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Ways ahead in Space Exploration (2)

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## OPTIMISING HUMAN SPACE EXPLORATION STRATEGIES AND POLICIES

**Abstract**

The key protagonists of human space exploration are pursuing different strategies. Yet in this international environment one would imagine cooperation rather than competition to be the most affordable. The long-term objective of the US/NASA is to reach Mars and set up a sustained human presence. A Lunar Orbital Platform (LOP) – Gateway would ultimately becoming a springboard to the Red Planet. This is consistent with a privatised ISS starting in 2025, freeing NASA to concentrate on human space programmes beyond LEO. SpaceX would create the capability of direct access to Mars, enabling regular shuttling from Earth. Asteroid mining retains some commercial interest and would piggy back the above. The Chinese will continue to gain additional LEO experience by establishing a larger space station, TienGong-3, in the next decade - with the possibility of hosting European astronauts. Later, China would deploy a permanent infrastructure on the Moon to explore and exploit local resources. Russia wished to continue its ISS/LEO programme as long as possible. Funding, a constant hurdle for the Russian space programmes, and the lack of reliable heavy lift capability remain challenging issues in their preparing for human exploration beyond LEO. ESA plans are not yet formalised: the Aurora programme of Lunar/Mars exploration appears to be running out of strategic vision with ExoMars probably the culmination rather than the first step; the Moon Village is still a concept and while it may materialise, the European lunar presence needs to be worked out. Since ESA will be without the independent means to put humans on the Moon for decades to come, its Member States are destined to fit into non-European strategies, seeking to capture specific niches, and more so to be on the critical paths of major projects. Yet, it remains to be seen if such a demarche is acceptable by all, or any of the players. Japan and Canada, partners to the ISS, will have to find their place alongside other emerging space nations in the developing landscape of strategies laid out by US, China and ESA. After analysing these different strategies, the paper will propose some scenarios based on a more holistic approach where the different players, including private entities, could contribute in a more synergistic mode, reducing costs, engaging throughout an improved path for a sustainable human space exploration. The outcome of the 2nd ISEF will be taken into account in building the different scenarios.