
Background and Status Briefing

on

International Space Station Utilization Management

Concept Development

11 July, 2002

User Workshop

Cocoa Beach, FL





Agenda

Vision and Guiding Principles

Mary Kicza, Associate Administrator, Biological and Physical Research/HQ

Background and Status of Utilization Management Concept Development

Mark Uhran/HQ

Functional Scope of ISS Utilization

Robin Henderson/MSFC

Objectives and Process Complexity

Roselle Hanson/KSC

Overview of Responses to Prior Questions

Dave Beck/HQ

Working Groups Organization and Charge

Neal Pellis, Program Scientist for ISS Research/HQ

Vision and Guiding Principles

Mary Kicza



Workshop Objective

To solicit ISS user thoughts regarding ISS utilization management implementation.





DRAFT Guiding Principles for ISS Utilization

For the purposes of this discussion, “utilization” refers to the scientific, technological and/or commercial use of the ISS for the purposes of basic or applied research and/or research of commercial significance.

Recognizing that research is the main use of the ISS, and that safety is the highest priority at all times, the following principles should guide the character and operation of any organization charged with facilitating utilization of the ISS:

- The organization must be aware of and responsive to user strategic goals and objectives;
- High quality basic and applied research should be paramount;
- Responsibility for managing ISS utilization does not require that the organization manage other ISS activities;

DRAFT Guiding Principles (Continued)

- The research community should have substantive and continuing involvement in all phases of planning, designing, implementing, conducting and evaluating utilization of the ISS;
- The organization must be flexible and capable of adapting over time in response to changing research needs and to lessons learned;
- In those cases where the organization has the responsibility for selecting research, basic and applied research must be selected on the basis of scientific and technical merit as determined by peer review. The selection processes for technology or commercial research need not be the same as those for scientific and engineering research; but, these endeavors must meet similar standards of quality.



DRAFT Strategic Vision for ISS Utilization

- Over the next decade, we expect the ISS to be used as a laboratory and test bed to support research in six spheres of endeavor:
 - Basic and applied research in the biological and the physical sciences;
 - Development of new knowledge and technologies;
 - The exploration and development of space;
 - Research of commercial significance;
 - Space science and Earth science research; and
 - Research of significance to other government agencies.
- The specific goals and objectives associated with ISS utilization will be aligned with and responsive to the strategic plans of the sponsors of research aboard the ISS.





DRAFT Strategic Vision for ISS Utilization, cont'd

- Planned change out of ISS carrier systems, experiments and experiment support systems will be a matter of routine, allowing for a timely and predictable progression of capabilities in response to user community needs.
- A clearly defined set of performance metrics which track the ability of the ISS to meet user requirements will have been established and monitored on a regular basis.
- Continuous process improvement mechanisms will be in place to achieve increased research utilization opportunities where possible, and to address negative trends in a timely manner.

Background and Status of Utilization Management Concept Development

Mark Uhran



Congressional Direction on Management of ISS

Research

- The FY 2000-NASA Authorization Act (P.L. 106-391) calls upon NASA to enter into agreement with an Non-Government Organization (NGO) for ISS “research utilization and commercialization management,” and submittal of an implementation plan by September 2001; the NGO agreement may not take effect until 120 days after submission of the implementation plan.
- The FY 2001 and FY 2002 VA-HUD-IA Appropriations Acts seek a “comprehensive proposal for managing the ISS science program,” prior to establishment of any NGO.



Agency Activities to Date

Numerous Agency studies have been performed addressing many organizational structures and implementation options for ISS research utilization management, including:

- October 1999 - Options for Managing Space Station Utilization,
Swales Aerospace
- December 1999 - Institutional Arrangements for Space Station
Research, National Research Council
- August 2000 - International Space Station Operations Architecture
Study, Computer Sciences Corporation
- June 2001 - NASA Internal Study

http://spaceresearch.nasa.gov/research_projects/ngo.html



ISS Utilization Management Concept Development Team Charter

The ISS Utilization Management Concept Development Team was established in March 2002 to examine detailed options for management of ISS research.

Charter:

- Characterize the current Agency ISS utilization processes, organizational interfaces and management framework;
- Identify inherently governmental functions within the ISS utilization processes;
- Assess the advantages and disadvantages of various management approaches to ISS utilization;
- Recommend NASA process and/or organization changes/reforms;
- Identify implications for workforce transition and/or skill mix rebalancing.

