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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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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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

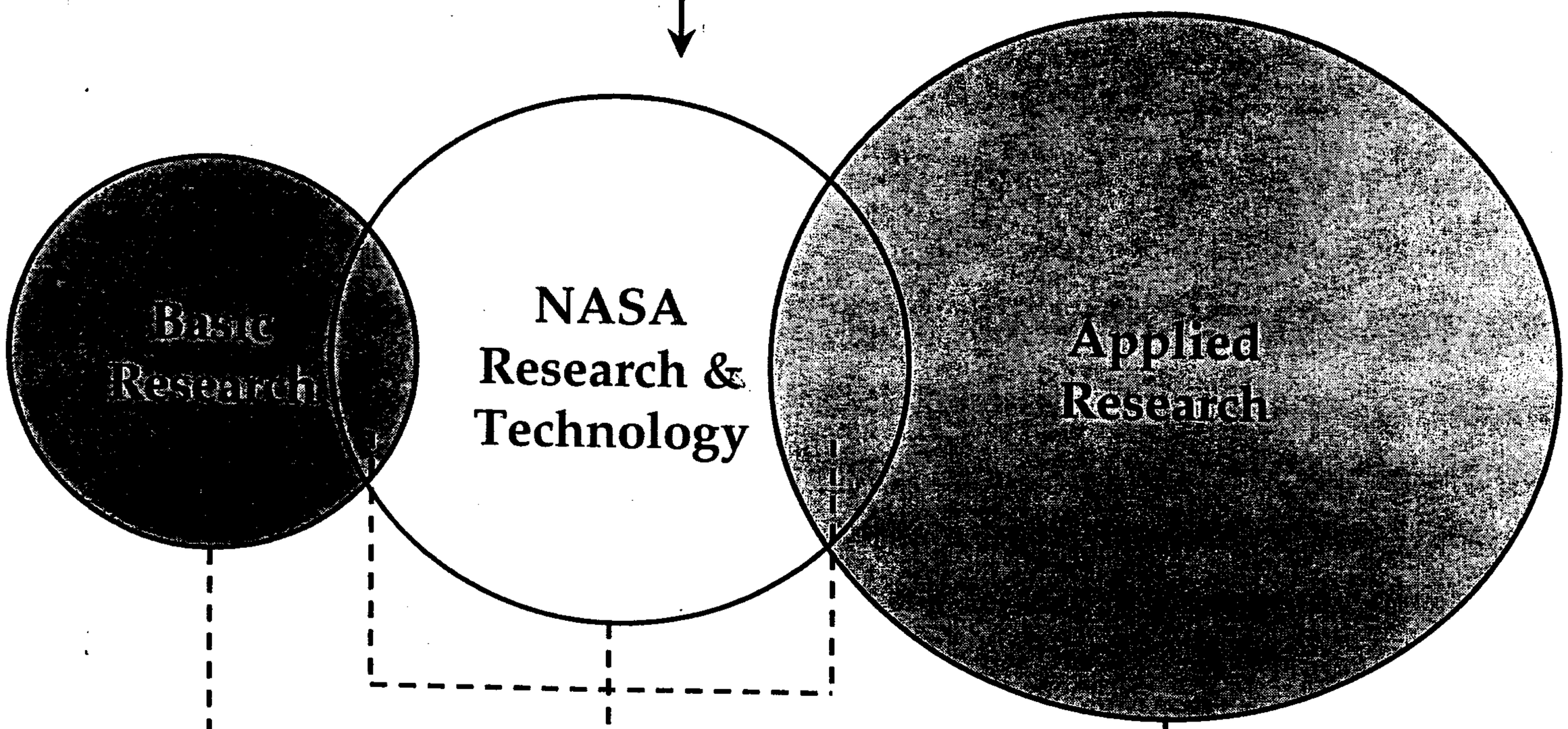
- Obtain additional inputs from the research community, investment community, other NASA centers, and Headquarters to incorporate into a