

Aerospace & Defense Practice

Space: The missing element of your strategy

The space sector is at an inflection point similar to what commercial air travel experienced after World War II and the internet saw in the 1990s. Is your company ready to capture the opportunity?

by Ryan Brukardt, Jesse Klempner, Bob Sternfels, and Brooke Stokes



When we speak about space with CEOs across geographies, industries, and backgrounds, we receive a range of reactions. For some, space is the stuff of science fiction, easily dismissed as a national-security domain dominated by a small number of governments. For others, space is the lifeblood of their institutions. Imagine ride hailers operating without the benefit of global positioning satellites, which provide the turn-by-turn directions that drivers need.

We assert that space is a timely topic for all leaders. Today, the space economy is valued at nearly half a trillion dollars and is growing at about 9 percent annually. Massive technological innovation is creating the opportunity for more capabilities to be deployed above Earth for the benefit of those on Earth. These capabilities—and the prices at which they can be delivered—could provide the linchpin in solving hard problems not only for businesses but also for civilization and the health of the planet. This creates an imperative for executives: if space isn't part of your strategy, it needs to be.¹

The space economy is at an inflection point

The early years of the space race were primarily a competition between superpowers marked by nationalistic exploration and national-security

interests. The cost to access space long proved prohibitive, undermining commercial-business cases. Only recently have we seen significant acceleration down the cost curve: launch costs have fallen 95 percent (with another massive reduction expected in the coming years) thanks to reuse, improved engineering, and increased volumes.

The world is in the midst of another acceleration down the cost curve, as satellites become less expensive and harness the scale of commercial electronics—think cameras from mobile phones and semiconductors used in autonomous-driving systems—to generate huge capability improvements per size, weight, and power. In turn, space systems' increasing reliance on software is reducing the physical size of space assets. Smaller satellites mean less weight to orbit and more capability when the satellites get there. The smaller size also manifests in vastly improved cost performance over time—often to a much greater extent than seen with other technologies (Exhibit 1).

Technology changes are also evident on the ground. Manufacturers of mobile phones are already modifying everyday smartphones to communicate with satellites; soon those who can afford a mobile phone will be able to access the global internet from anywhere on Earth. Large satellite dishes are giving way to small, compact, and significantly less

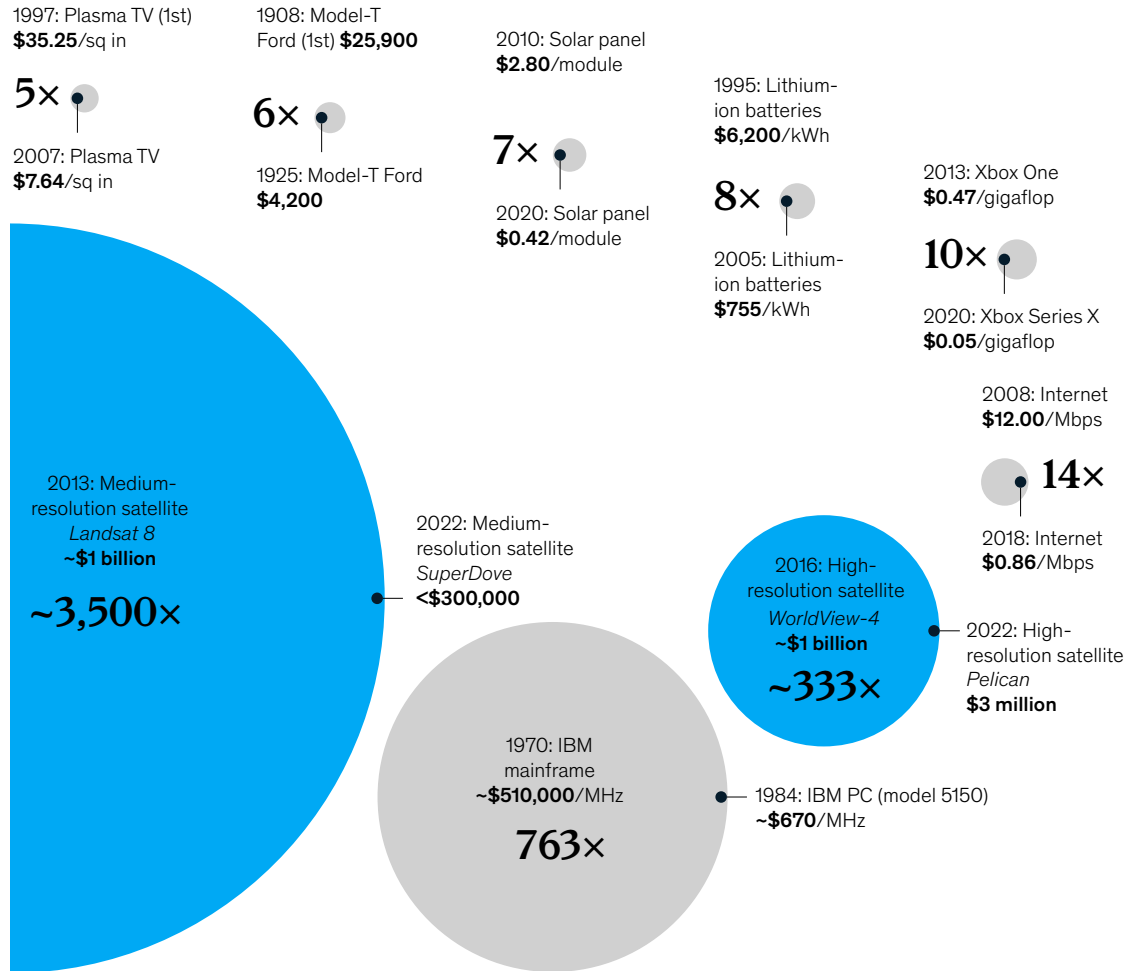
Massive technological innovation is creating the opportunity for more capabilities to be deployed above Earth for the benefit of those on Earth.

