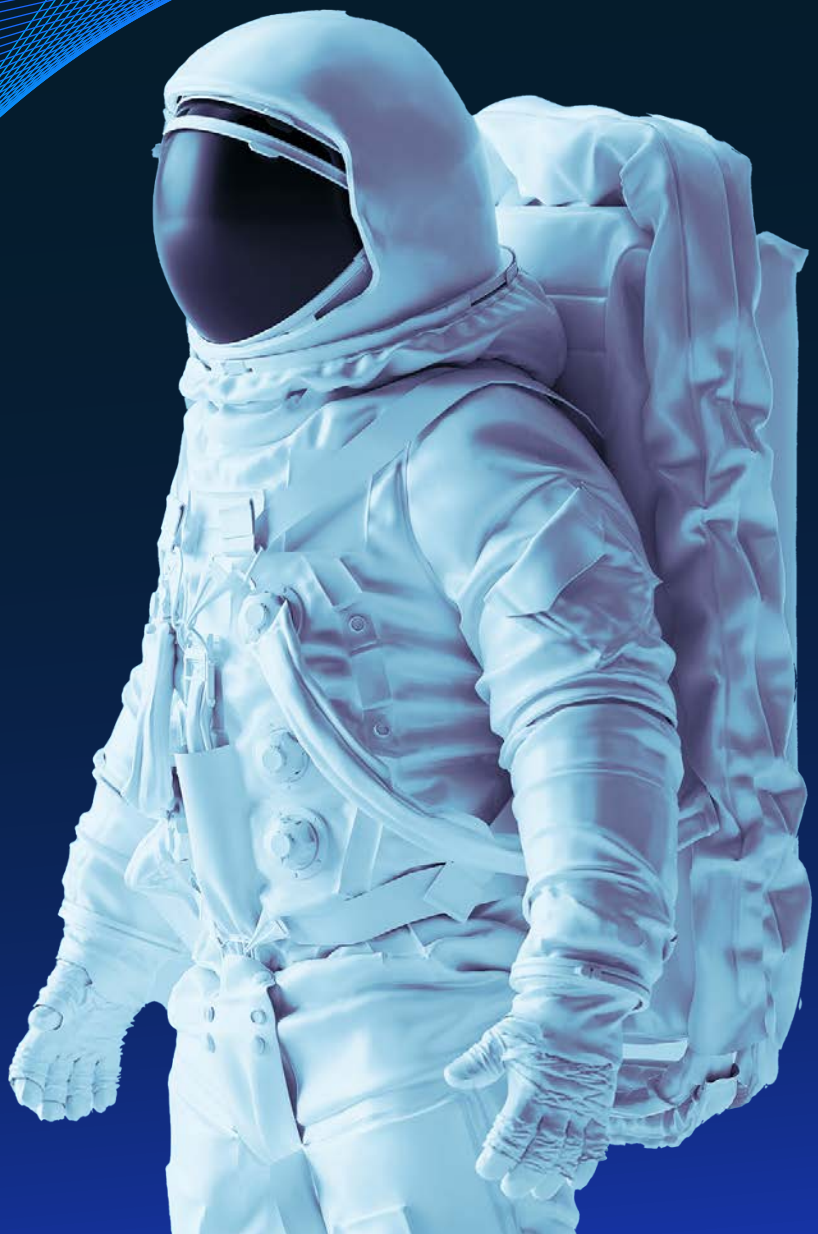
McKinsey & Company

The Next Normal

The future of space: It's getting crowded out there



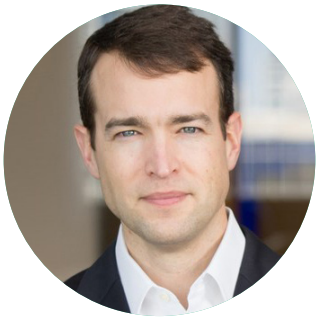
March 2022

Could you soon be taking trips to outer space? Some experts think so. As rocket launches have gotten cheaper, thousands more satellites—and many more people than ever before—can venture into orbit. And it's not just governments funding these missions; private companies are getting in on the action, too. But more objects in space also means more space debris and higher risks of collisions. In this edition of *The Next Normal*, McKinsey experts and industry executives envision the space industry's next decade.

In this issue

Chris Daehnick

Jess Harrington



Jesse Klempner

The Next Normal | Video transcript

Outer space in 2030

In this video, three of McKinsey's aerospace experts describe the ways in which future activity in space will benefit people on Earth—and some challenges that could arise along the way.

Humans have been fascinated by the mysteries of the cosmos for thousands of years, and we've been venturing into space for more than six decades. The desire to discover more about outer space continues to create new opportunities as well as new challenges. Hear three McKinsey experts' views on the future of the space sector.

What might space travel look like?

Jess Harrington: Space tourism is still in its infancy, and as of right now there's not a whole lot to do in space. It's like a very expensive rollercoaster.

