

15th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Strategies & Architectures as the Framework for Future Building Blocks in Space Exploration and
Development (1)

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REVIEW AND ANALYSIS OF (EUROPEAN) BUILDING BLOCKS FOR A FUTURE MOON
VILLAGE**Abstract**

The paper represents the findings and conclusions of a working group that considered building blocks for a Moon Village.

The proposed paper on building blocks for Moon activities intends to inform the reader about existing and near-term capabilities that – if properly combined – show the potential feasibility of establishing a permanent presence on the Moon. The perspective is European. Nevertheless, it is apparent that the

Moon could be an objective that encourages the worlds space industries, agencies and any interested parties to consider what elements they could contribute.

There are many well-known approaches for Moon transfers. The combination of launcher, spacecraft propulsion systems and selected transfer dictate the payload mass available. This can be in the order 1t to 20t, per individual launch. Our review identifies the broad range of potential mission types (e.g. delivery of infrastructure, emplacement of consumables, or human transport) that would benefit from multi-lateral engagement.

The building blocks identified are significant in number and vary in maturity. In our study we have identified the following building-block groups: Launchers, Transportation, Science and Research, Habitation, Resources, Electrical Power, Operations, Life Support, Robotics and Communications. Within these we identified key building blocks and technologies, for example: the Multi-Purpose Crew Vehicle (MPCV) Ariane 5/6, In-Situ Resource Utilisation (ISRU), Rovers/Habitats, Advance Manufacturing, Robotics, Closed & Open life support systems and existing ground infrastructure. The AI challenge and the complimentary aspects of robotics and human-tendered capabilities are important. The technical information covers concept, mass, power and the technologies that enable their realisation. This aims to show the engagement options for the variety of stakeholders that exist.

In conclusion:

- Efforts towards Moon activities already exist inside and outside Europe and are reported on
- It is important to communicate that the worldwide space industry has a head start with respect to the Apollo era.
- Near-term proposed programmes, e.g. a cis-lunar habitat, represent credible further steps.
- Certain capabilities are inherently global in partnership (i.e., transportation, launchers)
- Energy generation and storage present formidable challenges that depend heavily on landing site and operational scenario.

We assert that it is essential to pose a unique goal to drive ongoing efforts in a multi-lateral environment: a philosophy on how to further explore the Moon. Perhaps it is the next natural step for humanity, with challenges and opportunities for international cooperation.