coordinated concept for ISS research utilization and commercialization
- Evaluate and incorporate results of previous NGO studies, relevant "lessons learned" and related 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

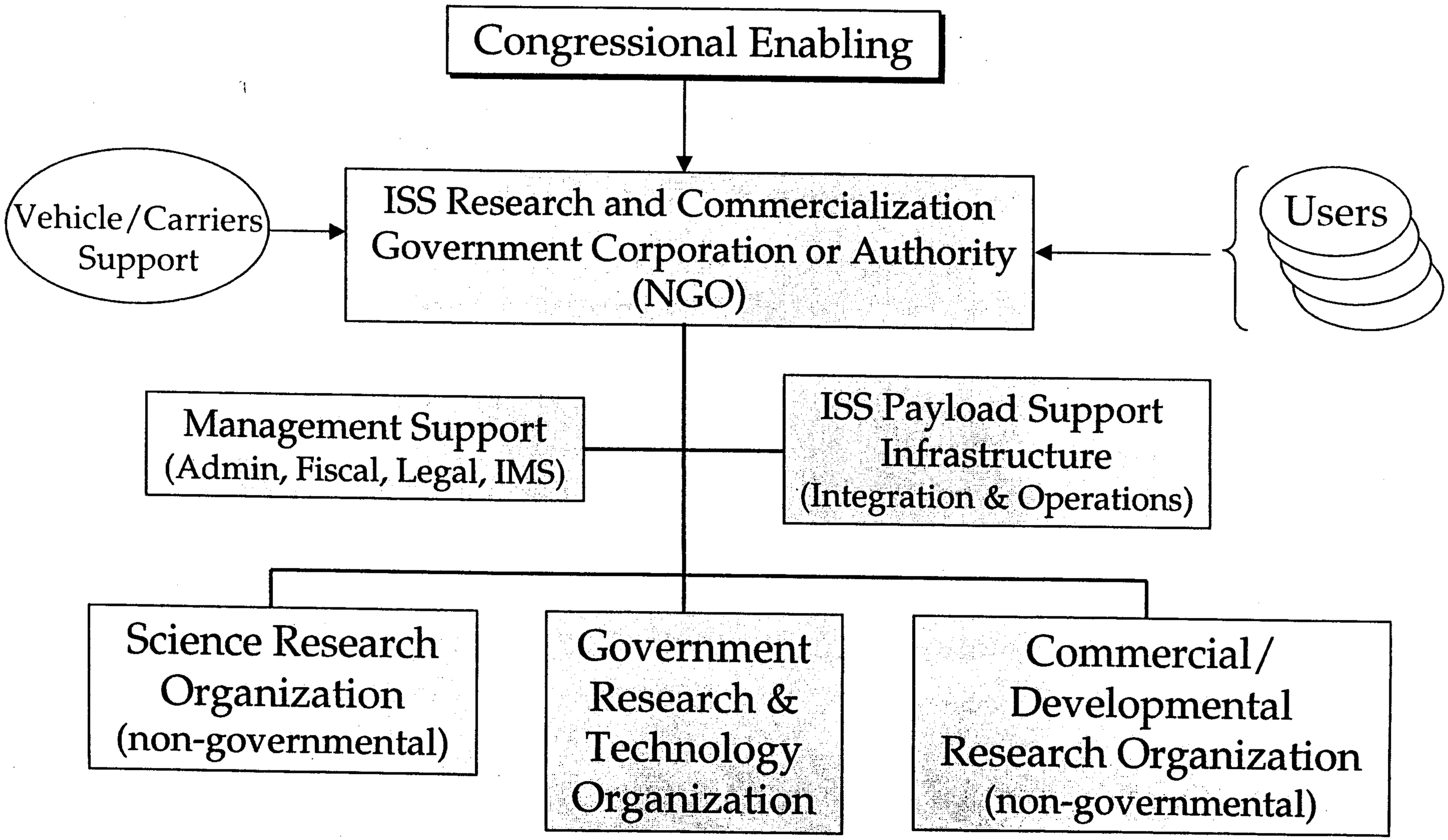
Sources:
NSF Science and Technology Indicators 2000
"Unlocking the Future," House of Representatives Science Committee, 1998



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.)