Team Membership

Mark Uhran Betsy Park
Mike Wargo, PhD Jennifer Rhatigan, PhD
Charles Barnes, PhD Jim Scheib
Barbara Kreykenbohm Michael Richardson
Eve Lyon Mary Hall
David Beck Roselle Hanson
Karen Blynn William Cirillo
Bonnie Dalton Robin Henderson
Jack Salzman Thomas Inman
Angel Otero



Near-Term Schedule

Concept Development Team Kickoff 2QTR FY02

Complete Concept Development

Report to Congress 4QTR FY02



Functional Scope of ISS Utilization

Robin Henderson



ISS Utilization Functions (Total Scope)

- Function 0. Defining and Implementing Policy and Strategic Plans**
- Function 1. Management of Research Utilization**
- Function 2. Preparing and Allocating Budgets**
- Function 3. Selecting and Prioritizing Research**
- Function 4. Establishing Payload/Experiment Requirements and Feasibility**
- Function 5. Developing Cost, Schedule and Risk Assessments**
- Function 6. Developing and Qualifying Flight Research Systems**
- Function 7. Maintaining and Sustaining Flight Research Systems**
- Function 8. Developing Ground Systems**
- Function 9. Maintaining and Sustaining Ground Systems**
- Function 10. Constructing Ground Facilities**
- Function 11. Maintaining Ground Facilities**
- Function 12. Certifying Safety of Research Flight and Ground Systems**
- Function 13. Managing Missions and Allocating Services**
- Function 14. Integrating User Missions - Analytical**
- Function 15. Integrating User Missions - Physical**
- Function 16. Integrating User Missions - Operational**
- Function 17. Conducting Research & Analysis and Disseminating Results**
- Function 18. Educating and Reaching Out to the Public (including industry)**
- Function 19. Recommending ISS Pre-Planned Product Improvements**
- Function 20. Managing Archival of Research Samples, Data and Results**





ISS Utilization Function Definitions - Draft

- Function 0. Defining and Implementing Policy and Strategic Plans.** This function includes the definition, development and implementation of public policies and strategic plans related to ISS research and utilization. Specific functions include organization and execution of boards, panels, working groups and advisory committees involved in the definition of research plans and processes; definition, development and coordination of national and international cooperation; and the organization of forums for planning development of research programs on a strategic global scale within public policy. Policy and plan implementation is distributed across both headquarters and field center organizations.
- Function 1. Management of Research Utilization.** This function represents the management of research utilization on the ISS. It includes strategic and tactical implementation of management functions.
- Function 2. Preparing and Allocating Budgets.** This function includes long-range and fiscal budget formulation, justification and budget execution of ISS research and utilization. Specific functions include budget preparation, legislative consideration and approval, budget execution oversight and reporting, and evaluation of performance.



ISS Utilization Function Definitions - Draft

- Function 3. Selecting and Prioritizing Research.** This function includes the announcement of research opportunities; operation of non-advocate peer panels in science and corresponding review bodies for technological or commercial projects; programmatic or other evaluations associated with the selection process; and selection / prioritization of experiments, tests, demonstrations, or other research activities on the ISS. This function includes both the investigations and the associated payload manifests to the ISS at the corresponding levels of detail associated with headquarters and field center prioritization and queuing processes. The prioritization function includes determination of national and agency priorities for utilization of the ISS, inclusive of commercial initiatives.
- Function 4. Establishing Payload/Experiment Requirements and Feasibility.** This function defines and documents the payload/experiment requirements necessary to fully accomplish a specific set of research objectives and/or goals. These requirements must be written in sufficient detail to determine the feasibility of successfully completing that investigation with: 1) existing flight experiment hardware, 2) some modification of existing flight experiment hardware, or 3) new flight experiment hardware concepts. In limited cases, these requirements are written to establish the feasibility of providing the capabilities necessary to accomplish a particular range and/or class of experiments through the use of a core facility and experiment unique payloads. When these requirements have been verified as sufficient, they are documented and entered into a program/project configuration management system. This definition covers the Formulation Phase of a project.

ISS Utilization Function Definitions - Draft

- Function 5. Developing Cost, Schedule and Risk Assessments.** This function includes the development of estimates of the costs for Ground and/or Flight Systems needed to satisfy ISS research requirements as well as estimates of when these systems will be available for deployment and operations. These cost and schedule assessments can involve estimates for accomplishing the research objectives through the use of existing systems, the modification of existing systems, or the development of new systems. NASA will use these estimates during ISS research planning and during the process of approving new system developments. The fidelity of the cost and schedule estimates will be characterized through an assessment of the risks involved in providing the needed systems within the cost estimate and by the estimated deployment date. NASA's need for high fidelity cost and schedule estimates may require risk reduction through technology development/demonstration efforts as a part of the function. This may include work necessary for NASA to estimate pricing and evaluate commercial proposals. This definition covers the Approval Phase of a project.
- Function 6. Developing and Qualifying Flight Research Systems.** This function represents the design, development, test, integration and evaluation of flight research equipment (i.e. hardware and software) used in the transportation, accommodation or operation of research payloads on the ISS, including the preparation of all necessary documentation, configuration control and conduct of qualification and acceptance/certification testing and acceptance procedures, protocols and processes to ensure that all requirement are met. Flight research equipment refers to subrack payloads, facilities, multi-use equipment, etc. For facilities, the activities described below will often include an integrated effort where the facility developer must include and assess inputs from individual subrack payloads to form a part of their facility effort.





