NASA's Human Research Program: Evolving Collaborations to Enable the Future of Human Spaceflight

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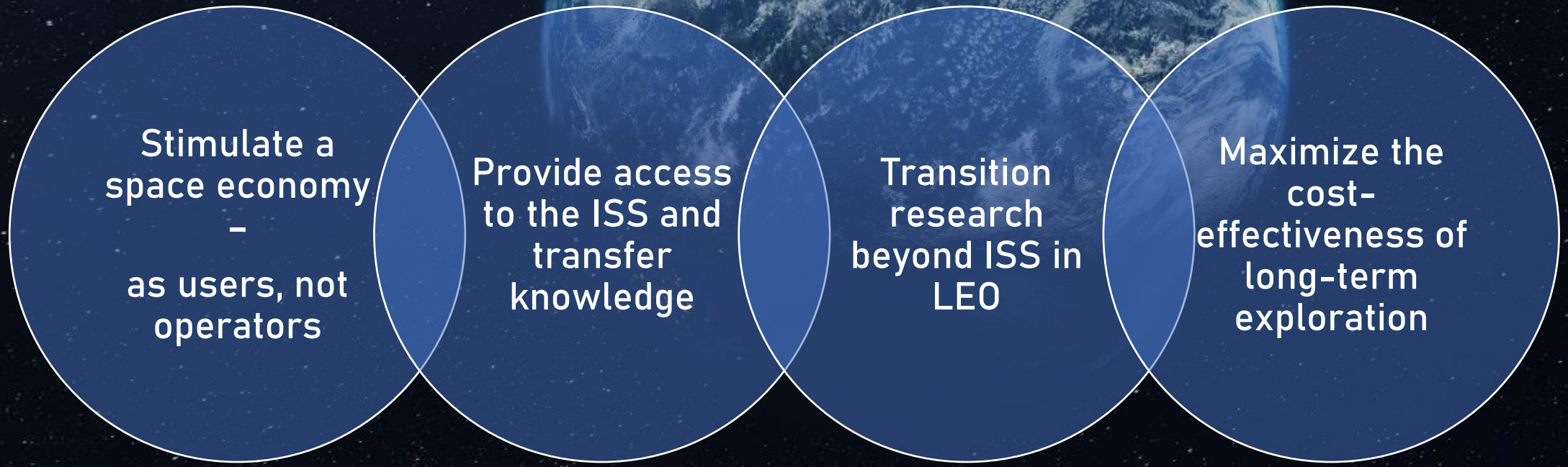
International Cooperation is NASA's Heritage

- Cornerstone of NASA's activities throughout its history
- Directed by National Aeronautics and Space Act that created NASA in 1958
- Strongly endorsed by the 2020 National Space Policy
- Includes over 6,700 total agreements with over 135 nations
- Brings multiple benefits to NASA and its partners