¹ For more, see Mina Alaghband, Ryan Brukardt, and Jesse Klempner, "Why on earth should business care about space?," McKinsey, October 7, 2022.

Exhibit 1

Satellites have rapidly improved their cost performance compared with many other technologies.

Increases in cost performance over approximately 15-year time horizons,¹ multiples of reduction



¹Prices are converted to 2022 dollars. Comparisons reflect products with similar end markets; however, they are not meant to construe perfect substitutes. Products may not be comparable on other factors (eg, satellites may not be comparable on data rates, signal-to-noise ratio, lifetime—but, increase is notable even on other dimensions such as dollar per bit).
 Source: American Enterprise Institute; Center for Strategic & International Studies; CPI inflation calculator, expert interviews; National Renewable Energy Laboratory; NCTA – The Internet & Television Association; McKinsey analysis

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expensive phased arrays that can retrieve large amounts of data from space for broad terrestrial dissemination. On the ground, advanced data processing and analytics are allowing even better

use of the information collected from space—similar to when your smartphone camera stitches together a panoramic shot from several pictures. Today’s satellites can build a picture even when conditions

are cloudy or dark. Sensors can measure moisture in the air and on the ground. Elements can be detected from space.

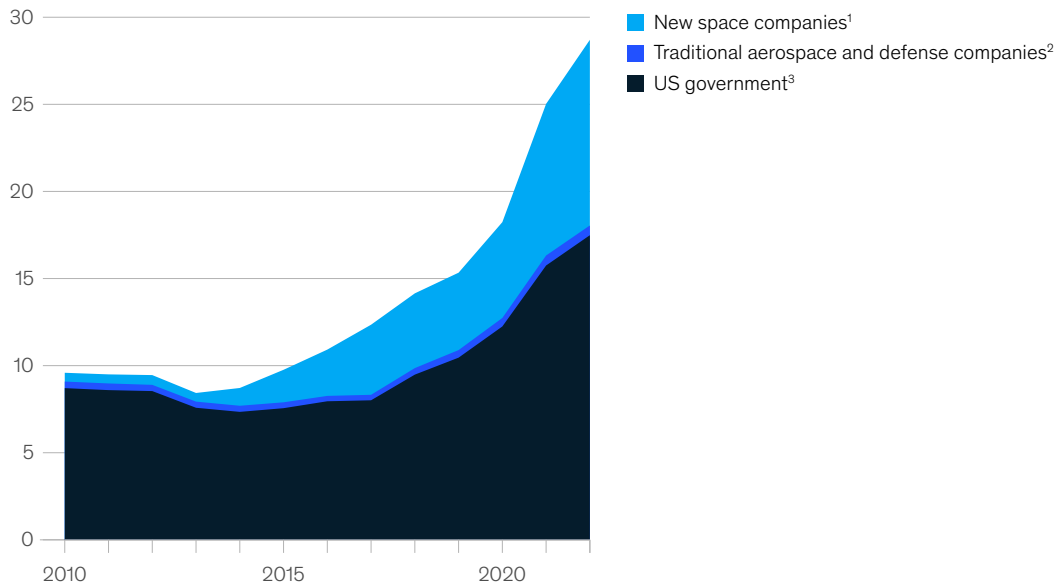
All this technological progress is taking place as capital inflows are increasing. While the US government remains the primary source of funding, private companies, especially new space players, have substantially increased their investment in recent years (Exhibit 2).² Private-sector funding in space-related companies topped \$10 billion in