ISS Utilization Function Definitions - Draft

- Function 7. Maintaining and Sustaining Flight Research Systems.** This function represents the maintenance, operations and sustaining engineering of flight research systems (e.g. facility payloads, EXPRESS Racks, EXPRESS Pallet) through upgrades, replacement, or spares. It represents the recurring costs associated with Function 6.
- Function 8. Developing Ground Systems.** This function represents development of all multi-user, discipline-specific and experiment-unique ground systems necessary to support the successful operation of the flight research systems. It includes all associated systems, subsystems, components or other related items (e.g. communications, data processing, data analysis equipment, GSE, training hardware and simulators) necessary to the ground program. This function excludes the development of ground systems that also serve non-ISS programs and projects. This function represents those major systems that have a non-recurring cost.
- Function 9. Maintaining and Sustaining Ground Systems.** This function represents the maintenance, operations, and sustaining engineering of multi-user, discipline-specific and experiment-unique ground systems or equipment (e.g. communications, data processing, data analysis equipment, GSE, training hardware and simulators). It represents the recurring costs associated with Function 8. This function excludes maintaining and sustaining ground systems that also serve non-ISS programs and projects.

ISS Utilization Function Definitions - Draft

- Function 10. Constructing Ground Facilities.** This function represents major acquisitions in terms of buildings, laboratories and test facilities, including initial outfitting of capital equipment (e.g. overhead cranes, lab benches, autoclaves, hoods) and furniture, associated with multi-user and discipline-specific ISS research and utilization. This function may include construction of ISS-specific portions of facilities that also serve non-ISS programs and projects and represents major acquisitions that have a non-recurrent cost.
- Function 11. Maintaining Ground Facilities.** This function represents the maintenance, operations, and sustaining engineering associated with buildings, laboratories, and test facilities for multi-user and discipline-specific ISS research and utilization (e.g. Control Centers, Telescience Centers). This function may include maintaining ISS-specific portions of facilities that also serve non-ISS programs and projects. It represents the recurring costs associated with Function 10.
- Function 12. Certifying Safety of Research Flight and Ground Systems.** This function represents the assessment of 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. This function includes safe design, manufacture, verification, and operation. It also includes preparation and presentation of safety data packages, including integrated safety data packages for a compliment of payloads or experiments. The responsibility for final approval of safety will remain with NASA.



ISS Utilization Function Definitions - Draft

Function 13. Managing Missions and Allocating Services. This function includes the definition and commitment of services between the end-user, or payload developer, and the Agency in order to ensure timely production of all user hardware, software and documentation deliverables in accordance with pre-agreed milestones. This function also includes the planning, integrating, and scheduling and of all user-related activities necessary for successful multilateral utilization of the space station in flight or on the ground in pre and post-flight periods. User related activities include: (1) transportation assignments to launch vehicles; (2) physical accommodation assignments to the space station user accommodation elements, and; (3) operating period assignments on the space station with corresponding resource allocations for crew time, energy, data transmission and any unique resources specific to individual user activities. In order to plan, integrate and schedule these critical user activities efficiently and effectively on a multilateral basis, the mission management function is also responsible for directing the orderly performance and timely completion of all remaining principle functions which are on the critical path to user transportation, accommodation and operations. In cases where joint program commitments are required among the station partners in order to transport, accommodate, or operate user elements, this activity includes the negotiation of joint program documents and management of the implementation phase.



ISS Utilization Function Definitions - Draft

- Function 14. Integrating User Missions - Analytical.** The purpose of analytical integration to ensure safe and functional hardware and software interfaces. The ‘user’ side of the interface may be an experiment, a payload, or a payload complement. The ‘operator’ side of the interface may be the crew, a rack, a pallet, an ISS laboratory module, an exposed facility, launch vehicle(s), ground operations center(s); any of which may belong to one or more International Partners. Functions necessary to ensure safe and functional interfaces include: negotiation of Interface Control Documents, development of interface verification plans, certification of interface verification procedures, analyses and/or testing to support interface verification, analyses and/or testing to support verification, safety and compatibility of a complement of payloads, development and certification of complement-unique software configurations, development of operational constraints, and real-time support for anomaly resolution.
- Function 15. Integrating User Missions - Physical.** This function includes the physical buildup, testing, validation/ verification of functional interfaces, specialized science processing, and integration of experiments, payloads, or payload complements during the ground processing phase in preparation for launch to the ISS. This function also includes physical deintegration of experiments and payloads at the landing site.



ISS Utilization Function Definitions - Draft

Function 16. Integrating User Missions - Operational. This function includes the near real-time activity conducted at payload and station operations centers. This includes short term planning and replanning, contingency planning, and responses to unplanned events associated with or otherwise affecting the ISS research program at all levels. Payload training activities are also included in this function.

Function 17. Conducting Research & Analysis and Disseminating Results. This function represents the work of the principal investigator in scientific endeavors, or the project investigator in technological or commercial endeavors, that is directed toward the achievement of research objectives. The investigator specifically leads the development of requirements and objectives for the research, undergoes appropriate research review, is involved in the experiment procedure development and on-board real-time research operations, conducts analysis of the data and/or samples, prepares operational reports, compares results to objectives, submits research reports, provides input to the archiving process, and participates in research conferences to report and discuss results to the research community.