NASA Key Policies and Announcements

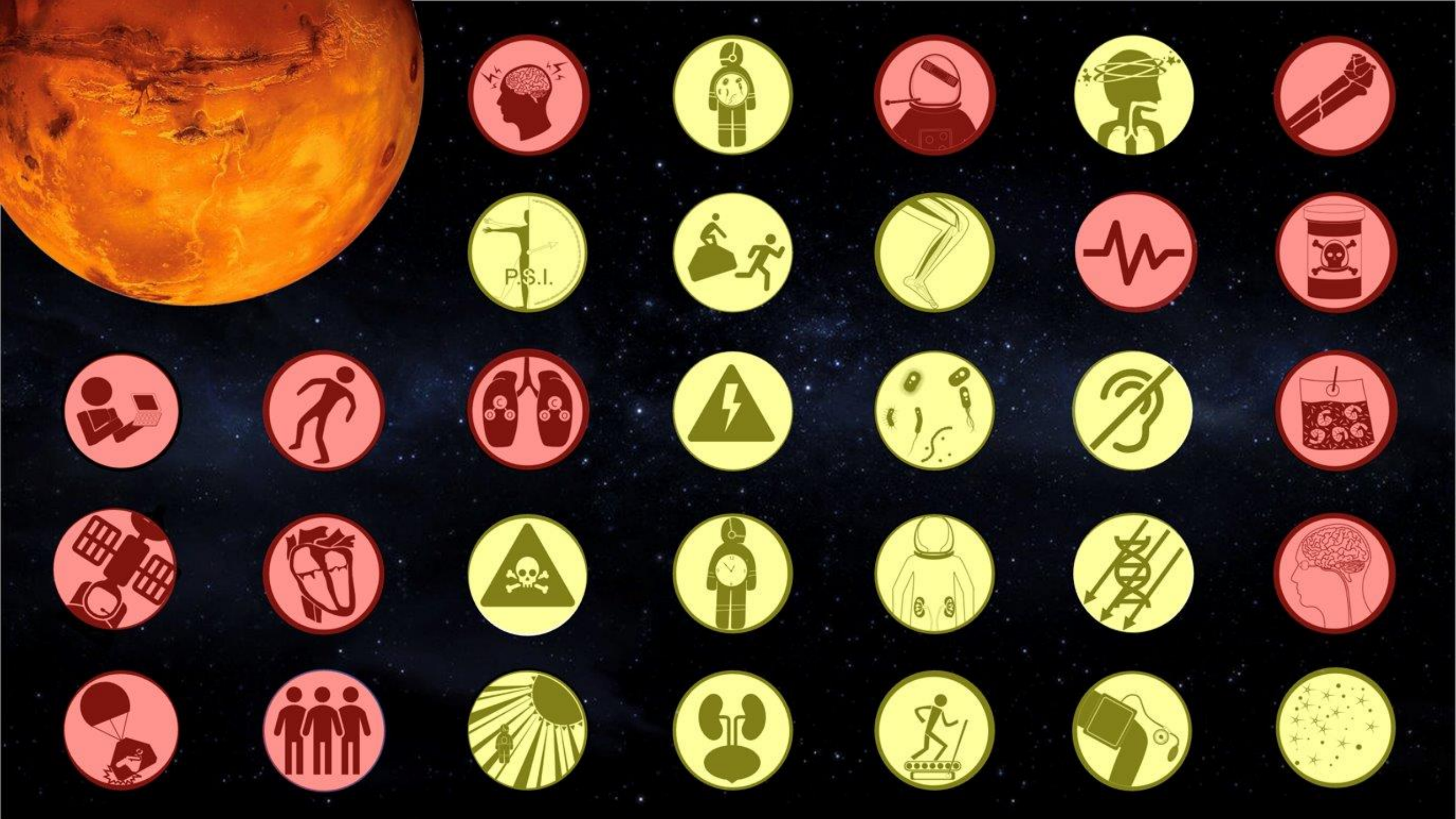
COMMERCIAL "DESTINATIONS" FOR…

Research and development | In-space manufacturing, assembly, and servicing | Entertainment
Sponsorship & marketing | Space tourism | Transportation of people and cargo | …and more!



NASA's Human Research Program Mission Statement

To enable space exploration beyond low Earth orbit by reducing the risks to human health & performance


P.S.I.

