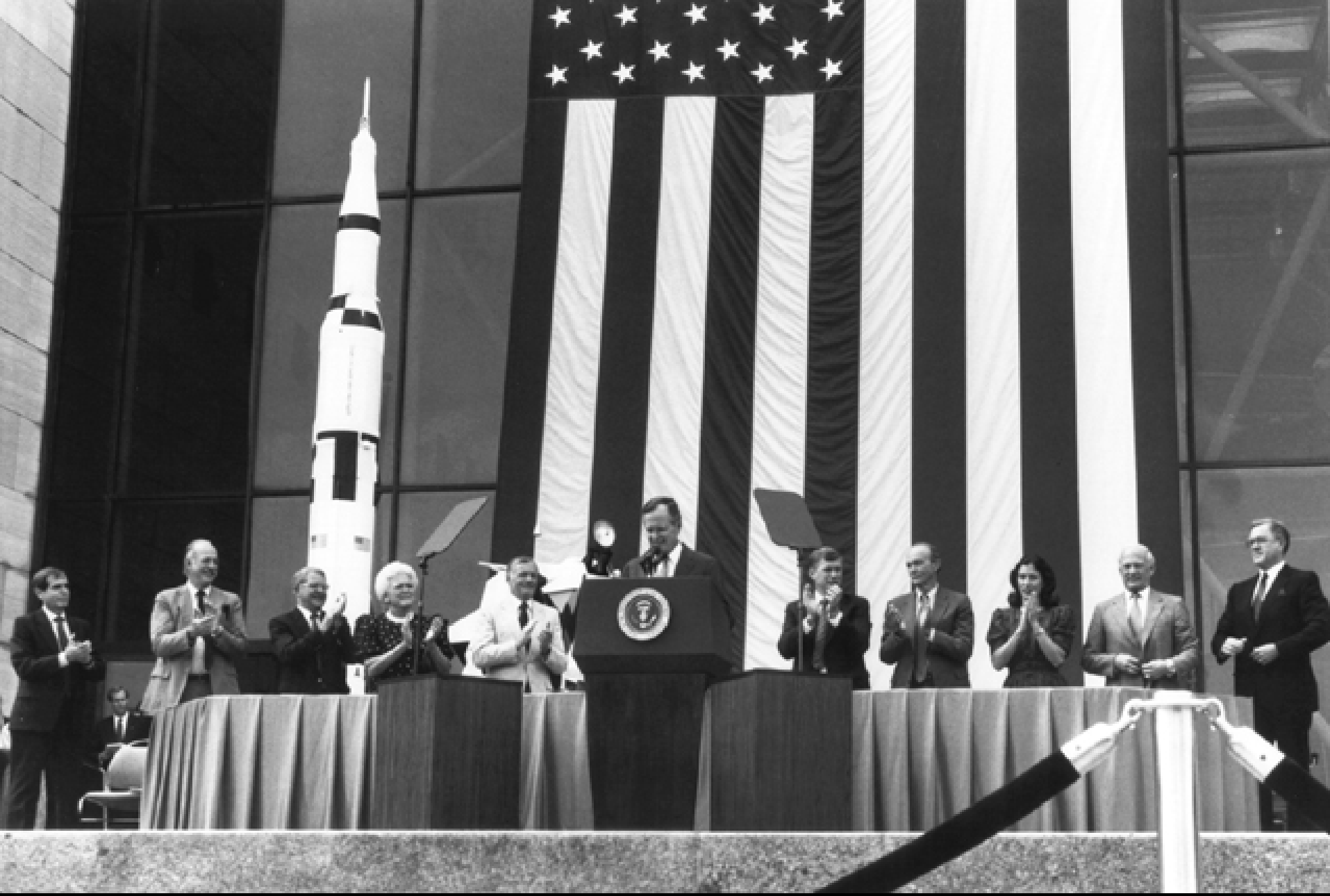
2nd Space Exploration Conference

Managing Science in a Program of Human Exploration

Lessons Learned From
Apollo, Skylab, ASTP and Shuttle/Spacelab
NRC Committee on Human Exploration
(CHEX, ’89 – ’96)

Noel W. Hinners



SEI - 1989: Trigger for the SSB CHEX Study

(Committee on Human Exploration)

