



**International
Academy of
Astronautics**

THE HUMAN SPACEFLIGHT ACTIVITIES OF THE INTERNATIONAL ACADEMY OF ASTRONAUTICS

San Jose', 9 March 2016

By

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International Academy of Astronautics**



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- Global Cooperation in Deep Space Exploration
- Space Exploration Landscape
- IAA Role
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- Specific Activities
- Conclusions



INTERNATIONAL ACADEMY OF ASTRONAUTICS

- Non Governmental Organization (NGO), Founded in Stockholm in 1960, based on the tradition of classical Academies
- Main Goals:
 - Foster development of astronautics for peaceful purposes
 - Recognize distinguished individuals to foster international cooperation
- 1200 Academicians, elected from 85 Countries, are part of the Academy, members are coming from scientific and humanistic fields
- Secretariat in Paris, with Centers in India, China and Africa
- Major deliverables are Cosmic Studies and Symposia



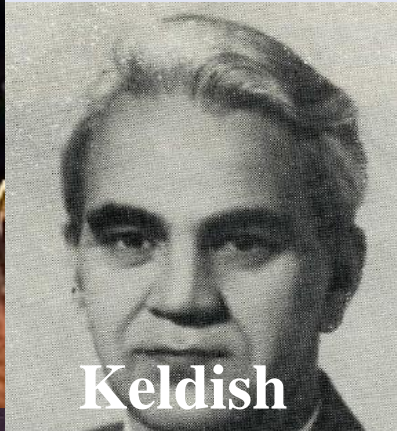
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IAA Human Spaceflight Activities

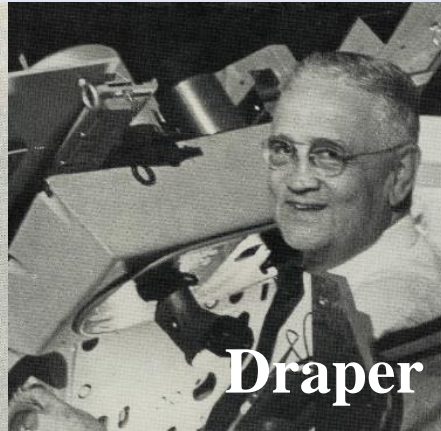
INTERNATIONAL ACADEMY OF ASTRONAUTICS



Gagarin



Keldish



Draper



Armstrong

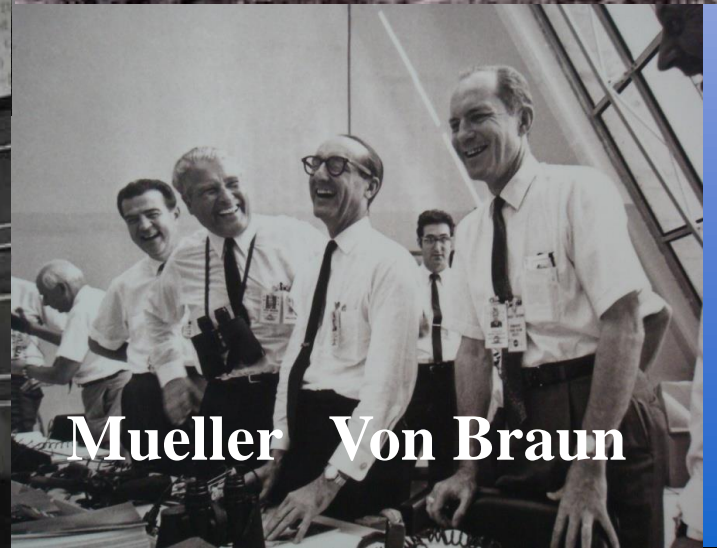
Aldrin

Theodore von Karman
1st President



Pickering

Van Allen



Mueller

Von Braun



GLOBAL COOPERATION IN DEEP SPACE EXPLORATION

- The Societal and Strategic considerations of Human Exploration are paramount for all countries in the world to justify becoming global.
- IAA recognizing this, has organized two Head of Space Agencies Summits in 2010 and 2014 dedicated to Space Exploration beyond Earth. More than 30 Head of Space Agencies attended the Summits