ISS Utilization Function Definitions - Draft

- Function 18. Educating and Reaching Out to the Public (including industry).** This function includes the development, dissemination and evaluation of information to the public through a wide variety of methods in order to educate and broaden awareness of the ISS program and its associated benefits and to inspire the next generation of explorers.
- Function 19. Recommending ISS Pre-Planned Product Improvements.** This function represents the user community recommendations and priorities for improvement of ISS productivity through upgrades, changes, or additions to the ISS spacecraft systems, elements, and/or processes which enhance the quality or quantity of user accommodations or operations, this supports the broader P³| Objectives of the Program.
- Function 20. Managing Archival of Research Samples, Data and Results.** This function represents the management of ground archiving of research products in accordance with established processes for future use in an accessible manner that ensures preservation of information. The function also includes facilitating and enabling the distribution of results. Research samples, data and results that are proprietary in nature will continue to be maintained by the industrial sponsor.



Objectives and Process Complexity

Roselle Hanson



Recommended ISS Utilization Objectives

1. Facilitate the pursuit of flight research

- Manage outfitting of the U.S. portion of ISS to enable research
- Manage research selection and effectiveness
- Manage efficient research infrastructure and processes
- Advocate academic, government, & industry utilization of the ISS

2. Optimize research opportunities within current capabilities of ISS and with future enhancements for greater capabilities

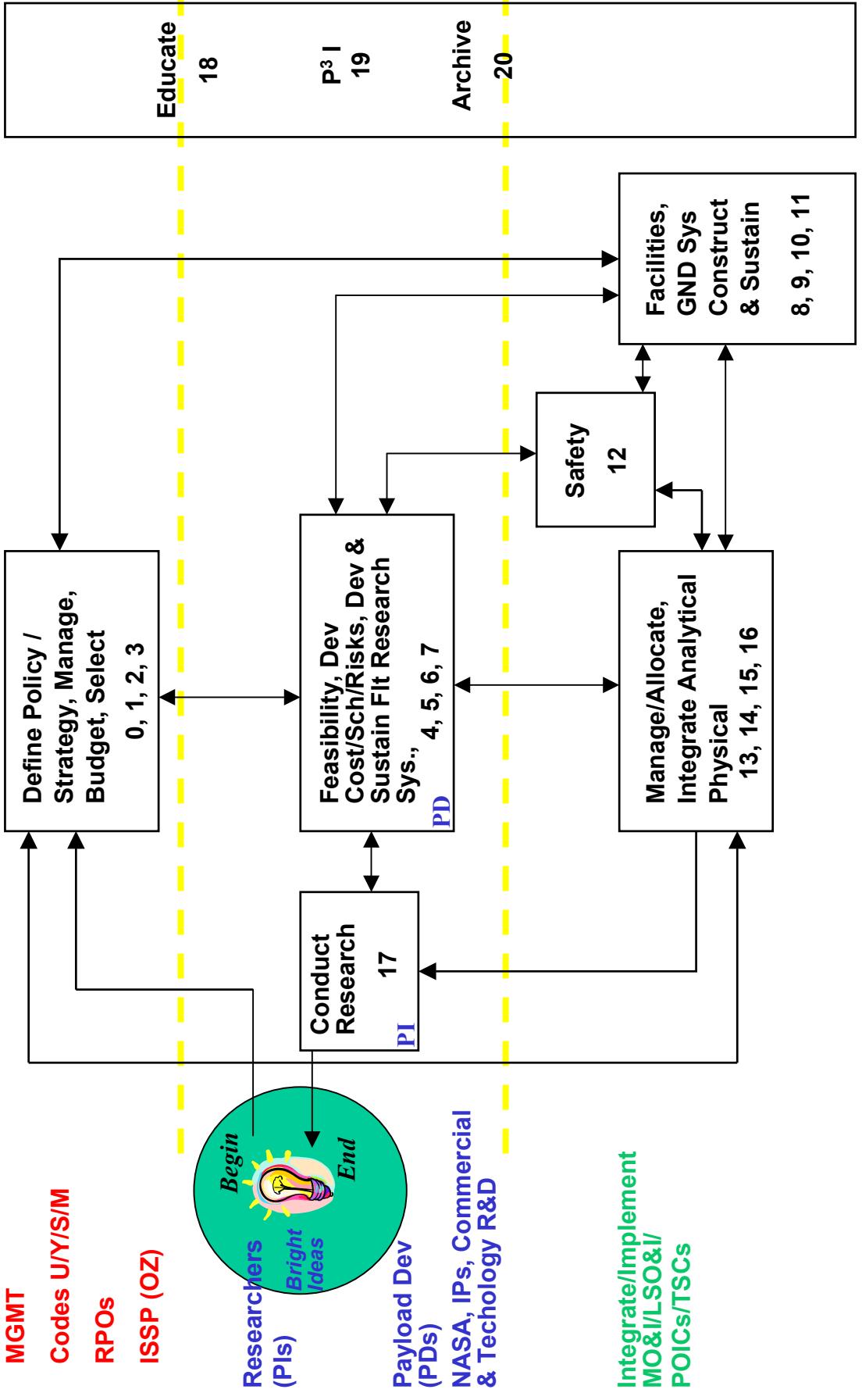
- Make the complex operating environment associated with ISS transparent to the end-user
- Reduce the end-to-end cycle time associated with the announcement, selection, development, flight and achievement of results for research and development endeavors on the ISS

