

Istituto Nazionale di Astrofisica
Radio Astronomia



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**Working toward the implementation of
the Moon Village approach**

The MOON VILLAGE ASSOCIATION

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Moon Village Association

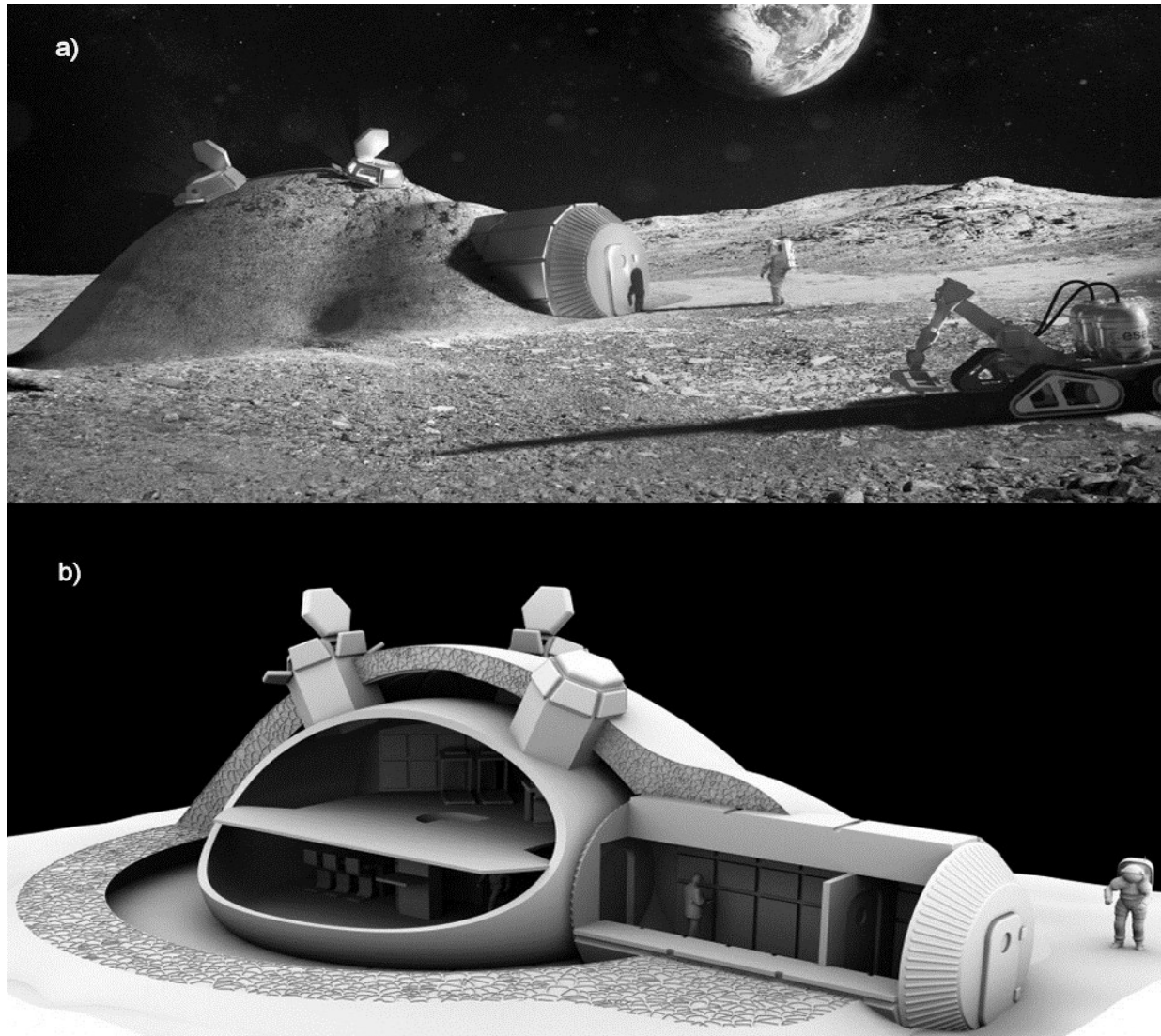


MOON
VILLAGE ASSOCIATION

The role of the Moon in human space exploration

- **In particular, the Moon village has a wider scope than the exploration of our satellite: it is intended as a first step along the way of establishing humankind as a spacefaring civilization.**
- **The use of the Moon as a stepping stone for the exploration and then the settling of our solar system (starting with Mars) and beyond is an integral part of the concept.**

The Moon Village.