Chris Daehnick: We're a long way, I think, from having people who are basically untrained astronauts go out and do extravehicular-type activities. Also, long-term stays in space are not easy on the body.

Jess Harrington: Beyond 2030, maybe you do see space hotels where you have the ability to do a moon walk.

Chris Daehnick: Who knows, if there was a colony on Mars, that might be a place where you go for a year.

Jesse Klempner: The most important thing that I think we have to keep in mind is that despite the fact that 600 or 700 individuals have actually gone into space, space should exist within an industrial concept to support the people on Earth. I do believe that point-to-point transport is a use case that is not explored or thought about enough today. Point-to-point transport is the idea that I can launch a rocket from New York and land in Paris in 30 minutes.

Many more satellites in space

Thousands of tourists aren't yet going into space, but thousands of satellites are already out there, helping us communicate, predict the weather, and understand our planet. Thousands more are on the way.

Jess Harrington: If every single concept were to launch in full, we'd have probably 8,000 to 12,000 satellites go up every year for the next ten years: this will help bring internet to people who don't have access right now. It will be able to track emissions. It will be able to give you a better read of certain storm systems, and you'll be able to track them earlier.

Chris Daehnick: The idea of being able to connect to the internet from anywhere—whether you're flying on an airplane over the poles or in the wilderness in Alaska—is something that these new types of capabilities are going to enable.

Jesse Klempner: The more mass that we can put in space, the more likely we'll be able to find something interesting to do with it, whether that is ultimately manufacturing or assembling in space or moving beyond cislunar space.

Jess Harrington: The cislunar economy could be several different things; there have been a lot of different proposals. It could be mining asteroids, or it could be manufacturing in space.

A rise in space junk

While satellites and rocket launches represent great technological advancement, more activity in space also means more space debris—which could become a big problem.

Chris Daehnick: The likelihood of a collision is much bigger than if satellites were just static objects.

Jess Harrington: Something as small as a little fleck of paint can cause real damage to something like the International Space Station, so being able to track every space object is going to be really critical: knowing where things are so that you can maneuver your satellite out of the way.

Jesse Klempner: The more things that we put up there, the more coordination is required, the more intentionality is required, and the more transparency is required. And if we're able to meet all of those requirements, hopefully space debris will not be a terrible problem.

> 'If every single concept were to launch in full, we'd have probably 8,000 to 12,000 satellites go up every year for the next ten years.'
>
> –Jess Harrington

Shoot for the moon—and beyond

It's an exciting time to be in the space industry. Opportunities abound for both governments and the private sector. But of course, success in space isn't guaranteed. If you're shooting for the moon, you can't have your head in the clouds.

Jesse Klempner: I think the most important message to any CEO, investor, or interested party in the space industry today is, "If you don't think you're going fast enough right now, you're not. You should be spending as much time removing roadblocks to speed as you are creating new processes or coming up with new ideas."

Chris Daehnick: You need to balance the dreamers and the hard-edged practical people. The space industry is a very inspiring place to be. It drives a lot of innovation, and you can attract hugely talented individuals to work for you. But if you're a CEO and you run a business, at some point you need to turn a profit.

Jess Harrington: I would push people with visionary ideas to make sure that those ideas also align with a clear market need. Just because something is really cool does not necessarily mean that you'll be able to fund it.

Chris Daehnick, an associate partner in McKinsey's Denver office, is the senior leader of Radar, McKinsey's analytics platform for the aerospace and defense market; **Jess Harrington** is a consultant in the Washington, DC, office and a leader of Radar; and **Jesse Klempner** is a partner in the Chicago office and a leader in McKinsey's Aerospace & Defense Practice.

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March 2022 | Interview

Making aerospace ‘diverse and dynamic’: An interview with Airbus U.S.’s Debra Facktor

Debra Facktor

One of the highest-ranking female executives in the aerospace industry foresees a space economy—and a space workforce—that look very different from today’s.

Space is becoming more crowded, both literally and figuratively. There are thousands more satellites in outer space than in years past (with thousands more on the way), and more companies competing in the space industry than ever before. That’s exciting to Debra Facktor, who has spent her entire career in the aerospace sector and who, in March 2020, assumed the role of head of U.S. Space Systems for Airbus U.S. Space & Defense.

Facktor recently spoke with McKinsey’s Jess Harrington about her responsibilities at Airbus U.S., the future of the aerospace sector, and her experience as a woman in a male-dominated industry. Excerpts of their conversation follow.

McKinsey: First, tell me about your job. What areas are you focused on?

Debra Facktor: I’m an engineer by training, but I don’t do engineering every day anymore. My job today is running our U.S. Space Systems line of business, which encompasses small satellites, human space flight, and space exploration. I manage a team of great people who understand all the technical aspects of building satellites and traveling out to space.

