research
	Lead the Development and Implementation of Short Term Tactical Plans to Maximize Cost Effectiveness/Timeliness of ISS Fluids & Combustion Discipline Research Return
	Plan, Advocate, and Defend the Research Discipline ISS Content, Budget, and Milestone Schedules
	Conduct Flight Hardware Concept and System Studies to Increase Research Return Within Available Resources
	Conduct System Studies to Maximize Flight Hardware Common Systems/Reuse and to Identify hardware Upgrades
	Provide Information and Support to the Enterprise and Discipline Program Scientists in All Phases of Project Development
	Define Near Term Program Content and Utilization Traffic Model Based upon Resource Availability
	Provide Oversight and Guidance to the Phase B Phases of Project Development
	Provide Oversight and Guidance to Execution Phase Projects on Technical, Financial and Schedule Performance
	Certify theat Flight Hardware is Ready for Shipment, Integration, Launch and On-Orbit Operations
	Approve Science Requirements Documents, Science Requirements Envelope Document, and Project Plans and Recommend ATP Approval
	Assure System Level Requirements are Defined, Coordinated, Appropriately Allocated, and Verified
	Collaborate and Liaison with International Partners and Commercial Entities to Further Fluids & Combustion Research on ISS
	Define, Coordinate and Implement Make-Buy Decisions
	Provide Contract Technical Management and Direction (COTR)
	Provide Discipline Advocacy and Upward Reporting
2.	**Project Management/Project Execution**
	Perform Project Planning and Direction; Develop Project Plans
	Flow Down Science Requirements to Functional/Engineering Requirements
	Provide Project Management for all Phase B/C/D/E efforts; Provide Contract Management (TR Level)
	Conduct Those Phase B Requirements Definition Efforts That Involve a Significant Amount of Requirements Definition
	Conduct Selected, Limited Phase C/D/E Development Efforts Enabled by Unique In-House Core Competency/Capabilities
	Conduct Surveillance and Management of Contracted Activities
	Perform Independent Verification and Validation as Warranted
	Perform Independent Trade-Off Studies to Guide Technical Approaches and Technology Selections
	Provide Technical Management to the Flight Hardware Development Functions
	Provide Mission Integration and Management Function for Facility Class Flight Hardware
	Manage the Development of Government Furnished Equipment and Government Owned Ground Support Equipment
	Manage the Utilization of the Ground Based Microgravity Research Facilities and Laboratories
	Provide Technical Management to the Increment Management (Integration and Operations) Functions
	Coordinate GRC Planning, Development and Integration Activities with MRPO and ISSPO
	Manage the Development and Operation of the GRC Telescience Support Center
	Manage Data Archiving and Dissemination
	Educate Principal Investigators on ISS Acceleration Environment and Potential Effects/Impact on Research Results
	Advise Principal Investigators on Establishing Acceleration measurement Requirements
	Interpret Facility/Payload Data for Principal Investigators (Real-Time and Post Flight)
	Provide Project Advocacy and Upward Reporting
B.	**Science and Technology Management**
1.	**Science Management**
	Guide PI in Refining Science Requirements and Finalizing and Maintaining a Science Requirements Document
	Provide PI Access to and Assistance in Utilizing Unique Government Facilities/Capabilities (e.g., drop towers)
	Provide Unique Hardware Capabilities (e.g., Diagnostics for Use at PI Home Institution)
	Assist Principal Investigator in Evaluating /Selecting Experiment Concepts, Designs, and Operating Procedures
	Identify, Develop and Advocate New Research Thrusts in Microgravity Research
	Manage, Develop and Maintain ISS Discipline Research Plan and Facility Science Requirements Envelope Document
	Verify Experiment Hardware/Software Performance Satisfies Science Requirements
	Support PI During Experiment Planning and Operations
	Develop Experiment Data Management Plans
	Facilitate Research Data Analysis/Interpretation
	Communicate the Significance of Research Results to the Public
	Represent the Research Program to Domestic/International Conferences, Symposia and Media

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	175	175	175	180	180
USG Cost	(est. $M)	33.32	33.80	33.92	35.23	36.12

Basis of Estimate:

1) Negotiated GRC Civil servant workforce to support these task

2) Assumes 1 FTE = $87,000 + 26% overhead.
plus Carrier accounts charges, $16.13/ hrs, ODIN ,Program support ,G Hardware procurements, and inflation

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost	(NOA $M)	2.48	2.56	2.75	3.30	3.75

Basis of Estimate:

1) 2002 Congressional Budget.

2. **Advance Technology Management**
   - Conceive and Conduct Leading Edge Research and Technology Development to Enhance Future Experiment Hardware Capabilities
   - Prioritize Advance Technology Development Needs in Support of Ground-Based and Spaceflight Experiments
   - Conduct Advanced Technology Development Studies
   - Collaborate with Other Microgravity Disciplines and Enerprises on New and Enabling Technology
   - Review and Evaluate for Technical Content Science and ATD/ITD Proposals

C. **Business and Outreach Management**

1. **Systems Management**
   - Establish and Maintain System Policies, Procedures and Engineering Standards Applicable to Flight Hardware Development (ie., ISO)
   - Develop Short and Long Term Plans for Ground Facilities Utilization and Support
   - Provide Information Technology Services and Support, Including IT Security Requirements
   - Manage and Administer the Division Management, Change and Surveillance Board Activities
   - Provide the Configuration Management Function at the Division Level
2. **Resource Management**
   - Provide Budgeting, PR Control, Financial Synthesis and Reporting and Financial Analysis
   - Provide Financial Interface with MRPO and ISSPO to Coordinate NOA, POP, ITA and Other Financial Transactions
   - Coordinate and Negotiate Resource (Staffing, In-House Support, Training and Travel) Requirements
   - Provide Project Cost and Schedule Support and Assist In Developing Budget Submittals and Project Reporting
   - Coordinate Procurement Activities, Including the Initiation and Renewal of Grants
3. **Advocacy**
   - Establish Liaisons with Academia, Industry and Other Organizations to Jointly Develop Programs to Advance Microgravity Science
   - Plan and Coordinate Media Relations and Public Awareness Activities
   - Communicate the Significance of Research Results to the Public
   - Manage the Division Websites Development and Maintenance
   - Oversee the Development and Maintenance of Educational and Outreach Reference Material
   - Provide "InReach" to Center and Program Organizations to Develop Outreach Synergy Across Disciplines

GRC (Contracted) — **Microgravity Research Program Management (RPO): GRC Microgravity Science Division**

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	56.43	51.81	53.85	59.70	57.85

Basis of Estimate:
1) 2002 Congressional Budget.

Contract # — **Microgravity Research, Development and Operations Contract (FDC)**

(Federal Data Corporation - NAS3 99155)

A — **FLUIDS AND COMBUSTION FACILITY PRODUCTION, DEPLOYMENT AND INITIAL OPERATION**

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	32.59	25.08	21.99	13.17	4.33

Basis of Estimate:
1) 2002 Congressional Budget.

TASK DESCRIPTION

1. **Provide the Management Function to Monitor, Control and Report the FCF Effort**
   - (a) Provide NASA with Information Necessary to Implement Government Surveillance
   - (b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
   - (c) Maintain an Inventory of all Government Furnished Property and Items Purchased
   - (d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews
2. **Plan, Implement and Maintain a Product Assurance System**
   - (a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
   - (b) Develop a Safety Plan and Work in Accordance to that Plan
   - (c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
   - (d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
   - (e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process
   - (f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation
3. **Develop a Preliminary Design of the FCF System**
   - (a) Develop and Document the Preliminary Design-to-Specifications
   - (b) Develop a Preliminary Hardware and Software Design
   - (c) Produce Mock-Ups, Breadboards, brassboards and subsystem Prototype Hardware to Establish Feasibility and Reduce Risk
   - (d) Provide Assurance that the Preliminary Design will meet ISS Safety and Verification Requirements
   - (e) Develop Preliminary Versions of the PIA and ICD for Each rack
   - (f) Update the Contractor Project Plan
   - (g) Provide a Produce Assurance Plan
4. **Incrementally Complete the Design to Meet the Performance and Functional Requirements**
   - (a) Generate Complete System Build-to-Specifications
   - (b) Perform System Level Analyses and Trade Studies to Optimize the Design
   - (c) Develop an Overall Detailed Flight Design
   - (d) Develop Final Software Design and Perform Code Development
   - (e) Minimize development Risk Through Development of Engineering Model Hardware
   - (f) Perform Required Testing and Integration
   - (g) Develop a Comprehensive Final Verification Plan
   - (h) Perform the Analysis and Implementation Planning for Long Term Payload Operations

5. **Fabricate, Assemble, Test, Verify and Deliver an Operational FCF System per Requirements**
   (a) Fabricate, Assemble, Test, Verify and Deliver the FCF
   (b) Perform the Mission and Technical Integration Necessary to Assure delivery of a Fully Functional FCF System
   (c) Incrementally Fabricate, Assemble, and Test FCF Flight Ground and Other Hardware and Software
   (d) Conduct Installation, Assembly and Checkout Activities with the ISS
   (e) Conduct Qualification, Acceptance and Verification Activities on all Components, Subsystems and Combined Assemblies
   (f) Concur Acceptance testing of Flight and Ground Racks and Overall FCF System
   (g) Provide Assurance that the Experiment System Meets all ISS Safety and Verification Requirements
   (h) Develop Procedures for Crew Tended, Untended and Off-Nominal Operations
   (i) Develop the Payload Training Center Unit (PTCU)
   (j) Provide all ground Servicing at KSC to Ensure Successful Integration with the ISS Transportation System
   (k) Provide Support for Six Experiment development Teams for Initial On-Orbit Operations
6. **Provide for Initial Installation, Checkout, Calibration and Operation of the FCF System to Include the Initial Experiment**
   (a) Provide for Initial Installation, Checkout, Calibration and Operation of the FCF Racks and Experiments
   (b) Verify Post-Launch Performance and State-of-Health of FCF System
   (c) Perform On-Orbit Performance Verification Program

B PAYLOAD ENGINEERING, INTEGRATION and OPERATIONS

	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost (NOA $M)	5.71	7.55	9.22	15.96	18.89

Basis of Estimate:
1) 2002 Congressional Budget.

TASK DESCRIPTION

1. **Mission Integration & Planning Functions**
   (a) Develop processes that Facilitate the Strategic and Tactical Planning of GRC Investigations
   (b) Facilitate Efforts to Maximize Science Return and Research Opportunities on ISS
   (c) Develop and Maintain a Planning Database that Includes PI Resource Requirements and Resource Allocations
   (d) Support Development of the Mission Evaluation Requests (MERs)
   (e) Develop and Maintain an Integrated GRC Traffic Model
   (f) Develop and End-to-End PI Integration Process for FCF PIs into FCF
   (g) Provide Generic PI Specific Documentation Required for Integration into the FCF
   (h) Develop any Tools required to Facilitate the PI Integration Process and to be Compatible with the ISS Program
2. **FCF Increment Engineering and Execution**
   (1) General
   (a) Provide the Engineering Integration (Physical, Analytical and Operation) of Experiments into the FCF
   (b) Provide Engineering Integration of FCF and PI Complement into ISS
   (c) Provide for Continuous Operation of the FCF on an Increment and/or Multi-Increment Basis
   (d) Coordinate with the ISS Program and PI Specific Development Teams to Develop and Document Increment Specific Requirements to be Certified at the Increment Readiness Review
   (e) Perform the Integration Activities for FCF and PI Specific Experiments (Analytical compatibility, FCF/PI verification, ISS/FCF verification, Mission Planning, Training, etc.)
   (g) Perform Structural, thermal, power, operations, Command and Data Management, Safety and Diagnostics Integration and Engineering Functions
   (h) Manage the PI Specific and ISS Data Products and Documentation Requirements
   (i) Perform Transportation Options Analysis and Recommendations on FCF Manifesting
   (j) Verify All Requirements for a Specific Increment at Increment Acceptance Review
   (2) PI to FCF Integration
   (a) Develop PI Specific Hardware and Software for use in FCF System
   (b) In Conjunction with the PI Development Teams, Develop the PI Specific Integration Agreement (IA)
   (c) In Conjunction with the PI Development Teams, Develop the PI Specific Interface Control Document
   (d) Provide a Liaison to the PI Specific Development Teams to Facilitate the Integration Process
   (e) Provide an Updated FCF Accommodations Handbook
   (f) In Conjunction with the PI Development Teams, Develop an Integration Schedule
   (g) Book Manage all PI Specific to FCF Integration Documentation
   (3) FCF to ISS Integration
   (a) Integrate all Relevant Inputs from the PI Development Teams
   (b) Maintain and Update all Required Documents and Data Deliverables for the ISS Program on an Increment Basis (PIA, ICD, Verification Plan, Flight & Ground Safety Packages)
   (c) Assist the PI Development Teams in Presenting to the ISS Safety Panels
   (d) Provide Engineering Products Required by ISS, including PI Specific Experiment Information
   (4) FCF Verification
   (a) Develop and Maintain the FCF Test Equipment for Early Development Testing and Final Verification & Test of the Final Integrated FCF - PI System
   (c) Provide Sufficient Personnel Support, Training and Training Materials on the Use of FCF to the PI Specific Development Teams
   (d) Provide All Interface and Verification Tests between FCF and the PI Specific Hardware
   (e) Provide Scheduling, Installation, Check-Out and Verification of the PI Specific Experiment Hardware and Software into the Ground Integration Unit (GIU)
   (f) Perform the Integrated FCF/PI Verification and Validation Tests

(g) Provide Support for Installation and Initial Check-Out of PI Specific Experiment Hardware and Software into the FCF Engineering Development Unit (EDU)

(5) FCF Training

(a) In Conjunction with the PI Specific Development Teams, Develop and Present all Integrated Training Materials for use
(b) Support the Installation of the PI Specific Experiment's Training Unit in the FCF Payload Training Center (PTC) at JSC
(c) Develop the Integrated Training Requirements (ISS, ISS Crew, FCF, PI Specific)
(d) Implement the Training Requirements for the PTC, the Computer-Based Training, the Part-Task Trainers and the On-Orbit Training
(e) Provide Training to the PI Specific Development Cadre

(6) Increment Execution

(a) Provide Real-Time Operations and Supporting Activities During ISS Increment Operations
(b) Coordinate Real-Time Operational Requirements
(c) Acquire and Process Real-Time Data
(d) Support the Correlation of Scientific Data with FCF and ISS Mission Events
(e) Prepare FCF Performance Reports and Maintain FCF Performance Databases
(f) Plan and Schedule all FCF On-Orbit Operations, in Conjunction with PI Specific Development Teams
(g) Support Post-Launch PI Specific Hardware Check-Out on ISS (Integration, Activation, Calibration, System Characterization and Operational Procedure Verification)
(h) Provide Trained Cadre of Console Operators
(i) Be on Console when FCF is Active
(j) Respond to Requests from ISS Crew, Ground Team or any Off-Nominal Situation
(k) Develop Standard Procedures for On-Orbit Problems or Anomalies

3. FCF System/Sustaining Engineering

(1) Maintain the Flight Unit During its 15 Year Deployment on ISS
(2) Track FCF System and Component Level Performance
(3) Identify FCF Components for Replacement
(4) Design, Fabricate Assemble and Test FCF Replacement Components
(5) Maintain and Implement FCF Spares and Logistics

4. FCF Upgrades

(1) Develop Deferred or Evolving Combustion and Fluids Element Components
(2) Integrate New and Emerging Technologies into the FCF Configuration

5. Telescience Development

(1) Develop and Implement a Ground System for Telescience Operations per SSP54500, 50305 & 50304
(2) TSC must be capable of supporting all GRC Space Operations Activities
(3) Provide for Overall Management of the TSC Project, Requirements Development, Capability Development and Test & Verification of the Telescience System
(4) Locate the TSC at GRC and Support Remote User Locations
(5) Maximize the Use of Commercially available Hardware and Software
(6) Incorporate Trek Work Stations and the Remote Copy of the Enhanced HOSC (EHS) into the Design and Development of the TSC

6. Telescience Operations

(1) Perform Ground Operations from the TSC and from Remote Sites Where Principal Investigators are Located
(2) Provide Operational Support Systems Required to Plan, Monitor and Control On-Orbit Experiments
(3) Coordinate Real-Time FCF and Experiment Commanding Requirements
(4) Perform TSC Facility Operations during On-Orbit, Simulation and Training Activities
(5) Simulate On-Orbit Operations for Ground Verification and Ground Operations Training
(6) Operate and Maintain the TSC Facility and Support Systems
(7) Coordinate with Experiment Teams to Develop Increment Specific Telescience Requirements
(8) Store, Distribute, Retrieve and Archive Telemetry Data
(9) Ensure the Physical and Automated Information Systems Security for the TSC Facility and all Users
(10) Provide Experimenters with a Remote Capability to Control and Monitor their Experiment On-Orbit and Communicate with the GRC TSC and other Ground Systems
(11) Conduct Simulations and Training Sessions for the TSC Cadre and all Users to Assure Proficiency Throughout all Phases of Operations
(12) Certify the Readiness of the TSC, its Systems and Cadre at each Increment ORR

7. Acceleration Measurement Operations

(1) Perform Mission Operations of the Microgravity Acceleration Measurement Hardware (STS/ISS)
(a) Coordinate Real-Time Operational Requirements
(b) Acquire, Process and Distribute Real-Time Acceleration Measurement Data
(c) Support the Correlation of Scientific Data with Acceleration Data and ISS Mission Events
(d) Prepare Acceleration Hardware Performance Summary Reports and Maintain Performance Databases
(e) Monitor Acceleration Measurement Hardware When Activated
(f) Respond to Crew and Ground Team Communications and Off-Nominal Situations
(2) Plan and Schedule all Microgravity Acceleration Measurement Hardware On-Orbit Operations
(a) Develop and Maintain Mission Timelines
(b) Obtain all Necessary Ground and On-Orbit Resources
(c) Train Staff for Console Operations
(d) Develop Standard Procedures to Resolve On-Orbit Problems or Anomalies

Contract # **Microgravity Research, Development and Operations Contract (FDC & Zin Technologies)**

(Federal Data Corporation - NAS3 99155; Zin Technologies - NAS3 99154)

Contract Cost (NOA $M)	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
	18.12	19.18	22.65	30.58	34.64

Basis of Estimate:
1) 2002 Congressional Budget.

C **DEVELOPMENT OF PI SPECIFIC EXPERIMENTS, ACCELERATION MEASUREMENT INSTRUMENTS AND DIAGNOSTICS**

TASK DESCRIPTION

1. **Provide the Management Function to Monitor, Control and Report the FCF Effort**
   - (a) Provide NASA with Information Necessary to Implement Government Surveillance
   - (b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
   - (c) Maintain an Inventory of all Government Furnished Property and Items Purchased
   - (d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews
2. **Plan, Implement and Maintain a Product Assurance System**
   - (a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
   - (b) Develop a Safety Plan and Work in Accordance to that Plan
   - (c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
   - (d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
   - (e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process.
   - (f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation
3. **Experiment Definition**
   - (a) Provide Initial System Level Experiment Concept for SCR
   - (b) Provide Top-Level Engineering Requirements that Address the PIs Science Requirements
   - (c) Conduct System Design and Mission Analyses to Evaluate Potential Carrier Options
   - (d) Formulate a Preliminary Engineering Plan for Development of the Experiment Concept
4. **Requirements Definition**
   - (a) Define the Fundamental System Requirements (Science, Carrier, Safety, Operations and Quality)
   - (b) Determine Overall feasibility of Candidate Experiment Concepts
   - (c) Design and Develop Breadboards to Reduce Risk and Evaluate Functional Performance
   - (d) Develop and Integrated Concept (Experiment to Carrier)
   - (e) Formulate an Engineering Plan to be Presented at RDR
5. **Preliminary Design**
   - (a) Develop a Preliminary Design-to-Specification
   - (b) Develop preliminary Hardware and Software design
   - (c) Design, Develop and Fabricate Engineering Mockups, Breadboards, Brassboards and Prototype Hardware
   - (d) Provide Assurance that the Preliminary Design will Meet Carrier Safety and Verification Requirements
   - (e) Develop Preliminary versions of the PIA and ICD
   - (f) Develop a Detailed Project Plan
   - (g) Provide a Product Assurance Plan
6. **Design and Development**
   - (a) Generate System Build-to-Specifications
   - (b) Develop a Comprehensive Flight design
   - (c) Design, Develop and Fabricate an Engineering Model
   - (d) Develop a Comprehensive Verification Plan
   - (e) Provide Assurance that Final Design will Meet all Carrier Safety and Verification Requirements
7. **Carrier Integration, Operations and Training Planning**
   - (a) Perform Analyses and Implement Planning Necessary to Define, Prepare for and Conduct Experiment Operations
   - (b) Prepare Training Requirements and Plan
   - (c) Perform Integrated Logistics Analyses
   - (d) Develop a Detailed Assembly, Integration and Test Plan
8. **Fabrication, Assembly and Test**
   - (a) Perform Mission and Technical Integration Efforts Necessary to Assure Delivery of a Fully Functional System
   - (b) Fabricate, Assemble and Test Flight Unit
   - (c) Fabricate, Assemble and Test Qualification Unit
   - (d) Fabricate, Assemble and Test Ground Unit (if required)
   - (e) Develop, Verify, Validate and Maintain all Software Necessary to Control and Utilize the Flight Hardware
9. **Installation, Assembly and Checkout (IACO)**
   - (a) Integrate the Experiment Hardware and Software with the Carrier
   - (b) Conduct qualification, Acceptance and Verification Activities
   - (c) Provide Assurance that the Experiment System Meets all Carrier Safety and Verification Requirements
   - (d) Develop procedures for Crew tended, Untended and Off-Nominal Operations
   - (e) Conduct Logistics Support Analyses
   - (f) develop all training materials for the Experiment
   - (g) Provide for all Ground Servicing Activities at KSC to Ensure Successful Integration of Experiment Hardware with the Carrier or Transportation System
10. **Operations**
    - (a) Support On-Orbit Integration Activities with the Carrier and ISS
    - (b) Provide t Real-Time Experiment Operations
    - (c) Provide PI Mission Operations Support
    - (d) Provide Post Mission Operations

(e) Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software

MSFC — **Microgravity Research Program Management (RPO): MSFC Microgravity Science & Application Dept**

A Program and Project Management

1. Program Management

- Plan, advocate, and defend the research discipline content, budget, and milestone schedules
- Lead the Development and Implementation of Long Range Materials Science and Macromoecular Biotechnology Strategic Plans
- Lead the Development and Implementation of Short term Tactical Plans
- Provide Management of the Ground-Based Experiments Program
- Provide Information and Support to the Enterprise and Discipline Program Scientists in All Phases of Project Development
- Define Program Content and Utilization Traffic Model Based upon Resource Availability
- Provide Oversight and Guidance to the Phase A/B Phases of Project Development
- Provide Oversight and Guidance to Execution Phase Projects on Technical, Financial and Schedule Performance
- Approve Project Plans and Recommend ATP Approval
- Assure System Level Requirements are Defined, Coordinated, Appropriately Allocated, and Verified
- Collaborate and Liaison with International Partners and Commercial Entities to Further Materials Science and Macromolecular Biotechnology Research on ISS
- Define, Coordinate and Implement Make-Buy Decisions
- Provide Contract Technical Management and Direction (COTR)
- Provide Discipline Advocacy and Upward Reporting

2. Project Management

- Perform Project Planning and Direction
- Conduct all Phase A experiment concept and requirements definition efforts
- Provide Project Management for all Phase B/C/D/E efforts; Provide Contract Management at TR Level
- Conduct those Phase B requirements definition efforts that involve a significant amount of requirements definition
- Conduct Selected, Phase C/D/E Efforts for Skill Development/Retention in the CS Workforce (including MSRF)
- Conduct Surveillance and Management of Contracted Activities
- Perform Independent Verification and Validation as Warranted
- Provide Technical Management to the Flight Hardware Development Functions
- Provide Mission Integration and Management Function for Facility Class Flight Hardware
- Provide Technical Management to the Increment Management (Integration and Operations) Functions
- Coordinate MSFC Development and Integration Activities with MRPO and ISSPO
- Manage Discipline Data Archiving and Dissemination
- Provide Project Advocacy and Upward Reporting