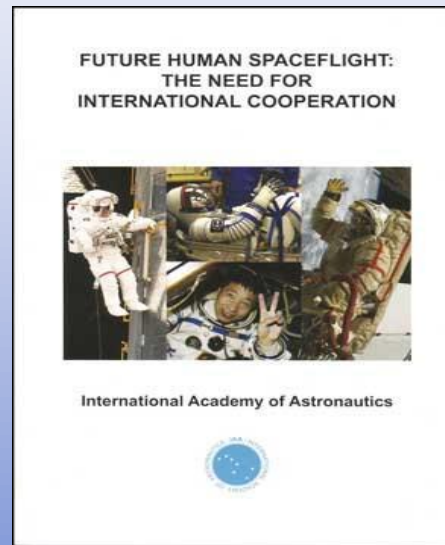
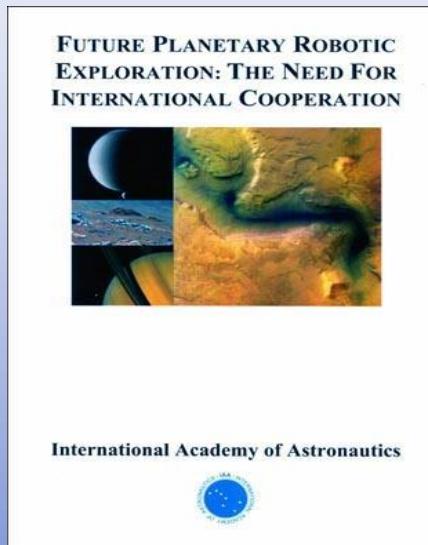




GLOBAL COOPERATION IN DEEP SPACE EXPLORATION

- The following reports were presented at the Summits:

-2010



-2014

International Academy of Astronautics
(IAA)



PLANETARY ROBOTIC EXPLORATION
& HUMAN SPACEFLIGHT

IAA PROPOSALS TO SPACE AGENCIES

- “IAA Proposals” was a synthesis, of 15 activities: 4 in Robotics, 11 in HSF, written by a team (>200) of senior international experts, to foster new projects in Global Deep Space Exploration cooperation including Space Developing countries



SPACE EXPLORATION LANDSCAPE

- Global Space Exploration Strategy defined by 12 Space Agencies in 2007
- International Space Exploration Coordination Group (ISECG) set-up to coordinate Space Agencies exploration policies
- Two Roadmaps published in 2011 and 2013 a new is planned in 2016
- International Space Exploration Forum (ISEF) held several meetings, last in Washington in 2014 and next in Tokyo in 2017
- So far the complexity and difference of priorities in the Space Agencies involved has prevented to reach an agreement on a common program for exploration beyond the International Space Station
- Since ISS program is expected to be concluded by 2024 is urgent to reach an agreement on its follow-up



IAA ROLE

- The Societal and Strategic considerations of Human Exploration beyond LEO are paramount for all countries in the world to justify increasing the global reach.
- IAA and ad-hoc Academicians Reflection Groups are taking initiatives to accelerate the convergence of reaching an agreement for the post ISS global sustainable programme by:
 - ◆ Organizing HoA Summits and Technical Meetings
 - ◆ Publishing Cosmic Studies
 - ◆ Acting as a catalyst of interest groups world wide to increase critical mass, i.e. BRICS countries
 - ◆ Supporting long term vision, i.e. Global Moon Infrastructure and Utilization



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IAA Human Spaceflight Activities

ACTIVITIES THEMES

**Support Human
Exploration in LEO**

**Enabling
Capabilities for
Future Programs**

**SPACE
AGENCIES/IN
DUSTRIES/N
GOs**

Future Global Deep Space Programs



Support Human Exploration in Low Earth Orbit:

- Public/Private Human Access to Space: Human Orbital Market (1/2)
- **Team:** Co-Chairs: K.Davidian,[ken.davidian@faa.gov](USA), S. Di Pippo (Italy)

Nationalities:US, Italy, China, Japan, Russia, Indonesia, India, France

- **Goal:**

For a given country or region, world-wide, how likely is the emergence of a viable commercial Human Orbital industry in 2020-30 ?

