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INTERNATIONAL SPACE EXPLORATION: MAPPING COMPARATIVE READINESS LEVELS  
ACROSS NATIONAL ACTORS

**Abstract**

International space exploration is driven simultaneously by the human quest for knowledge and the motivations of the modern nation-state. The quest for curiosity and understanding co-exists with the desire for competitive advantage, technological development, scientific understanding, economic growth, international prestige, and security enabled by command and control of the strategic environment offered by space. At the national level, space exploration has always represented both a competitive and collaborative endeavor. Nations accrue tangible benefits from space activity 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.

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 priorities, though, all are conceptually faced with a common set of daunting space exploration environments:

- The Moon;
- Mars; and
- Deep space

Each of these three environments imposes unique technological challenges. But beyond this, each environment 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.

Against this backdrop, this paper assesses 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 these three environments (Moon, Mars, and Deep Space) through the prism of a metric-based analytic matrix.

Three separate metric-based approaches are considered:

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

The paper reviews the numeric findings for each approach. It characterizes the relative space exploration readiness levels of each nation. By revealing relative space exploration capability, the paper hopes to inspire discussions toward collaborative longer-term space exploration mission planning and road-mapping.