B Science and Technology Management

1. Science Management

- Guide PI in Refining Science Requirements and Finalizing and Maintaining a Science Requirements Document
- Provide PI Access to and Assistance in Utilizing Unique Government Facilities/Capabilities (e.g., drop towers)
- Support PI in Evaluating /Selecting Experiment Concepts, Designs, and Operating Procedures
- Identify, Develop and Advocate New Research Thrusts in Microgravity Research
- Manage PI Grants/Cooperative Agreements/Contracts
- Assure Reporting of PI Research Efforts/Progress
- Conduct PI research (in-house PI's)
- Manage, Develop and Maintenance of Discipline Research Plan and Science Requirements Envelope Document
- Verify Experiment Hardware/Software Performance Satisfies Science Requirements
- Support PI During Experiment Planning and Operations
- Communicate the Significance of Research Results to the Public
- Facilitate Data Analysis/Interpretation
- Represent the Research Program to Domestic/International Conferences, Symposia and Media

2. Advance Technology Management

- Identify and Prioritize Advance Technology Development Needs in Support of Ground-Based and Spaceflight Experiments
- Conduct Advanced Technology Development Studies
- Conceive and Conduct Leading Edge Research and Technology Development to Enhance Future Experiment Hardware Capabilities
- Collaborate with Other Microgravity Disciplines and Enterprises on New and Enabling Technology
- Review and Evaluate for Technical Content Science and ATD/ITD Proposals

C Business Management and Advocacy

1. Systems Management

- Establish and Maintain System Policies, Procedures and Engineering Standards Applicable to Flight Hardware Development (ie., ISO)
- Develop Short and Long Term Plans for Ground Facilities Utilization and Support
- Provide InformationTechnology Services and Support, Including IT Security Requirements
- Manage and Administer the Division Management, Change and Surveillance Board Activities
- Provide the Configuration Management Function at the Division Level

2. Resource Management

- Provide Budgeting, PR Control, Financial Synthesis and Reporting and Financial Analysis
- Provide Financial Interface with MRPO and ISSPO to Coordinate NOA, POP, ITA and Other Financial Transactions
- Coordinate and Negotiate Resource (Staffing, in-house Support, Training and Travel) Requirements
- Provide Project Cost and Schedule Support and Assist in Developing Budget Submittals and Project Reporting
- Coordinate Procurement Activities, Including the Initiation and Renewal of Grants

Basics of Table Locations:
> Table locations are not meant to match a task description.
> Tables show MSAD CS and Contractor FTE's and $

Total	FY 2001	FY 2002	FY 2003	FY 2004
CS W/F (FTEs)	194	209	211	211
CS Cost ($M)	18.430	20.900	22.155	23.632

	FY 2001	FY 2002	FY 2003	FY 2004
TBE W/F (FTEs)	5	5	5	5
TBE Cost ($M)	0.625	0.650	0.675	0.700

Basics of Estimate (CM/DM Support):
> Based on $125K in FY2001 and ramping $5K in the out years

	FY 2001	FY 2002	FY 2003	FY 2004
P&W W/F (FTEs)	24	24	24	24
P&W Cost ($M)	3.000	3.120	3.240	3.360

Basics of Estimate (Engineering&Consulting Support):
> Based on $125K in FY2001 and ramping $5K in the out years

	FY 2001	FY 2002	FY 2003	FY 2004
CSC W/F (FTEs)	4	4	4	4
CSC Cost ($M)	0.500	0.520	0.540	0.560

Basics of Estimate (Program Support):
> Based on $125K in FY2001 and ramping $5K in the out years

3. **Advocacy**
   - Establish Liaisons with Academia, Industry and Other Organizations to Jointly Develop Programs to Advance Microgravity Science
   - Plan and Coordinate Media Relations and Public Awareness Activities
   - Communicate the Significance of Research Results to the Public
   - Manage the Division Websites Development and Maintenance
   - Oversee the Development and Maintenance of Educational and Outreach Reference Material
   - Provide "InReach" to Center and Program Organizations to Develop Outreach Synergy Across Disciplines

MSFC (Contracted) — **Microgravity Research Program Management (RPO): MSFC Microgravity Science & Application Department**

Contract # — **Microgravity Science & Applications Department (MSAD), Support Contracts**
(TBE, H0031329); (P&W, NAS8-40831); (CSC, NAS8-60000); (Boeing, NAS8-50000); (Hernandez, NAS8-40364); (Sverdrup, NAS8-40836); (SAIC, NAS8-99060); (CST, NAS8-98001); (ASRI, NAS8-97330); (USRA, NCC8-66); (TVA, H30565D); & (New Contract, TBD)

A — **Material Science Research Facility (MSRF) - Includes Definition, Development, Integration, Test, Experiment Integration, and Mission Operation. MSRF is an in-house project. The following activities are conducted in a support mode to responsible CS.**

TASK DESCRIPTION

1. **Provide the Management Function to Monitor, Control and Report the Effort**
   - (a) Provide NASA with Information Necessary to Implement Government Surveillance
   - (b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
   - (c) Maintain an Inventory of all Government Furnished Property and Items Purchased
   - (d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews
2. **Plan, Implement and Maintain a Product Assurance System**
   - (a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
   - (b) Develop a Safety Plan and Work in Accordance to that Plan
   - (c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
   - (d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
   - (e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process
   - (f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation
3. **Develop a Preliminary System**
   - (a) Develop and Document the Preliminary Design-to-Specifications
   - (b) Develop a Preliminary Hardware and Software Design
   - (c) Produce Mock-Ups, Breadboards, brassboards and subsystem Prototype Hardware to Establish Feasibility and Reduce Risk
   - (d) Provide Assurance that the Preliminary Design will meet ISS Safety and Verification Req'ts
   - (e) Develop Preliminary Versions of the PIA and ICD for Each rack
   - (f) Provide a Produce Assurance Plan
4. **Incrementally Complete the Design to Meet the Performance and Functional Requirements**
   - (a) Generate Complete System Build-to-Specifications
   - (b) Perform System Level Analyses and Trade Studies to Optimize the Design
   - (c) Develop an Overall Detailed Flight Design
   - (d) Develop Final Software Design and Perform Code Development
   - (e) Minimize development Risk Through Development of Engineering Model Hardware
   - (f) Perform Required Testing and Integration
   - (g) Develop a Comprehensive Final Verification Plan
   - (h) Perform the Analysis and Implementation Planning for Long Term Payload Operations
5. **Fabricate, Assemble, Test, Verify and Deliver an Operational Requirements**
   - (a) Fabricate, Assemble, Test, Verify and Deliver
   - (b) Perform the Mission and Technical Integration Necessary to Assure delivery a Fully Functional System
   - (c) Incrementally Fabricate, Assemble, and Test Flight Ground and Other Hardware and Software
   - (d) Conduct Installation, Assembly and Checkout Activities with the ISS
   - (e) Conduct Qualification, Acceptance and Verification Activities on all Components, Subsystems and Combined Assemblies
   - (f) Conduct Acceptance testing of Flight and Ground Racks Plus Overall System
   - (g) Provide Assurance that the Experiment System Meets all ISS Safety and Verification Requirements
   - (h) Develop Procedures for Crew Tended, Untended and Off-Nominal Operations
   - (i) Develop the Payload Training Center Unit (PTCU)
   - (j) Provide all ground Servicing at KSC to Ensure Successful Integration with the ISS Transportation System
   - (k) Provide Support for Six Experiment Development Teams for Initial On-Orbit Operations
6. **Provide for Initial Installation, Checkout, Calibration and Operation Including the Initial Experiment**
   - (a) Provide for Initial Installation, Checkout, Calibration and Operation of the Racks and Experiments
   - (b) Verify Post-Launch Performance and State-of-Health
   - (c) Perform On-Orbit Performance Verification Program

B — **PAYLOAD ENGINEERING, INTEGRATION and OPERATIONS - Material Science Research Facility (MSRF) and Material Science Glovebox (MSG) are currently in-house led efforts with significant number of support contractors reporting to responsible CS.**

TASK DESCRIPTION

1. **Mission Integration & Planning Functions**
   - (a) Develop processes that Facilitate the Strategic and Tactical Planning of MSFC Investigations
   - (b) Facilitate Efforts to Maximize Science Return and Research Opportunities on ISS
   - (c) Develop and Maintain a Planning Database that Includes PI Resource Requirements and Resource Allocations

	FY 2001	FY 2002	FY 2003	FY 2004
Boeing W/F (FTEs)	7	7	7	7
Boeing Cost ($M)	0.875	0.910	0.945	0.980

Basics of Estimate (ISS Hardware Support):
> Based on $125K in FY2001 and ramping $5K in the out years

	FY 2001	FY 2002	FY 2003	FY 2004
Hernandez W/F (FTEs)	4	4	4	4
Hernandez Cost ($M)	0.500	0.520	0.540	0.560

Basics of Estimate (S&MA Support):
> Based on $125K in FY2001 and ramping $5K in the out years

	FY 2001	FY 2002	FY 2003	FY 2004
Sverdrup W/F (FTEs)	79	90	107	124
Sverdrup Cost ($M)	9.875	11.700	14.445	17.360

Basics of Estimate (Core Engineering&Services Support):
> Based on $125K in FY2001 and ramping $5K in the out years

Δ 1.825
2.745

FY 2001 FY 2002 FY 2003 FY 2004

(d) Support Development of the Mission Evaluation Requests (MERs)
(e) Develop and Maintain an Integrated MSFC ISS Utilization Traffic Model
(f) Develop and End-to-End PI Integration Process for PIs into MSRF and MSG
(g) Provide Generic PI Specific Documentation Required for Integration
(h) Develop any Tools required to Facilitate the PI Integration Process and to be Compatible with the ISS Program

2. Increment Engineering and Execution

(1) General

(a) Provide the Engineering Integration (Physical, Analytical and Operation) of Experiments on the ISS
(b) Provide Engineering Integration and PI Complement into ISS
(c) Provide for Continuous Operation of the on an Increment and/or Multi-Increment Basis
(d) Coordinate with the ISS Program and PI Specific Development Teams to Develop and Document Increment Specific Requirements to be Certified at the Increment Readiness Review
(e) Perform the Integration Activities for and PI Specific Experiments (Analytical compatibility, PI verification, verification, Mission Planning, Training, etc.)
(g) Perform Structural, thermal, power, operations, Command and Data Management, Safety and Diagnostics Integration and Engineering Functions

(h) Manage the PI Specific and ISS Data Products and Documentation Requirements
(i) Perform Transportation Options Analysis and Recommendations on Manifesting
(j) Verify All Requirements for a Specific Increment at Increment Acceptance Review

(2) PI Integration

(a) In conjunction with PI Development Teams, Develop PI Specific Hardware and Software
(b) In Conjunction with the PI Development Teams, Develop the PI Specific Integration Agreement (IA)
(c) In Conjunction with the PI Development Teams, Develop the PI Specific Interface Control Document
(d) Provide a Liaison to the PI Specific Development Teams to Facilitate the Integration Process
(e) Provide an Updated Accommodations Handbook
(f) In Conjunction with the PI Development Teams, Develop an Integration Schedule
(g) Book Manage all Pi Specific to Integrated Documentation

(3) ISS Integration

(a) Integrate all Relevant Inputs from the PI Development Teams
(b) Maintain and Update all Required Documents and Data Deliverables for the ISS Program on an Increment Basis (PIA, ICD, Verification Plan, Flight & Ground Safety Packages)
(c) Assist the PI Development Teams in Presenting to the ISS Safety Panels
(d) Provide Engineering Products Required by ISS, Including PI Specific Experiment Information

(4) Verification

(a) Develop and Maintain the Test Equipment for Early Development Testing and Final Verification & Test
(b) Provide Sufficient Access of Hardware and Software to the PI Specific Development Teams to Ensure Successful Operation of the Final Integrated - PI System
(c) Provide Sufficient Personnel Support, Training and Training Materials to the PI Specific Development Teams
(d) Provide All Interface and Verification Tests between MSRF or MSG and the PI Specific Hardware
(e) Provide Scheduling, Installation, Check-Out and Verification of the PI Specific Experiment Hardware and Software into the Ground Integration Unit (GIU)
(f) Perform the Integrated PI Verification and Validation Tests
(g) Provide Support for Installation and Initial Check-Out of PI Specific Experiment Hardware and Software into the Engineering Development Unit (EDU)

(5) Training

(a) In Conjunction with the PI Specific Development Teams, Develop and Present all Integrated Training Materials for use
(b) Support the Installation of the PI Specific Experiment's Training Unit in the Payload Training Center (PTC) at JSC
(c) Develop the Integrated Training Requirements (ISS, ISS Crew, and PI Specific)
(d) Implement the Training Requirements for the PTC, the Computer-Based Training, the Part-Task Trainers and the On-Orbit Training
(e) Provide Training to the PI Specific Development Cadre

SAIC W/F (FTEs)	1	1	1	1
SAIC Cost ($M)	0.125	0.130	0.135	0.140

Basics of Estimate (MIS Support):
> Based on $125K in FY2001 and ramping $5K in the out years

	FY 2001	FY 2002	FY 2003	FY 2004
CST W/F (FTEs)	7	7	7	7
CST Cost ($M)	0.875	0.910	0.945	0.980

Basics of Estimate (Scheduling&Graphics Support):
> Based on $125K in FY2001 and ramping $5K in the out years

A: 35

(6) **Increment Execution**
- (a) Provide Real-time Operations and Supporting Activities During ISS Increment Operations
- (b) Coordinate Real-time Operational Requirements
- (c) Acquire and Process Real-time Data
- (d) Support the Correlation of Scientific Data with ISS Mission Events
- (e) Prepare Performance Reports and Maintain Performance Databases
- (f) Plan and Schedule all On-Orbit Operations, in Conjunction with PI Specific Development Teams
- (g) Support Post-Launch PI Specific Hardware check-out on ISS (Integration, Activation, Calibration, System Characterization and Operational Procedure Verification)
- (h) Provide Trained Cadre of Console Operators
- (i) Be on Console when Active
- (j) Respond to Requests from ISS Crew, Ground Team or any Off-Nominal Situation
- (k) Develop Standard Procedures for On-Orbit Problems or Anomalies

3. **System/Sustaining Engineering**
- (1) Maintain the Flight Unit During its 15 Year Deployment on ISS
- (2) Track System and Component Level Performance
- (3) Identify Components for Replacement
- (4) Design, Fabricate Assemble and Test Replacement Components
- (5) Maintain and Implement Spares and Logistics

4. **Upgrades**
- (1) Develop Deferred or Evolving Combustion and Fluids Element Components
- (2) Integrate New and Emerging Technologies into the Configuration

5. **Telescience Development**
- (1) Develop and Implement a Ground System for Telescience Operations per SSP54500, 50305 & 50304
- (2) TSC must be capable of supporting all MSFC Ground Support Operations Activities
- (3) Provide for Overall Management of the TSC Project, Requirements Development, Capability Development and Test & Verification of the Telescience System
- (4) Locate the TSC at MSFC and Support Remote User Locations
- (5) Maximize the Use of Commercially available Hardware and Software
- (6) Incorporate Trek Work Stations and the Remote Copy of the Enhanced HOSC (EHS) Into the Design and Development of the TSC

6. **Telescience Operations**
- (1) Perform Ground Operations from the TSC and from Remote Sites Where Principal Investigators are Located
- (2) Provide Operational Support Systems Required to Plan, Monitor and Control On-Orbit Experiments
- (3) Coordinate real-time and Experiment Commanding Requirements
- (4) Perform TSC Facility Operations during On-Orbit, Simulation and Training Activities
- (5) Simulate On-Orbit Operations for Ground Verification and Ground Operations Training
- (6) Operate and Maintain the TSC Facility and Support Systems
- (7) Coordinate with Experiment Teams to Develop Increment Specific Telescience Requirements
- (8) Store, Distribute, Retrieve and Archive Telemetry Data
- (9) Ensure the Physical and Automated Information Systems Security for the TSC Facility and all Users
- (10) Provide Experimenters with a Remote Capability to Control and Monitor their Experiment On-Orbit and Communicate with the MSFC TSC and other Ground Systems
- (11) Conduct Simulations and Training Sessions for the TSC Cadre and all Users to Assure Proficiency Throughout all Phases of Operations
- (12) Certify the Readiness of the TSC, its Systems and Cadre at each Increment ORR

		FY 2001	FY 2002	FY 2003	FY 2004
ASRI W/F (FTEs)		10	10	10	10
ASRI Cost ($M)		1.250	1.300	1.350	1.400

Basics of Estimate (Manufacturing Support):
> Based on $125K in FY2001 and ramping $5K in the out years

		FY 2001	FY 2002	FY 2003	FY 2004
USRA W/F (FTEs)		79	90	107	124
USRA Cost ($M)		9.875	11.700	14.445	17.360

Basics of Estimate (Science Support):
> Based on $125K in FY2001 and ramping $5K in the out years

Contract #	Microgravity Research, Development and Operations
C	**DEVELOPMENT OF Material Science, Macromolecular Biotechnology, and Glovebox Investigations are currently in-house led activities with support contractors providing the following services on responsible CS.**

TASK DESCRIPTION

1. **Provide the Management Function to Monitor, Control and Report the Effort**
- (a) Provide NASA with Information Necessary to Implement Government Surveillance
- (b) Establish a Configuration Management Process to Control Critical Hardware, Software and Documentation
- (c) Maintain an Inventory of all Government Furnished Property and Items Purchased
- (d) Conduct all Milestone Reviews, Safety Reviews and other NASA Defined Reviews

2. **Plan, Implement and Maintain a Product Assurance System**
- (a) Become Certified as ISO 9001 and Maintain an Effective Quality Program
- (b) Develop a Safety Plan and Work in Accordance to that Plan
- (c) Have a Materials Assurance process for Documenting the Materials and Processes Associated with the Final Design Hardware
- (d) Assure the reliability, Availability and Maintainability of the Flight and Ground Segment
- (e) Assure the Management, Safety and Control of all Flight-Related Software/Firmware and the Software Development Process
- (f) Have a Risk Management Process to Control Critical Flight Hardware, Software and Documentation

3. **Experiment Definition**
- (a) Provide Initial System Level Experiment Concept for SCR
- (b) Provide Top-Level Engineering Requirements that Address the Pis Science Requirements
- (c) Conduct System Design and Mission Analyses to Evaluate Potential Carrier Options
- (d) Formulate a Preliminary Engineering Plan for Development of the Experiment Concept

4. **Requirements Definition**
- (a) Define the Fundamental System Requirements (Science, Carrier, Safety, Operations and Quality)
- (b) Determine Overall feasibility of Candidate Experiment Concepts
- (c) Design and Develop Breadboards to Reduce Risk and Evaluate Functional Performance

		FY 2001	FY 2002	FY 2003	FY 2004
TVA W/F (FTEs)		1	1	1	1
TVA Cost ($M)		0.125	0.130	0.135	0.140

Basics of Estimate (Scheduling&Integration Support):
> Based on $125K in FY2001 and ramping $5K in the out years

(d) Develop and Integrated Concept (Experiment to Carrier)
(e) Formulate an Engineering Plan to be Presented at RDR

5. **Preliminary Design**
   (a) Develop a Preliminary Design-to-Specification
   (b) Develop preliminary Hardware and Software design
   (c) Design, Develop and Fabricate Engineering Mockups, Breadboards, Brassboards and Prototype Hardware
   (d) Provide Assurance that the Preliminary Design will Meet Carrier Safety and Verification Requirements
   (e) Develop Preliminary versions of the PIA and ICD
   (f) Develop a Detailed Project Plan
   (g) Provide a Product Assurance Plan
6. **Design and Development**
   (a) Generate System Build-to-Specifications
   (b) Develop a Comprehensive Flight design
   (c) Design, Develop and Fabricate an Engineering Model
   (d) Develop a Comprehensive Verification Plan
   (e) Provide Assurance that Final Design will Meet all Carrier Safety and Verification Requirements
7. **Carrier Integration, Operations and Training Planning**
   (a) Perform Analyses and Implement Planning Necessary to Define, Prepare for and Conduct Experiment Operations
   (b) Prepare Training Requirements and Plan
   (c) Perform Integrated Logistics Analyses
   (d) Develop a Detailed Assembly, integration and Test Plan
8. **Fabrication, Assembly and Test**
   (a) Perform Mission and Technical Integration Efforts Necessary to Assure Delivery of a Fully Functional System
   (b) Fabricate, Assemble and Test Flight Unit
   (c) Fabricate, Assemble and Test Qualification Unit
   (d) Fabricate, Assemble and Test Ground Unit (If required)
   (e) Develop, Verify, Validate and Maintain all Software Necessary to Control and Utilize the Flight Hardware
9. **Installation, Assembly and Checkout (IACO)**
   (a) Integrate the Experiment Hardware and Software with the Carrier
   (b) Conduct qualification, Acceptance and Verification Activities
   (c) Provide Assurance that the Experiment System Meets all Carrier Safety and Verification Requirements
   (d) Develop procedures for Crew tended, Untended and Off-Nominal Operations
   (e) Conduct Logistics Support Analyses
   (f) develop all training materials for the Experiment
   (g) Provide for all Ground Servicing Activities at KSC to Ensure Successful Integration of Experiment Hardware with the Carrier or Transportation System
10. **Operations**
   (a) Support On-Orbit Integration Activities with the Carrier and ISS
   (b) Provide t real-time Experiment Operations
   (c) Provide PI Mission Operations Support
   (d) Provide Post Mission Operations
   (e) Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software

	FY 2001	FY 2002	FY 2003	FY 2004
New Contract \ (FTEs)	36	35	35	36
New Contract Cost ($M)	4.500	4.550	4.725	5.040

Basics of Estimate (Microgravity Prime Support):
> Based on $125K in FY2001 and ramping $5K in the out years

JSC (In-House) — **Microgravity Research: Cellular Biotechnology**

Provide surveillance and contract management of contracted activities
Provide technical management of all contracted activities for the entire research and development effort
Report discipline metrics
Develop, manage and maintain research plans and science requirements documents
Perform project planning and direction
Provide project management for all Phase B/C/D/E efforts
Provide representation at various ISS boards, panels, meetings and reviews
Coordinate JSC integration activiites with MRPO and ISSPO
Represent the research program to domestic/international conferences, symposia and media
Generate management reports that reflect the status of ISS payload and planning operations
Communicate the significane of research results to the public
Develop informational and educational materials targeted at technical professionals, educators, students and the public
Conduct advanced technology development studies to enhance future experiment hardware capabilities
Manage data archiving/dissemination
Plan, advocate and defend research discipline content, budget and milestone schedules
Administer and manange PI grants/cooperative agreements/contracts
Assure reporting of PI research efforts/progress
Guide PI in refining science requirements, and experiment procedures
Support PI during experiment planning and operations
Dfacilitate experiment data analysis and interpretation
Verify experiment hardware meets science requirements

	FY 2001	FY 2002	FY 2003	FY 2004
USG W/F (FTEs)	9	10	10	10

NASA JSC (Contracted) — **Contracted Support for Cellular Biotechnology**
Wyle/Cellular Biotechnology Program Contract/JSC/SD12 (Contract #NAS9-97114; UPN 398)

1. **Hardware development**
   (a) Design, fabricate, test and flight certify the necessary equipment and subsystems for operation on the ground and aboard the ISS.
   (b) Design and develop hardware in accordance and compliance with ISO 9001
   (c) Establish a configuration management process to control critical hardware, software and dpcumentation
   (d) Establish and maintain a verification program for flight hardware

	FY 2001	FY 2002	FY 2003	FY 2004
Contract C (NOA $M)	10.77	21.28	31.43	31.59

Basis of Estimate:
1) 2000 Congressional budget.