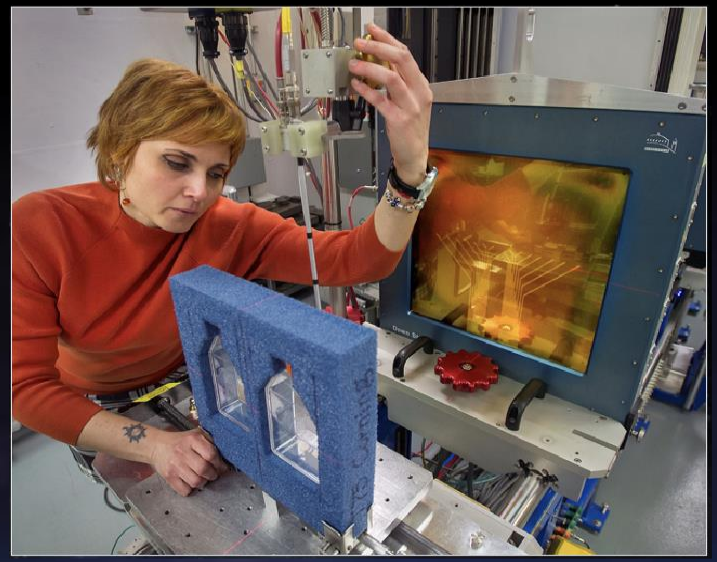

Human Research Program
STEPS TO MARS
EARTH:
Ground Analogs of Spaceflight
LOW EARTH ORBIT:
International Space Station
Commercial Spaceflight Vehicles
Commercial Space Stations
LUNAR MISSIONS:
Orion
Gateway
Human Landing Systems
Lunar Outposts and Rovers
DISTANCE
RADIATION
GRAVITY
ENVIRONMENT
ISOLATION