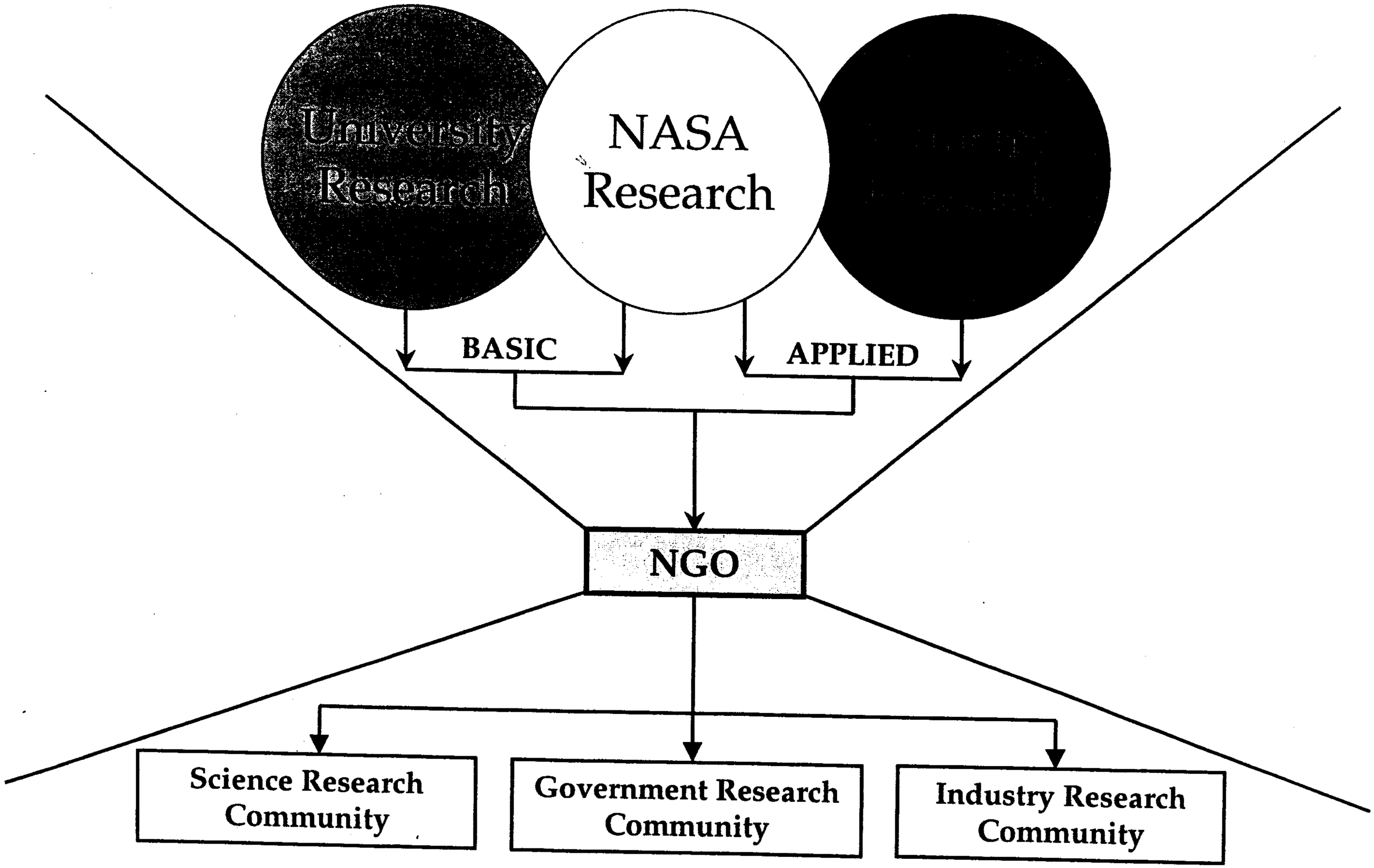
- Management Support:
  - » Administrative
  - » Business/Fiscal
  - » Legal
  - » Information Management (including Data Archiving)
- Research Organizations (Science, Government R&T, Commercial/Developmental):
  - » Customer fulfillment and execution
  - » Experiment Design, Development & Operations (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		