(e) Develop and document requirements and design specifications
(f) Develop preliminary hardware and software designs
(g) Conduct all design and requirements reviews
(h) Provide assurnace that preliminary design will meet ISS safety and verification requirements
(i) Perform system livel analyses and trade studies to optimize designs
(j) Perform required testing and verification
(k) Develop engineering model hardware to minimize development risk
(l) Perform engineering design and drafting for required components and systems

2. **Sensor technology development**

(a) Develop online, rapid, selective sensors and real-time process control technologies for measurement and regulation of the concentration of substrates, cell products, and dissolved gases, as well as biomass in bioreactors, leading to fully-automated bioreactor systems.
(b) Develop functional requirements documents
(c) Develop, evaluate and deliver operational breadboard technologies that meet functional req'ts
(d) Provide designs, experimental data and reports to NASA
(e) Develop and implement an annual sensor technology development plan
(f) Submit original findings for publication to peer-reviewed scientific and technical journals
(g) Identify emergent, novel, or mature technologies that have the potential to meet requirements
(h) Perform cell-based experiments in relevant bioreactor environments
(i) Provide theoretical, concept and prototype technology models to NASA
(j) Track and record performance of technologies that are developed into flight hardware

3. **Facility development**
(a) Define, design, develop, test and flight certify a rack-level facility to support experiments in cellular biotechnology.
(b) Develop and maintain a BTF master schedule
(c) Prepare and conduct BTF status meetings
(d) Plan for and conduct a Requirements Definition Review (RDR)
(e) Develop and provide a set of metrics on BTF development to NASA

4. **Cell Science Support**
(a) Develop and utilize special methodologies for predicting and modeling the responses of cells to microgravity; perform all preflight, flight and postflight operations for each flight experiment.
(b) Iteratively conduct ground-based cell and tissue culture experiments
(c) Perform pre-flight, flight, and post-flight operations
(d) Optimize PI experiment paramaters (e.g., protocols, materials, culture media formulation, etc.)
(e) Evaluate flight experiment hardware performance in ground-based culture experiments
(f) During a flight, conduct simultaneous control experiments on the ground
(g) Assemble lab procedures, protocols, documents and records for publication by the PI
(h) Collect all PI experiment data and communicate these data to NASA
(i) Maintain pre-flight, flight, and post-flight records of experiments

5. **Payload and Facility Integration**
(a) Define, consolidate and document the requirements, capabilities and interfaces for cellular biotechnology payloads for EXPRESS Rack and BTF
(b) Ensure that all flight documentation accurately reflects requirements
(c) Facilitate and coordinate all Level IV, II/II, and I tests, acceptance and functional test, and integrated testing
(d) Maintain current databases on changes in the ISS and ground support facilities
(e) Participate in ISS teleconferences, meetings, AITs, IPTs and working groups
(f) Provide integration at multiple levels to transition experiment hardware to space operations
(g) Provide flight project management and experiment integration for ISS missions
(h) Meet ISS mission milestones, and develop implementation plans for support of each mission
(i) Prepare acceptance data packages
(j) Ensure required test procedures have been developed, reviewed, and delivered to testing facilities
(k) Schedule and assist in the conduct of acceptance and certification of all experiment hardware
(l) Perform integrated analyses of experiment systems and EXPRESS and BTF
(m) Participate in all required safety reviews, design reviews, and requirements reviews
(n) Develop all required documents and presentations to the various ISS panels and boards
(o) Submit flight specific data and review applicable documentation, such as PIPs, PDL, etc.
(p) Develop inflight procedures in accordance with the Crew Procedures Management Plan
(q) Ensure inflight procedures are compatible with safety, biocontainment, and inflight activities
(r) Develop a plan and schedule, coordinate, and provide crew training for each flight investigation
(s) Maintain detailed databases to track major milestones and actions

6. **Mission Operations Support**
(a) Provide real-time support during on-orbit operations
(b) Conduct capability assessments to optimize ISS resource envelopes to meet user requirements
(c) Update and review all flight procedures and flight documenatation
(d) Perform flight simulation support
(e) Perform operations procedures modifications resulting from simulations or in real-time
(f) Review operations requirements to ensure on-orbit mission profiles are realistic and optimized
(g) Support mission operations reviews
(h) Maintain and update flight schedules and mission timelines, identifying key issues
(i) Support and coordinate all processes required for PI support during real-time operations
(j) Develop and maintain a traffic model
(k) Develop and implement a ground system for telescience
(l) Perform TSC operations during on-orbit, simulation and training activities

7. **Outreach**

		FY 2001	FY 2002	FY 2003	FY 2004
Contractor	(FTEs)	110	178	278	261

(a) Plan, develop, update and maintain publications such as videos, news articles, PAO briefings and web pages

(b) Provide personnel and logistics support for outreach activities, including special projects, demos, displays, seminars and presentations
(c) Interface with existing and future PIs, and with institutes and centers
(d) Provide status updates on outreach and education activities
(e) Develop and maintain a database of PIs
(f) Develop materials and content for exhibits on- and off-site

8. **General**
(a) Become ISO 9000 certified and maintain an effective quality management program
(b) Provide NASA with information necessary to implement government surveillance
(c) Establish a configuration management process to control critical hardware, software and documentation
(d) Develop and implement a safety and health plan and work in accordance to that plan
(e) Provide packing/crating, shipping, and receiving government- and contractor-provided equipment
(f) Coordinate all relevant program acitivites aboard the KC-135 and DC-9 aircraft
(g) Conduct internal audits to ensure contract requirements are fully complied with
(h) Establish and maintain a system to ensure identification of all materials/products for appropriate traceability
(i) Assist in the preparation of research proposals, reports, and peer-reviewed papers in professional journals
(j) Contribute experiment data and information to the archival databases at MSFC
(k) Plan, coordinate, conduct and document workshops and conferences for the formulation of new programs
(l) Develop and implement risk management techniques
(m) Provide routine calibration, certification and maintenance support and records thereof for instrumentation
(n) Provide specialized training and qualification of perosnnel as necessary

JPL (In-House)

Research Management: Microgravity Fundamental Physics (JPL)

1. **Utilization Program Management**

1. **Consolidated Program Integration Management:** Provides for a single JPL point-of-contact for the flight planning and integration of all Fundamental Physics microgravity experiments deployed on the International Space Station. Specific activities include:
a) Coordination with flight projects (Low Temperature Microgravity Physics Experiments and Laser Cooling and Atomic Physics Experiments) to ensure requirements for resources, logistics and accommodations are documented and recognized by ISS planners
b) Review of ISS change documentation for impacts to Fundamental Physics activities
c) Coordination and execution of payload accommodation tradeoff studies
d) Coordination of Fundamental Physics flight planning with the MFSC Microgravity Research Program Office.
e) Representation of Fundamental Physics discipline at ISS reviews
f) Development of requirements and planning for operational activities, e.g., telescience support
g) Facilitation of Fundamental Physics participation in Glovebox Investigator program
h) Generation of management reports that reflect status of ISS payload planning and operations
i) Benchmarking of Fundamental Physics processes against those of other MRP and ISS disciplines
j) Representation of Fundamental Physics interests at, and assurance of appropriate project representation for, numerous ISS boards, panels, forums and working groups

2. **Telescience Support Center:** Planning and implementation of a Telescience Support Center at JPL to facilitate engineering operations and science activities in both multi-user facilities and experiment-unique payloads. Specific functions to be incorporated include:
a) Connectivity between JPL and ISS payload operations center
b) Monitoring of instrument and facility health and status by engineering staff at JPL
c) Archiving and backup of science data at JPL
d) Provision of science data to Principal Investigators at their home institutions
e) End-to-end simulation and testbedding for verification, checkout, procedure development, training, and simulation

3. **Outreach:** Development and propagation of informational and educational materials targeted at other technical professionals, the general public, and students to promote awareness of, convey information about, and build support for Fundamental Physics experiments. Specific functions include:
a) Formal Education modules on fundamental physics research for K-5 grade levels, including teacher training
b) Informal education institutes sponsored by OLMSA or JPL, including traveling exhibits, with necessary ancillary materials (slides, pictures, video) for presentations and public talks.
c) Website content, including artwork and on-line educational materials emphasizing the value and benefit of fundamental physics research

2. **Flight Experiments Utilization (Low Temperature Microgravity Physics Experiments and Laser Cooling and Atomic Physics Experiments [PARCS and RACE]): Definition, development, test, integration, launch preparation, and operations support of investigation-unique experiment hardware and software.**

1. **Translation of investigation science requirements into instrument functional requirements:** Peer-reviewed and selected science
2. **Development of required instrumentation technologies:** Specific technologies and tools required to build and operate instrumentation for fundamental physics experiments are developed. These include high-fidelity laser systems, precise magnetic field control, milli-Kelvin thermal control, ultra-high vacuum technologies, cryogenic management systems, quantum interferometry, and others.
3. **System engineering of integrated experiment:** Specification of purchased/contracted components, maintenance of experiment performance requirements and their verification, and assurance that science requirements are satisfied.
4. **Experiment hardware assembly and integration:** Fabrication of ultra-high precision and/or highly unique instrumentation components, assembly and integration of in-house and purchased components, final packaging of complete instrument, all qualification, test, and verification activities.
5. **Launch campaign and flight operations:** Preparation and certification of integrated experiment for shipping, launch vehicle integration, and launch. Engineering and scientific monitoring of experiment during launch, operations, and recovery phases. Interface with RPO and ISS organizations for all accommodations, resource, and operations issues.
6. **Risk management and mission assurance:** Overall management of development, performance, cost, and schedule risk during definition, development, test, and operations. Assurance of full science return during flight activities.

3. **Low Temperature Microgravity Physics Facility Development:**

1. **Develop Science Requirements Envelope Document (SRED):** Identify requirements from selected, candidate, and typical flight

	FY 2001	FY 2002	FY 2003
JPL total W (FTEs)	18.6	18.6	19.5	25.4
JPL total α (est. $M)	6.674	7.852	14.996	15.451

Basis of Es 1) Workforce costs are on an actual, full-cost basis.
3) JPL cost includes JPL labor with all associated direct costs, as well as procurements and hardware purchased by JPL and used in experiment definition, assembly, integration, test, and operations.

2. **Mission Integration & Planning Functions:** Develop processes that facilitate the strategic and tactical planning of fundamental physics investigations. Facilitate efforts to maximize science return and research opportunities on ISS. Develop and maintain a planning database that includes PI resource requirements and resource allocations. Support development of the mission evaluation requests (MERS). Develop and maintain an integrated Fundamental Physics traffic model. Develop and end-to-end PI integration process for LTMPF PI's into LTMPF. Provide generic PI specific documentation required for integration into the LTMPF. Develop any tools required to facilitate the PI integration process and to be compatible with the ISS program.
3. **Management and Engineering Support:** Perform Contractor Technical Management oversight of LTMPF contract. Negotiate deliveries and schedule milestones with contractor. Continuosly evaluate contractor performance and take early action i n case of any discrepancies. Ensure that the contractor designs, builds, tests, and delivers the facility consistent with the SRED requirements.
4. **Mission Integration, Testing, and Launch Support:** Integrate the instruments to be flown on the first flight with the facility and verify that all functional and perfromance requirements are being met. Work closely with the principal investigators to calibrate and optimize their instruments prior to delivery for the launch campaign. Run nominal Sequence of Events testing of the entire system and use to train the mission operations personel. Perform system environmental testing on the fully integrated flight system and verify that the equipment survived functionally as well as performance wise. Use special containers to ship equipment cold to launch site while not jeopardiaing the vacuum and cryogenic integrity of the experiments. Support the processing flow at the launch site. Support launch and misison operations.
5. **LTMPF Verification:** Develop and Maintain the LTMPF Test Equipment for Early Development Testing and Final Verification & Test. Provide Sufficient Access of LTMPF Hardware and Software to the PI Specific Development Teams to Ensure Successful Operation of the Final Integrated LTMPF - PI System. Provide Sufficient Personnel Support, Training and Training Materials on the Use of LTMPF to the PI Specific Development Teams. Provide All Interface and Verification Tests between LTMPF and the PI Specific Hardware. Provide Scheduling, Installation, Check-Out and Verification of the PI Specific Experiment Hardware and Software into the Ground Integration Unit (GIU). Perform the Integrated LTMPF/PI Verification and Validation Tests. Provide Support for Installation and Initial Check-Out of PI Specific Experiment Hardware and Software into the LTMPF Engineering Develoment Unit (EDU).
6. **LTMPF Training:** In Conjunction with the PI Specific Development Teams, Develop and Present all Integrated Training Materials for use. Develop the Integrated Training Requirements (ISS, ISS Crew, LTMPF, PI Specific). Implement the Training Requirements for the PTC, the Computer-Based Training, the Part-Task Trainers and the On-Orbit Training.
7. **Increment Execution:** Provide Real-Time Operations and Supporting Activities During ISS Increment Operations. Coordinate Real-Time Operational Requirements. Acquire and Process Real-Time Data. Support the Correlation of Scientific Data with LTMPF and ISS Mission Events. Prepare LTMPF Performance Reports and Maintain LTMPF Performance Databases. Plan and Schedule all LTMPF On-Orbit Operations, in Conjunction with PI Specific Development Teams. Support Post-Launch PI Specific Hardware Check-Out on ISS (integration, Activation, Calibration, System Characterization and Operational Procedure Verification). Provide Trained Cadre of Console Operators. Be on Console when LTMPF is Active. Respond to Requests from ISS Crew, Ground Team or any Off-Nominal Situation. Develop Standard Procedures for On-Orbit Problems or Anomalies.
8. **LTMPF System/Sustaining Engineering:** Maintain the Flight Unit During its 15 Year Deployment on ISS. Track LTMPF System and Component Level Performance. Identify LTMPF Components for Replacement. Design, Fabricate Assemble and Test LTMPF Replacement Components. Maintain and Implement LTMPF Spares and Logistics.

JPL (Contracted)	Contracted Support for Microgravity Fundamental Physics
Contract #	Contract Title and Performing Organization
1.	**Flight Experiments Components:** ***GENERIC INSTRUMENT DEVELOPMENT FUNCTIONS:*** **Preliminary Design:** Develop a Preliminary Design-to-Specification. Develop preliminary Hardware and Software design. Design, Develop and Fabricate Engineering Mockups, Breadboards, Brassboards and Prototype Hardware. Provide Assurance that the Preliminary Design will Meet Carrier Safety and Verification Requirements. Develop Preliminary versions of the PIA and ICD Develop a Detailed Project Plan Provide a Product Assurance Plan. **Design and Development:** Generate System Build-to-Specifications. Develop a Comprehensive Flight design. Design, Develop and Fabricate an Engineering Model. Develop a Comprehensive Verification Plan. Provide Assurance that Final Design will Meet all Carrier Safety and Verification Requirements. **Carrier Integration, Operations and Training Planning:** Perform Analyses and Implement Planning Necessary to Define, Prepare for and Conduct Experiment Operations Prepare Training Requirements and Plan Perform Integrated Logistics Analyses. Develop a Detailed Assembly, Integration and Test Plan. **Fabrication, Assembly and Test:** Perform Mission and Technical Integration Efforts Necessary to Assure Delivery of a Fully Functional System. (Fabricate, Assemble and Test Flight Unit. Fabricate, Assemble and Test Qualification Unit. Fabricate, Assemble and Test Ground Unit (if required). Develop, Verify, Validate and Maintain all Software Necessary to Control and Utilize the Flight Hardware. **Installation, Assembly and Checkout (IACO):** Integrate the Experiment Hardware and Software with the Carrier Conduct qualification, Acceptance and Verification Activities. Provide Assurance that the Experiment System meets all Safety and Verification Requirements Develop procedures for nominal and Off-Nominal Operations Develop all training materials for the Experiment Provide for all Ground Servicing Activities at launch site to Ensure Successful Integration of Experiment Hardware with the Carrier or Transportation System. **Operations:** Support On-Orbit Integration Activities with the Carrier and ISS Provide Real-Time Experiment Operations. Provide PI Mission Operations Support. Provide Post Mission Operations. Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software. Provide Sustaining Engineering and Maintenance of Experiment Hardware and Software ***INSTRUMENT-SPECIFIC CONTRACTS:*** **1. University of New Mexico - DYNAMX:** Develop the physics package for the DYNAMX instrument and verify that it will meet all science requirements. Provide science, engineering, software, and operations support during integration and test activities at JPL, launch campaign activities at the launch site, and mission operations during the flight of the experiment. **2. Stanford University - SUMO:** Develop the physics package for the SUMO instrument and verify that it will meet all science requirements. Provide science, engineering, software, and operations support during integration and test activities at JPL, launch campaign activities at the launch site, and mission operations during the flight of the experiment. **3. University of California at Santa Barbara - BEST:** Develop the physics package for the BEST instrument and verify that it will meet all science requirements. Provide science, engineering, software, and operations support during integration and test activities at JPL, launch campaign activities at the launch site, and mission operations during the flight of the experiment.
2.	**Low Temperature Microgravity Physics Facility (Ball Aerospace)**
1.	**Project management:** Provide NASA with information necessary to implement government surveillance. Establish a configuration management process to control critical hardware, software and documentation. Maintain an inventory of all government-furnished property and items purchased. Conduct milestone reviews, safety reviews and other NASA defined reviews. Develop a materials assurance process for documenting the materials and processes associated with the final design hardware. Assure the reliability, availability and maintainability of the flight and ground segment. Assure the management, safety and control of all flight-related software/firmware and the software development process. Develop a risk management process to control critical flight hardware, software and documentation.
2.	**Develop a Preliminary Design of the LTMPF:** Develop and document the preliminary design-to-specifications. Develop a preliminary hardware and software design. Produce mock-ups, breadboards, brassboards and subsystem prototype hardware to establish feasibility and reduce risk. Provide assurance that the preliminary design will meet ISS safety and verification req'ts. Develop preliminary versions of required documentation. Update the contractor project plan. Provide a product assurance plan.
3.	**Incrementally complete the design to meet performance and functional requirements:** Generate complete system build-to-specifications. Perform system-level analyses and trade studies to optimize the design. Develop an overall detailed flight design. Develop final software design and perform code development. Minimize development risk through development of engineering model hardware. Perform required testing and integration. Develop a comprehensive final verification plan. Perform the analysis and implementation planning for long term payload operations.
4.	**Fabricate, assemble, test, verify and deliver an operational LTMPF system per requirements.** Perform the mission and technical integration necessary to assure delivery of a fully functional LTMPF system. Incrementally fabricate, assemble, and test LTMPF flight ground and other hardware and software. Conduct installation, assembly and checkout activities with the ISS and launch carrier. Conduct qualification, acceptance and verification activities on all components, subsystems and combined assemblies. Conduct acceptance testing of flight and ground racks and overall LTMPF system. Provide assurance that the experiment system meets all ISS safety and verification requirements. Develop procedures for nominal and off-nominal operations. Develop the payload training center unit (PTCU). Provide all ground servicing to ensure successful integration with the transportation system. Provide support for experiment development teams for initial on-orbit operations. Provide all requisite documentation and procedures so that the combined JPL and PI teams can operate the facility
5.	**Provide for initial installation, checkout, calibration and operation of the LTMPF system to include the initial experiments:** Provide for initial installation, checkout, calibration and operation of the LTMPF racks and experiments. Verify post-launch performance and state-of-health of LTMPF system. Perform on-orbit performance verification program
MSFC SPD (Inhouse)	**SPACE PRODUCT DEVELOPMENT OFFICE ISS UTILIZATION PLANNING AND ADMINISTRATION**
	Develop and implement SPD ISS utilization program plans. **Develop ISS flight proposals and traffic model.** **Develop flight selection decision package considering technical, business, and flight accommodation request.** **Represent SPD payload user requirements to the ISS Program.** **Assist PD's in developing and implementing their ISS utilization plans.** **Manage SPD ISS user operations.** **Provide input to ISS Program and develop consolidated utilization budgets.** **Provide SPD ISS utilization advocacy.** **Formulate utilization metrics and monitor PD performance against them.** **Manage authorized budget and resources.** **ISS utilization status reporting to HQ.**

	FY 2001	FY 2002	FY 2003	FY 2004
Contract t ($M)	8.837	7.448	9.008	

	FY 2001	FY 2002	FY 2003	FY 2004
USG W/F (FTEs)	5	5	5	5
USG Cost (est. $M)	0.70	0.70	0.70	0.70

Basis of Estimates
1) Assumes 1 FTE = $100,000 + 40% overhead.

	Program Outreach (Industry/Public).
MSFC SPD (Contracted)	**Space Product Development Program Services (bd Systems Contract #NAS8-99005);UPN___)**
WBS	
3.1	**SPD Program Payload Development and Requirements Integration Support** Maintain documentation and schedules to reflect the status of the payload development activities for SPD payload development projects. Develop schedules to reflect payload development activities for the SPD Program Office. Disseminate SPD payload planning manifest information to NASA Headquarters, other NASA centers, Commercial Space Centers, other government agencies, universities and companies, and the ISS payload integration teams.
3.2	**SPD Program Research Integration Support** Represent SPD payload requirements and overall research goals in the ISS Research Mission Management activities to such forums as the Multidiscipline Working Group and the Increment Research Working Group.
3.3	**SPD Payload Operations Support** Maintain necessary documentation to properly represent SPD Program manifest planning and research goals. Develop and maintain payload operations requirements for SPD payload projects Represent SPD payload operations requirements in the proper ISS program forums
3.5	SPD Program Projects Support
3.5.1	Develop schedules and documentation to reflect SPD payload operations requirements.
3.5.2	Develop and maintain documentation to reflect the performance and goals of SPD research projects. Develop, prepare and maintain documentation, briefing materials, reports, and other related information on SPD Program and commercial research projects. Research, recommend and coordinate with the microgravity science program, International Space Station (ISS) Program Office, Commercial Space Centers (CSC's), independent commercial payload developers, universities, private companies, NASA Headquarters and Field Centers to develop the SPD Program documentation. Develop the agenda, coordinate dates, perform all logistics planning and commuicate plans to all participants in Program reviews, meetings and telecons.
MSFC SPD (Contracted)	**ISPR Common Hardware Contract (Boeing Contract # NAS8-50000**
	Produce common ISPR hardware items (AAA's, coldplates, connectors, etc.)
MSFC SPD (Cooperative Agreements)	**Commercial Space Center Funding**
	Develop payloads and experiments including design, development, test, training, operations, and post-flight analysis. **Identify Products.** **Generate proposals and business plans.** **Develop industry partnerships.** **Develop ISS product roadmaps.** **Provide input to long term plans and program direction** **Provide advocacy input.** **Project metrics reporting** **Project planning and direction.**

Contract C (NOA $M)	FY 2001	FY 2002	FY 2003	FY 2004
	0.873	0.899	0.900	0.900

Contract C (NOA $M)	FY 2001	FY 2002	FY 2003	FY 2004
	0.23			

Contract C (NOA $M)	FY 2001	FY 2002	FY 2003	FY 2004
WCSAR NCC8-129	1.733	1.218	1.184	1.448
BIOSERVE NCC8-131	1.450	1.270	1.220	2.014
UAB NCC8-126	6.661	5.743	5.859	3.901
SDC NCC8-128	1.400	0.750	0.750	1.279
UAH NCC8-132	1.067	1.060	0.925	0.400
CCACS NCC8W-0096	2.630	3.500	3.200	3.300
CAMMP NCC8-139	1.445	1.050	0.775	0.932
Center for Space Power	0.400	0.400	0.400	0.500

New Commercial Centers				1,500

08/09/00 DRAFT

Functions Associated with International Space Station Utilization and Research Program Management

Index to Functional Workbook

Section 1: Headquarters, Space Station Program Office, Space Station Project Offices
- Functions of Headquarters
- Functions of JSC/Space Station Program Office
- Functions of MSFC/Payload Operations
- Functions of KSC/Payload Processing

Section 2: Functions of MSFC Research Program Office (RPO) for Microgravity Research and Space Product Development

Section 3: Functions of JSC Research Program Office (RPO) for Biomedical Research and Countermeasures

Section 4: Functions of ARC Research Program Office (RPO) for Fundamental Biology

Section 5: Functions of GSFC Research Program Office (RPO) for Earth and Space Sciences

Section 6: Functions of OSF Research Program Office (RPO)

Description

This functional workbook was developed by the respective functional offices to describe both in-house and contracted functions over the FY 01 - 05 horizon. For in-house functions, civil service workforce plans are included with conversion to dollars based on local overhead rates in most cases. For contracted functions, budget plans are included. In most cases, the basis of estimate is cited. Efforts remain underway to establish uniformity across all sections; regardless, the current draft provides a level-of-deatil down to specific WBS, or SOW, elements and thus represents a comprehensive definition and reasonable estimate of the total scope of functionality.