3. Increase the long-range productivity of research and development

- Generate and disseminate:
 - New knowledge
 - Space-based and Earth-based applications

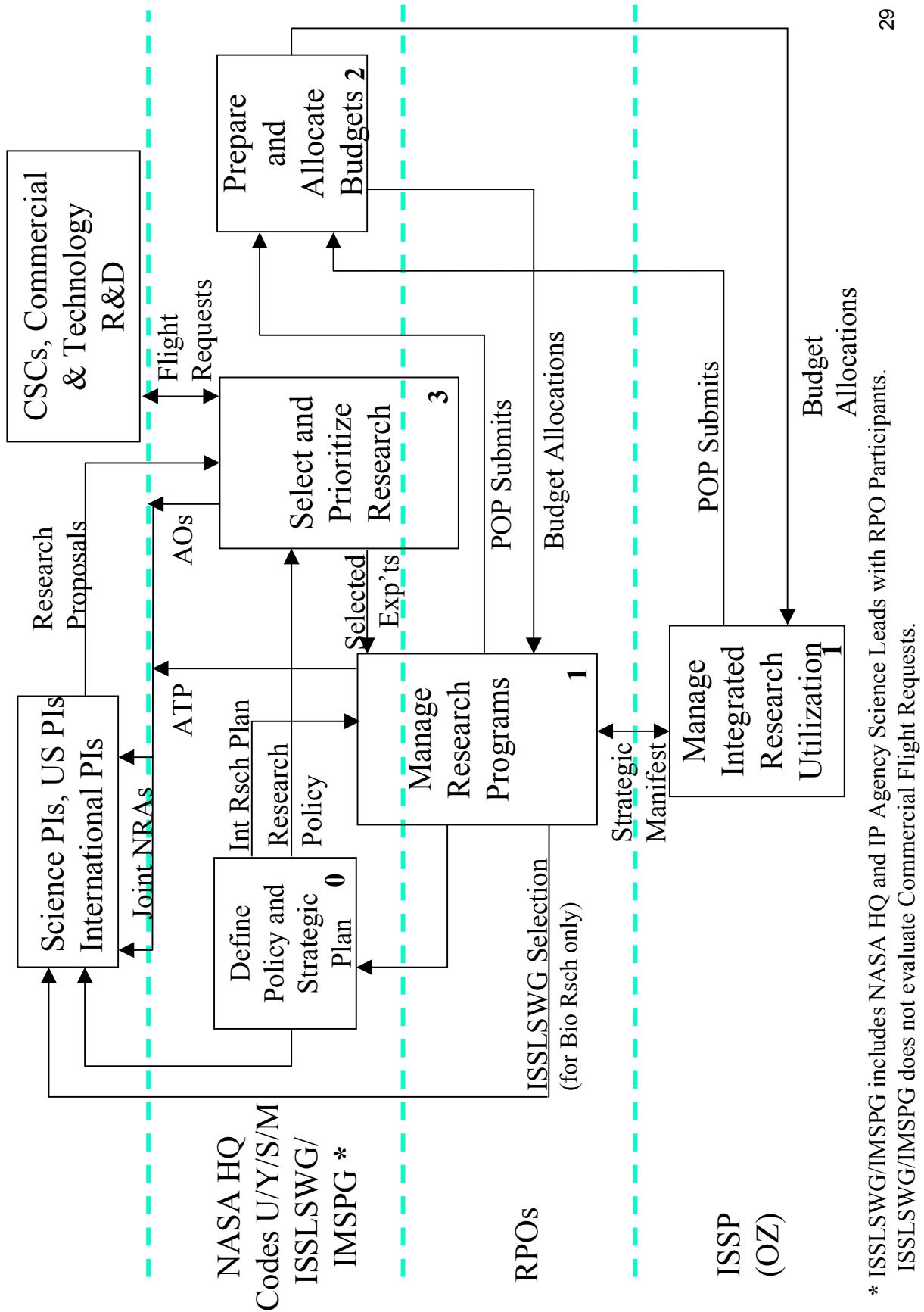