Approach:

- Multi-disciplinary study methodology
- Five Analysis Phases
 1. Identification of Target Markets
 2. Conduct Literature Review
 3. Assess Socio-economic Factors (e.g., Political, Legal, Capital, Historical, Cultural)
 4. Identify HOM Industry Chains, Related and Supporting Industries
 5. Assess Probability of HOM Emergence





Public/Private Human Access to Space: Human Orbital Market (2/2)

Study Phase	CAN	CHI	EUR	FRA	GER	ITA	JAP	RUS	UK	USA
Phase 1. Target HOM Results	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Phase 2. Literature Review Methodology	✓	✓	✓	✓	✓	✓		✓	✓	✓
Phase 3. Relevant Social Factors - Theory / Methodology					✓					✓
Phase 4. Theory / Methodology: HOM Industry Base Competitiveness Evaluation			●							✓
Phase 5. Theory / Methodology of HCM Emergence Evaluation										✓

- **Final Report: 100 Pages**
 - Part 1. Theory & Methodology
 - Part 2. Common Results - Country / Regional Results
 - Part 3. Conclusions & Recommendations



Support Human Exploration in Low Earth Orbit:

➤ Feasibility of Inter-Agency Protocol to handle emergency of LEO Astronauts:

- **Team:** Chair: S.Ramakrishnan [ramkrish49@gmail.com] (India)
Nationalities: India, Germany, US, Germany, China, Austria

- **Goals:**
 - Assess legal and technical needs to establish an Understanding to fill existing regulatory space law gaps
 - Propose Draft International Agreement for rescue
 - Propose a Roadmap for possible implementation

- **Relevance:**

Major on the public, See
Press clip after Summit 2014:



In Orbit

COMMENTARY

Spaceflight Safety

International study probes orbital crew rescue

By Frank Morring, Jr.
Senior Editor Frank Morring, Jr., blogs at:
AviationWeek.com/onspace
morring@aviationweek.com

At the recent heads-of-agency summit in Washington, an international group of experts presented the results of an IAA study that outlines potential features of a space crew rescue regime and suggests a way forward to create it. The group, which included govern-



Enabling Capabilities for Future Programs

➤ Feasibility Study of Astronauts Standardized Career Dose Limit in LEO and outlook for BLEO

- **Team:** Chair: S. McKenna-Lawlor [stil@nuim.ie] (Ireland);
Nationalities: Canada, China, Germany, India, Ireland, Japan, Malaysia, Poland, Russia, US, Italy, Czech, Sweden
- **Goals:**



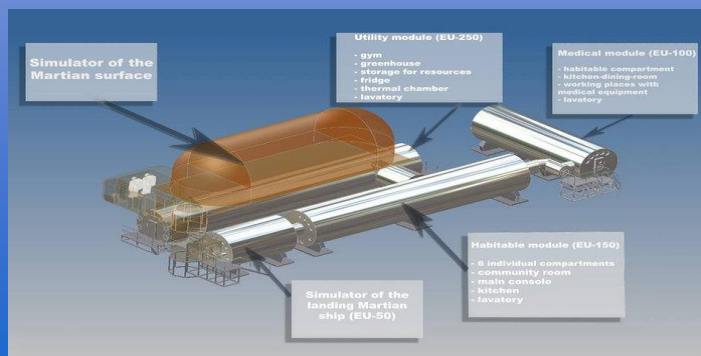
- Assess Radiation Standards and Models of Space Agencies in LEO;
- Propose a methodology to derive common radiation standards for Human Missions around and on the Moon
- Foster improved models and technologies
- Preliminary definition of a HSSA



Enabling Capabilities for Future Programs

➤ IAA Virtual Institute of Space Life Sciences and Medicine

- **Team:** Chairs: R.Gerzer (Germany), O.Orlov (Russia)
J.Davis (US), Ying-hui Li (China), Chiaki Mukai (Japan);
Other Nationalities: France, NL, Brazil, Italy, Sweden, Belgium
- **Goals:**