ns Associated with
pace Station R&D Program
Program Office Worksheet)

NASA JSC (In-House)		Research Program Management (RPO): Biomedical Research and Countermeasures
	1.0.	**Program mgmt of flight projects (Biastronautics Technology Rack and Human Research Facility)**
	1.1.	Coordinate and baseline Level 1 Program requirements with Code UL
	1.2.	Assure Program commitment agreements are maintained
	1.3.	Review Program/Project resources, objectives, and schedules
	1.3.1	Review and approve Project Plans
	1.4.	Approval of Project authority to proceed at control Milestones (Requirements Review)
	1.5.	Represent the HLS RPO to ISS payload strategic and tactical planning process
	1.6.	Assignment of flight resource allocation to projects
	1.7.	Develop and operate standardized Program Management tools for the ISS flight projects
	1.7.1	- Integrated Project Schedule Tools/ ISS Research Schedules
	1.7.2	- Budget Reporting Systems
	1.7.3	- Program Requirements Docouments and Flow down system
	1.7.4	- Program Review Processes and meetings
	1.7.5	- Configuration Management Plans and Processes
	1.8.	Program Review of Project technical, budget, and schedule
	1.9.	Representing status and issues to top center/agency management
	1.10.0	Prepare and manage budgets for:
	1.10.1	- Program Operating Plan
	1.10.2	- Center Operating Plan
	1.10.3	- Budget exercises and adjustments
	1.10.4	
	1.11.	Manage budget interactions between Life Sciences (Code UL) and ISS Code M
	1.12.	Develop and manage Technical Task Agreements (TTAs) with the ISS Research Office
	1.13.	Apply Agency, JSC center and Directorate level goals and objectives to the flight projects including: safety, outreach, quality processes
	2.0.	**Human Life Sciences Research Program Office (HLS RPO)to the ISS Payloads Control Boar**
	2.1.	Develop and coordinate support for the other ISS boards,panels, and forums
	2.1.1	Represent BR&C to ISS Research Planning Working Group (RPWG)
	2.1.2	Support the development of the ISS RPWG manifest planning process
	2.1.3	Develop, document, and implement an BR&C manifest planning process
	2.1.4	Develop BR&C strategic and tactical manifesting inputs to HQ and JSC
	2.2.	Participate in ISS payload process definition
	2.3.	Consolidated cofiguration management and change impact assessment
	2.4.	Support Certification of Flight Readiness activities and endorsements
	3.0.	**HRF and BaTR Project Management**
	3.1.	Establish and manage Project Plans and requirements Level 2, 3
	3.2.	Coordinate external science advisory groups chartered by Level 1
	3.3.	Establish and manage ageements (ITAs, Intercenter MOUs,International Res contracts) with implementing organizations
	3.4.	Establish and manage project budgets
	3.5.	Manage internal and external configuration control and change control
	3.6.	Establish and manage integrated project schedules
	3.7.	Present the technical cost and management status of the ISS projects to JSC and ISS Program.
	3.8.	Support activities with the International Space Life Sciences Strategic Planning Working Group (ISLSWG)
	3.8.1	- ISS hardware sharing with International Partners
	3.8.2	- experiment development and operation
	3.8.3	- support to research solicitation, review and selection
	3.8.4	- experiment definition and flight assignment
	3.9.	Development of JSC Telescience Center and project operations capability
	3.10.	Development of ISS integration products(ICDs, verification plans)
	3.11.	Development of operations products (training, procedures, Crew briefings)
	3.11.1	Manage Baseline Data Collection in U.S. Facilities
	3.11.2	Manage NASA BDC in Russian facilities
	3.12.	Project Integration with Russian Human research elements

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	4	4	4	4	4

Basis of Estimate: Latest POP

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
USG W/F	(FTEs)	12	12	11	9	9

3.13. Integration with ISS medical operations activities, hardware sharing, etc.
3.14. Manage data archive for human research
3.15. Manage education and outreach products.
3.16. Present the safety report to the Payload Safety Review panel.
3.17. Develop COFR plans and execute endorsements

NASA JSC (Contracted) Contract #	RPO Contracted Support for Biomedical Research and Countermeasures Program Contract Title and Performing Organization
4.0.	-NAS9 19100 Science, Engineering, Analysis and Test Contract Lockheed Martin Space Operations Project and Program Management Support
4.1.	Project Management
4.1.1	Project Coordination/Integration
4.1.1.1	Flight and Ground Safety
4.1.1.2	Scheduling, Status Reviews, Meetings
4.1.2	Manifests and Data Sets
4.1.2.1	Payload Data Library - Configuration
4.1.2.2	Payload Data Library - Integration Agreement
4.1.3	Project Documentation/IPS
4.1.3.1	Integrated Planning System
4.1.3.2	Library Services
4.1.3.3	Documentation- General
4.1.4	Configuration Management
4.1.4.1	Control Board support
4.1.4.2	CR and action item tracking
4.1.4.3	Software Development Process
4.1.4.3.1	Software Development Plan
4.1.4.3.2	Procedures
4.1.1.4.3.3	Software Configuration Management Plan and Procedure
4.1.4.3.4	Display development process
4.1.5	Public Information and Exhibit
4.1.6	Web Development and Maintenance
4.2.	AHST Project Management Services
4.2.1	Project Management
4.2.2	Requirements Analysis and Planning
4.2.3	Document Development
4.2.4	Integrated Rack Verification
4.2.5	Experiment Verification
4.3	International Partner Coordination
4.3.1	IP Coordination
4.3.2	Requirements Definition
4.3.3	Document Development
4.3.4	Data Review and Representation at Design Reviews
4.4	Systems Engineering
4.4.1	Requirements Analysis and Planning
4.4.2	Document Development
4.4.2.1	Payload Data Library - Command and Data Handling Data Set
4.4.2.2	Payload Data Library - ICD/Payload Verification Plan Data Set
4.4.2.3	Payload Data Library - KSC Technical Data Set
4.4.2.4	Payload Data Library - KSC Support Data Set
4.4.3	Integrated Rack Verification
4.4.4	Experiment Verification
4.4.5	Experiment Definition and Development
4.4.5.1	Experiment Development/ PI Coordination
4.4.5.1.1	Define experiment requirements
4.4.5.1.1.1	Complete Experiment Documents, update/support CCB as required
4.4.5.1.1.2	Support experiment review process

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
Contract Cost	($M)	20.18	19.23	29.13	29.01	29.01
	Total:					

4.4.5.1.1.2.1 Experiment Requirement Reviews
4.4.5.1.1.2.2 Experiment Preliminary Design
4.4.5.1.1.2.3 Experiment Critical Design
4.4.5.1.1.3 Support develop/update online resource tools
4.4.5.1.1.4 Review/update Planning Data Set (iURC)
4.4.5.1.2 Ensure JSC IRB/HRMRB compliance
4.4.5.1.2.1 Prepare protocols for submittal
4.4.5.1.2.2 Support reviews/close AI's/update as required
4.4.5.1.3 Support crew procedure development
4.4.5.1.3.1 Prepare initial experiment inputs
4.4.5.1.3.2 Review/update Payload Ops Data Set
4.5.1.4 Prepare Data Sharing Plan
4.5.1.5 Conduct SVTs
4.5.2 Experiment Unique Crew Training/ Baseline Data Collection
4.5.2.1 Support Crew Training Process
4.5.2.1.1 Make input/review Training Data Set
4.5.2.1.2 Prepare for/support PTDR process
4.5.2.1.3 Support crew training simulations
4.5.2.1.4 Support development of GSP materials/training
4.5.2.2 Provide preflight mission support
4.5.2.2.1 Prepare Baseline Data Collection plan
4.5.2.2.2 Support preflight Baseline Data Collection
4.5.2.2.3 Support post-flight Baseline Data Collection
4.5.2.2.4 Support crew debrief process
4.5.2.2.5 As-run Baseline Data Collection Summary
4.5.3 Experiment Systems Development
4.5.3.1 Support experiment systems development
4.5.3.1.1 Support h/w development, kit development, engr analysis, ICD
4.5.3.1.2 Support s/w development, Payload Display Review panel process
4.5.3.1.3 Prepare safety packages, support Payload Safety Review Panel process
4.5.3.1.3.1 Phase 0/1
4.5.3.1.3.2 Phase II
4.5.3.1.3.3 Phase III
4.5.3.1.4 Review/update Configuration Data Set
4.5.3.2 Support certification and verification testing of experiment systems
4.5.3.3 Support KSC integration
4.5.3.3.1 Make input/review KSC Tech Req Data Set
4.5.3.3.2 Make input/review KSC Support Data Set
4.5.3.4 Review/update Ground Data Services Data Set
4.5.3.5 Support h/w and data return/distribution

4.6 Operations

4.7 Training

4.8 TSC Development and Operations
4.8.1 Facility Buildup
4.8.2 Data System Development & Implementation
4.8.3 Connectivity & Link
4.8.4 Network & Security
4.8.5 Database & Web Updates
4.8.6 Data Display Updates & Integration
4.8.7 Operations Support
4.8.8 Systems Management & Administration
4.8.9 Sustaining Engineering
4.8.1 Payload Data Library - Ground Data Services

4.9 HSLSPO Science Management
4.9.1 HSLSPO Program Science Support

4.9.2 HSLSPO Increment Science Support
Coordinate HRMRB presentations
Coordinate Crew Informed Consent Briefings
5.1.0 Hardware Development & Integration Management

5.1.1 Project Management
- 5.1.1.1 Planning & Operations
- 5.1.1.2 Schedules & Cost
- 5.1.1.3 Monthly & Weekly Reports Reports
- 5.1.1.4 Monitoring and Control
- 5.1.1.5 Status Reviews and Meetings
- 5.1.1.6 Project Administration Support
- 5.1.1.7 Procurement Support
- 5.1.1.8 Payload Interface Revision Notice Reviews and Impacts

5.2.0 Hardware Development Projects

5.2.1 Systems Engineering
- 5. 2.1.1 Technical Assessment
- 5. 2.1.2 Requirements Analysis and Planning
- 5. 2.1.3 Engineering Management
- 5. 2.1.4 Test Plans and Procedures

5.2.2 Program Reviews
- 5.2.2.1 Design Reviews
- 5.2.2.2 Configuration Control Board
- 5.2.2.3 Flight Safety Reviews
- 5. 2.2.4 Ground Safety Reviews
- 5. 2.2.5 Software Code Reviews

5.2.3 Project Documentation
- 5. 2.3.1 Requirements Documents
- 5.2.3.2 Design Review Documents
- 5.2.3.3 Integration Documents
- 5. 2.3.4 Analysis & Study Reports
- 5. 2.3.5 Data Packages
- 5.2.3.6 Software Test Plans
- 5.2.3.7 Software Version Descriptions
- 5.2.3.8 Sustaining Engineering Plans

5.2.4 Design
- 5.2.4.1 Mechanical Design
- 5.2.4.2 Electrical Design
- 5.2.4.3 Software and Database Design
- 5.2.4.4 Manufacturing Design

5. 2.5 Procurement
- 5.2.5.1 Subcontracts
- 5.2.5.2 Mechanical Elements
- 5. 2.5.3 Electrical Elements
- 5.2.5.4 COTS Software
- 5.2.5.5 Printed Wiring Board Coupon Testing

5. 2.6 Engineering Analysis
- 5.2.6.1 Structure/Load Analysis
- 5.2.6.2 Fracture Analysis
- 5.2.6.3 Thermal Analysis
- 5.2.6.4 Reliability & Maintainability Analysis
- 5.2.6.5 Human Factors Analysis

5.3.0 Systems Engineering & Integration

5.3.1 Systems Engineering
- 5.3.1.1 Technical Assessment
- 5.3.1.2 SE&I Management
- 5.3.1.3 Test Plans and Procedures

5.3.2 Program Reviews
- 5.3.2.1 Design Reviews
- 5.3.2.2 Configuration Control Board
- 5.3.2.3 Flight Safety Reviews
- 5.3.2.4 Ground Safety Reviews
- 5.3.2.5 Flight Readiness Reviews

5.3.3 Engineering Analysis
- 5.3.3.1 Structure/Load Analysis
- 5. 3.3.2 Fracture Analysis

5. 3.3.3 Thermal Analysis
5. 3.3.4 EMI/Radiation Analysis
5.3.3.5 Microgravity Analysis
5.3.3.6 Air Flow/Acoustic Analysis
5.3.4 System Documentation
5.3.4.1 Requirements Documents
5.3.4.2 Design Review Documents
5.3.4.3 Interface Control Documents
5.3.4.4 Analysis & Study Reports
5.3.4.5 Data Packages
5. 3.5 Rack/Payload Integration
5. 3.5.1 Reviews
5.3.5.2 Schedules
5. 3.5.3 Plans & Procedure Development
5.3.5.4 Test Planning and Execution
5. 3.5.5 Test Report & Data Packages
5.3.5.6 Stowage Configuration
5.3.5.7 Shipping & Logistics

08/09/00 DRAFT

Functions Associated with International Space Station Utilization and Research Program Management

Index to Functional Workbook

Section 1: Headquarters, Space Station Program Office, Space Station Project Offices
- Functions of Headquarters
- Functions of JSC/Space Station Program Office
- Functions of MSFC/Payload Operations
- Functions of KSC/Payload Processing

Section 2: Functions of MSFC Research Program Office (RPO) for Microgravity Research and Space Product Development

Section 3: Functions of JSC Research Program Office (RPO) for Biomedical Research and Countermeasures

Section 4: Functions of ARC Research Program Office (RPO) for Fundamental Biology

Section 5: Functions of GSFC Research Program Office (RPO) for Earth and Space Sciences

Section 6: Functions of OSF Research Program Office (RPO)

Description

This functional workbook was developed by the respective functional offices to describe both in-house and contracted functions over the FY 01 - 05 horizon. For in-house functions, civil service workforce plans are included with conversion to dollars based on local overhead rates in most cases. For contracted functions, budget plans are included. In most cases, the basis of estimate is cited. Efforts remain underway to establish uniformity across all sections; regardless, the current draft provides a level-of-deatil down to specific WBS, or SOW, elements and thus represents a comprehensive definition and reasonable estimate of the total scope of functionality.

Functions Associated with International Space Station R&D Program

(Research Program Office Worksheet)

NASA ARC (In-House)		Research Program Management (RPO): Fundamental Biology						
		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	
USG W/F	(FTEs) Total	32.55	28.65	26.95	25.05	24.15	20.45	
Civil Service only	393-20	32.55	28.65	26.95	25.05	24.15	20.45	
Civil Service only	479-85	0.0	0.0	0.0	0.0	0.0	0.0	
Cost $M		2.734	2.523	2.271	1.757	1.517	1.511	

NASA JSC (Contracted)			RPO Contracted Support for Fundamental Biology							
	393-20 & 479-85									
			FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	
WBS #	Contract #	Contractor			($M)					
1.0 - 10.0	NAS2 00014263	Lockheed Martin	28.169	28.736	25.850	13.391	18.652	14.843		Project-wide support
7.2.1	NAS2 00097021	ORBITEC	9.944	12.472	15.379	8.556	6.105	7.143		Plant Research Unit
7.2.2	NAS2 00098024	STAR	12.252	11.225	10.766	7.059	12.006	11.668	1.500	Advanced Animal Habitat
7.2.4	NAS2 00096001	PSI	5.211	5.529	5.596	3.282	0.000	0.000		Cell Culture Unit
6.0	SERVQ000H1911	Hernandez	0.732	0.853	0.755	0.260	0.479	0.151		SS&MA
7.1.3	MSFC	Boeing	10.710	8.200	3.200	0.100				Habitat Holding Rack
		Total $M:	**67.018**	**67.016**	**61.545**	**32.648**	**37.241**	**33.805**	**1.500**	

Functions Associated with International Space Station R&D Program

NASA ARC (In-House)		Research Program Management (RPO): Fundamental Biology Program Office
		Flight Research Program Management Coordinate and baseline Level 1 Program requirements with Code UL Assure Program commitment agreements are maintained Review Program/Project resources, objectives, and schedules Review and approve Project Plans Approval of Project authority to proceed at control Milestones (Requirements Review) Represent the FB RPO to ISS payload strategic and tactical planning process Assignment of flight resource allocation to projects Program Review of Project technical, budget, and schedule Representing status and issues to top center/agency management Review/manage budgets for: - Program Operating Plan - Center Operating Plan - Budget exercises and adjustments Review Technical Task Agreements (TTAs) developed by the projects with the ISS Research Office Develop and coordinate support for the other ISS boards,panels, and forums Represent FB to ISS Research Planning Working Group (RPWG) Support the development of the ISS RPWG manifest planning process Develop, document, and implement an FB manifest planning process Develop FB strategic and tactical manifesting inputs to HQ and JSC Participate in ISS payload process definition Consolidated configuration management and change impact assessment Support Certification of Flight Readiness activities and endorsements Support activities with the International Space Life Sciences Strategic Planning Working Group (ISLSWG) - ISS hardware sharing with International Partners - experiment development and operation - support to research solicitation, review and selection - experiment definition and flight assignment FB Increment Science /Increment Research Team Support Approve/appoint increment scientist Approve COFR plans and execute endorsements Support activities with the International Space Life Sciences Strategic Planning Working Group (ISLSWG) - ISS hardware sharing with International Partners - experiment development and operation - support to research solicitation, review and selection - experiment definition and flight assignment

ARC Life Sciences Division - Utilization 393-25

NASA ARC (In-House)		Research Program Management (RPO): Fundamental Biology
	1.	**Program Management of FB Flight Projects (base support)** 1. Coordinate FB priorities to provide payload development and implementation support in division 2. Represent FB objectives and status to Center, intercenter, and HQ management 4. Assure Program commitment agreements are baselined and maintained 5. Review and approve Project technica l status, resources, objectives, and schedules 6. Assign flight resource allocation to projects 7. Manage and adminster the Division Management , Change, and Surveillance Board; approve and provide Project authority to proceed at control Milestones (Requirements Review) -Approval to experiment Phase development from A to B to C -Approval of Project phase elements e.g., equivalent to PRR, PDR, CDR -Approval of flight readiness and shipments of flight elements off-site to launch or experiment sites 8. Develop and operate standardized Program Management tools for the ISS flight projects -Budget reporting system -Project requirements and flow down system (ISO standardization and reference) -Project control board

		FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
FTE	CS	8.5	8.7	9	9	9
	SSC	12.00	12.00	16.00	15.50	13.50
Manpower BUDGET ($M)		2,051	2,242	2,903	3,161	3,087
Materials		684	747	967	1,053	1,029

Estimate: Latest POP

Resrouces Dichroma (Center Contract) -2FTE; IT: Raytheon-2FTE (Center Contract);

Lockheed/Martin= Balance NAS2-14263*

- Configuration management plan
9. Approve and direct all intercenter and programmatic interactions for the division
10 Prepare and manage budgets for:
- Program Operating Plan
- Center Operating Plan
- Budget exercises and adjustments
10Track all Division PR's, SR's, their status along with preparation of major procurement justifications and grants
11 Ensure adequate staff, facilities, and capability to conduct ISS utilization support activities at ARC
-Develop short and long term plans for ground facilities utilization and support
-Provide IT services, support, and security
12 Provide monthly budget variance to ISS
13 Develop and manage Technical Task Agreements (TTAs) with the ISS Research Office
14 Apply Agency, ARC and Directorate level goals and objectives to the flight projects including: safety, outreach, quality processes
15 Provide advanced planning to coordinate ISS flight proposals vs. FB experiments for other platforms
16 Manage Data archiving and dissemination
17.Oversee development and maintenance of educational and outreach materials and program

2. **Fundamental Biology Payload Project Development**
1. Establish and manage Project requirements
2. Manage PI contracts (PI flight experiments)
3. Coordinate science requirements vs hardware capabilities with BRP until validation flights complete
At validation complete, negotiate all science requirements vs hardware capabilities
-Prepare Experiment Integrated Requirements Document per experiment/per increment
-Prepare Experiment Integrated Logisitics requirements for pre/post flight support
-Disseminate all data and data products post flight and support PI analyses of data
4. Plan, implement, and maintain a Product Assurance system for each increment

3. Establish and manage ageements (ITAs, Intercenter MOUs,International Res contracts) with implementing organizations
4. Establish and manage payload project budgets
5. Manage internal and external change traffic
6. Establish and manage integrated project schedules including payload by payload PDR, CDR, Safety Reviews
Develop and manage Project Plans, PI integrated requirements plans, payload verification plan, Product Assurance Plans,
7. Present the technical cost and management status of the ISS projects to ARC. FB. and ISS Program.
8. Support activities with the International Space Life Sciences Strategic Planning Working Group (ISLSWG)
- ISS hardware sharing with International Partners
- experiment development and operation in the FB suite of hardware
- support to research solicitation, review and selection
- experiment definition and flight assignment
9. Operate Telescience Support Center and maintain project operations capability at assembly complete

10 Develop ISS integration products (ICDs, verification plans) in support of ongoing experiments and changing EUE/EGE
11 Develop, implement, and maintain Integrated Logistics Plan to support validation flights and ongoing utilization activities on increment by increment basis
12 Ensure delivery of stowage hardware and biological elements and documents (COFRs, integration packages) to launch site per increment
13 Provide integration support at launch and landing sites to both launch/landing teams and PI requirements
14.Provide sustaining engineering planning and implementation for validated suite of FB hardware

3. **Acceleration Facilities**
1. Maintain suite of acceleration facilities to support science community ground experiments which serve as controls to ISS 2.5m centrifuge
2. Provide resource plans and schedules for maintenance of acceleration ground facilities which serve as ground control to FB hypergravity flight experiments
3. Interface with science community to provide data for use of facilities for their NRA/NIH proposals
4. Provide support, including unique GS,E for PI requested use of acceleration facilities

Animal Care Facility
4. 1. Provide services to support animal test activities prior to flight implementation
2. Provide resource plans and schedules for maintenance of animal care facilities to ensure adequate pre-flight testing along with asynchronous ground controls.
3. Maintain AAALAC as nationally recognized facility and provide all associated required national documentation

NOTE: Center Levy of Distributed CS/SSC Manpower which provides NO DIRECT Support

		FY2001	FY2002	FY2003	FY2004	FY2004
	CS	14.7	15.1	15.1	21.4	18.2
	SSC*	57.7	80.7	108.5	113.8	94.6
Budget w UFR	- Manpwr	8,820	12,318	15,926	16,572	16,437
	Mat'l	2,940	4,106	5,309	5,524	5,479

*Lockheed/Martin SSC Support

		FY01	FY02	FY03	FY04	FY05
	CS	0.2	0.2	0.2	0.7	0.7
	SSC*	1.5	1.5	1.5	2.5	1.5
Budget ($K) -	Mnpwr	308	263	266	412	311
	Mat'rls	103	42	89	138	104
	CS	0.5	0.5	0.5	1	1
	SSC**	9.5	10	10	11	11
Budget ($M)	Mnpwr	796	868	906	1,083	1,128
	Mat'l	265	289	302	361	376
Bionetics Contract						
ARC Center Distributed EP		20	19	20	20	20