The role of the Moon in space exploration

- **The Moon may play an important role in Mars exploration: is it a stepping stone for future human Mars missions?**
- **This is a controversial question**
- **Should we proceed to lunar exploration and utilization before attempting human Mars exploration?**
- **Does this increase substantially the time required to mount a Mars exploration campaign?**
- **Is it affordable to proceed to the exploration of both?**

Exploration and exploitation

- **Are exploration goals synergetic with the economic utilization of the Moon?**
- **What are the appropriate roles of governments and private organizations in Moon and Mars exploration?**
- **What could be an optimal international framework to complement and possibly coordinate efforts of particular countries in the Moon and Mars exploration?**
- **What technological and scientific effort is required?**

Starting a lunar economy

- **Lunar resource utilization may lead to a significant commercial interest in lunar exploration and settlement** Close one of the lunar poles, water can be extracted
- **It may be possible to draw water from a near-Earth comet and transport it to the Moon**
- **Mining the lunar regolith for minerals. Most of the regolith consists of oxides, like SiO_2 , Al_2O_3 , TiO_2 , CrO_3 , FeO , MnO , etc.**
- **The solar wind implants some volatiles**
- **Materials from metallic asteroids may be very important**

What will follow the ISS?

- **It is often stated that when the commitment to the ISS ends, a human Mars mission is a candidate for the next international effort in space**
- **However, it is not likely that there will be sufficient funding available for either a human mission to Mars or a sustained Lunar exploration campaign until the ISS Program ends in the early 2020s, nominally 2024**
- **Developing systems may not be able to begin until the mid-to late-2030s, postponing a Mars mission well into the 2040s or beyond**

Synergies between Moon and Mars exploration

- **A lunar outpost will produce the propellant required to go to Mars?**
- **The Moon, or a station near it, will serve as a spaceport to launch missions farther into space?**
- **These statements must be assessed with care and scepticisms, in particular the first one.**

The Moon as a spaceport

- **The trajectory to any solar system planet must start with a launch in the ecliptic plane**
- **The ISS has an orbital plane far from the ecliptic**
- **The orbit of the Moon has an inclination of just 5° on the ecliptic, so the Lagrange points of the Moon may be better positions for a spaceport.**
- **A point on the equator of the Moon is also all right, but anyway the spacecraft must be carried from Earth**
- **The Moon might become a convenient spaceport if the spacecraft is built on the Moon using lunar materials**

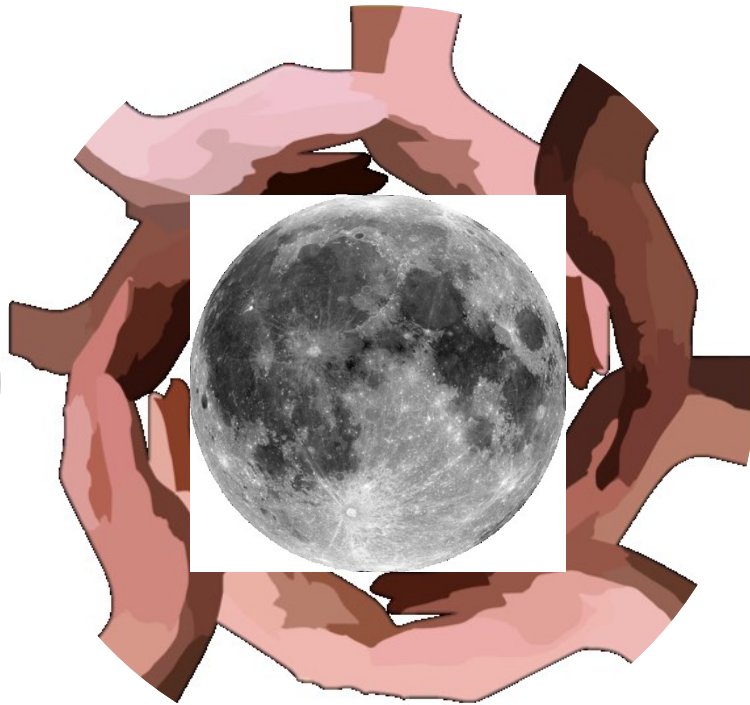
The Moon as filling station

- The Moon contains much oxygen, mostly in the form of oxides. To extract it will require energy**
- An industry on this scale is unlikely to be established in the time remaining before we initiate the human exploration of Mars**
- Only if large quantities of water are found, both fuel and oxidizer can be produced easily and efficiently**
- Even in this case, it is questionable that the quantity of water present on the Moon is so large to justify its use for anything other than lunar exploration and colonization**

