

## ESA'S MOON VILLAGE AND GLOBAL COOPERATION

The 'Moon Village' vision is a part of ESA Director General Johann-Dietrich Woerner's [Space 4.0](#) concept, a new epoch in the space sector where space exploration is no longer exclusive to the public sector but open to private organizations as well.

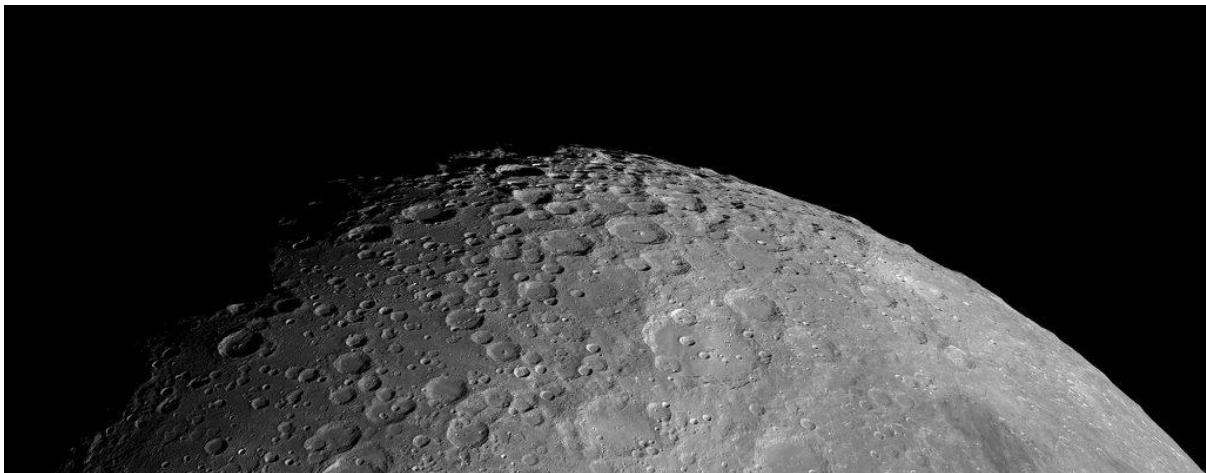
ESA Director-General Johann-Dietrich Woerner discussed his concept of an international "Moon Village" cooperation at the International Astronautical Congress (IAF) in Jerusalem in October 2016 [1].

A concise summary accepted by the ESA Council Meeting on Ministerial level in December 2016 is repeated here verbatim:

### MOON VILLAGE: A VISION FOR GLOBAL COOPERATION AND SPACE 4.0

*Editor's note: This is a [cross-post](#) from the ESA Ministerial Council 2016 minisite.*

From the earliest astronomy to the space race, humankind has witnessed a constant evolution in the exploration and use of space. Now, with the International Space Station (ISS), an unparalleled level of cooperation has been achieved which has continued largely unaffected by any crises that may be occurring on Earth: many nations all pulling together, demonstrating day in, day out, just how important it is to invest in research and technology.



The paradigm shift that we see today in space activities is best encapsulated by the term 'Space 4.0', and the 'Moon Village' concept seeks to transform this paradigm shift into a set of concrete actions and create an environment where both international cooperation and the commercialisation of space can thrive.

The Moon Village concept was developed through a process of thorough analysis but it is vital to understand that what we are describing is neither a project nor a programme. By 'Moon Village' we do not mean a development planned around houses, some shops and a community centre. Rather, the term 'village' in this context refers this: a community created when groups join forces without first sorting out every detail, instead simply coming together with a view to sharing interests and capabilities.

The Moon Village is open to any and all interested parties and nations. There are no stipulations as to the form their participation might take: robotic and astronaut activities are equally sought after. You might see not only scientific and technological activities, but also activities based on exploiting

resources or even tourism. It is precisely the open nature of the concept that would allow many nationalities to go to the Moon and take part while leaving behind them on Earth any differences of opinion.

From a scientific perspective, the Moon is truly fascinating, firstly as an archive of Earth's early history, but also because you could site a radio telescope on the far side of the Moon and stare deep into the Universe without any interference from human made signals. For future space missions, you could develop and test methods based on new technologies, such as additive manufacturing, that could potentially make use of locally available resources.

*Moon Village is not a single project, nor a fixed plan with a defined time table. It's a vision for an open architecture and an international community initiative.*

It is clear that in the future, humans will take part in crewed flights farther into the Solar System, so the Moon Village could also act as the perfect springboard and testing ground with that objective in mind.



The Moon Village concept has the potential, by providing fascination and inspiration in equal measure, to awaken renewed interest in **STEM** subjects, with benefits being felt well beyond the world of space. Now we must bring interested parties together so as to achieve at least some degree of coordination and exploitation of potential synergies.

## **DISCUSSION**

*(J. Kehr, Editor SpaceOps News, Journal of SpaceOperations & Communicator)*

The vision of a global Moon village with an open architecture is intriguing and kind of reminds me of the visionary scenario of the German bestseller author Frank Schaetzing : [LIMIT] 2009, in which he depicts not only moon-mining activities by different nations (USA, Russia) but also flourishing space tourism in a first class hotel on the Moon. The means of transportation is a privately funded space elevator – which is a little ways off to come about. However Jan Woerner's concept moves us strongly in this direction.

In my opinion it contains all the right ingredients to further space exploration and commercialization

and also to capture the interest of the people, in contrast to offering a one-way trip to the Mars as reality show (Mars One mission).

The important ingredients are: global cooperation for one goal but allowing to pursue individual interests, inspiration for the future, long term commitments for the joint goal and the promise of return of investments (ROI).