- Create a Global think-tank to promote joint activities of collaboration of space and terrestrial life science community
- Foster Development Countries involvement
- Exploit utilization of existing on-ground and in space facilities (i.e. EnviHab, MARS, NHHPC,..)
- Resources will be sought to run the Institute with contributions in kind and financial



Enabling Capabilities for Future Programs

➤ Human Space Technology Pilot Projects with Developing Spacefaring Countries

- **Team:** Co-Chairs; G.Reibaldi [giuseppe.reibaldi@iaamail.org](Italy), Z.Fengyuan (China)

Other Nationalities: India, Austria, Germany, Singapore, Japan, Malaysia, Russia, USA, Nigeria, Russia, Pakistan, France, Korea, Thailand, S.Arabia

- **Goals:**



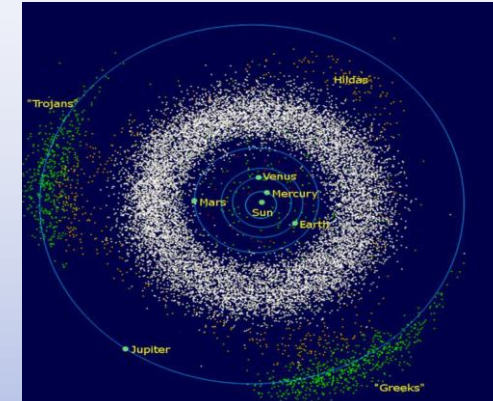
- Define Emerging Spacefaring Countries Challenges and Opportunities in exploiting HSF technologies in Life Science and Education
- Identify available Infrastructures, Ground and In-orbit, for implementing projects
- Release a Call for Pilot Project Proposals
- Pilot Projects selection, definition, implementation
- Decision Road map in cooperation with UNOOSA



Future Global Deep Space Programs

➤ Space Mineral Resources, Challenges and Opportunities

- **Team:** Chair: Art Dula [artdula@gmail.com] (US)
Nationalities: US, China, Saudi Arabia, Russia, France, Japan, Germany, Spain, Australia, Sri Lanka, Ukraine
- **Goals:**
 - Confirm the legality of exploiting SMR under the current space treaties.
 - Assess the technical, economical, social feasibility, including the published Industrial Roadmaps
 - Segment the possible Markets.
 - Propose a Global action plan for demonstration missions in partnership Industry/Space Agencies



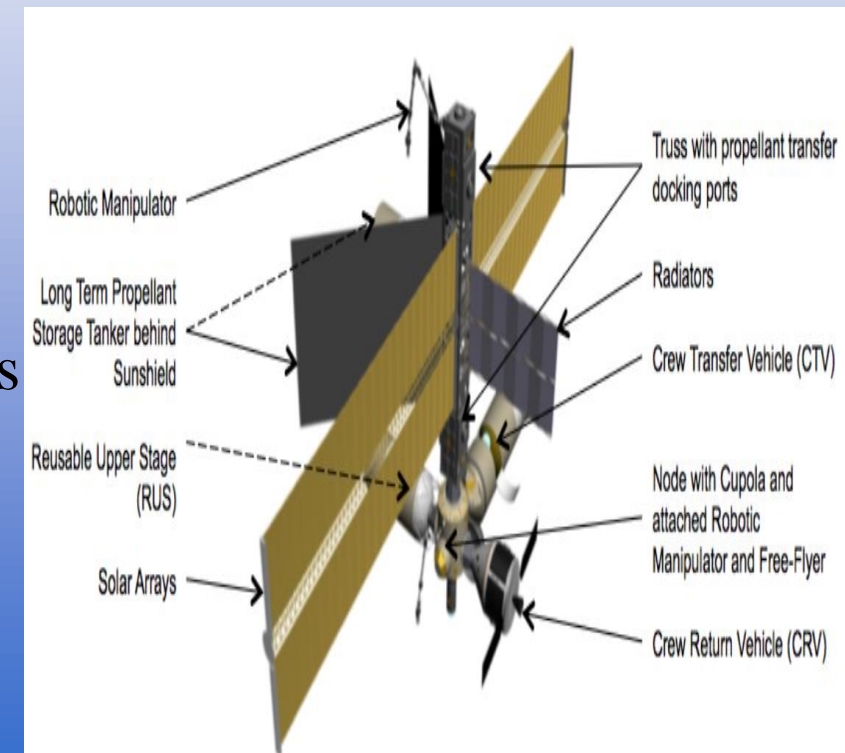
[Courtesy Deep Space Industry]