The Moon as training station

- **The Moon may be an ideal training ground**
- **All the technologies associated with the habitat, the life support systems, and the transportation systems can be easily tested for periods sufficient to qualify them**
- **However, the Moon and Mars are very different locations, with different operating conditions, e.g. energy production technologies**
- **The usefulness of testing systems on the Moon may, or may not, make technical and programmatic sense. It mostly depends on the systems we are dealing with**

What is the Moon Village?



THE MOON VILLAGE IS ...

- An ensemble of efforts worldwide, governmental, private and general public
- Aiming to explore and use the moon resources
- In a sustainable manner

THE MOON VILLAGE IS NOT ...

- An “ISS on the Moon”
- A literal village
- A single science facility
- Restricted to the surface of the Moon

What is the Moon Village Association?

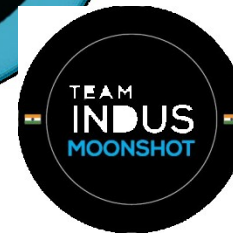
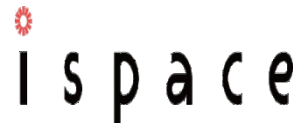
The Moon Village Association (MVA) was created in June 2017, to foster the implementation of the Moon Village

A forum to advance development of the Moon Village involving Industry, government, space agencies, international organizations / NGOs, and the Public at large

A catalyst stimulating a virtuous cycle of investments for the development of a lunar economy aiming to settle humankind on the Moon as well as cultural inspiration for future generations

**Individual Members:
170 from 34
countries**

**Institutional
Members:
7 from 6 countries**



MVA Individual Members



NEWS

Get In

Receive updates on global Moon-related developments via social media, newsletters, networking, press releases, meetings & more...

Community

Participate in MVA global & regional activities, with others from companies, NGOs, Agencies, venture capitalists, etc.

Make a Difference

Participate in MVA Working Groups & Workshops and help build a global consensus *vis-à-vis* Humanity's lunar future

MVA Institutional Members

Widen Horizons

Develop contacts with prospective customers, service providers, employees and more across the globe



Lead the Future

Participate in the emerging multi-billion Moon Market of goods and services

Moon Market

Have access a unique MVA database products, technologies & services)...

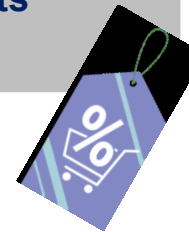
- brief product description;
- technology readiness levels (TRL);
- possible applications: including spin-offs / spin-ins;
- partnership opportunities: investor, payload supplier, and more



LOGIN

Savings

Get discounts on participation in MVA events



Win Recognition

Eligibility for the annual MVA Award for best achievements in Lunar exploration, utilization & settlement



MVA Global Network

MVA is creating A Global Network among all members



The Network Provides...

Direct connections with the major players worldwide, including space agencies, experts, companies, think tanks, venture capitalists etc.

Regional Coordinators lead local MVA activities, including regional meetings, special events, and more...

The Network Spans...

Now : Africa, China, Hungary, Cyprus, South America, Japan, Russia, Italy

Coming : India, US, Others...

Working Groups & Workshops

- The MVA is framing a consensus global view of humanity's Lunar future – missions & markets, architectures, cultural considerations, and more
- Many of the technical and community engagement activities of the Moon Village Association will be accomplished through a series of ongoing “Working Groups”
- These Working Groups will
 - ✓ Be led by members in good standing of the Association
 - ✓ Conduct their activities by means of email, cooperative online means, teleconferences, etc., according to a coordinated schedule
 - ✓ Support an annual MVA “International Moon Village Workshop”



Working Groups



Summary



- The Earth is going to the Moon – to discover the unknown, to develop new resources, to extend human activity and presence – and improve the quality of life here at home
- The Moon Village Association invites individuals and institutions around the Globe to join in advancing Humanity's next step into the future...
- Get involved immediately: membership, networks, working groups and more...



The Moon Village Association

www.moonvillageassociation.org