		TOTAL All CONTRACT $M	11,975	15,691.0	20,001	21,228	20,963

Contractor · **Lockheed Martin WBS**

SUB TASK NO.	SUB TASK TITLE	LOE ACTIVITY/PRODUCT TITLE
1	General Management	Prepare position papers, advocacy material, etc. as required
		Provide support for the development of the SL annual report
		Provide a monthly report of support activities
	ISO 9000 Documentation Support	Provide minutes for the SL Quality System Steering Committee meetings
		Track action items derived from the SL Quality System Steering Committee meetings
		Establish a process that incorporates an on-going staff training program
		Establish a database that tracks the current training status of all civil servants and contractors
		Review and incorporate updates to SL ISO Standard Operating Procedures and Work Instructions
		Provide ISO status, record ISO action items and provide a summary report of the ISO related meeting topics for the Code SL Management Review
2	Division Planning and Scheduling	Provide technical and schedule status as required
3	Cost Analysis and Tracking	Prepare project related costing documentation as required
5	Advanced Planning and Outreach	Support national conferences by developing exhibit booth materials, logistics and staffing for at least two national conferences, including ASGSB
		Update and maintain the Code SL web site on a frequent basis
		Serve as the ISLSWG site curator and provide updates as required
		Update and maintain the ABIS database and place all presentations on the database within 10 days of the meeting at which the presentation was made
		Provide ISS payload options and resource requirements analysis as required
		Provide technical analysis and support the technical feasibility of proposed experiments to the Life Sciences Annual NRA by supporting the ITR and developing a database to maintain PI progress and status
		Provide input to the 2000 HEDS component of the ARC Research and Technology report
		Provide position papers and analysis of ISS operational scenarios in support of ARC and GB&E payloads
		Develop an integrated plan to capture database of Earth Benefits derived from the Life Sciences Divisions flight and ground based activities. Once plan is approved begin implementation plan as resources and time allows
		Develop an implementation plan that identifies advocacy groups and describes strategies to elicit support from these groups. Once the plan is approved begin implementation as resources and time allows
		Update the congressional database with information, including mailing addresses for the US congress
		Support Advanced Technology Development tasks by developing a consolidated technology/science requirements database, organizing workshops to develop strategic plans for technology development and acquisition
		Develop a draft project plan for the HyperG Gravitational Research Study
		Support of Free Flyer initiative, develop detailed payload accommodations criteria
		Support Astrobiology payload planning activity
		Provide a liaison function between SL, BRP, GB&E and Astrobiology to ensure collaborative activities are identified and supported
		Review Critical Questions database, update with current science research information
6	Data Archiving and Information Systems	Support computer systems security for Code S
		Provide continuous ISO document support for DAP SOPs and WIs
		Upgrade Biospecimen Facility Bar Code System in conjunction with SSBRP planning
		Provide Biospecimen Sharing Plan support
		Provide SSBRP CDS and DAP interface support
		Provide support completion of Life Into Space Book II
		Digital Image Library on-line
		Develop a plan to create an integrated personnel database
		Implement the RDMS (Relational Database Management System
		Complete SL-3, SL-J, IML-1, IML-2 Phase 2 data and deliver to JSC
		Complete1991-1996 experiment Phase I data and deliver to JSC
		Develop a web interface prototype for RDMS
		Collect phase 1 1991-1998 Primary Payload data and deliver to JSC
		Collect phase 1 1991-1998 Small Payload data and deliver to JSC
		Collect phase 1 1995-1997 NASA Mir data and deliver to JSC

		Develop a library system for the DAP office holdings
		Complete SLS-2 Phase 2 Project and Baldwin data and deliver to JSC
7	Configuration Management	Staff and provide a functional documentation control center
		Provide engineering release center document inventory on a monthly basis
		Review comments of proposed engineering documents, e.g. drawings, procedures and any initiated changes to base lined engineering documents
		Provide monthly agenda, minutes and their distribution for the Project Control Board

TASK PLAN NO. FPI 2.0 (6), REV. A, OPERATIONS SUPPORT
TASK PLAN MANAGER: ANGELA WR/

LEVEL OF EFFORT (LOE) ACTIVITIES/PRODUCTS LISTING AND DUE TIMES

SUB TASK NO.	SUB TASK TITLE	LOE ACTIVITY/PRODUCT TITLE
2	Integrated Logistics Operations	Coordinate highbay Maintenance
		Support General Servicing, calibration & Inventory
		Coordinate Forklift & GSA Van maintenance with Motor Pool
		Insure shipping records reflect equipment location and destination
		Coordinate shipments with NASA 255 and/or Fed-Ex
		Maintain the MCS and materials distribution functions
		Update SL Work Instructions
		Support facility maintenance
3.1	FPI Operations Administration/Management	Provide Administrative support to operations staff
		Conduct staffing, resource and budget assessments
		Conduct Task Plan Management
		Provide International Liaison support
		Support SL ISO effort
		Maintain membership on SLO/SLE Steering Committee
4.1	Generic Multi-Increment Support	Support multi-increment planning
		Support MER development & Blank Book development
		Support traffic model database development
		Provide Liaison support for POIF
4.2	Training Capability Development	Provide oversight, guidance, mentoring of training approach
		Support training planning for Flight & Ground Crew
		Define Tmg HW requirements/Flight HW features
		Develop curricula for Grnd Training
		Develop SIM Requirements
		Prepare & Conduct Voice Protocol Tmg
		Update requirements for Training Facility Development
		Plan Facility Modification for Training Facility Capability
4.11	UF-1 Increment Support	Maintain UF1 Milestone Schedule (Tier 1)
		Support team meetings
		Support payload reviews
		Maintain UF1 Operations Milestone Schedule (subtier)
		Develop/maintain Express Deliverables Matrix
		Plan & Conduct Phase C/D Project Reviews
		Develop/Integrate IURC
		Support KSC Support Requirements Data Set in PDL for BPS
		Support Science development of ADF LIRD, or equiv. for ADF
		Manage Grnd Tmg & Cert
		Support Science Photo/Video Req. Definition in PDL
		Provide T&I Support
		Provide Logistics Support
		Develop MVT Procedures & Support MVT

		Support Contact Identification: Planning
		provide Admin/Pld Ping Support
		Support ADF Biospecimen Sharing Plan EVT Test Plan Development
		Support TSC/TreK/GDS development
		Conduct Crew Training
		Support Sims at approx L-9, L-5, L-3
		Support HW Turnover & IDP Development
		Prepare PIP Annexes
4.20	UF-3 Increment Support	Maintain project schedule
		Support team meetings
		Support payload reviews
		Support Project Plan Development
		Conduct Phase A Review
		Support operations, payload planning, stowage & logistics, Training
		Conduct hardware processing planning
4.21	EMCS Planning & Support	Maintain project schedule
		Support team meetings
		Support payload reviews
		Maintain Project Plan
		Develop Phase A/B Experiments Review Packages
		Support Phase A/B Experiment Reviews
		Document Phase A/B Experiment Results
		Support ESA negotiations
		Support increment specific data collection
		Support development of test plan
		Conduct flight/prototype hardware testing
4.26	Space Station Utilization Facility Management	Conduct planning and implementation of facility utilization for ISS
4.27	Passive Dosimeter (5A.1/6A/7A.1 Increments)	Provide coordination for Passive Dosimeter First Flight
		Update PIA & First Increment Addendum
		Populate Generic Data Sets
		Develop non-increment specific training materials

TASK PLAN NO. FPI 3.0 (6), REV. A, HARDWARE DEVELOPMENT SUPPORT

TASK PLAN MANAGER: DEMOS TSAI

LEVEL OF EFFORT (LOE) ACTIVITIES/PRODUCTS LISTING AND DUE TIMES

SUB TASK NO.	SUB TASK TITLE	LOE ACTIVITY/PRODUCT TITLE
1	Small Payloads	TBD
3	Neurolab	Provide Input for Final Postflight Report
4	FPI Task Order 3.0 Engineering Administration/ Management	ISO 9001 Training
		Financial Reporting
		Status Reporting
		Support for ERG Process as Member and Trainer of Staff
		Support Project/Payload Status Reviews
5.11	UF-1	Payload System Schematics
		Assembly and Installation Drawings of BPS and ADF
		Payload Transfer Drawings/Requirements
		Payload Application Software
		Payload Configuration Drawings

		Participate in in-flight operations simulations
		Begin development of Flight TOPS using the MVT TOPS
		Begin development of the Flight ADF ACUC
		Plan for an ADF Biospecimen Sharing Program
4.21	EMCS Planning and Support	Participate in EMCS IWG. Product: Meeting Minutes and Assessments
		Conduct risk analyses for experiment based on technical and scientific challenges and provide inputs to EMCS Project Risk Mitigation Plan (Ops). Product: Input to EMCS Project Risk Mitigation Plan (Ops)
		Develop inputs and provide test success criteria for the STF acceptance test plan. Interpret and provide analyses on test results. Provide recommendations for system performance improvements, as necessary. Product: STF Test Plan success criteria, STF
		Attend ASGSB Meeting, Seattle
		Participate in STF testing activities with Engineering and Operations. Provide technical support and assessments during the execution of the STF testing activities. Product: Completed STF acceptance test
		Participate in testing activities with Engineering and Operations for prototype hardware. Provide analyses for test results. Product: Prototype test(s) results analyses
		Attend ESTEC Midterm Review
		PI Site Visit – Exp. 299/Ferl; Product: Trip report and meeting minutes.
		Organize and implement PI seminar at ARC for Exp. 299/Ferl. Product: PI Seminar and summary TIR.
		Participate in Exp. 299/Ferl Pre-ØA Review. Product: Inputs and sections of Pre-ØA Review package
		Develop and release Exp. 299/Ferl preliminary ERD. Product: Preliminary ERD, Exp. 299/Ferl
		Participate in Exp. 299/Ferl ØA Review; Product: Inputs and sections of ØA Review package
		PI Site Visit – Exp. 207/Duke Product: Trip report and meeting minutes.
		Write and deliver final version of Experiment 207/Duke ERD and baseline. Product: Baselined ERD, Exp. 207
		Participate in Exp. 207/Duke ØA Review. Product: Inputs and sections of ØA Review package
		Participate in Exp. 207/Duke ØB Review. Product: Inputs and sections of ØB Review package
		Support UF-3 Project Development Activities
		Project Integration and support activities
9.1	Nutrition/Foodbar Testing and Development	180 day Fisher rats feeding study
		Weekly analyses and reports
		Pregnancy and neonatal studies
		Weekly analyses and reports
		Mice pregnancy and neonatal studies
		Weekly analyses and reports
		Foodbar drying studies
		Weekly analyses and reports
10.1	Phase A Experiment Definition	PI Monthly Status Charts
		Coordinate PI ARC visits and seminars
		Pre-Phase A presentation for PCB
		Phase A presentation for PCB

SSBRP Hardware Development & Integration Management WBS		
	1	**Management**
	1.1	**General Management (includes major reviews)**
	1.2	**Project Planning and Scheduling (includes Hardware Tracking/Expediting)**
	1.3	**Configuration Management**
	1.4	**Cost Analysis & Tracking (includes WBS Development & Maintenance)**
	1.5	**Project Document Development (includes Project Plan, Policies & Procedures, PMR)**
	1.6	**Outreach**
	1.7	**Project Strategic Planning (this is a catch-all for HQ actions and similar activities)**
	1.8	**Automated Data Processing**
	1.9	**Multi-Program Support**
	1.1	**Other ARC Support**
	1.11	**Other Support Service Contract Support**
	1.12	**Miscellaneous**
	2	**Systems Engineering**
	2.1	**General Systems Engineering**
	2.2	**Project Wide Support**

		Payload Stowage Drawings
		Process Travelers and Test and Operation Procedures
		Annex Part 1: Flight Planning
		Annex Part 2: Flight Planning
		Annex Part 3: Flight Planning/Trajectory Description
		Annex Part 7: Training
		Annex Part 8: Launch Site Support
		Annex Part 9: Verification Plan
		Thermal Report
		Cargo Integration Readiness Review
		Provide Manifest and Stowage Data
		Interface and Consumable Requirements
		Certificates of Conformance for Verification
5.20	UF-3	Define Preliminary Increment Stowage Interfaces per PIA
		Define EUE Requirements: Draft
		Define EUE Requirements: Final
		Develop Outline for Stowage Hardware Matrix
5.21	European Modular Cultivation System Planning and Support	Specify and Procure Components for Science Test Facility
		Draft Acceptance Test Procedure for STF
		Support STF Testing with Science and Operations
		Develop Preliminary EUE Requirements for E207 & E299
		Design and Fabricate Prototype EUE Hardware (3 Sets)
		Test Prototype Hardware

TASK PLAN NO. FPI 4.0 (6) REV. A, SCIENCE OPERATIONS SUPPORT

TASK PLAN MANAGER: JOHN KAUME LEVEL OF EFFORT (LOE) ACTIVITIES/PRODUCTS LISTING AND DUE TIMES

SUB TASK NO.	SUB TASK TITLE	LOE ACTIVITY/PRODUCT TITLE
2	Integrated Logistics Operations	Support/Maintain/Update ARC/DFRC inventory database
		Verify possession of Equipment Operation Manuals for all ARC and DFRC equipment.
		Maintain familiarization & training on all lab equipment.
		Act as primary point of contact for laboratory issues & facilitate good relationships with investigators.
		Provide proper ISO 9000 documentation.
		Provide organization & support for KSC/DFRC telecon.
		DFRC Labs
		Yearly inventory of all labs, trailers, equipment, & chemicals.
		Maintain accuracy of MSDS book and manuals (cc: ARC)
		Provide semi annual report on status of facilities, equipment, refrigerator/freezer temperature validation, chemicals, MSDS, and manuals to SLL & ILOM .
		Coordinate maintenance of facilities and old equipment and installation of new equipment. Maintain equipment calibration & documentation.
		Update and implement start up and shut down procedures and revise ISO9000 documentation
		Coordinate visits of AAALAC and implement required changes
		Coordinate facility activities and create a list of facility needs, due dates and status.
		Implement check in/out procedures with lab users
		Coordinate with ES&H Coordinator, FSR's and Code Q to ensure safety requirements are met. This includes GFCI, chemical inventory, storage, disposal, MSDS's, monthly lab walk-thru's & documentation, and attending safety meetings.
		Coordinate facility, equipment and labcoat maintenance. Set up & track maintenance contracts.
		Plan equipment verification, calibration, testing and repair. Track property decaled items and coordinate installation & decal of new equipment.
		Maintain chemical inventory
		Maintain familiarization and training on lab equipment
		Conduct freezer ID update and Temp. test annually; provide report

		Create lab use document called "utilization of Flight Operations Facilities" (similar to XAP0003) and the ARC Orientation packet.
3.1	FPI Science Administration/ Management	Science Logistics Team Management
		Oversee Student Interns: Tasks, evaluations
		Lockheed Personnel Interface/Lead
		Provide Task & Travel Planning & scheduling for all Science Logistics a
		Activities & tasks
		ISO Documentation: Review, Revise.
		Track budget and spending per contract profile
		Organize & support logistics meetings & telecons
		Provide lab planning support for FPI/SSBRP flight experiments & ARC non-flight projects.
		Provide logistics support at KSC & DFRC
		Oversee & track Science Logistics Team tasks & projects to completion
		Oversee & track Science Logistics Team tasks & projects to completion
		Support monthly PMR & Payload meetings
		Payload/Project Activities (STS 107, B1, UF 1)
		Attend telecons & technical exchange meetings with mission support personnel & provide assistance as needed
		Review LIRD/SIRD for accuracy & resolve discrepancies & other procurement details
		Provide mission packet information to ILOM & SLL
		Provide check off list for each mission
		Provide Mission Safety Packet to DFRC safety
		Organize & support setup/shipping meeting trip prior to mission
		Provide safety training to all PRF visitors
		Provide safety training documentation to FSR
		Implement start up and shut down(per ISO instructions)
		Assist with shipping of ground & flight samples
		Provide Trip Report (Deliverable)
		Provide lab support and planning support
		Support Brady EVT (STS-107)
		Support Chapman EVT (STS-107)
		Support Vandenburg EVT (STS-107)
		Support Pyle EVT (STS-107)
		Support BPS MVT (UF-1)
		Support ADF MVT (UF-1)
		Provide lab & planning support for science ground tests and flight experiment test at KSC
		Provide support to ensure that all Project/Payload Science Requirements are promptly met with regard to facilities, supplies, & equipment
		Provide on-site logistics support for scrub turnarounds & contingency landings
		Maintain SIRD/LIRD documentation & new MSDS
4.11	UF-1	Preliminary ERD for Dr. Doty (ADF PI)
		Promote KSC Support Requirement Data Set (Preliminary) in PDL for ADF and BPS experiments
		Preliminary ERD for Dr. Dickman (ADF PI)
		Prepare presentation and support the PGOWG#3
		Prepare the presentation packet and support the ADF PI Phase A Status Review
		Produce the Final ADF PI ERD's
		Promote the Post-Ops Photo / Video Delivery Requirements in PDL
		Release No Wilco LIRD
		Input to Payload Planning Data Set – IURC (Baseline)
		Provide organization and support the ADF Investigator Working Group (IWG) meetings
		Provide organization and support the BPS Investigator Working Group (IWG) meetings
		ADF MVT ACUC Protocol
		MVT Procedures for Pre- and Post-Flight Operations
		Prepare the science presentation packet and support the UF-1 Phase C Status Review
		Submit MVT Mission Packet to KSC (packet includes the activity schedule, badging list, and shipping matrix)
		Promote KSC Support Requirement Data Set (Baseline) in PDL for ADF and BPS experiments
		Input to Payload Planning Data Set-IURC (Final)
		Release BPS No Wilco LIRD, Rev. A
		Provide organization and support the ADF Post-MVT IWG meetings
		Provide organization and support the BPS Post-MVT IWG meetings
		Update the ADF and BPS Toxicology Table for SS&MA
		Provide input to the new middeck mission planning documentation for the ADF experiment (this will replace IURC, EIA, etc.)

	2.3	Internal Interface Engineering
	2.4	External Interface Engineering
	2.5	Integration Test and Verification
	2.6	Systems Engineering Modeling and Analysis
	3	Science
	3.1	Science Task Management
	3.2	Science Requirements
	3.3	Science Definition
	3.4	Reserved
	3.5	Project Wide Support
	3.5.1	Project Planning
	3.5.2	Operations and Training
	4	Operations
	4.1	Operations Task Management
	4.2	Ground Facility Development
	4.3	Reserved
	4.4	Project Wide Support
	4.4.1	Project Planning
	4.4.2	Integrated Logistics
	5	Systems Development
	5.1	In-house Back-up Development (includes test beds)
	5.2	Shop Support
	5.3	Mockup and Display Design, Development and Maintenance
	5.4	Project Wide Support
	6	SRM&QA
	7	Facility Equipment
	7.1	Host Systems
	7.1.1	Centrifuge (CR)
	7.1.1.1	CR Project Office Management
	7.1.1.2	CR Hardware Development
	7.1.1.2.1	Contractor Management
	7.1.1.2.2	Development through Qualification Test
	7.1.1.2.3	Flight Hardware including spares
	7.1.1.2.4	Training Hardware including spares
	7.1.1.2.5	Software
	7.1.1.2.6	GSE
	7.1.2	Life Sciences Glovebox (LSG)
	7.1.2.1	LSG Project Office Management
	7.1.2.2	LSG Hardware Development
	7.1.2.2.1	Contractor Management
	7.1.2.2.2	Development through Qualification Test
	7.1.2.2.3	Flight Hardware including spares
	7.1.2.2.4	Training Hardware including spares
	7.1.2.2.5	Software
	7.1.2.2.6	GSE
	7.1.3	Habitat Holding Rack
	7.1.3.1	HHR Project Office Management
	7.1.3.2	HHR Hardware Development
	7.1.3.2.1	Contractor Management
	7.1.3.2.2	Development through Qualification Test
	7.1.3.2.3	Flight Hardware including spares
	7.1.3.2.4	Training Hardware including spares
	7.1.3.2.5	Software
	7.1.3.2.6	GSE
	7.2	Habitats
	7.2.1	Biomass Production System (BPS)/Plant Research Unit (PRU)
	7.2.1.1	BPS/PRU Project Office Management
	7.2.1.2	PRU Hardware Development
	7.2.1.2.1	Contractor Management
	7.2.1.2.2	Development through Qualification Test
	7.2.1.2.3	Flight Hardware including spares
	7.2.1.2.4	Training Hardware including spares
	7.2.1.2.5	Software

	7.2.1.2.6	GSE
	7.2.1.3	BPS Hardware Development
	7.2.1.3.1	Contractor Management
	7.2.1.3.2	Development through Qualification Test
	7.2.1.3.3	Flight Hardware including spares
	7.2.1.3.4	Training Hardware including spares
	7.2.1.3.5	Software
	7.2.1.3.6	GSE
	7.2.2	**Advanced Animal Habitat -C (AAH-C)**
	7.2.2.1	AAH-C Project Office Management
	7.2.2.2	AAH-C Hardware Development
	7.2.2.2.1	Contractor Management
	7.2.2.2.2	Development through Qualification Test
	7.2.2.2.3	Flight Hardware including spares
	7.2.2.2.4	Training Hardware including spares
	7.2.2.2.5	Software
	7.2.2.2.6	GSE
	7.2.3	**Aquatic Habitat**
	7.2.3.1	Aquatic Habitat Project Office Management
	7.2.3.2	Aquatic Habitat Hardware Development
	7.2.3.2.1	Contractor Management
	7.2.3.2.2	Development through Qualification Test
	7.2.3.2.3	Flight Hardware including spares
	7.2.3.2.4	Training Hardware including spares
	7.2.3.2.5	Software
	7.2.3.2.6	GSE
	7.2.4	**Cell Culture Unit (CCU)**
	7.2.4.1	CCU Project Office Management
	7.2.4.2	CCU Hardware Development
	7.2.4.2.1	Contractor Management
	7.2.4.2.2	Development through Qualification Test
	7.2.4.2.3	Flight Hardware including spares
	7.2.4.2.4	Training Hardware including spares
	7.2.4.2.5	Software
	7.2.4.2.6	GSE
	7.2.5	**Avian/Egg Incubator**
	7.2.5.1	Avian/Egg Incubator Project Office Management
	7.2.5.2	Egg Incubator Hardware Development
	7.2.5.2.1	Contractor Management
	7.2.5.2.2	Development through Qualification Test
	7.2.5.2.3	Flight Hardware including spares
	7.2.5.2.4	Training Hardware including spares
	7.2.5.2.5	Software
	7.2.5.2.6	GSE
	7.2.5.3	Avian Hardware Development
	7.2.5.3.1	Contractor Management
	7.2.5.3.2	Development through Qualification Test
	7.2.5.3.3	Flight Hardware including spares
	7.2.5.3.4	Training Hardware including spares
	7.2.5.3.5	Software
	7.2.5.3.6	GSE
	7.2.6	**Insect Habitat**
	7.2.6.1	Insect Habitat Project Office Management
	7.2.6.2	Insect Habitat Hardware Development
	7.2.6.2.1	Contractor Management
	7.2.6.2.2	Development through Qualification Test
	7.2.6.2.3	Flight Hardware including spares
	7.2.6.2.4	Training Hardware including spares
	7.2.6.2.5	Software
	7.2.6.2.6	GSE
	7.2.7	**Reserved**
	8	**Other Equipment**
	8.1	Major Laboratory Science Equipment
	8.1.1	**Refrigerated Centrifuge**

	8.1.1.1	Refrigerated Centrifuge Project Office Management
	8.1.1.2	Refrigerated Centrifuge Hardware Development
	8.1.1.2.1	Contractor Management
	8.1.1.2.2	Development through Qualification Test
	8.1.1.2.3	Flight Hardware including spares
	8.1.1.2.4	Training Hardware including spares
	8.1.1.2.5	Software
	8.1.1.2.6	GSE
	8.1.2	**Incubator**
	8.1.2.1	Incubator Project Office Management
	8.1.2.2	Incubator Hardware Development
	8.1.2.2.1	Contractor Management
	8.1.2.2.2	Development through Qualification Test
	8.1.2.2.3	Flight Hardware including spares
	8.1.2.2.4	Training Hardware including spares
	8.1.2.2.5	Software
	8.1.2.2.6	GSE
	8.1.3	**Small Mass Measuring Device (SMMD)**
	8.1.3.1	SMMD Project Office Management
	8.1.3.2	SMMD Hardware Development
	8.1.3.2.1	Contractor Management
	8.1.3.2.2	Development through Qualification Test
	8.1.3.2.3	Flight Hardware including spares
	8.1.3.2.4	Training Hardware including spares
	8.1.3.2.5	Software
	8.1.3.2.6	GSE
	8.1.4	**Passive Dosimeter**
	8.1.4.1	Passive Dosimeter Project Office Management
	8.1.4.2	Passive Dosimeter Hardware Development
	8.1.4.2.1	Contractor Management
	8.1.4.2.2	Development through Qualification Test
	8.1.4.2.3	Flight Hardware including spares
	8.1.4.2.4	Training Hardware including spares
	8.1.4.2.5	Software
	8.1.4.2.6	GSE
	8.1.5	**Micro Mass Measuring Device (MMMD)**
	8.1.5.1	MMMD Project Office Management
	8.1.5.2	MMMD Hardware Development
	8.1.5.2.1	Contractor Management
	8.1.5.2.2	Development through Qualification Test
	8.1.5.2.3	Flight Hardware including spares
	8.1.5.2.4	Training Hardware including spares
	8.1.5.2.5	Software
	8.1.5.2.6	GSE
	8.2	Minor Laboratory Science Equipment
	8.2.1	**Minor Laboratory Equipment Project Office Management**
	8.2.2	**Compound Microscope Hardware Development**
	8.2.3	**Dissecting Microscope Hardware Development**
	8.2.4	**Slow Freeze Accessories Hardware Development**
	8.2.5	**Dissection Equipment Hardware Development**
	8.2.6	**Specimen Labeling Tools Hardware Development**
	8.3	Miscellaneous Equipment
	8.3.1-5	**Reserved**
	8.3.6	**Habitat Checkout Unit**
	8.3.6.1	Habitat Checkout Unit Project Office Management
	8.3.6.2	Habitat Checkout Unit Hardware Development
	8.3.7-8	**Reserved**
	8.4	**Stowage Systems**
	8.4.1	**Service System**
	8.4.2	**Transportation Racks**
	9	**Flight Assembly, Checkout, and Validation**
	9.1	**Flight Assembly, Checkout, and Validation - Science**
	9.1.1	**Generic Support**
	9.1.4	**7A.1 Support**

	9.1.5	UF-1 Support
	9.1.6	UF-2 Support
	9.1.7	UF-3 Support
	9.1.8	UF-4 Support
	9.1.9	UF-5 Support
	9.2	Flight Assembly, Checkout, and Validation - Operations
	9.2.1	Generic Support
	9.2.4	7A.1 Support
	9.2.5	UF-1 Support
	9.2.6	UF-2 Support
	9.2.7	UF-3 Support
	9.2.8	UF-4 Support
	9.2.9	UF-5 Support
	10	User Operations Facility Development (also called Telescience Support Center [TSC])
	10.1	Data System Development

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Functions Associated with International Space Station Utilization and Research Program Management

Index to Functional Workbook

Section 1: Headquarters, Space Station Program Office, Space Station Project Offices
- Functions of Headquarters
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- Functions of MSFC/Payload Operations
- Functions of KSC/Payload Processing

Section 2: Functions of MSFC Research Program Office (RPO) for Microgravity Research and Space Product Development

Section 3: Functions of JSC Research Program Office (RPO) for Biomedical Research and Countermeasures

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Section 6: Functions of OSF Research Program Office (RPO)

Description

This functional workbook was developed by the respective functional offices to describe both in-house and contracted functions over the FY 01 - 05 horizon. For in-house functions, civil service workforce plans are included with conversion to dollars based on local overhead rates in most cases. For contracted functions, budget plans are included. In most cases, the basis of estimate is cited. Efforts remain underway to establish uniformity across all sections; regardless, the current draft provides a level-of-deatil down to specific WBS, or SOW, elements and thus represents a comprehensive definition and reasonable estimate of the total scope of functionality.

