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INTERNATIONAL SPACE EXPLORATION: MAPPING COMPARATIVE READINESS LEVELS  
ACROSS LEADING NATIONAL ACTORS

**Abstract**

At the national level, space exploration has always represented simultaneously a competitive and collaborative endeavor. Nations accrue tangible benefits from space activity—benefits that can set them apart from their peers. At the same time, space by its very nature reinforces the notion that people across societies are more united in their similarities than divided by their distinctions; just as the Earth appears small when viewed against the enormity of outer space, human differences can seem trivial alongside the promise of combined space exploration efforts. Accordingly, since the dawn of the space era, countries have sought to balance between unilateral and multilateral space exploration, calibrating their approaches over the decades depending on both the larger geopolitical context and their respective capabilities and limitations in terms of resources, technology, and national will.

This contradiction between individual national versus unified multinational approaches to space exploration persists today—with emerging space powers such as China joining established actors, including Europe, Japan, Russia, and the United States, in the global balancing act. All five of these actors have consistently articulated space exploration as a chief scientific and symbolic goal—and all five have within the past year re-affirmed their intent to pursue space exploration, as well as the investments needed to sustain it, in high-level policy pronouncements.

Regardless of each country's space exploration practices and priorities, though, all are faced with a common set of daunting space exploration environments: the Moon, Mars, and deep space. Each of these three environments imposes its own unique technological challenges. But beyond this, each environment also embodies an escalating series of technological challenges, because as nations move from the lunar to the Martian environment and then into deep space, the space exploration objective being pursued becomes progressively more remote in terms of distance, time, and inherent feasibility.

This paper will assess the comparative readiness of these five space actors in pursuing these three space exploration environments. The paper examines each country's national space exploration capabilities in the three environments through the prism of a metric-based analytic matrix.

Three separate metric-based approaches are considered:

1. A space exploration policy leadership-based metric approach;
2. A space technology achievement-based metric approach;
- and 3. A future space exploration plans-based metric approach.

In the process, this paper characterizes the relative national space exploration readiness levels of each nation, with a view to furthering discussions toward collaborative longer-term space exploration mission planning and road-mapping.