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GLOBAL SPACE FUTURES – 2050

Abstract

The current space age is characterized by the democratization and globalization of space activity, in which many more private entities have space capabilities and many more countries, at all stages of development, are able to participate in space activities. The accelerating growth of new commercial space activities also coincides with a hardening of geopolitical conflict between nations allied with the United States, China, and Russia. Looking ahead approximately to roughly 2050, what might global space activities look like across civil, commercial, and national security space sectors? In particular, what are the international security implications of space commerce over the next 30 years?

Making predictions about the future and crafting future scenarios can take many different approaches, from extrapolating current trends and crowdsourcing expert opinions, to building complex mathematical models and scenarios of alternative futures. Rather than trying to predict a likely or singular future, a more modest aim is to understand what alternative futures are possible and indicators that a particular future is emerging. Positing a range of futures enables the bounding of uncertainty and mitigation of surprises. Identifying indicators of emerging futures allows the creation of strategies to exploit or hedge against events, without necessarily assuming a particular future will occur.

Changes in what space activities are seen as desirable as well as changes in what activities might be technically possible can produce alternative space futures. Depending on the time horizon, various "shocks" may occur that change the course of future events. Exogenous events can be "normal" or "radical" changes. Examples of radical changes, which are difficult to foresee and bound, include a future Carrington event, Kessler syndrome, or a catastrophic planetary impact. This paper does not say what nations should do, but rather describes what is possible.

What might be key signposts of different scenarios or futures emerging? A loss of U.S. domestic political support for human space exploration would leave China the global leader by default. Successful demonstrations of a reusable heavy-lift capability and the Starship-based Human Landing System would make the Artemis scenario both feasible and likely. Demonstration of effective use of lunar resources would make a "McMurdo Station" on the Moon more sustainable and likely. Finally, an expansion of economic activity in space distinct from direct government subsidies could accelerate human expansion and could create vital national interests beyond the Earth.