Functions Associated with International Space Station R&D Program

(Research Program Office Worksheet)

OSS & OES Level II	ISS/OSS & OES
A	PROGRAM LEVEL MANAGEMENT AND INTEGRATION

TASK DESCRIPTION

1. **Enterprise Support**
   - (a) Represent OSS & OES ISS interests to domestic and international conferences, symposia, and other forums
   - (b) Support attached Space Station Utilization Board Working Group
   - (c) Assist with developing cost sharing, data sharing and other barter agreements at inter-agency and international levels
   - (d) Support preparation of Enterprise solicitation Announcements
   - (e) Assist with Enterprise strategic planning regarding ISS utilization
   - (f) Generate RPO Program Plan compliant with NPG 7120.5A

2. **System Integration**
   - (a) Develop and implement OSS & OES CM Procedure for ISS controlled Documentation and Change Evaluation
   - (b) Perform Level 2 configuration management for OSS & OES inputs to ISS
   - (c) Provide technical evaluations for Space Station Change Requests (CRs), Payload Interface Revision Notices (PIRNs), and action items
   - (d) Act as the OSS & OES RPO single-point-of-contact with the ISS Payload Control Board (PCB), being a strong advocate for OSS & OES Research.

3. **Payload Planning & Manifesting**
   - (a) Act as the OSS & OES RPO single-point-of-contact with the ISS Research Planning Working Group (RPWG), being a strong advocate for OSS & OES Research
   - (b) Support the development of the ISS RPWG manifest planning process
   - (c) Develop OSS & OES strategic and tactical manifesting inputs to HQ and JSC

4. **Mission Integration**
   - (a) Works with SSPO in developing, revising and refining the generic payload integration process
   - (b) Assist Implementing Centers in working integration issue resolution as required
   - (c) Participate on Payload Mission Integration Team

Payload Site Analytical Integration (EXPRESS Pallet, JEM-EF, Columbus EPF, WORF)
- (a) Review appropriate documentation including requirements, definition, verification, integration, and supporting tools, models, and equipment
- (b) Provide support to payload developers: (1) review payload specific ICDs and verification plans (2) review data and requirements necessary for engineering and operations integration planning and execution (3) participate in issue resolution (4) support payload verification planning, tracking, and statusing, and (5) support develpment of payload integration agreements
- (c) Support the payload engineering integration and verification process at the site/carrier to payload level. Review payload integration requirements and data. Review agreements with payload developers regarding interfaces, schedules, accommodations, resources requirements, operations support, and physical integration/test/checkout services to be provided.

Payload Engineering & Integration
- (a) Provide guidance and support to payload design, development, fabrication, integration & test, and launch operations
- (b) Provide integration management for payloads, acting as primary payload interface to ISS Program
- (c) Work resolutions of payload interface issues
- (d) Support program and peer reviews
- (e) Assist payloads with safety processes, interface documentation, schedules, and deliverables
- (f) Complete CoFR tasks and endorsements
- (g) Generate working agreements between OSS & OES RPO and payload funding programs and implementing centers

5. **Operations/Utilization**
   - (a) Provides technical expertise related to the definition of payload operations processes to support earrth and space science research
   - (b) Establish OSS & OES RPO positions on key payload operations and utilization functions such as the development of flight rules, crew procedures, ground and on-board displays, crew timelines, training concepts, payload command and control concepts
   - (c) Provide increment Scientist support for continuing operations

5. **Science Operations Integration**
   - (a) Recommend resource allocation over-subscription resolutions
   - (b) Assess overall OSS & OES RPO status/impacts during the mission
   - (c) Recommend solutions for OSS & OES RPO Payload conflicts

6. **Payload Retrieval**
   - (a) Work with SSPO in developing requirements for unpressurized payload retrieval
   - (b) Manage individual OSS & OES payload retrieval

7. **Resources Management**
   (a) Integrated planning and anaysis of ISS OSS & OES Research Program
   (b) Works with payload funding Programs to identify and appropriately plan funding and workforce requirements to adequately support programmatic and technical tasks

   Outreach
   (a) Generate outreach materials including websites, borchures, papers, and presentations

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Functions Associated with
International Space Station R&D Program
(Research Program Office Worksheet)

					FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
	Research Program Management (RPO): Code M								
Code M (Contracted)	**Code M Research Program Office Support**	Contractor	MYE		4	6	6	7	7
		Cost @ 1.4			.56	.84	.84	.98	.98
	TASK DESCRIPTION	C/S			1	1	1	1	1
	Support Research Planning Working Group (RPWG) Processes	Basis of Estimate:			Contractor support for pressurized and unpressurise				
	(1) Supports Integration and management of ISS research resource requirements and objectives of the Code M Research Program Office								
	(2) Reviews the Integrated Payload Mission Model (IPMM) yearly								
	(3) Reviews the Tactical Resource Allocation Letter at PP-30								
	(4) Coordinates Code M tactical inputs to the Increment Definition & Requirements Document Planning Letter at PP-24								
	(5) Generates the Code M Payload Tactical Plan (PTP) at I-22								
	(6) Reviews changes to the baselined PTP that impacts research and/or research resource across several increments for Code M								
Code M (Contracted)	**Manager, Code M Research Program Office**								
	(1) Supports Integration and management of Code M-RPO research resource requirements and objectives starting at I-22 until the completion of postflight activities for a specific increment								
	(2) Serves as the point of contact for providing an integrated research status of on-orbit research activities for Code M								
	(3) Prioritize increment research within Code M								
	(4) Provide integrated research input to the RPWG for planning, replanning, and nominal and off-nominal operations								
Code M (Contracted)	**Code M SUPPORT (Science Applications Int'l Contract #_____; UPN 479-80)**								
	TASK DESCRIPTION								
	Space Station Payloads Office Support								
	Payload Program Management and Engineering Support								
	ISS Research Program Manager Support								
	Research Integration Support								
	Discipline Management support								
	Work with user sponsors, payload developers & users appropriate to this discipline to develop an integrated set of requirements on Space Station capabilities and processes which are needed by this discipline				FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
	Represent the ISS Payloads Office to the various science and programmatic working groups within the Research Discipline	Contract Cost	($M)						
	Work with user sponsors, payload developers & users appropriate to the discipline to develop integrated payload data necessary for inclusion into the payload strategic planning process								
	Commercialization								
	Assist in development of processes and policy for commercialization initiatives within NASA								
Code M (Contracted)	**TACTICAL SPACE UTILIZATION MANAGEMENT**								
			Total:						
Code M (Contracted)	**SPACE STATION PAYLOAD UTILIZATION**								

Payload Tactical Planning: Perform assessments and analyses to support payload manifesting, planning, and groundrules and constraints documentation

EXPRESS Pallet Oversight

1) Review design review plans, drawings/documentation, trades, analysis, and initiation of Review Item Discrepancies.

EXPRESS Rack Payload Analytical Integration

1) Review, track and status the capability to implement the EXPRESS Rack payload and integrated EXPRESS Rack compliment payload analytical integration process. Contractor developed models, tools and equipment necessary to implement these tasks shall be appropriately reviewed. Review the EXPRESS Rack Payload Accommodations Handbook (PAH), EXPRESS Rack Payload Interface Definition Document (IDD), EXPRESS Rack Payloads Generic Payload Verification Plan.

2) Provide support to EXPRESS RACK Payload Developers.(1) review EXPRESS Rack Payload specific ICDs and associated EXPRESS Rack Payload Verification Plans (2) review experiment and operations data and requirements, necessary for engineering and operations integration planning and execution, (3) participate in issue resolution associated with ICDs, PVPs and payload data files, (4) support payload verification planning, tracking, and statusing, and (5) support the review of individual sub-rack payload EXPRESS Integration Agreements (EIA).

3) Support the EXPRESS payload/experiment engineering integration and verification process at the EXPRESS payload-to-Rack and the EXPRESS payload compliment level. Review payload integration requirements and data. Review agreements with payload developers regarding interfaces, schedules, accommodations, resources requirements, operations support, and physical integration/test/checkout services to be provided.

EXPRESS PALLET PAYLOAD ANALYTICAL INTEGRATION

1) Review, track and status the capability to implement the EXPRESS Rack payload and integrated EXPRESS Rack compliment payload analytical integration process. Contractor developed models, tools and equipment necessary to implement these tasks shall be appropriately reviewed. Review the EXPRESS Rack Payload Accommodations Handbook (PAH), EXPRESS Rack Payload Interface Definition Document (IDD), EXPRESS Rack Payloads Generic Payload Verification Plan. 2) Provide support to EXPRESS Pallet Payload Developers, including: (1) review EXPRESS Pallet Payload specific ICDs and associated EXPRESS Pallet Payload Verification Plans, (2) review experiment and operations data and requirements, necessary for engineering and operations integration planning and execution, (3) provide issue resolution associated with ICDs, PVPs and payload data files, (4) support payload verification planning, tracking, and statusing, and (5) support development of individual sub-pallet payload EXPRESS Integration Agreements (EIA). 3) Support the EXPRESS pallet/experiment engineering

EXPRESS Pallet Payload Software Integration and Verification

(1) Review Pallet Payload Software Integration and Verification Documentation

Payload Training Operations: Includes the effort to support increment independent and increment dependent payload operations training for crew. Included in this category are those tasks related to supposing simulations.

Realtime, Non-Realtime, and Post Operations: Includes the tasks necessary to support real-time Payload Operations Integration Center (POIC) Cadre operations and the distributed operations IP cadre during real-time operations, support payload operations real-time planning, Included in this category are those tasks related to:

a)Mission Planning, including weekly planning and developing necessary planning products to support payload and payload support systems operations execution onboard and on the ground

b) Data Management, including the replanning of data/video systems operations

c) Operations Control, including supporting of POIC tasks required to support the execution of integrated station plans, operation of payload support systems, EXPRESS racks/pallets, coordination of payload operations via crew and ground control, and safety assurance of payload operations. Also includes support of response to system/payload anomalies and changes to the onboard executable plans.

d) Post Increment Support, including the preparation of lessons learned, and post-increment reports. Includes support of the post-mission video processing, duplication and distribution activities.

e) Operations integration, including payload safety support, configuration management, anomaly resolution, and offline special support.

Code M PAYLOAD OPS AND FACILITY ENGINEERING SUPPORT

		Task Description								
		(1) Support integration activities between payload developer and the Code M RPO								
		(2) Support major PD reviews (PDR, CDR, Ground Ops Reviews, Safety Reviews, SAR, etc.)								
		(3) Support major ISSP reviews (SCIR, IOR, CoFR, etc.)								
Code M (Contracted)		**Code M - Support the integration of multiple PD requirements into the ISSP. Includes flight integration, flight CoFR coordination, increment definition develop., detailed manifest tracking, logistics & maintenance, cargo integration assessments, & schedule development & assessments**								
		(1) Evaluate & status schedules for process definition, data delivery, hardware development, & documentation delivery								
		(2) Participate as required to represent the Code M RPO in working groups, boards, reviews, & Technical Interchange Meetings								
Code M (Contracted)		**PAYLOAD ENGINEERING & INTEGRATION**								
		(1) Support program reviews								
		(2) Complete CoFR tasks and endorsements								
		(3) Review & support payload planning activities including support to PMIT, IDRD, IPMM, topologies, etc.								
		(4) Provide real-time console support & payload anomaly resolution support during mission								
		(5) Provide support to the off-site reviews for TIMs, PDRs, CDRs, etc. - Travel								

Functions Associated with International Space Station R&D Program

(Research Program Office Worksheet)

NASA JSC (In-House)		Research Program Management (RPO): Engineering Reseach & Technology (ER&T)
	1.0.	**Program mgmt of flight projects**
	1.1.	Coordinate and baseline Level 1 Program requirements with Code M
	1.2.	Assure Program commitment agreements are maintained
	1.3.	Review Program/Project resources, objectives, and schedules
	1.3.1	- Review and approve Project Plans
	1.4.	Approval of Project authority to proceed at control Milestones (Requirements Review)
	1.5.	Represent the ER&T RPO to ISS payload strategic and tactical planning process
	1.6.	Assignment of flight resource allocation to projects
	1.7.	Develop and operate standardized Program Management tools for the ISS flight projects
	1.7.1	- Integrated Project Schedule Tools/ ISS Research Schedules
	1.7.2	- Budget Reporting Systems
	1.7.3	- Program Requirements Docouments and Flow down system
	1.7.4	- Program Review Processes and meetings
	1.7.5	- Configuration Management Plans and Processes
	1.8.	Program Review of Project technical, budget, and schedule
	1.9.	Representing status and issues to top center/agency management
	1.10	Prepare and manage budgets for:
	1.10.1	- Program Operating Plan
	1.10.2	- Center Operating Plan
	1.10.3	- Budget exercises and adjustments
	1.11	Manage budget interactions between Engineering and ISS.
	1.12	Develop and manage Technical Task Agreements (TTAs) with the ISS Research Office
	1.13	Apply Agency, JSC center and Directorate level goals and objectives to the flight projects including: safety, outreach, quality processes
	2.0	**ER&T RPO interfaces with the ISS Payloads Control Board**
	2.1	Develop and coordinate support for the other ISS boards,panels, and forums
	2.1.1	Represent ER&T to ISS Research Planning Working Group (RPWG)
	2.1.2	Support the development of the ISS RPWG manifest planning process
	2.1.3	Support the development of the Code M manifest planning process
	2.1.4	Develop ER&T strategic and tactical manifesting inputs to HQ Code M and JSC
	2.2.	Participate in ISS payload process definition
	2.3.	Consolidated cofiguration management and change impact assessment
	2.4.	Support Certification of Flight Readiness activities and endorsements
	3.0.	**ER&T Payloads Management**
	3.1.	Establish and approve Project Plans and requirements Level 2, 3
	3.2.	Coordinate external advisory groups chartered by Level 1
	3.3.	Establish and manage ageements (ITAs, Intercenter MOUs) with implementing organizations
	3.4.	Establish and manage project budgets
	3.5.	Coordinate internal and external payload configuration control and change control
	3.6.	Establish and manage integrated project schedules
	3.7.	Present the technical cost and management status of the ISS projects to JSC and ISS Program.

USG W/F	(FTEs)	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
		1	1.5	2	2	2.5
		.14	.21	.28	.28	.35

Cost@1.4

NASA JSC (Contracted)		RPO Contracted Support for Biomedical Research and Countermeasures Program
Contract #		**Contract Title and Performing Organization**
NAS9 19100		Science, Engineering, Analysis and Test Contract Lockheed Martin Space Operations
	4	Project and Program Management Support
	4.1	Project Management
	4.1.1	Project Coordination/Integration
	4.1.2	Manifests and Data Sets
	4.1.3	Project Documentation/IPS

Contract Cost	($M)	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
		0.25	0.27	0.30	0.50	0.50

4.1.4	Configuration Management
4.1.5	Public Information and Exhibit
4.1.6	Web Development and Maintenance
4.2.	ER&T Project Management Services
4.2.1	Project Management
4.2.2	Requirements Analysis and Planning
4.2.3	Document Development
4.2.4	Integrated Rack Verification
4.2.5	Experiment Verification
4.3	International Partner Coordination
4.3.1	IP Coordination
4.3.2	Requirements Definition
4.3.3	Document Development
4.3.4	Data Review and Representation at Design Reviews
4.4	Systems Engineering
4.4.1	Requirements Analysis and Planning
4.4.2	Payload Data Library - Command and Data Handling Data Set
4.4.3	Payload Data Library - KSC Support Data Set
4.4.4	Coordinate Experiment Verification
4.4.5	Experiment Development/ PI Coordination
4.5.2	Support Crew Training Process
4.5.3	Support Experiment Systems Development
4.6	Support Operations Requiremets
4.7	Support Training Requirements
5.0	**Hardware Development Projects**
5.1	**Systems Engineering**
5.1.1	Technical Assessment
5.1.2	Requirements Analysis and Planning
5.1.3	Engineering Management
5.1.4	Test Plans and Procedures
5.2	**Program Reviews**
5.2.1	Design Reviews
5.2.2	Configuration Control Board
5.2.3	Flight Safety Reviews
5.2.4	Ground Safety Reviews
5.2.5	Software Code Reviews

Appendix E:
ROM Costs Associated with Current Organization and Content for ISS Utilization and Research Program Management

February 2001 OMB Passback is not reflected (~ 37% overall cut)

Appendix E: ROM Costs Associated Current Organization and Content for International Space Station Utilization and Research Program Management

30 January, 2001 Revision

	FY 01	FY 02	FY 03	FY 04	FY 05
TOTAL IN-HOUSE WORKFORCE:	717	703	692	706	689
TOTAL IN-HOUSE COSTS:	89.6	96.0	110.1	107.9	108.0
TOTAL CONTRACT COSTS:	312.2	305.6	348.0	366.0	373.1
GRAND TOTAL COST:	**402.3**	**402.1**	**458.6**	**474.4**	**481.6**

- Costs represent RY $M order-of-magnitude based on 2000 POP process; no attempt was made to fine-tune estimates for study purposes.
- Field centers were asked to use local overhead rates in converting workforce to cost (1.4 multiplier used for HQ).
- Detailed breakouts in following pages.

Appendix E: ROM Costs Associated with Current Organization and Content for International Space Station Utilization and Research Program Management

30 January, 2001 Revision

	FY 01	FY 02	FY 03	FY 04	FY 05
Functions of Headquarters					
- In House Workforce	2.5	5.0	7.5	10.0	12.5
- In House Costs	0.35	0.70	1.05	1.40	1.75
- Contract Costs	19.57	39.33	42.15	42.67	48.39
-- Global Science & Technology (Peer Review)	0.42	0.83	1.25	1.67	2.09
-- Flight Principle Investigator Grants	19.15	38.50	40.90	41.00	46.30
total cost of function:	**19.92**	**40.03**	**43.20**	**44.07**	**50.14**
Functions of JSC/Space Station Program Office					
- In House Workforce	30	30	30	30	30
- In House Costs	3.33	3.33	3.33	3.33	3.33
- Contract Costs	30.40	26.97	21.93	17.33	20.85
-- United Space Alliance (Payload Ops & Facility Engr)	3.34	3.53	3.71	3.81	3.98
-- Boeing (Payload Engineering & Integration)	24.66	20.56	15.22	10.52	13.87
-- Lockheed-Martin (Payload Office Support)	1.10	1.58	1.60	1.60	1.60
-- Science Applications Int'l (Program Office Support)	1.30	1.30	1.40	1.40	1.40
total cost of function:	**33.73**	**30.30**	**25.26**	**20.66**	**24.18**

Appendix E: ROM Costs Associated with Current Organization and Content for International Space Station Utilization and Research Program Management

30 January, 2001 Revision

	FY 01	FY 02	FY 03	FY 04	FY 05
Functions of MSFC/Payload Operations					
- In House Workforce	185	151	134	129	117
- In House Costs	25.90	21.14	18.76	18.06	16.38
- Contract Costs	86.15	66.19	69.18	69.66	69.23
-- Boeing (Payloads Utilization)	61.15	48.43	49.60	49.44	49.09
-- Lockheed-Martin (Utilization & Mission Support)	25.00	17.76	19.58	20.22	20.14
total cost of function:	**112.05**	**87.33**	**87.94**	**87.72**	**85.61**
Functions of KSC/Payload Processing					
- In House Workforce	33	32	32	32	32
- In House Costs	4.62	4.48	4.48	4.48	4.48
- Contract Costs	8.99	7.79	8.48	10.18	12.74
-- Boeing (Utilization Support)	6.81	5.58	6.04	7.52	10.06
-- Dynamac (Life Science Support)	2.18	2.21	2.44	2.66	2.68
total cost of function:	**13.61**	**12.27**	**12.96**	**14.66**	**17.22**

Appendix E: ROM Costs Associated with Current Organization and Content for International Space Station Utilization and Research Program Management

30 January, 2001 Revision

	FY 01	FY 02	FY 03	FY 04	FY 05
Functions of MSFC/Research Program Office					
- In House Workforce (MSFC + GRC)	416.6	432.7	436.5	447.4	443.1
- In House Costs (MSFC+GRC)	50.38	60.67	76.01	73.92	75.67
- Contract Costs (MSFC + GRC)	135.21	130.63	156.36	172.03	167.49
-- Teledyne Brown	1.363	1.44	1.47	1.497	1.526
-- P&W	3.86	3.982	4.104	4.226	4.348
-- Boeing	1.605	1.642	1.679	1.05	1.085
-- CST	1.617	1.654	1.692	1.729	1.766
-- University of Alabama-Huntsville	0.23	0.237	0.244	0.251	0.259
-- Sverdrup	10.765	12.703	15.621	18.709	20.883
-- Computer Sciences Corp.	0.59	0.61	0.63	0.65	0.67
-- Unspecified Contract Cost	2.69	2.76	2.85	3.3	3.75
-- Federal Data Corporation	32.59	25.08	21.99	13.17	4.33
-- Unspecified Contract Cost	5.71	7.55	9.22	15.96	18.89
-- Federal Data Corporation & Zin Technologies	18.12	19.18	22.65	30.58	34.64
-- Hernandez Engineering	0.54	0.56	0.58	0.6	0.62
-- Science Applications International Corp.	0.135	0.14	0.145	0.15	0.155
-- ASRI	1.35	1.4	1.45	1.5	1.55
-- University Space Research Associates	10.665	12.6	15.515	18.6	20.77
-- Tennessee Valley Authority	0.135	0.14	0.145	0.15	0.155
-- New Contract	4.86	4.9	5.075	5.4	5.58
-- Wyle	10.85	10.73	26.38	29.3	23.1
-- Unspecified Contract Cost	8.837	7.448	9.008	6.577	4.701
-- bd Systems	1.866	0.885	1.602	2.941	3.138
-- Commercial Space Centers	16.829	14.991	14.313	15.685	15.572
total cost of function:	**185.59**	**191.30**	**232.37**	**245.95**	**243.16**

