Next Steps in Exploring Deep Space

IAA/ ESA workshop
ESTEC 22/23 sept 2003

Organisers B.H. Foing & W. Huntress
105 registered participants

Programme and abstracts on
http://www.estec.esa.nl/conferences/03C45/index.html
This workshop discussed

• A vision for the scientific exploration of space by humans in the first half of the 21st Century.

The purpose: to provide a roadmap for a systematic, logical, plan for exploration of the Solar System and unlocking the mysteries of the Universe.

• science-driven, co-driven or science enabled

• a program that builds gradually and systematically to establish a permanent presence at each outpost along the way and

• that builds the communications, transportation and other logistical infrastructure as it proceeds.

The workshop will elaborate a process to set of long-term scientific goals for space exploration that provide the context for carrying out scientific investigations at specific destinations in space.

Scientific priorities established by various communities and space agencies over the world.

• Possible architectures for the space flight infrastructure required

• to pursue these science goals at the specified destinations,

• build up and feedback on an ongoing IAA cosmic study ”Next Steps in Exploring Space”

• relevant policy, international aspects and public engagement in this enterprise

Next Steps 2003
Day 1: Monday 22 Sept, plenary session
Welcome and Introduction B. Foing / W. Huntress (conveners)
Session I: The Future of Astronomy & Fundamental Physics from Space
   (Chair: A. Gimenez)
Session II: The Future of Solar System Exploration Science
   (Chair: W. Huntress)
Session III: Technology and Human Aspects
   (Chair: G. Haerendel)

Session IV: Contributed Talks and Discussions in Splinter Groups
(Charge to the groups: Based on science, develop an exploration strategy for both robots &
humans; where do humans provide significant benefit)
Group 1: Moon ESCAPE Copernicus Chair: O. Korabilev
Group 2: NEOs ESCAPE Yb005 Chair: A.C. Levasseur Regourd
Group 3: Mars Room Einstein Chair: R. Pellinen
Group 4: Space Telescopes ESCAPE Yb005 Chair: J.P. Swings, V. Icke

Informal reception + poster session
Day 2: Tuesday 23 Sept
Session V: Rationale for exploration, models for the future (Chair: J. Zimmerman)
Session VI: Architectures for the Next Steps in Deep Space
   ESA Cosmic Vision towards the next decade & Aurora
Session IV (splinter groups continued)
(Charge to the groups: Based on science, develop an exploration strategy for both robots &
humans; where do humans provide significant benefit: preparation of group report )

Session VI: Architectures for the Next Steps in Deep Space
   (presentations space agencies) (Chair: B.H. Foing)
IAA Cosmic study “Next Steps in Exploring Deep Space” W.Huntress

Session VII: Splinter Groups’ Reports, Wrap-up Discussion & Closing remarks:
(incl. Scientific Research Priorities, Robotic and Human aspects, Spacecraft Transportation
   Systems, Near-Term and Long-Term Roadmap, Implementation)
Sessions and Panels Chairs, W. Huntress, B.H.Foing,
• **MOON group report:** renewed Lunar exploration (Muses-A, Clementine, Lunar Prospector)
• Future: SMART-1, Lunar A, Selene, Chandrayan-1, Chinese, US South Pole Aitken return
• Next steps: robotic outposts for geology, then life science, ISRU, life support systems
• Man tended missions from 2015 aiming at permanent presence in 2020
• Moon as testbed for technologies, human/robot operations, step to solar system exploration
• Earth-Moon L1 robotic/manned infrastructure supporting Moon/Mars/NEO exploration

• **MARS group report:** fleet of technology (Pathfinder) and science missions (MGS, Odyssey, Mars Express orbiter and lander, Mars Exploration rovers), and in the near future (2005 Mars Reconnaissance Orbiter, 2007 Phoenix, 2009 Exomars and Mars Science Laboratory)
• Mars network missions for science and supporting human exploration
• Global survey (radar, water, hydrothermal)
• Mars Sample Return mission for search for life; planetary protection
• Technical, medical and ethical aspects of human to Mars
• **NEO group report:**
  − Complete survey of hazardous objects >100 m
  − Characterise several NEOs in situ with fly by or RdV missions
  − Model impact effects and mitigation

• **Large telescope group:**
  − Telescopes at Sun-Earth L2
  − Science: cosmology and structure of Universe, giant 100m IR cold telescopes, interferometers/hypertelescopes: imaging Earth like exoplanets
  − Interest for Telescope maintenance/Human repair: garage vs automobile club

• **“Next Steps in Exploring Deep Space” Programmatic:**
  − Societal and exploration driven, science as co-pilot,
  − New studies for architectural design,
  − Cost estimates, technology roadmap
  − Roadmap for international effective collaboration,
  − Extend forum and consolidate plan with space agencies/ partners for implementation