Woerner says that the pieces of the plan are smoothly falling into place when describing the outcome of ESA's Ministerial Council 2016 at Lucerne, Switzerland [5].

Space 4.0 and the 'Moon Village' garnered worldwide cooperation, with all 22 ESA member states along with cooperating states outside the EU expressing support. After multiple rounds of lively discussion (as well as exhausting negotiations on funding), his proposal 'Space 4.0' for a United Space in Europe" amassed €10.3 billion (\$10.77 billion) in pledges at the end of the 2016 ESA Council conference [6].

ESA isn't the only one with eyes set on the Moon, British architecture firm Foster + Partners designed their own version of an inflatable lunar habitat with a catenary dome capable of shielding inhabitants from space radiation and small debris. The Google Lunar X-prize also challenged a battalion of 16 international claimants to aim for the Moon.

The space agencies of India, Russia, Japan, and China have also exploration programs for the Moon.

Woerner's vision was confirmed at a DG Media Briefing meeting at ESTEC on January 18, 2017 which was broadcast online. Watching this briefing motivated me to kind of try to find some answers to questions which were not asked during the briefing by searching for additional ESA and other public statements.

#### *1. Who should take the first steps?*

As per ESA/EU declaration (October 26, 2016), "The common European vision is that Europe remains a world-class actor in space and a partner of choice on the international scene. By 2030, Europe should be able to fully benefit from its space solutions to implement its policies, to strengthen European values and security, improve knowledge and foster prosperity. Every single European citizen should benefit from Europe's space capacities and capabilities." [3].

ESA and EU are prepared to initiate and take a leading part to realize this vision.

NASA does not want a landing on the Moon according to Charles Bolden, NASA Administrator: "Nasa will not take the lead on a human lunar mission. NASA is not going to the Moon with a human as a primary project probably in my lifetime. And the reason is, we can only do so many things. Instead the focus would remain on human mission to asteroids and to Mars. We intend to do that, and I think it can be done." [7], however an US Federal Aviation Administration advisory committee has recommended that the FAA start discussions with the European Space Agency about commercial participation in an international lunar base concept promoted by the agency's leader [4].

#### *2. Who could be interested to participate and what could be a kernel "village"*

As mentioned above the Moon is an interesting object for many spacefaring nations and a couple of missions are already underway: the Google X-prize triggered a worldwide competition to set a rover on the Moon move it some 500m and send images of the moon surface back to Earth.

Furthermore the space agency of China is planning a lunar sample return mission, the space agency of Russia is planning a lunar lander with ESA participation, NASA wants to fly the Orion/service module around the Moon by 2020 as a demo mission and also India (Chandrayaan 2) and South Korea (Moon rover) are in "the act", Japan's JAXA has currently no concrete missions planned but with its completed Kaguya mission is definitely a potential partner, in particular with its ISS-partner experience. So, all those countries could be potential participants for joining the "vision".

A possible "kernel" village is shown in the above picture. It consists of a Columbus like module with inflatable domes attached, the domes and the module(s) will be covered with lunar soil for protection. ESA is actively working on methods of covering the domes with lunar dust/soil using robotic rovers [2].

### *3. Time horizon to start setting up development priorities to avoid duplications and interface problems.*

During a “Moon Village”-workshop in EAC Cologne Andreas Morgensen (ESA) assessed the necessary development cycle for a new suite of technical capabilities to last around 20 years [2].

### *4. What kind of body would govern and coordinate such an enterprise?*

As ESA DG Woerner pointed out, ESA sees its role as “enabler for cooperation” and to start on a small Moon landing project, requiring modest start-up cost to provide “multiple use for multiple users”. As the ‘Moon village’ vision was also the result of developing Europe’s future in space after the planned discontinuation of the international ISS program in 2024, the assumption could be made that the structure on an international moon base partnership would be established according to the same agreements like for the ISS: a “partner/bulkhead”- approach, i.e., everybody would be responsible for his own contributions (no exchange of funds) sharing the cost for the joint infrastructure according to bartering agreements.

With new partners (China, India) and private companies (Industry) invited to participate, the negotiations will be more difficult than for the ISS. One lesson from ISS agreement negotiations should be heeded: the earlier infrastructural interfaces and standards can be agreed the less costly the adaptations during the various implementation phases will be.

The ISS experience showed that big international co-operations across divergent political borderlines are possible, however future political disputes and “surprises” are not predictable – bound to unwanted cost overruns and much longer implementation periods than planned (for the ISS, I would guess it was a factor 2 in implementation time).

In summary: ‘Moon Village’ is an excellent initiative to keep space exploration in the focus of global interest and to unify the major spacefaring nations including their industry and academia for a joint goal.

The goal is so challenging that it only can be achieved by joining all forces.

So, let’s do it!

## **References**

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[2] Moon Village build-up video  
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[3] Vision and Goals for the future of Europe in space  
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[4] FAA endorsement (Space News)  
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See also: <http://spacenews.com/faa-advisory-group-endorses-moon-village-concept/#sthash.6rsLW15c.dpuf>.

[5] Woerner’s Blog: <http://blogs.esa.int/janwoerner/2016/12/04/esa-council-at-ministerial-level-2016-success-tinged-with-a-bit-of-disappointment/>

[6] Slowly coming together: <https://futurism.com/esas-plan-for-a-moon-village-is-slowly-starting-to-come-together/>

[7] Hedman, Eric 4 Aug. 2014. The Moon or Mars? The Space Review, see also <http://www.thespacereview.com/article/2737/1>