Appendix E: ROM Costs Associated with Current Organization and Content for International Space Station Utilization and Research Program Management

30 January, 2001 Revision

	FY 01	FY 02	FY 03	FY 04	FY 05
Functions of JSC/Research Program Office					
- In House Workforce	16	16	15	13	13
- In House Costs	2.24	2.24	2.1	1.82	1.82
- Contract Costs	20.18	19.23	29.13	29.01	29.01
-- Lockheed-Martin (Program/Project Mgmt Support)	20.18	19.23	29.13	29.01	29.01
total cost of function:	**22.42**	**21.47**	**31.23**	**30.83**	**30.83**
Functions of ARC/Research Program Office					
- In House Workforce	32.05	33.4	33.7	42	38.18
- In House Costs	2.49	3.09	3.97	4.50	4.09
- Contract Costs	10.93	14.32	19.61	23.61	23.91
-- Lockheed-Martin (Project Support)	7.28	9.86	13.89	15.02	12.94
-- Dichroma (Resources Support)	0.22	0.23	0.23	0.24	0.25
-- Bionetics (Animal Care Facility)	0.75	0.82	0.95	0.97	1.01
-- Hernandez Engineering (Safety & Mission Assurance)	0.18	0.29	0.39	0.45	0.26
-- Materials (EUE/EGE/Shipping, Facil. Sprt, etc.)	2.50	3.12	4.15	6.93	9.45
total cost of function:	**13.42**	**17.41**	**23.58**	**28.11**	**28.00**

Appendix E: ROM Costs Associated with Current Organization and Content for International Space Station Utilization and Research Program Management

30 January, 2001 Revision

	FY 01	FY 02	FY 03	FY 04	FY 05
Functions of GSFC/Research Program Office					
- In House Workforce					
- In House Costs		*ROM estimate; details not available*			
- Contract Costs					
total cost of function:	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Functions of OSF/Research Program Office					
- In House Workforce	2.0	2.5	3.0	3.0	3.5
-- OSF Payloads	1.0	1.0	1.0	1.0	1.0
-- Engineering Research	1.0	1.5	2.0	2.0	2.5
- In House Costs	0.28	0.35	0.42	0.42	0.49
-- OSF Payloads	0.14	0.14	0.14	0.14	0.14
-- Engineering Research	0.14	0.21	0.28	0.28	0.35
- Contract Costs	0.81	1.11	1.14	1.48	1.48
-- OSF Payloads	0.56	0.84	0.84	0.98	0.98
-- Engineering Research	0.25	0.27	0.3	0.5	0.5
total cost of function:	**1.09**	**1.46**	**1.56**	**1.90**	**1.97**

Appendix F:
Definition of Inherently Governmental Functions

Appendix F: Definition of Inherently Governmental Functions

- **41 U.S.C. § 405, OMB Circular No. A-76**

- **<u>Definition</u>: "A function that is so intimately related to the public interest as to mandate performance by Government employees."**
  - Act of Governing (i.e. discretionary exercise of Government authority)
  - Monetary actions and entitlements

- **<u>Accountability</u>: Executive Branch policy is to ensure Government action is taken as a result of informed, independent judgments made by Government officials who are ultimately accountable to the President.**

Appendix F: Definition of Inherently Governmental Functions, continued

- **<u>Agency Determination</u>: Agency is responsible for determining whether a function is an inherently Government function. Agency decisions may be reviewed and, if necessary, be modified by appropriate OMB officials.**

- **<u>Degree of Reliance/Oversight</u>: The greater the degree of reliance on a contractor, the greater the need for Agency oversight. Agency's decision of the number of Government officials needed for oversight should consider:**
  - Scope of activity in question
  - Technical complexity of the project and its components
  - Technical capability, numbers and workload of Federal oversight officials
  - Inspection techniques available
  - Importance of the activity

Appendix G:
Full Text of Applicable Congressional Legislation and Excerpts from the White House Budget Blueprint

APPROPRIATIONS SIDE

The Act

H.R. 4635, Appropriations Act for NASA for Fiscal Year 2001, and for other purposes. [The Act incorporates H.R. 5482 – the House Bill]

[H.R. 5482, Page 111]
"No funds in this or any other Appropriations Act may be used to finalize an agreement prior to December 1, 2000 between NASA and a non-government organization to conduct research utilization and commercialization activities of the International Space Station."

The Conference Report

Conference Report on H.R. 4635, Department of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 2001 [18 October, 2000].

[Page 153-154]
"The conferees do not agree with the Senate requirement for a blueprint plan that identifies lead and complimentary [sic] universities that will coordinate with NASA for science disciplines that will be the focus of research after assembly of the ISS is complete. The conferees direct NASA to submit a plan to the committees on Appropriations of the House and the Senate which includes various ISS management options. The conferees agree that such a plan will give the Congress the information it needs in order to determine what management structure is best and most able to deliver the benefits of the ISS. The Committee on Appropriations will require this information prior to approving funding for any final agreement. Therefore, the conferees have included an administrative provision which prohibits the expenditure of funds prior to December 1, 2001 for finalizing an agreement between NASA and a non-government organization to conduct research utilization and commercialization management activities of the ISS."

AUTHORIZATION SIDE

The Act

H.R. 1654, Authorization Act for NASA for Fiscal Years 2000, 2001, and 2002, and for other purposes.

[Page 1654-14]
"Sec. 205. Space Station Research Utilization and Commercialization Management

(a) Research Utilization and Commercialization Management Activities. – The Administrator of NASA shall enter into an agreement with a non-government organization to conduct research utilization and commercialization management activities of the ISS subsequent to substantial completion as defined in section 202(b)(3). The agreement may not take effect less than 120 days after the implementation plan for the agreement is submitted to the Congress under subsection (b).

(b) Implementation Plan. – Not later than September 30, 2001, the Administrator shall submit to the Committee on Commerce, Science and Transportation of the Senate and the Committee on Science of the House of Representatives an implementation plan to incorporate the use of a non-government organization for the ISS. The implementation plan shall include –

(1) a description of the respective roles and responsibilities of the Administration and the non-government organization;
(2) a proposed structure for the non-government organization;
(3) a statement of the resources required;
(4) a schedule for the transition of responsibilities; and
(5) a statement of the duration of the agreement."

The Conference Report

Report 106-843, Conference Report to accompany H.R. 1654.

[Page 34]
"Section 205. Space station research utilization and commercialization management. The conferees further note that as the ISS approaches full assembly, NASA must begin to focus on establishing an organizational infrastructure capable of ensuring that the ISS is fully and effectively utilized for scientific and engineering research. The conferees commend NASA for initiating a review of management structures by the National Research Council's Space Studies Board and Aeronautics and Space Engineering Board. The national Research Council recommended that a "consortium led by a research institution or group of institutions, governed by an independent board of directors, managed by a strong scientific director, and guided by an advisory process that is broadly representative of the research community" be charged with managing scientific activities aboard ISS. The conferees further note that NASA has had success with utilizing non-government organizations for the operation of major scientific research programs, such as the Hubble Space Telescope. Conferees are also concerned about commercialization opportunities aboard the Space Station. The non-government organization should ensure that equitable opportunities exist for industry to participate in activities. NASA should work with the Department of Commerce's Office of Space Commercialization to ensure that the selected non-government organization has adequate expertise in this area. The conferees therefore direct NASA to enter into an agreement with a non-government organization that will manage the research utilization and commercialization aspects of the ISS. The non-government organization should be selected competitively.

A Blueprint for New Beginnings: Overview of the President's Ten Year Budget Plan

"***International Space Station:*** NASA will undertake reforms and develop a plan to ensure that future Space Station costs will remain within the President's 2002 Budget plan. Key elements of this plan will: restore cost estimating credibility, including an external review to validate cost estimates and requirements and suggest additional options as needed; transfer Space Station program management reporting from the Johnson Space Center in Texas to NASA Headquarters until a new program management plan is developed and approved; and open future Station hardware and service procurements to innovation and cost-saving ideas through competition, including launch services and a Non-Government Organization for Space Station research."

A Blueprint for New Beginnings: Overview of the President's Ten Year Budget Plan, Section 33, page 155, March 2000

Appendix H:
Memorandum of 16 November 1998 (with Attached Reference Model) from the Associate Administrators, Human Exploration and Development of Space Enterprise on "Non-Government Organization for Space Station Utilization".

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of: US

NOV 16 1998

TO: Distribution

FROM: M/Associate Administrator for Space Flight
U/Associate Administrator for Life and Microgravity Sciences and Applications

SUBJECT: Non-Government Organization (NGO) for Space Station Utilization

Ensuring a national return-on-investment from the International Space Station represents an unprecedented challenge in terms of achieving the most effective balance between public and private management. The prospect of employing a NGO to manage the US share of space station utilization and perform payload integration, in close association with an investment trust capable of nurturing private entrepreneurship, offers potential benefits. NASA is firmly committed to pursuit of this potential.

Based on successful experiences with the Space Telescope Science Institute, Jet Propulsion Laboratory and a range of non-government centers, institutes and private consortia, NASA intends to thoroughly evaluate alternative institutional arrangements which can most effectively leverage the specialized talents of government, industry and academia. Toward this objective we are initiating the development and broad review of a reference model for a NGO to meet these purposes. A first draft is enclosed to serve as a point-of-departure for further discussion.

We are requesting you designate, by November 30, 1998, a point-of-contact for your respective organizations to participate in the advancement of this important initiative. The Headquarters lead will be Mr. Mark Uhran. Since this activity represents a key evolutionary component of our overall approach to commercial development of the Space Shuttle fleet and International Space Station,

Mr. Uhran will also assume responsibility for this effort on behalf of the Human Exploration and Development of Space Enterprise.

We ask that you please provide your full support and valuable perspectives to these challenging tasks.

Arnauld E. Nicogossian

Joseph H. Rothenberg

Enclosure

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TA/Mr. Newberry
KSC/CD/Mr. Bridges
MSFC/DA01/Mr. Stephenson
SSC/AA00/Mr. Estess

REFERENCE MODEL

A NON-GOVERNMENT ORGANIZATION (NGO) FOR SPACE STATION UTILIZATION MANAGEMENT

Discussion Draft

October 1998

NASA Headquarters Point-of-Contact
Mark Uhran
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muhran@hq.nasa.gov

"K.E. Tsiolkovsky once wrote: 'The idea, fantasy, or fairy tale invariably comes first. Following this is the stage of scientific investigation. Last comes the crowning achievement of the idea'. From this undoubtedly accurate summarization we need to extract the concept of 'scientific investigation' and examine it more carefully. It is not as easy as it would first appear. Regarding the first step -- the idea, fantasy, or fairy tale – everything is clear. Man has always dreamed of achieving the unattainable (and still does today). Without dreams and the efforts made to attain them progress would be unthinkable. Even if the dream is initially unattainable, this does not mean that it may never be realized. Although harsh reality may intervene repeatedly to prove the impossibility of realizing the dream as yet, reality cannot force people to forget or discard it. Instead the dream is transferred to an original data bank: the fairy tale. There it lives on, continually reminding people of its existence, seeming to await the time when its realization will no longer be impossible.

A more complicated matter is that which Tsiolkovsky called 'scientific investigation.' This stage begins when the general development of scientific knowledge has reached a level of sophistication sufficient to allow someone to appear who is able to envision a way of realizing the dream (very often it is several people who live far apart and who work independently of one another). During this stage the dream begins to move towards reality, but it does not go beyond the discovery that what everyone has heretofore considered an unattainable -- and therefore empty -- dream is in fact possible after all."

from Herman Oberth: The Father of Space Flight
Boris V. Rauschenbach, 1994

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The purpose of this reference model is to initiate a discussion of a new management approach to R&D in low-earth orbit consistent with the present and future constrained budget challenges. The objective is to create a non-government organization (NGO) for accomplishing an aggressive science, technology and commercial development program while simultaneously limiting government functions to policy and oversight.

The ultimate success of the orbital R&D program depends equally on the efficient operation of the space and ground assets (laboratories, spacecraft, space station...) and on the optimal utilization of the assets by the R&D community. The utilization component must be managed in a manner which ensures productivity of the space station and other future ground and space assets.

The framework for a NGO should be based on a management structure that is representative of, and responsive to, a broad base within the utilization community. This management structure must possess a high degree of stability that will permit it to undertake and complete an integrated program over the expected life of the space station and associated assets.

VISION

- A dedicated NGO that will develop the low Earth orbit environment for all users (scientific, technological, and commercial), in order to advance scientific knowledge, technological capability, and commerce on Earth as a gateway to 21st Century exploration and development of space.

GOALS

1. Complete an operational concept and establish a NGO in the United States by FY 2000.
2. Employ the NGO to revolutionize the approach to research, exploration and development of space through increased academic cooperation and industrial collaboration.
3. Offer to expand the initial organization to accommodate international aspects in conjunction with completion of the International Space Station.

PRINCIPAL PURPOSES

1. Engage the science community in a cooperative endeavor to aggressively expand the scientific foundation for human exploration and development of space.
2. Engage the engineering community in a collaborative endeavor to aggressively expand the technological capability of the International Space Station and enable future human exploration and development of space.
3. Disperse information on the resulting scientific and technological achievements for the benefit of life on Earth, while stimulating the commercial community to expand the global economy in space products and services.

WORKING PRINCIPLES

(a) **Scope of R&D Program Management**

- The scope could include all R&D projects which utilize a US share of the International Space Station.
- Collaborating and supporting research using other NASA ground, air, and space assets could be included by written agreement.
- Basic and applied, flight and ground, research in science and technology could be pursued with strategic direction in selected areas such as, but not limited to:
  - biology, chemistry and physics
  - medical research and applications
  - environmental sciences and life support technologies
  - spacecraft system, subsystem and component engineering
  - space processing of materials
  - biotechnology
  - remote sensing
  - communications

- The scientific research program could be managed by the NGO and the research projects could be conducted by distributed laboratories, institutes, and research and development facilities in the academic, industrial, and government sectors.

- The technology development program could be managed by the NGO and the development projects could be conducted by distributed laboratories, institutes, and research and development facilities in the academic, industrial, and government sectors.

(b) **Scope of Commercial Program Development**

- Proof-of-concept or full-scale private commercial projects could be administered by the NGO in accordance with national policy.
- The policy could include specific provisions to address totally subsidized, partially subsidized, and non-subsidized entrepreneurial endeavors.
- A value-based pricing schedule could be established during the early operations period, with a transition to cost recovery when commercial enterprises become profitable.

- In the event recovery of public operating costs prohibits profitable operations, or the supply of station accommodations is exhausted, commercial enterprises could relocate to privately owned and operated space platforms.

(c) **Role in Space Exploration**

- The NGO could undertake R&D projects, sponsored by NASA, with applications to the human exploration and development of space enterprise.

(d) **Program and Project Funding**

- Funds could be provided by both public and private sources.
- Public sources could include government agencies which serve as catalysts, such as, but not limited to, NASA.
- Private sources could include philanthropies, industrial organizations, university/industrial consortia, financial institutions, and venture capitalists.
- A privately managed space trust corporation could be created to operate in close association with the NGO, in order to assist in the evaluation and financing of entrepreneurial ventures.

(e) **Program and Project Opportunities**

- Scientific and technological R&D opportunities, which are funded through public monies could be announced on a regular periodic basis and could be open to competition among academic, industrial and government scientists and engineers world-wide.
- Commercial opportunities could be open on a continuous basis for proposals by private organizations.
- Since the magnitude of opportunity will be constrained by available station resources and accommodations, an allocation policy could be established by the NGO Board of Directors.

(f) **Program Integrity and Project Selection**

Scientific Research:

- Projects could be externally peer reviewed to the highest standards and rated, prior to selection by the NGO Science Program Office based on scientific merit.
- The selections could conform to the programmatic objectives and funding levels of the respective sponsors.

Technology Development:

- Projects could be internally reviewed by the NGO Technology Program Office and selected based on engineering feasibility.
- The selections could conform to the programmatic objectives and funding levels of the respective sponsors.

Commercial Ventures:

- Projects could be administered by bonded personnel in the NGO Commercial Program Office.
- Selection criteria could vary with the level of public subsidization.
- Non-subsidized ventures could be selected on the basis of the magnitude of private capital at risk; partially subsidized ventures could be rated by the ratio of private-to-public funding, and; fully subsidized ventures could be selected at the discretion of the government sponsor.
- The NGO could be required by the Board of Dirctors to administer a portfolio with minimum shares in each of these categories.

(g) Notification of Project Awards

- The NGO could issue formal notifications of award, subject to the principles on program integrity and project selection.
- In cases of commercial ventures, with private funding, notifications could be confidential by prior request.

(h) Distribution of R&D Project Awards

- Funds could be allocated for award to both NGO-resident (e.g., 10%) and non-resident (e.g., 90%) scientists and engineers on a competitive basis.

Open Item: do the advantages associated with some degree of resident R&D outweigh the disadvantages?

Advantages include:

(1) the ability to attract a high-quality, professionally recognized science and engineering staff;

(2) the ability of the resident NGO staff to work at a peer level with the non-resident R&D community and to serve a "smart buyers";

(3) the increased professional credibility of the NGO; and

(4) the incentive created by broadening the NGO's scope of operations to include resident R&D.

Disadvantages include:

(l) the potential appearance, or actual existence, of a conflict of interest in the resident and non-resident R&D award process.

(i) **R&D Results**

Proprietary Results:

- All R&D results and information could be the property of the funding source and handled without public disclosure, as addressed through binding agreement among the parties.

Non-Proprietary Results:

- All research results could be treated as within the public domain.
- Every research project awarded could be required to conform to the data policy of the funding source.
- All reports could be archived at the NGO and available on-line through international telecommunications networks.

(j) **Resident Staff**

- Resident staff could be representative of the core science and engineering disciplines with visiting senior scientists and engineers in selected specialties.
- All visiting staff could be fully authorized to make decisions and enter into agreements on the behalf of their home institutions.
- Options for a government presence could include a liaison office limited to on-site representatives of the program sponsors, or visiting Senior Scientists and Engineers.

(k) **Project Scientists and Project Engineers**

- Every R&D project could include the designation of a resident NGO staff member as Project Scientist or Project Engineer.
- The role of the NGO Project Scientists and Engineers could be to assist non-resident flight research projects through the steps associated with physical, analytical, and operations integration of flight research projects.

(l) **Research Facilities**

- The NGO could be based in a physical facility (public or private) with either on-site, or geographically dispersed, laboratory assets, or both.
- It could employ state-of-the-art international telecommunications networks for communications with associated organizations from either the public or private sectors.

(m) **Laboratory Assets**

- Existing government assets could be transferred to the NGO for management or made available through negotiated agreement.
- These assets could include both space and ground-based facilities.
- Development of new assets, including flight instruments and facilities, could be performed by the NGO or placed under NGO management.

(n) **Payload Physical, Analytical, & Operations Integration**

- Functions could be performed by the NGO, or a mission support contractor to the NGO.
- Orbital real-time operations replanning could be performed by the space station operator in cooperation with a Mission Director and R&D Working Group assigned by the NGO.
- The NGO could perform all tactical planning for R&D operations on flight and ground systems.

(o) **Organizational Interfaces**

- The NGO could interface with public and private funding sources for space station related policy, oversight and strategic direction;
- with the space station operator (public or private) for payload accommodations and system operations integration;
- with world-wide academic, industrial and government organizations for space station R&D project performance;
- with private organizations for commercial ventures, and;
- with an external advisory committee for independent annual review.

(p) **Instruments of Agreement**

- Agreements between the NGO and associated organizations could be established through a variety of instruments and would be limited only by public law.
- These instruments could be tailored on a case-by-case basis to best protect the interests of the parties.
- The instruments could include, but would not be limited to:

  - memoranda of agreement
  - terms of reference
  - contracts
  - grants
  - joint endeavor agreements
  - memoranda of understanding
  - cooperative R & D agreements
  - space system development agreements
  - industrial guest investigator agreements
  - intergovernmental personnel agreements

(q) **Program Planning**

- The NGO could develop projections of available orbital accommodations and resources based on information supplied by the space station operator.
- The NGO could formulate options for accommodating research requirements, maintain a dynamic Mission Model, and produce an annual one-year R&D Program Plan and an annual one-year Commercial Prospectus.
- The Plan and Prospectus could be reviewed and approved by the NGO Board of Directors at an annual meeting.
- The annual Plan and Prospectus could be formulated within the broader context of the funding sponsors' long-term strategic plans and commitments.

(r) **Board of Directors**

- The NGO board could include academic, industrial, and government directors.
- Voting shares on the board could correspond to annual funding commitments of the sponsoring directors.
- The Board could ensure the NGO operates in accordance with its charter and within the policy established by the sponsoring directors.

(s) **Accountability**

- The NGO could produce quarterly reports on cost, schedule and performance status for every active R&D project and an annual report on achievements for every active R&D program.
- All reporting could be subject to proprietary information restrictions.
- The quarterly and annual reports could be the primary products delivered to the funding sponsors (e.g., NASA, or other public and private program sponsors).

(t) **Advisory Committees**

- An independent external advisory committee could perform periodic independent reviews of NGO progress and achievements.
- In the case of the United States, independent advice and guidance could also be provided by the standing boards and committees of the National Research Council.
- The NASA Advisory Council, and its standing committees and subcommittees, could perform periodic reviews at the request of the NASA program sponsoring offices.

(u) **Educational Responsibilities**

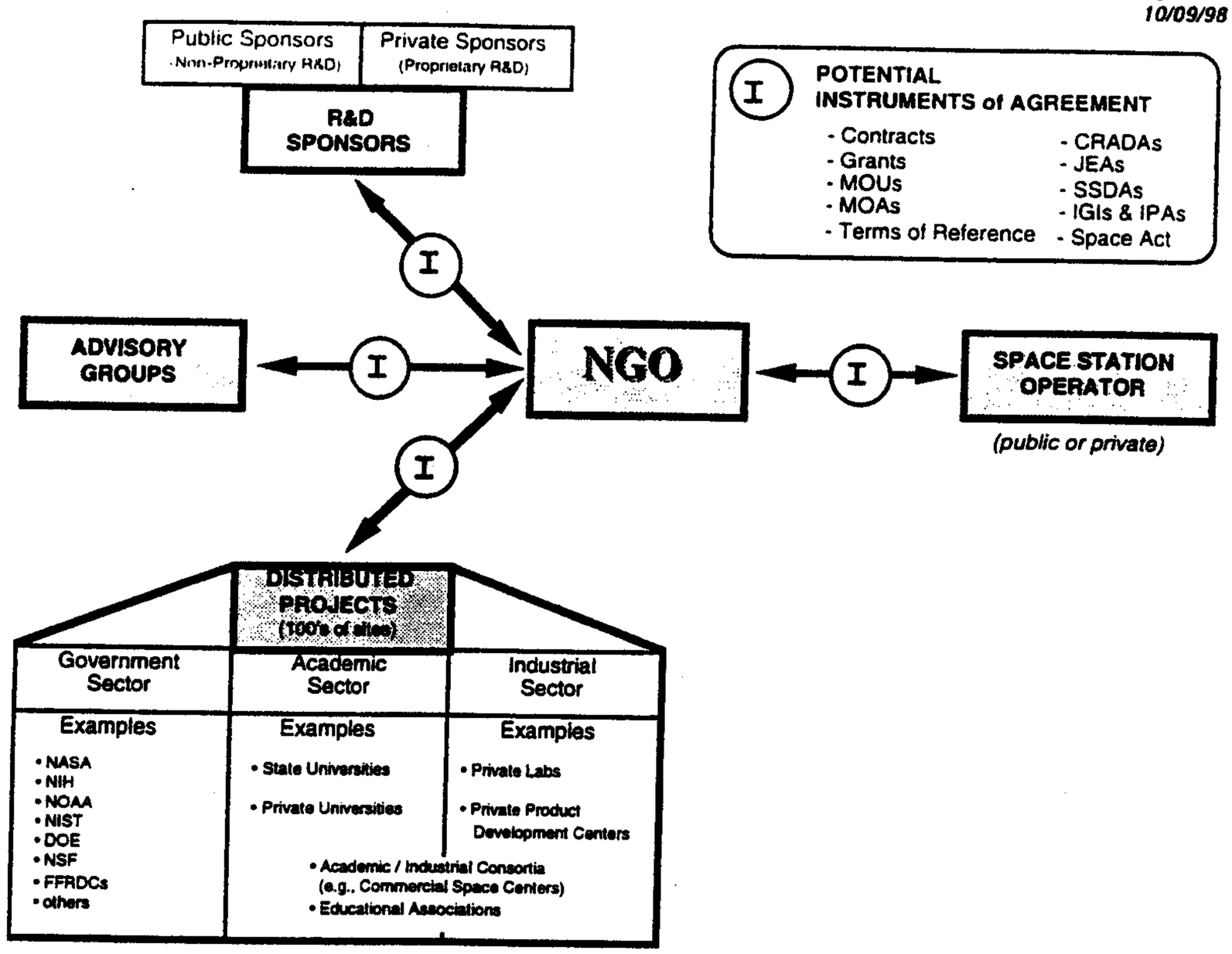
- The NGO could include a dedicated Education Office with responsibility for communicating the beneficial attributes of the orbital environment and the progress of the R&D program to public and private audiences at all levels in the academic, government and industrial sectors.
- The costs associated with this function could be funded by the space station owners and operators.