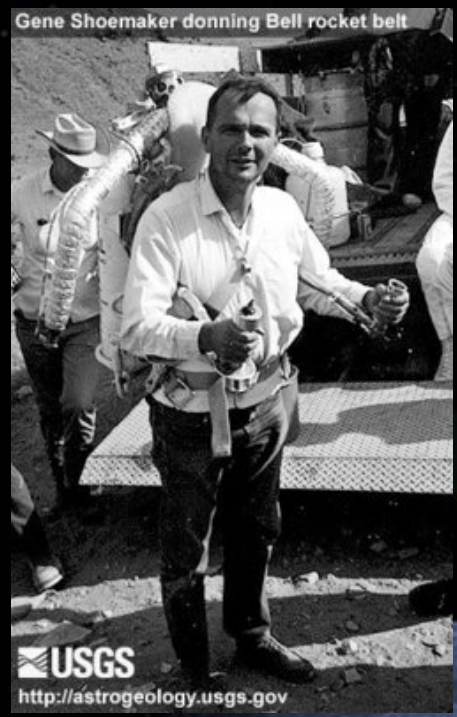
The CHEX Challenges

- The NRC Space Studies Board Recognized the SEI Potential, as Well as Historical Impediments and Antagonisms, for Productive Incorporation of Science in Human Space Flight Programs
  - **CHEX 1 & 2 (Requirements, Opportunity):** productivity of the scientific component of human space exploration appears to be correlated with the organizational approach and structure
  - **CHEX 3:** Thus look back and try to formulate principles and recommendations that can strengthen the prospects for future success. Studies Apollo, ASTP, Skylab and Shuttle/Spacelab
    - CHEX 3 made a deliberate effort to find ways to abolish the historic dichotomy between space science and human exploration and to seek ways to encourage a synergistic partnership