Ground Analogs of Spaceflight
Platforms for collaboration

HERA

:envihab

NSRL



Antarctica

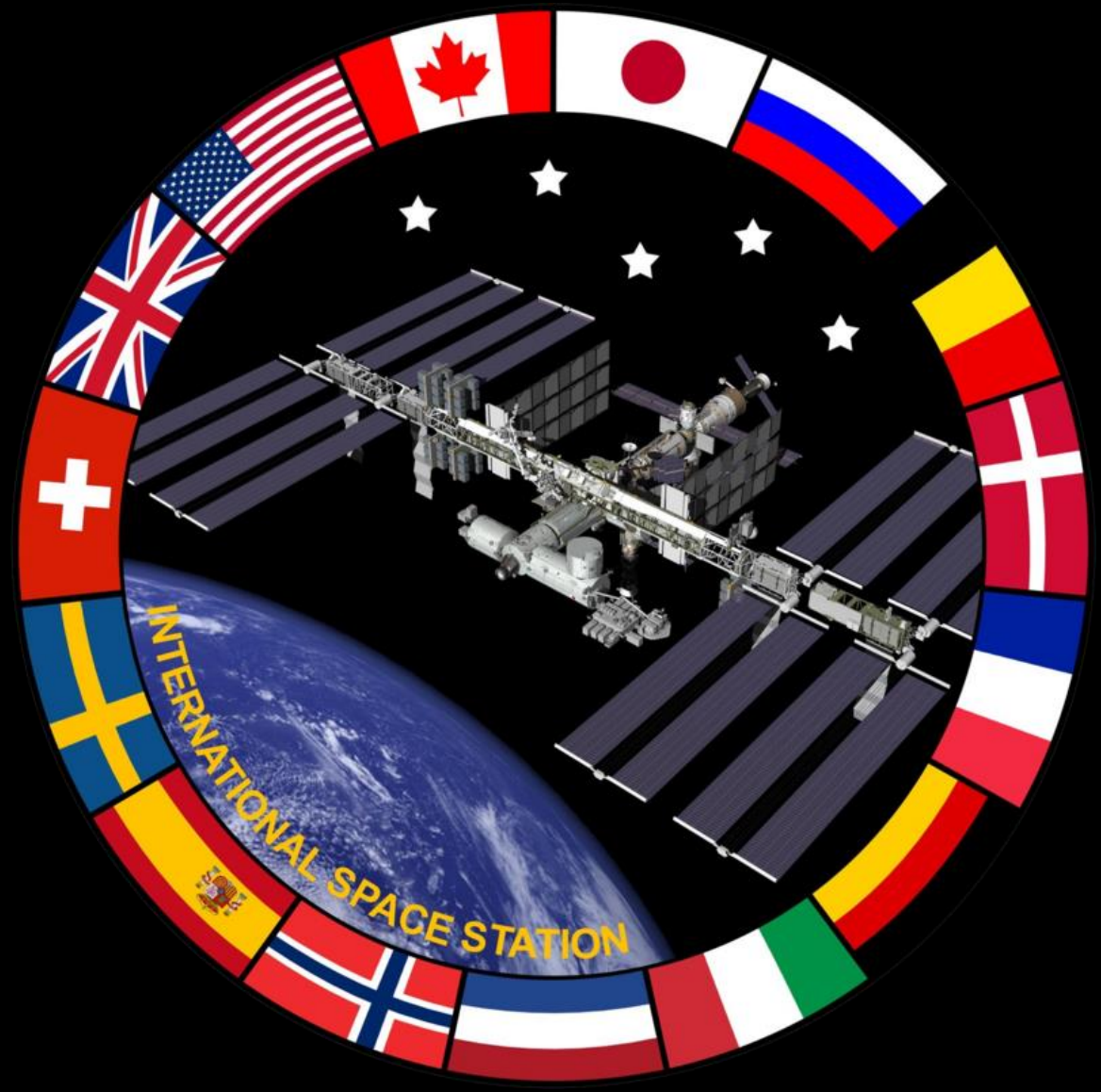
Kraken

CHAPEA

HUMANITY'S HOME IN ORBIT

OUR STATE-OF-THE-ART MICROGRAVITY LAB

ISS has provided a platform for broad international collaboration on space life sciences



Funded Commercial Partnerships

POLARIS DAWN

ARTEMIS ACCORDS

Angola 

Argentina 

Armenia 

Australia 

Bahrain 

Belgium 

Brazil 

Bulgaria 

Canada 

Colombia 

Czech Republic 

Ecuador 

France 

Germany 

Greece 

Iceland 

India 

Israel 

Italy 

Japan 

Lithuania 

Luxembourg 

Mexico 

Netherlands 

New Zealand 

Nigeria 

Peru 

Poland 

Republic of Korea 

Romania 

Rwanda 

Saudi Arabia 

Singapore 

Slovakia 

Slovenia 

Spain 

Sweden 

Switzerland 

Ukraine 

United Arab Emirates 

United Kingdom 

United States of America 

Uruguay 

United for Peaceful Exploration of Deep Space

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ARTEMIS I
ARTEMIS

ARTEMIS II


ARTEMIS III

Existing HRP International Partners

Korea Disease Control and Prevention Agency
National Institute of Health

Ground-Based International Research Collaborations

CIPHER (Complement of Integrated Protocols for Human Exploration Research)

CIPHER seeks to assess the whole human response to time spent in space.

14 studies that evaluate:

- Bone and joint health
- Brain and behavior
- Cardiovascular system
- Exercise performance
- Sensorimotor systems
- Vision
- Biomarkers

The Goal : Extrapolate station data to predict effects on missions to the Moon, Mars, and beyond!

ISS4Mars Use Cases Recommended for Future Implementation

Earth-Independent Medical Operations

Earth-Independent Integrated Operations

Lower-Body Negative Pressure Countermeasure

Earth-Independent ECLSS/Food/Autonomy

Post-Landing Assessment

International HRP Partnerships: The Road to Collaboration

- Form **relationships** between agencies or scientists by attending conferences, working groups, 1:1 meetings
- Develop top-level **ideas** for mutually-beneficial research on ground or in space with clear technical merit. Can also include discussing guidelines for standardized data measurements and handling, roadmaps, or education, etc.
- Identify **agreements** allowing more in-depth conversations
- Develop **detailed** collaboration and study design creation plans without direct funding of foreign investigators
- Identify **agreements** for detailed study plans for implementation, roles and responsibilities, data sharing, intellectual property, publication rights, etc.
- **Implement** study, analyze, and jointly publish and report