2021—close to a tenfold increase over the past decade (2022, despite much angst, had the second-most inflows in history).³ If the current momentum continues, commercial funding for space ventures could surpass government funding in the next 20 years. We have seen this same trend occur during the early days of mass commercial air travel (enabled by government investment in aviation during World War II) and the internet (originally conceived as a national-security network in the United States).

Exhibit 2

New space companies are increasingly fueling space-related R&D spending.

Space-related R&D expenditures, by source, \$ billion



¹This category includes space companies founded since 2000. It assumes that most funding going into these companies is for R&D. Larger funding raises were smoothed to reflect estimated R&D spend over time. The percentage also includes estimated profit reinvested into R&D.

²Space-related R&D estimated based on percentage of estimated space-related revenues to total revenues where required. Reflects only estimated nonrecoverable R&D spend (ie, not recovered in rates).

³Based on fiscal years. Includes estimated classified space funding and reflects only estimated nonprogram office spending.

Source: Company financial statements; Crunchbase; expert interviews; Corporate Performance Analytics by McKinsey; Radar by McKinsey; McKinsey analysis

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² Ryan Brukardt, Jesse Klempner, and Brooke Stokes, "R&D for space: Who is actually funding it?," McKinsey, December 10, 2021.

³ Ryan Brukardt, Jesse Klempner, and Brooke Stokes, "Space: Investment shifts from GEO to LEO and now beyond," McKinsey, January 27, 2022.

Implications for global institutions and leaders

We challenge CEOs and top-management teams to pressure test their space strategies, using McKinsey's ten timeless tests of strategy.⁴ Begin by asking if the strategy will beat the market. Continue by asking if your strategy puts you ahead of the trends. Most institutional strategies tend to assume that the status quo will continue because they extrapolate from the previous three to five years. Some trends are rapid, but most emerge over time. We believe that space is at the point at which leaders must consider its potential impact and, more importantly, begin to shape their organizational strategy to unlock the potential of this domain as it accelerates over the next five to ten years.

Space will affect all of civilization and the global economy:

- **Sustainability.** More than 160 satellites monitor Earth to assess the effects of global warming and detect activities, such as illegal logging, that might contribute to the problem. Satellites can monitor environmental changes, including those related to ocean water, water vapor, clouds, sea and land ice, and precipitation.⁵ Other satellites can provide information that can help government agencies take urgent action on wildfires, coastal erosion, and other climate-related natural disasters.
- **Inclusion.** The world is at the cusp of literally every person having access to a global internet (though it is likely to be expensive in the first years) with the launch of constellations such as the OneWeb and Starlink systems.⁶ This satellite connectivity could increase educational equity and social interactions and improve

public health. Further, global productivity will be massively affected, as these communications allow for everything from upskilling to access to banking services, broadening the ability of individuals everywhere to participate in the global economy.

- **Growth.** Space will provide an opportunity for growth across all sectors from semiconductors to agriculture, energy, and insurance.⁷ The following are a few examples:
 - **Agriculture.** Space-based remote sensors collect a multitude of data, including images, information on weather patterns, and measures for electromagnetic waves, all of which have applications for agriculture. Results from McKinsey's annual Digital Farmer Adoption survey show that 29 percent of row-crop farmers and 45 percent of specialty-crop farmers already rely on such data or plan to do so. The greatest value from satellite sensors for agriculture relates to yield improvement opportunities. For instance, farmers can use satellite images to identify areas that require replanting early in the season rather than conducting a manual inspection that might be time consuming and miss some areas of the field.
 - **Energy.** Utilities can use satellite data to monitor vegetation that might be interfering with critical infrastructure, including power lines. By addressing the problems before they escalate, companies might avoid power outages. Microlevel weather forecasting that uses space and terrestrial sensors can help predict when wind farms will be productive and when additional energy generation will be needed.