Space Physics

Con: Jim Van Allen

Pro: Gene Shoe-maker



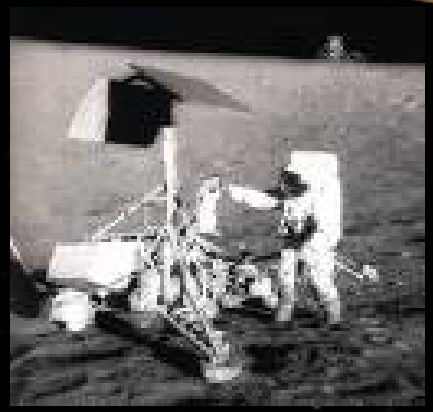
Geology and Geophysics

Apollo Robotic Precursors

Ranger (3/9)
Funded &
Managed by
OSS

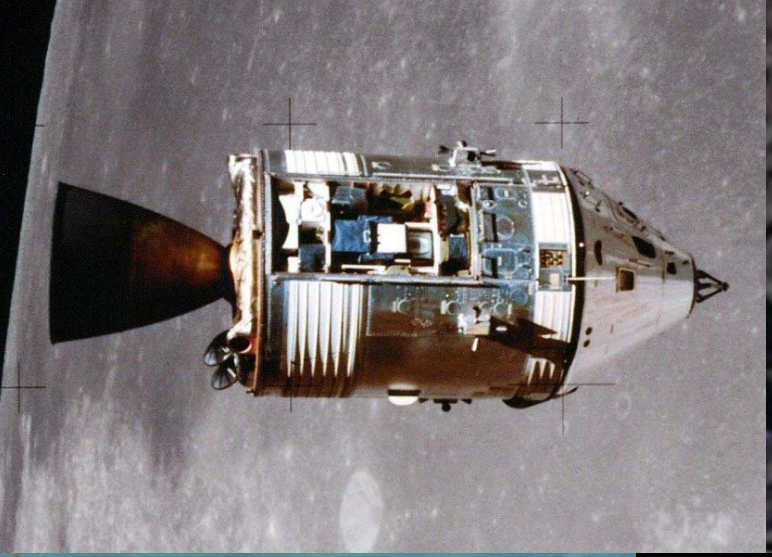
Site Certification

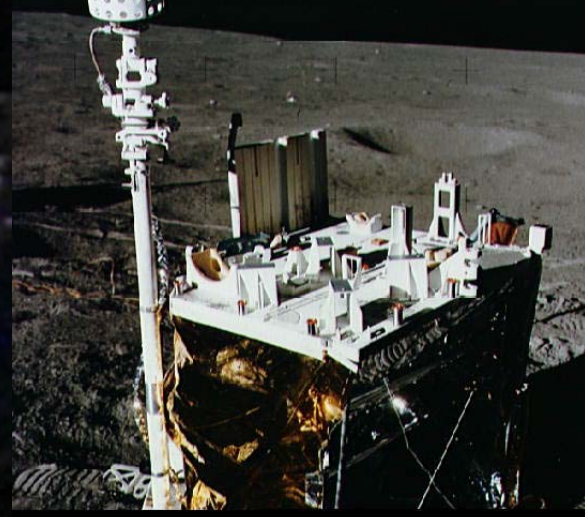
Ranger & Surveyor
Diverted from Science



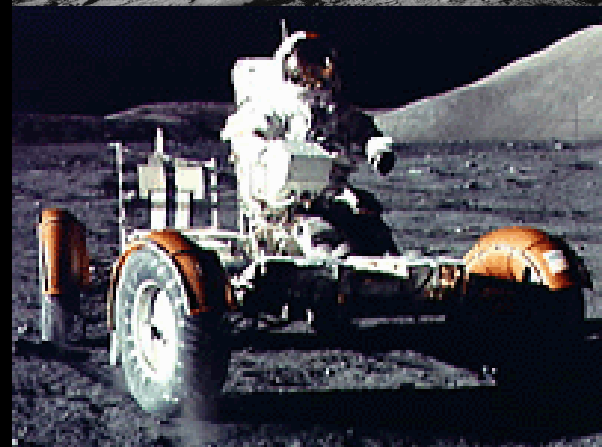
Surveyor (5/7)
Funded &
Managed by
OSS

Lunar Orbiter 5/5
LO 4 and 5 Devoted To Science
Funded & Managed by OSS
Responded to OMSF/OSS Requirements (1962)





Apollo Science: Spectacular, Forefront and Productive



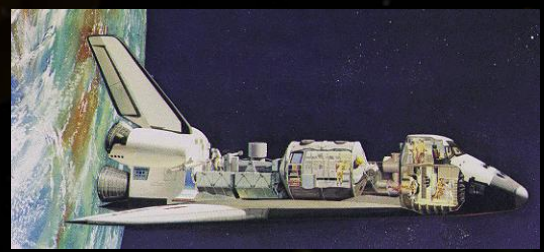
Funding and Management of Science in Apollo

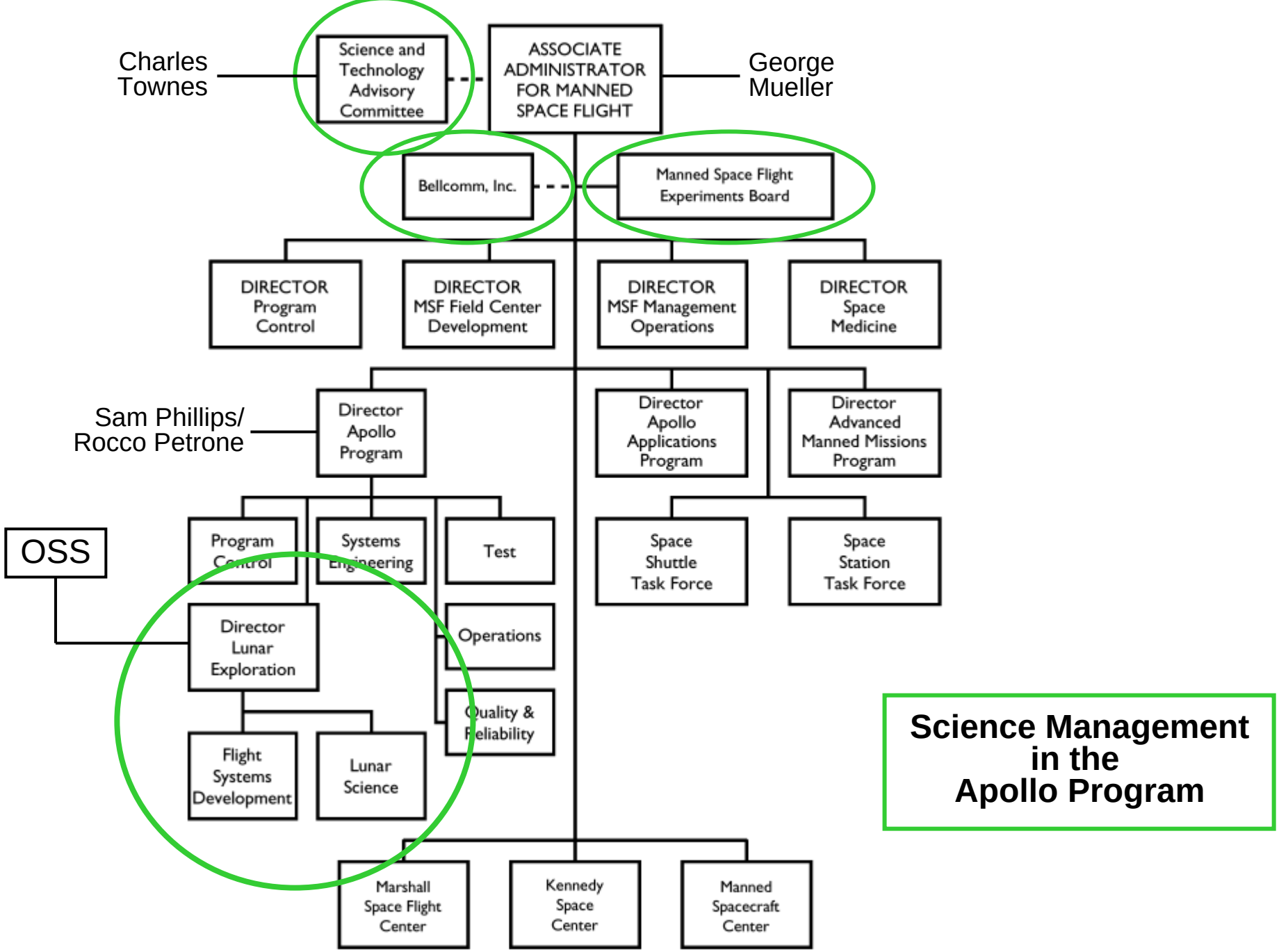
- NASA Hq Apollo Program Office Funded and Managed Science through Apollo Lunar Exploration Office – Project Management Largely at JSC and MSFC
- Science based largely upon SSB Iowa Summer Study (1962) and NASA Falmouth Woods Hole Study (1965). OSS controlled the "Science Process"
- Apollo Data Analysis Program (initiated in 1973)
  - Initiated, Managed and Funded by OSS