Top Level Flow ISS Utilization



Level 1 ISS Utilization Flow

Selection, Formulation & Manifesting



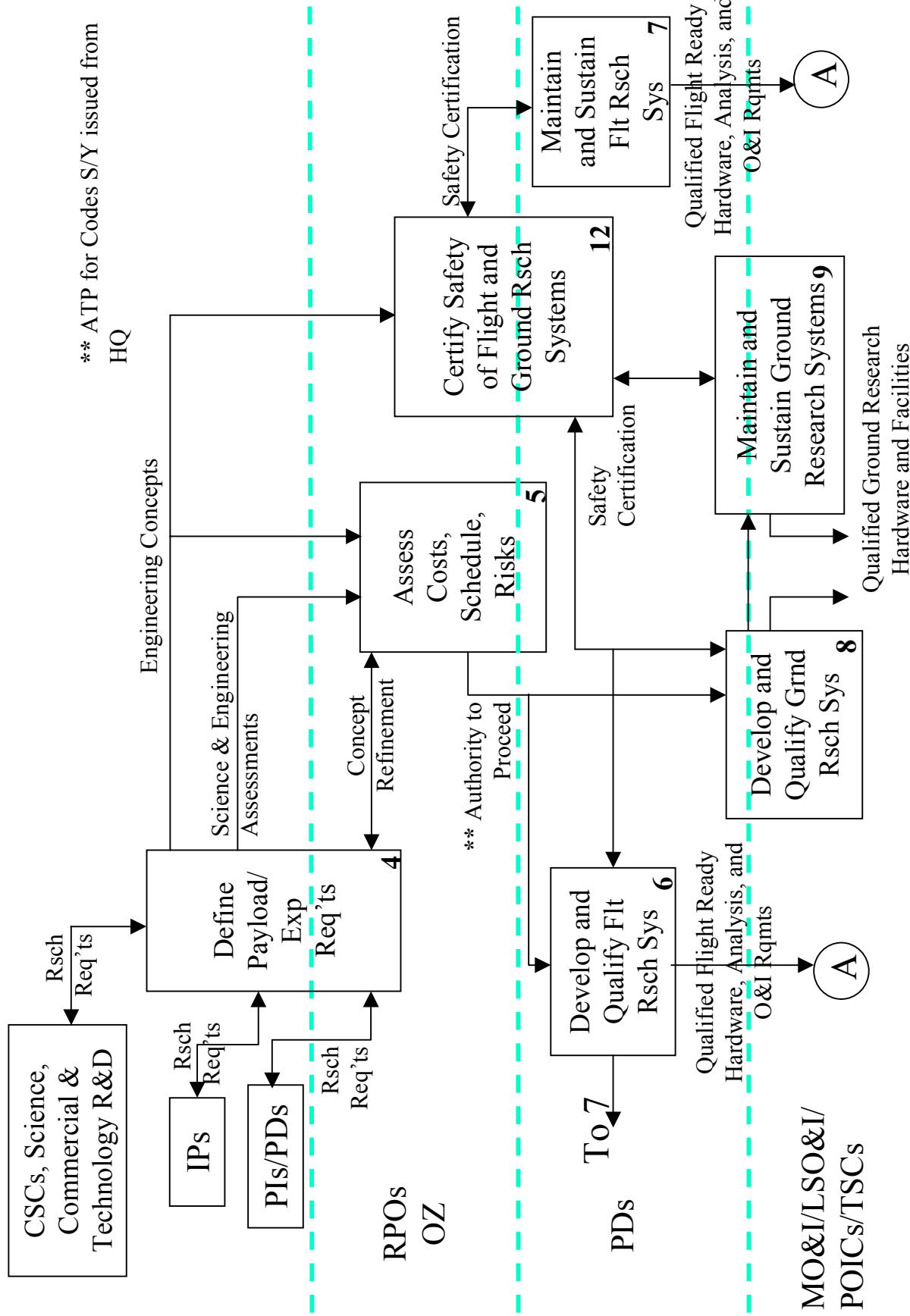
* ISSLSWG/IMSPG includes NASA HQ and IP Agency Science Leads with RPO Participants.