⁴ For more, see Chris Bradley, Martin Hirt, and Sven Smit, "Have you tested your strategy lately?," *McKinsey Quarterly*, January 1, 2011.

⁵ For more, see Ryan Brukardt, Jesse Klempner, Daniel Pachthod, and Brooke Stokes, "The role of space in driving sustainability, security, and development on Earth," McKinsey, May 19, 2022.

⁶ For more, see Chris Daehnick, Rob Hamill, Alexandre Ménard, and Bill Wiseman, "Is there a 'best' owner of satellite internet?," McKinsey, August 11, 2022.

⁷ For more, see Carsten Hirschberg, Ireen Kulish, Ilan Rozenkopf, and Tobias Sodoge, "The potential of microgravity: How companies across sectors can venture into space," McKinsey, June 13, 2022.

- **Insurance.** Better satellite imaging might allow more insurers to assess risks and damages at remote locations more cost-effectively, as improved resolution and greater image-sequencing frequency help them pinpoint problems more clearly and eliminate the need for in-person visits. Radio-frequency-based mapping, which can detect hidden shipping activity, can help maritime and commodities-based hedge fund customers track the movement of goods overseas.

Keeping space for everyone

Despite all of the potential that space has for Earth's inhabitants, there are warning signs that, if left unregulated, space as a domain could fall short of its full potential. The world has seen a 50 percent increase in the number of launches year over year from 2021 to 2022. There are more than 7,000 operational satellites and a staggering more than 45,000 human-made trackable artifacts in orbit (with an inestimable amount of additional material that cannot be tracked but can damage other spacecraft).⁸

There is a real issue with space junk, both from legitimate uses of space and from bad actors who intentionally cause space collisions that result in debris. Additionally, just as spectrum is a scarce commodity on Earth, so it is in space (and needs to be deconflicted with terrestrial activities). While innovation must be preserved, leadership on proper regulation is also needed.

Prioritizing space on your agenda

No matter the sector, there is opportunity in space for all. There is also responsibility in space for all. Space will be a key theater of growth and innovation during this decade. Leaders should open a dialogue across the gulf between the space community and end users to further the development of the

technologies and solutions that will matter most for businesses and the world:

1. **Set a vision.** Consider how the next era of the space economy will affect your sector. As we have said, no sector or industry will go untouched by space, so leaders need to understand what it means for their businesses and build proactive strategies. Just as internet companies are not the only ones that capture the value of the internet, the value potential from space will be far from limited to space-forward companies. How can your business disrupt itself now to capture a share of the space pie in five to ten years' time?
2. **Think boldly about how to participate in the space ecosystem.** Collaborate and make big bets. Create a new space business line, as some companies outside the aerospace industry have already done. Develop informal collaborations with space companies or forge strong public-private partnerships with government agencies or organizations. Participate in industry forums, engage in the dialogues around space governance and direction for the future, or otherwise dip your toe in.⁹ And then take the next step and partner with a space company (for example, in a win-win model where a start-up can benefit from an established company's go-to-market expertise and business model), buy a space solution (as we anticipate increased consolidation), supplement data from other sources with satellite-based data, launch a research project to the *International Space Station*, and more. It's no longer possible to say that space is too many degrees removed from your business.
3. **Get engaged in shaping the future of the space sector.** Space has potential for incredible societal and economic benefits. But decisions and actions taken in the next few years will sharply influence the direction of the scenario

⁸ "Space debris by the numbers," European Space Agency, accessed March 1, 2023.

⁹ For more, see Giacomo Gatto and Alyssa Goessler, "Can better governance help space lift off?," McKinsey, February 22, 2023.

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that unfolds. For instance, decisions by nations on the way they collaborate in space (such as jamming global positioning signals or communications or continuing to create debris with limited attempts to abate impact) could preclude the possibility of democratized, accessible, and open space. The imperative rests with leaders around the world and across industries to play a part in shaping the trajectory for space—and to do so at pace. CEOs and other

leaders should be talking about what's needed to enable the space economy and create a positive future for it.



From the stuff of science fiction to an everyday reality, space is the next major domain. If space isn't part of your strategy, it should be—don't be left on the ground.

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