After a Lot of Turmoil and Evolution, A Good Science Management Model Emerged

Science/Space Flight Post-Apollo

- Skylab: Apollo Telescope Mount – 1973/1974 - Apollo Model
  - Joint OMSF/OSS Program Office
  - Science by OSS; Funding, Mngt. by OMSF
  - “Successful” Results & Relationship
- Apollo-Soyuz Test Project – 1975 - Apollo Model
  - Joint OMSF/OSS Program Office
  - Science by OSS; Funding, Mngt. by OMSF
    - “Successful” Results & Relationship
- Shuttle/Spacelab – 1981 - Present
  - Shuttle: All Things to All People; No Joint Office OSS Selected, Managed and Funded Science
  - Non-Uniform Support by Science Community “Less than Successful” – Expensive, Cumbersome, Sub-Optimized for Science





OFFICE OF MANNED SPACE FLIGHT ORGANISATION, 1969

Science Management in the Apollo Program

Key Elements of Successful Science Management in Apollo

- Funding Was More Than Adequate X → ?
- Apollo Was Not a Threat to Science X → ?
- Lunar Science Was in Infancy – and Promised to be Exciting; Good "Community" Support X → X
- Joint Program Management Between Science and Human Exploration – Each Doing What it Does Best X → X
- Human Exploration Personnel and NASA Leadership Were Advocates of Science X → X

The Situation is More Difficult Today; What Might We Do?

CHEX Broad Principle #1

- INTEGRATED SCIENCE PROGRAM
  - The scientific study of specific planetary bodies, such as the Moon and Mars, should be treated as an integral part of an overall solar system science program and not separated out simply because there may be concurrent interest in human exploration of those bodies
  - Thus, there should be a single Headquarters office responsible for conducting the scientific aspects of solar system exploration

SMD

CHEX Broad Principle #2

- CLEAR PROGRAM GOALS AND PRIORITIES
  - A program of human spaceflight will have political, engineering, and technological goals in addition to its scientific goals
  - To avoid confusion and misunderstandings, the objectives of each individual component project or mission that integrates space science and human spaceflight should be clearly specified and prioritized

ESMD:
Clearly Distinguish Lunar Science, Preparation for Mars and Lunar Habitation

CHEX Broad Principle #3

- JOINT SPACEFLIGHT/SCIENCE PROGRAM OFFICE
  - The offices responsible for human spaceflight and space science should jointly establish and staff a program office to collaboratively implement the scientific component of human exploration
  - The Apollo model should be followed

ESMD/SMD

Managing Science in a Program of Human Exploration

A Surmountable Challenge