** ISSLSWG/IMSPG does not evaluate Commercial Flight Requests.



Level 1 ISS Utilization Flow

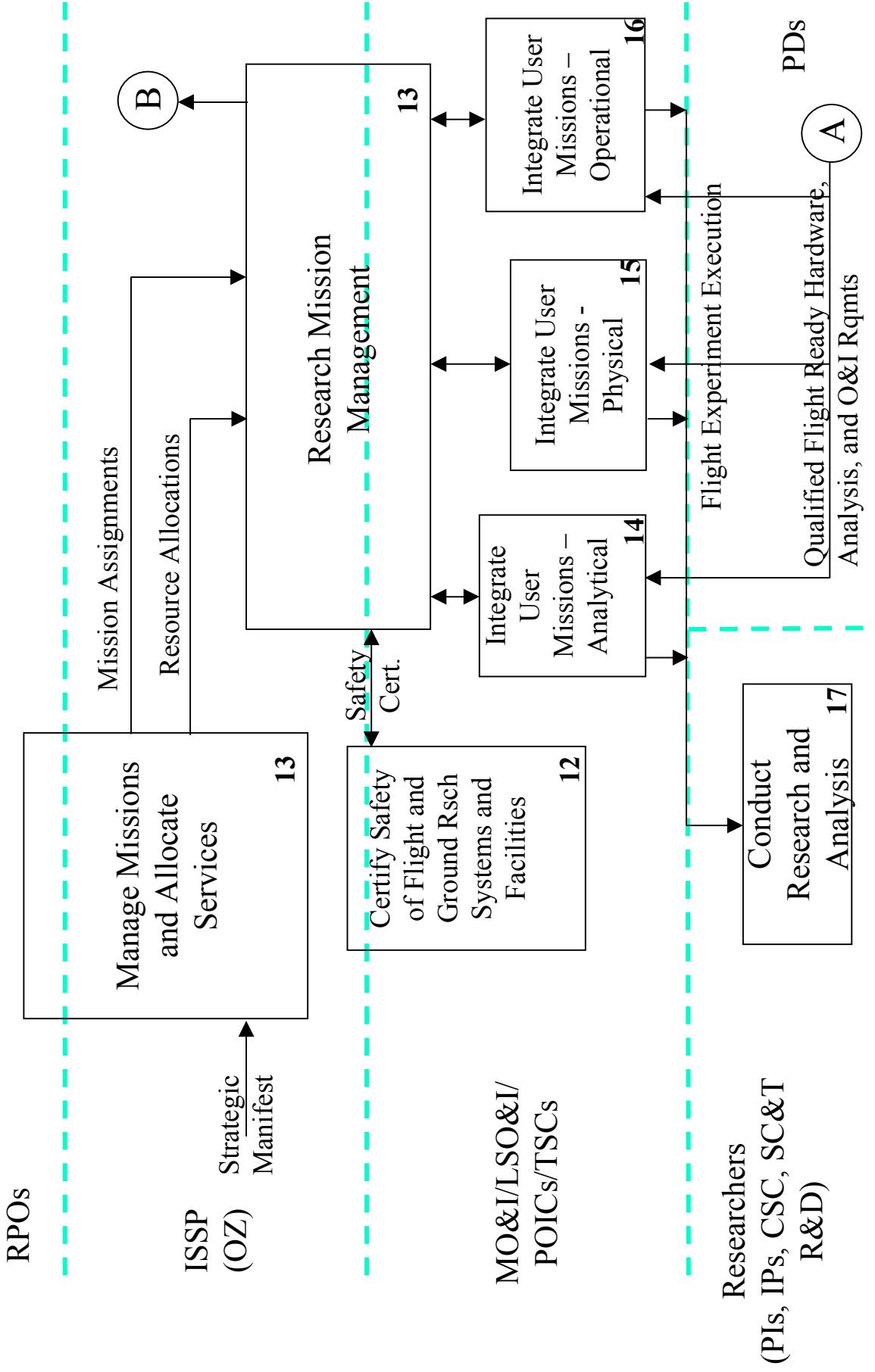
Post Experiment Selection





Level 1 ISS Utilization Flow

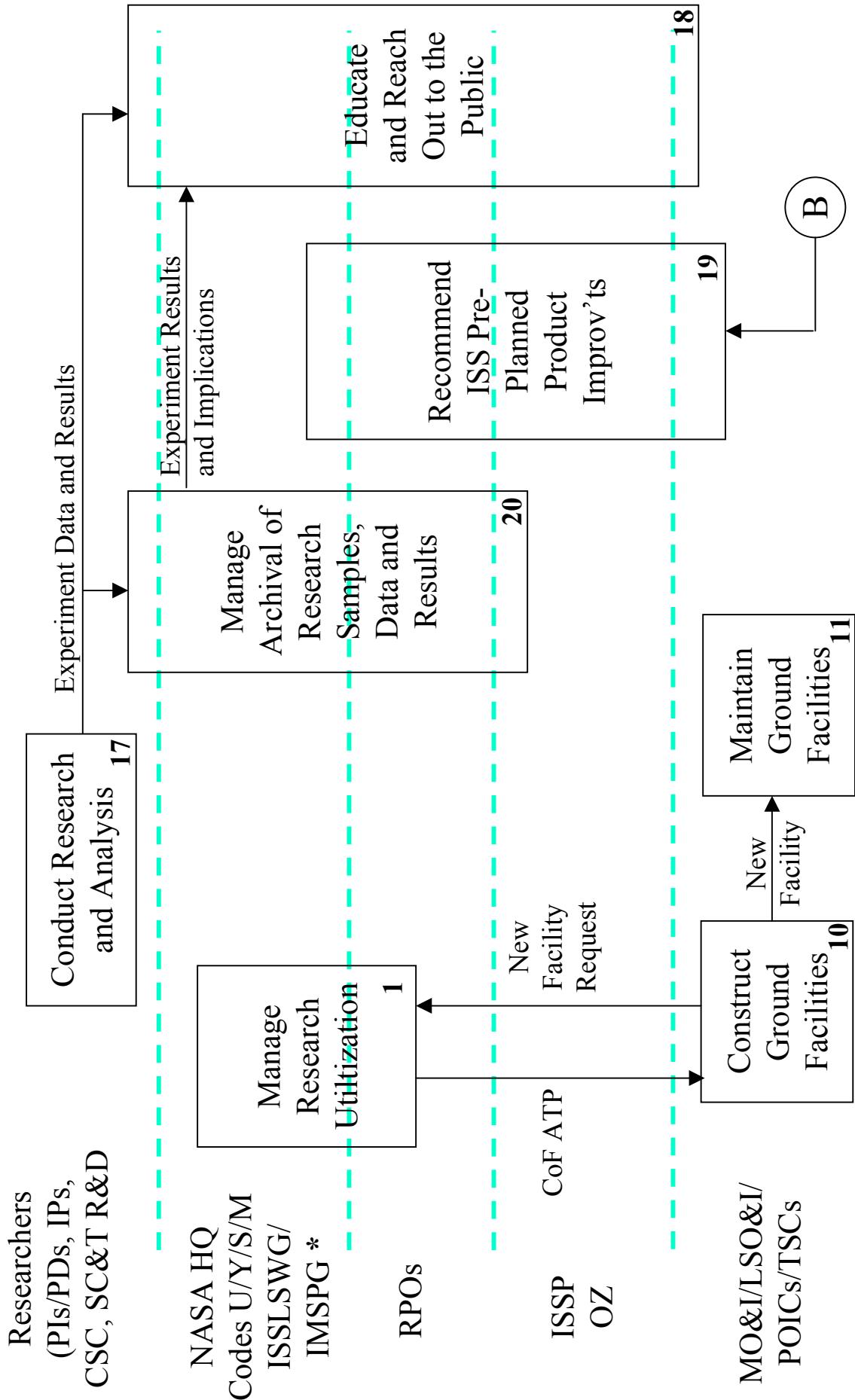
Post Manifest Baseline





Level 1 ISS Utilization Flow

Non-Hardware Related Activities



* ISSLSWG/IMSPG includes NASA HQ and IP Agency Science Leads with RPO Participants.

Overview of Responses to Prior Questions

Dave Beck



Preliminary Questions

- To what extent should an ISS utilization management organization --
 - be responsible for evaluating and prioritizing proposals for research, technology development, and commercial development to be performed aboard the ISS?
 - provide a capability for developing instrumentation and other hardware, and furnishing supplies, necessary for research, technology development, and commercial development to be performed aboard the ISS?
 - provide planning and support for samples and specimens (both living and non-living; reactive and inert) to be used in research, technology development, and commercial development aboard the ISS?
 - be responsible for allocating ISS resources (laboratory space, electricity, crew time, etc.) to individual projects for research, technology development, and commercial development to be performed aboard the ISS?



Preliminary Questions (continued)

- What are some of the differences that should be considered in managing research, technology development, and commercial development aboard the ISS?
- What other types of planning or support should an ISS utilization management organization conduct for research, technology development, and commercial development aboard the ISS?
- How should NASA ensure that the ISS utilization management organization is accountable to the ISS user community, and the general public, in its performance?
- What limitations should NASA impose on activities of the ISS utilization management organization?



Overview of Responses

- Emails from 8 individuals (6/20/02, 6/25/02, 6/26/02, 6/28/02, 7/1/02 [2] & 7/2/02 [2])