(v) **Criteria for Institute Site Selection**

- Criteria could include,
  - availability of existing facilities and skilled personnel;
  - geographic attractiveness for personnel relocation;
  - easy access for program sponsors and project managers;
  - potential for evolution to international operations;
  - association with an internationally recognized university;
  - support of the local and state governments; and
  - proximity to advanced telecommunications resources.

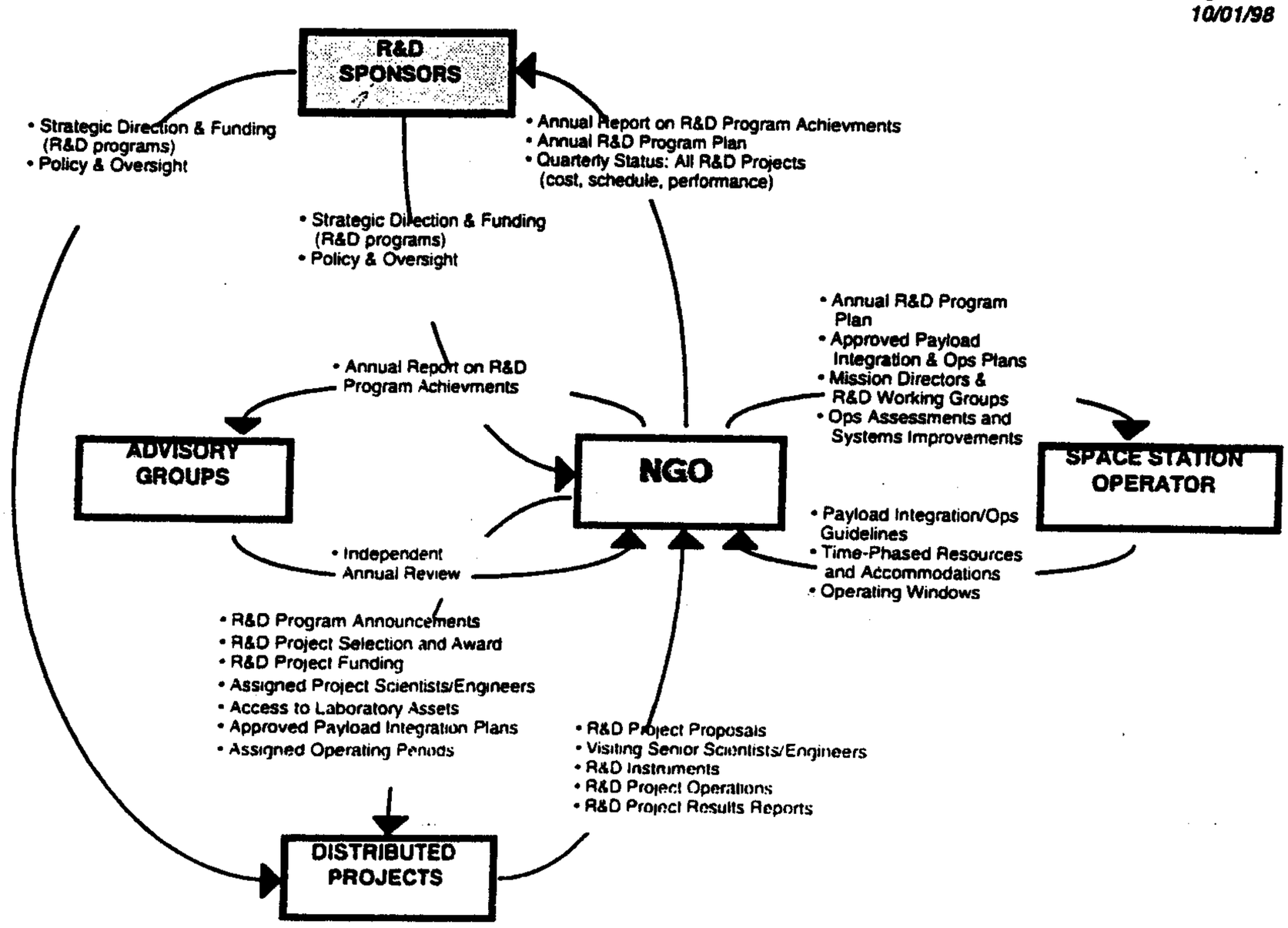
TERMINOLOGY

Working Draft
10/09/98



TRANSACTIONS

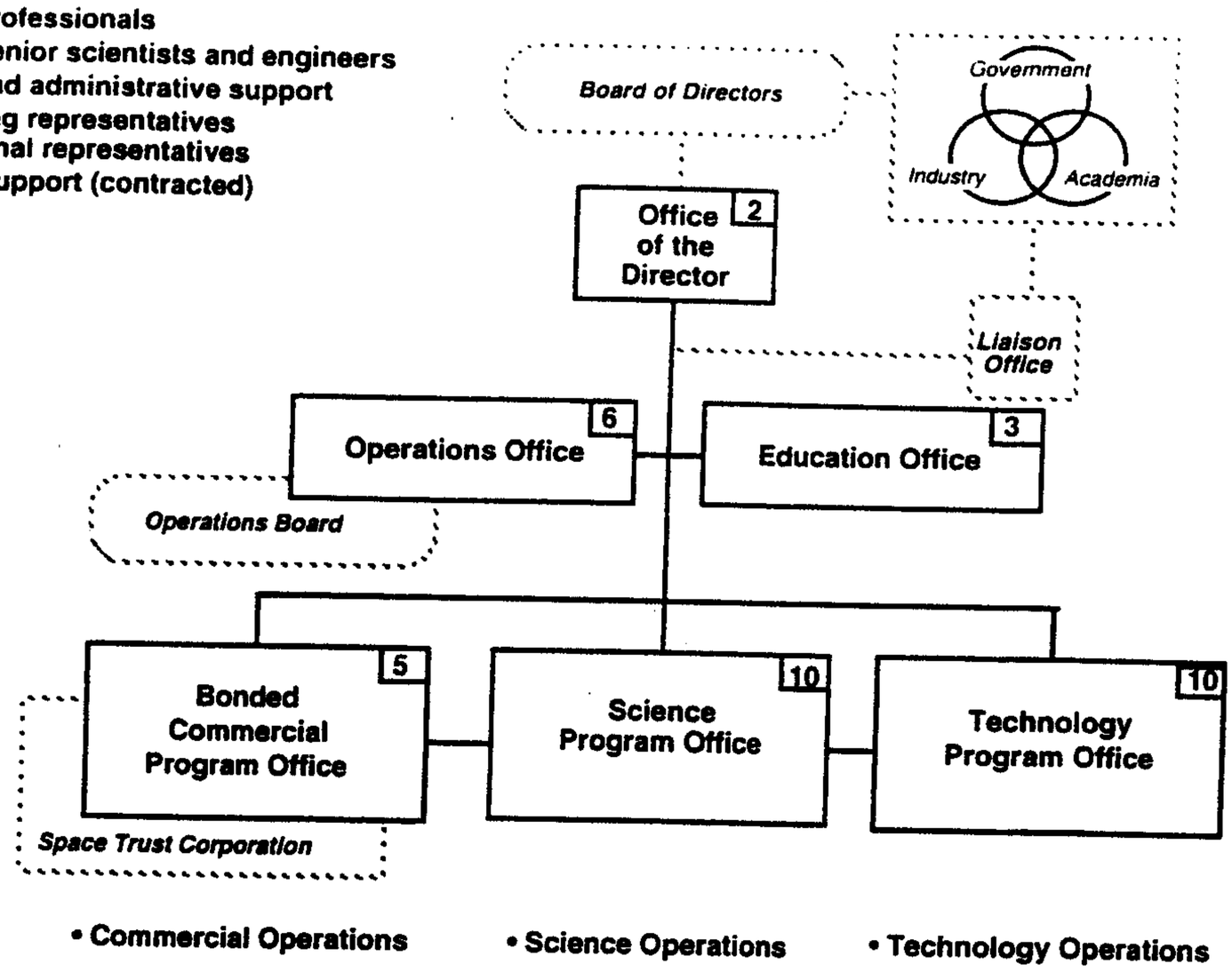
Working Draft
10/01/98



ORGANIZATION

Working Draft
10/09/98

36 Resident Professionals
+ visiting senior scientists and engineers
+ clerical and administrative support
+ sponsoring representatives
+ international representatives
+ mission support (contracted)



FUNCTIONS

Working Draft
10/09/98

Office of the Director
- selected by the Board of Directors
- utilization program development
- management and administration

Board of Directors
- annually reviews & extends research programs
- communicates policies of the sponsoring organizations
- approves Annual R&D Program Plan and Commercial Prospectus

Liason Office
- staffed by national and international program sponsors
- represents sponsors and provides oversight

Education Office
- develops collateral products for education
- communicates attributes of orbital environment and achievements of the R&D programs

Operations Office
- strategic, tactical, and contingency planning
- manages resource allocations & mission model
- manages mission support contract
- produces annual R&D Program Plan and annual Commercial Prospectus

Operations Board
- selects Project Scientists & Engineers for residency
- approves visiting Senior Scientists & Engineers
- assigns Mission Directors and R&D Working Groups
- approves payload integration plans & flight assignments
- assigns operating periods & accommodation sites

Science Program Office
- scientific research program management
- conducts nominal share of scientific research
- establishes science project queue
- defines requirements for flight instruments
- procures/develops flight instruments
- manages analytical, physical and operations integration
- manages science results archive

Technology Program Office
- technology development program management
- conducts nominal share of technology development
- establishes technology project queue
- defines requirements for flight equipment
- procures/develops flight equipment
- manages analytical, physical and operations integration
- manages technological results archive

Bonded Commercial Program Office:
- implements commercial policy of government sponsors
- liaisons to private sector and Commercial Space Center network
- establishes commercial project queue
- manages analytical, physical and operations integration
- maintains proprietary procedures and protocols

Space Trust Corporation
- manages private capital funds
- selects private ventures for funding with equivalent rigor to private capital markets
- finances qualified private ventures, if necessary

RESPONSIBILITIES

Working Draft
10/09/98

NASA

Headquarters

STRATEGIC NASA R&D PROGRAM PLANNING:
- Strategic direction and funding of R&D programs.
- Policy formulation.
- Oversight of NGO.

Field Centers

R&D PROJECT MANAGEMENT
- specific NASA projects

DEVELOPMENT
- Manage and conduct design, development, test, and evaluation of advanced spacecraft system projects for NASA Enterprises.
- Manage and conduct design, development, test, and evaluation of current space station payload facility class hardware, through to completion and on-orbit test and verification.

OPERATIONS & MAINTENANCE (potential GO-CO elements)
- Manage safe operation and maintenance Space Shuttle and International Space Station.
- Manage safe operation and maintenance of government ground-based laboratories, control centers, and facilities.

HUMAN RESOURCES (potential GO-CO elements)
- Maintain occupational safety and health of flight crews and ground personnel.
- Manage & conduct training of flight crews and ground personnel.

NGO

STRATEGIC SPACE STATION UTILIZATION PLANNING
- Strategic utilization planning for science, technology and commercial programs/projects.
- National & International collaboration and coordination for scientific research and technology development programs.
- Integration of station-wide utilization requirements.
- Definition and assignment of orbital operating periods to R&D projects.
- Mission modeling, resource allocation, and bartering.
- Utilization advocacy and education.

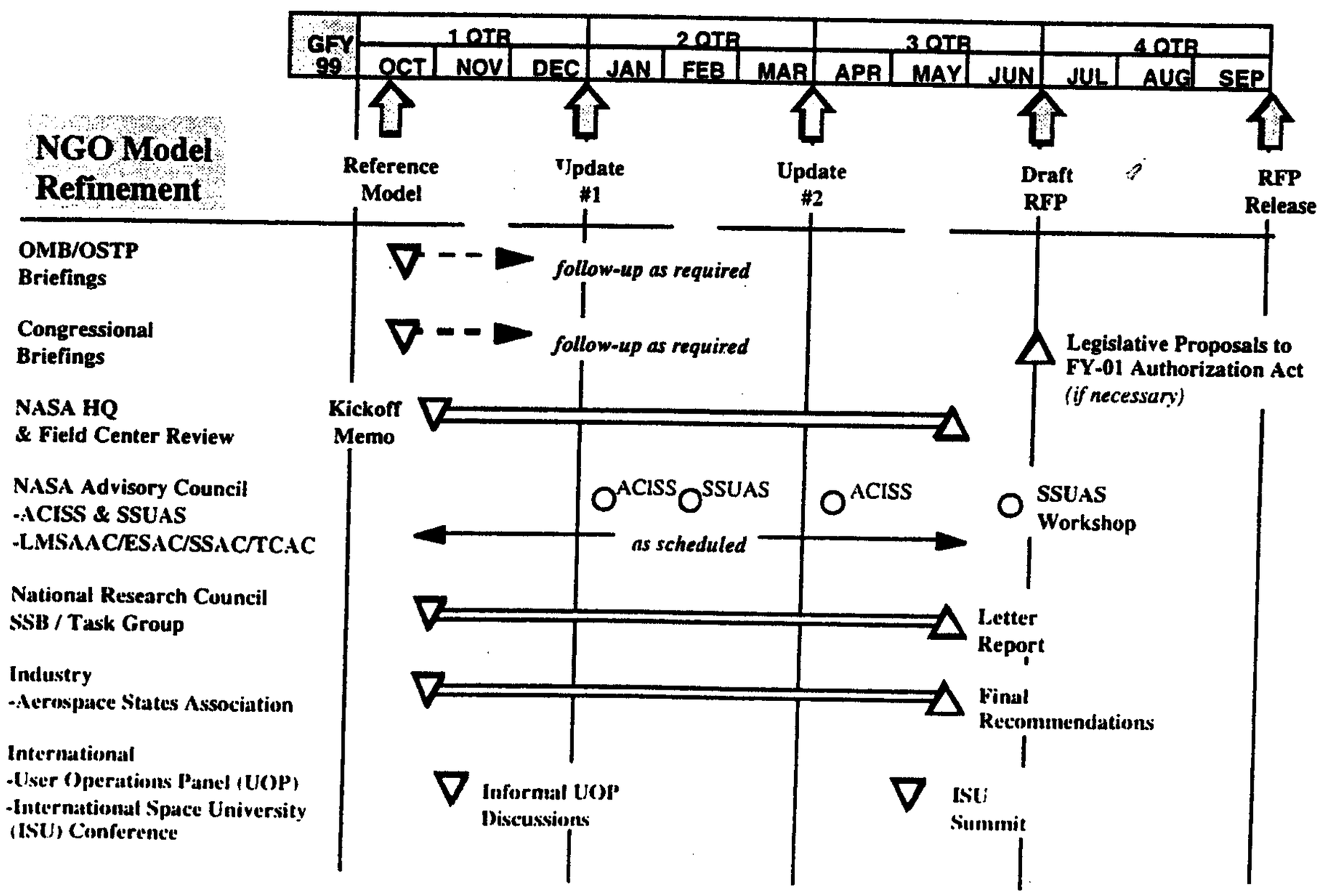
SPACE STATION UTILIZATION PROGRAM MANAGEMENT
- station-wide management integration for US programs.
- US interface to international partner utilizationprograms for mission integration.

DEVELOPMENT
- Manage development of requirements and specifications for next generation government sponsored payload hardware.
- Manage design, development, test and evaluation of future government sponsored payload elements.
- Develop recommendations for flight/ground system improvements.

OPERATIONS & MAINTENANCE
- Manage payload flight / ground systems operations & maintenance.
- Manage payload analytical, physical and operations integration.
- Represent US interests in international forums and provide Mission Director(s) and R&D Working Groups.
- Develop requirements for payload crew skills and qualifications.
- Manage payload data processing, data distribution, and results archiving.

STAKEHOLDER VETTING

Working Draft
10/09/98



DRAFT

DRAFT

Concept Development Review with Center Directors

Non-Government Organization (NGO) to Manage International Space Station Utilization

9 - 10 March, 2000

Contents:

- Objectives
- Actions Completed in CY-99
- An Approach to Detailed NGO Definition

HQ POC : Mark Uhran
MSFC POC : Irene Taylor
JSC POC : Jessica Kite
[illegible] POC : [illegible]

NASA Objectives *

- To facilitate the pursuit of flight research and make the complex operating environment associated with the International Space Station transparent to the end-user.

- To reduce the end-to-end cycle time associated with the announcement, selection, development, flight, and achievement of results for research and development endeavors on the International Space Station.

- To increase the long-range productivity of research and development by most effectively integrating and advocating government and industry utilization of the International Space Station.

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* It is not envisioned that a NGO would manage the research; but that it could integrate and most efficiently plan for broad-based utilization. Management of the research programs would remain as present.

Actions Completed in CY-99

- At NASA request, The National Research Council formed a *Task Group on Institutional Arrangements for Space Station Research* and delivered report in December 1999.
  - Report generally supports NGO concept and clears path for further definition by NASA.
  - Many recommendations are well beyond the NASA objectives.
  - No obligation to NASA to embrace every NRC recommendation in full.

- In parallel with NRC work, a trade study on *Options for Managing Space Station Utilization* was undertaken to objectively identify alternative NGO architectures.
  - Competitive procurement of a direct contract involving a consortium appears to be the most tested and historically effective option, if we proceed.
  - <u>Considerable work remains</u> to clearly establish the scope of functionality, organizational interfaces, transition schedule and budget.

- No changes to current baseline are anticipated until the scope of functionality,organizational interfaces, transition schedule and budget are fully defined and understood by all affected parties.

An Approach to Detailed NGO Definition

- **Functional Definition Team**
  - Establish multicenter core team to produce detailed definitions of utilization program functions.
  - Employ components of existing budgets as points-of-reference.

- **Functional Allocation Options**
  - Expand core team to develop series of options, with supporting rationale, which allocate functions to specific organizations:
    - -- headquarters offices (codes M, S, U, Y);
    - -- center offices (JSC, MSFC, KSC, ARC, GRC, JPL); and
    - -- representatives of science working groups on an advisory basis.
  - Develop criteria to evaluate options.

- **Validation and Review Cycle**
  - Review functional definitions, allocation options, proposed implementation schedules and budget plans with senior management.
  - Go / no go decision by Associate Administrators for Human Exploration and Development of Space Enterprise.
  - Following resolution of issues and internal agreement, review with:
    - -- internal stakeholders (NASA Science Council), and
    - -- external stakeholders (OMB, OSTP, Congressional Staff, NASA Advisory Council).

Schedule

Target	
3/15	Brief headquarters and center senior management.
3/30	Identify multicenter functional definition team.
5/30	Complete functional definitions.
8/30	Complete functional allocation options w/associated interfaces, implementation schedules and budget plans.
9/30	Review w/headquarters and center senior management.
10/15	HEDS Enterprise Go/No-Go decision Review w/internal and external stakeholders.
10/30	Draft SOW and acquisition strategy meeting.
12/30	Final SOW and RFP.
1/30	RFP release in conjunction w/US lab launch.
3/30	Proposals due.
5/30	Evaluations complete.

National Aeronautics and
Space Administration
Headquarters
Washington, DC 20546-0001

Reply to Attn of:

M

MAY 23 2000

TO: Distribution

FROM: M/Associate Administrator for Space Flight
U/Associate Administrator for Life and Microgravity Sciences and Applications

SUBJECT: Clarifications Regarding Studies Related to International Space Station (ISS) Utilization and Operations

During meetings conducted March 9-10, 2000, at the Marshall Space Flight Center (MSFC) and Johnson Space Center (JSC) on the subject of a potential "Non-Government Organization (NGO) to Manage International Space Station Utilization," several questions were raised regarding the relationship and scope of follow-on studies. The purpose of this memorandum is to provide clarification regarding future efforts in this area.

There are no preconceived conclusions with respect to the structure of such a contractual organization. In response to the recent report of the National Research Council task group on "Alternative Institutional Arrangements for Space Station Research," the intent is to form a team to develop detailed definitions of the specific functions currently associated with ISS utilization and the attendant research. These definitions will be valuable regardless of whether the Agency proceeds with a contract relationship for ISS utilization management and should be developed with disregard to such an outcome. This team will include: Ms. Irene Taylor, MSFC; Ms. Jessica Kite, JSC; Ms. Maynette Smith, KSC; and, Mr. Mark Uhran, NASA Headquarters.

Following the functional definition phase, the team will brief NASA Headquarters and center senior management on the results before proceeding with further work. If the management team elects to proceed, the study team will be expanded appropriately and charged to develop an option(s), with supporting rationale, which addresses potential contract relationships for ISS utilization management. This will also be reviewed with the management team prior to any procurement decisions.

A common understanding of the objectives, a thorough evaluation of the alternatives, and the engagement of all affected parties will be essential in the decision making process.

To this end, NASA candidate objectives for a potential contractual relationship include:

1. To facilitate the pursuit of flight research and make the complex operating environment associated with the ISS transparent to the end-user;
2. To reduce the end-to-end cycle time associated with the announcement, selection, development, flight and reporting of results for research and development (R&D) efforts on the ISS; and;
3. To increase the long-range productivity of R&D by most effectively integrating and advocating government and industry utilization of the ISS.

Efforts already underway within NASA which relate to these objectives are to be taken into full consideration. The recent international Payload Safety Conference, and any pursuant actions, represents an example. If it is determined that such activities are already achieving significant progress toward the stated objectives, further actions may not be required.

As a result of this effort, and in anticipation of next year's launch of the ISS United States Laboratory *Destiny*, considerable attention is turning toward the details of the payload integration process. It is expected that a number of previously established internal and external reviews will also explore this subject in some depth. In order to reduce workload impacts, the Space Station Program Office is requested to develop a comprehensive briefing which benchmarks the end-to-end payload integration process for use with multiple audiences.

In addition to the internal study on ISS utilization management, a reassessment of the approach to ISS system operations and maintenance (O&M) is being performed. This external "ISS Operations Architecture Study," led by Dr. John Cox, is examining the potential for improvements to ISS O&M in the coming era. Since O&M is intrinsically linked to utilization, the team has also been tasked to consider how the two functions would interface most effectively.

The internal and external studies are complementary by design and will position our management team to make the critical architectural decisions necessary as we expand space station operations in the months to come and begin ISS utilization.

If there are any questions regarding these activities and their necessary interrelationships please contact me.

Joseph H. Rothenberg

Arnauld E. Nicogossian, M.D.

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