Future Global Deep Space Programs

➤ Long Term Space Propellant Depot

- **Team:** Co-Chairs: LU Yu [luyalt@163.com](China), G.Saccoccia (Italy)
Nationalities: China, Italy, US, France, Germany, Russia, India
- **Goals:**
 - Identify requirements, concepts and opportunities for future high energy propellant space depots including technical, legal and economical aspects
 - Identify the required key technologies
 - Define the roadmap(s) for this new capability.

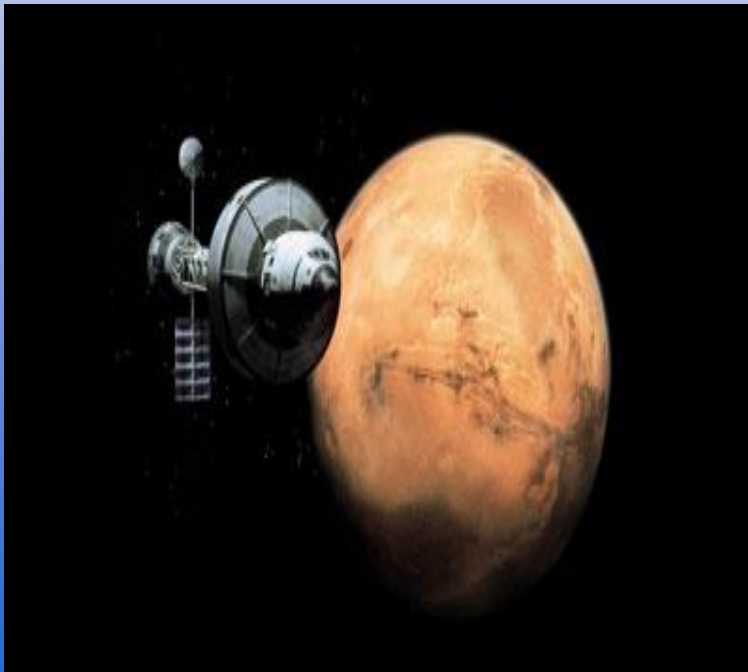




Future Global Deep Space Programs

➤ Global Human Mars System Mission Exploration

- **Team:** Co-Chairs: G.Genta [giancarlo.genta@polito.it] (I), A.Dupas (F)
Nationalities: Italy, France, US, CND, Ireland, Germany, Japan, Russia, China, Spain
- **Goals:**



- Define Global Scenario to define a baseline Mission including developing countries
- Assess the programmatic, technical, legal issues related
- Define the required technologies with decision milestones.
- Identify pilot missions to demonstrate technologies reducing risk and cost of the Global Mars mission



Supporting Long Term Vision

- IAA and ad-hoc Reflection Groups are initiating a process to rally, at global level, public at large in support of Long Term Visions following ISS, such as the creation of the Global Moon Infrastructure and Utilization
- Public Opinion and Industry support is a key component, beside government support, for a sustainable post-ISS programme
- The process is under definition and will be complementary and synergetic to the Space Agencies activities
- The involvement of Space Developing countries in future post-ISS programmes are key for their sustainability and global reach



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CONCLUSIONS

- Space Exploration (human and robotics) is a major investment in the future of mankind and requires to be sustainable; as such must open new markets to industry and governments
- ISS is coming to an end by 2024 and a follow-up needs to be agreed
- The ISECG and ISEF are fora to foster new cooperative programs, any additional forum is welcome if it can help to reach an agreed global program beyond ISS with supporting robotics projects
- IAA and Academicians are proactive taking actions aimed to accelerate the definition of the post-ISS programme involving space developing countries
- Space Agencies, Industries, Universities and Research Centers are invited to support those activities and propose new one