- Posted to Website on 6/24/02 (after removing names)

<http://spaceresearch.nasa.gov/common/docs/ngo/response.pdf>

- Copies available to break-out groups
- Additional responses may be submitted:
dbeck@hq.nasa.gov





Quotes from Responses

- “The ISS utilization management organization should be a single point of contact for an investigator or commercial entity whose research is to be done aboard the ISS.”
- “The ISS utilization management organization should not ... solicit, review or select the research that is to be done aboard the ISS.”
- “... the NGO should have the authority and responsibility for allocating U.S. on-orbit user resources in consultation with the ISS Program Office.”



Quotes from Responses (continued)

- “The NGO should lead, coordinate and/or develop, as appropriate, instrumentation and hardware that benefit the overall utilization effort.”
- “The processes of procuring technically demanding services should not be delegated to a non-governmental ISS management organization.”
- “The NGO should not use its privileged position to compete with profit-making organizations for work that can be done by them.”
- “The Director of the ISS utilization management organization must have stature...”

Working Groups Organization and Charge

Neal Pellis, PhD





Questions for Break-out Groups

- 1) Using the 21 ISS Utilization functions provided earlier
 - a) identify the functions which work well;
 - b) identify the functions which need improvement; and
 - c) recommend how to achieve the improvements.
- 2) Identify which functions could be performed under an alternative management structure.

Instructions for Break-out Groups

- Each group should select its own facilitator, note taker(s), and presenter(s).
- Groups have until 3 p.m. to discuss ISS utilization management.
- Everyone returns at 3 p.m. to this room.
- Each break-out group will have 25 minutes to have its presenter(s) provide a summary of the group's discussion.
- Locations for Break-out Groups:
 - Blue – Skylab-Atlas
 - Green – Challenger Ballroom
 - Yellow – Saturn-Vanguard
 - Pink – Gemini-Mercury