The biggest part of my job is business development for our small satellites: showcasing our satellites’ capabilities to customers. I sit on the board of Airbus OneWeb Satellites, which is our joint venture with [London-based communications company] OneWeb, so part of my job is providing leadership on the manufacturing side—making sure that our satellites are built on time, on budget, at high quality. These days I spend a lot of my time on email, it seems, and on virtual phone calls. I’m starting to do a little bit more travel, like to our factory in Florida where we make satellites.

Another part of my job is overseeing our US human space flight and space exploration business. For example, Airbus invested in the Bartolomeo platform, which is a large, payload-hosting platform attached to the International Space Station. So, if a company or agency wants to send a payload out to space—say, for Earth observation or for a scientific experiment—it can use our service.

The space economy of the future

McKinsey: It's amazing how many companies are now venturing out into space. I'd love your thoughts on where the space sector is headed in the coming years. What new kinds of economic activity might we see in space by 2030?

Debra Facktor: Well, for one thing, I think there will be major advances in human space flight. Even in the past year, we've seen great progress in the accessibility of space. In planning your 2030 vacation, you might be able to choose between taking a quick trip to Florida or taking a quick trip to space.

In 2030, when thousands more satellites will be orbiting the Earth, a new opportunity in space might be the on-orbit servicing of satellites. We're starting to see some companies invest in [on-orbit] refueling or repair services, whether it's to provide a propulsive boost to the correct orbit or to fix a dead battery.

Today, if your car breaks down on the side of the road at midnight, you can call a service like AAA [American Automobile Association]. You have their phone number; you trust them to come and jump your battery or repair your tire. Imagine you break down on that same road at midnight and a stranger comes up and says, "I'll fix your car." You'd probably say, "No, thank you. I'm going to wait until AAA comes or until the police come." The same thing can happen in space: What is the trusted service for satellites? These are some of the issues for companies to work out. It's about building not just the technical pieces but also the trustworthiness that makes that kind of business model work.

McKinsey: The notion of trustworthiness in space is interesting; it also comes into play when you think about the increasing risk of collisions in space. What do you see as the greatest threats to the continued growth in space activity between now and 2030?

Debra Facktor: One is overcrowding in space. As you said, with all the thousands of satellites and the human space flight missions going on, there's more debris and a greater likelihood of things hitting each other. We need to be mindful of our behaviors in space when it comes to space debris. We need to be good neighbors. One of the principles of the US Forest Service, for example, is "pack it in, pack it out": if you go camping in the woods and create trash, you pack up that trash and bring it back out with you. We need to create those kinds of norms in space.

Another concern is protection of information and cybersecurity. We're all worried about identity theft or spam in our emails, but what happens if our weather satellites start putting out spam? How does that affect airplanes during landing? That's just one example. We need to protect both the physical assets and the way that data comes to us, because we rely on that data on a day-to-day basis. One promising technology is laser communication, which will enable more secure communications from one satellite to another, and also between satellites and the ground. When data is communicated via laser, it's less easily intercepted or jammed than when you're transmitting using radio frequencies.

Government and industry

McKinsey: Who do you think will be providing space technologies? In other words, what will the space ecosystem look like in 2030? Will it be a mix of billionaire-backed start-ups and larger, traditional players like Airbus?

Debra Facktor biography

Education

Received BS and MS degrees in aerospace engineering from the University of Michigan; is an alumna of the International Space University summer session program in Strasbourg, France

Career highlights

Airbus U.S. Space & Defense, Inc.
(2020–present)
Head of U.S. Space Systems

Ball Aerospace
(2013–20)
VP and general manager of strategic operations

DFL Space and AirLaunch LLC
(2005–13)
President

Kistler Aerospace
(1997–2005)
VP of business development and strategic planning

ANSER Center for International Aerospace Coordination
(1988–97)
Chief of Moscow operations

Fast facts

Serves on the University of Michigan Industrial Advisory Board for aerospace engineering

Chairs the Space & Satellite Professionals International - Women in Space Engagement (SSPI-WISE) industry group

Serves as executive mentor for the Brooke Owens Fellowship and Matthew Isakowitz Fellowship Program

Has served as a board member or adviser for several industry organizations including the Future Space Leaders Foundation, Women in Aerospace (WIA), and the Intelligence and National Security Alliance (INSA)

Fellow of the American Institute of Aeronautics and Astronautics (AIAA) and the American Astronautical Society (AAS)

Academician in the International Academy of Astronautics

Proud third-generation University of Michigan Wolverine

Avid spinner

Staunch advocate for diversity and inclusion

Debra Facktor: I think the space ecosystem in 2030 will still be a mix of government and industry players but maybe playing different roles. I believe there's always a role for the government—first of all, to invest in R&D that perhaps has no direct commercial application but enables the next generation of STEM [science, technology, engineering, and mathematics] research and engenders creativity and learning. That will continue to be important. Government will take risks where industry is not able to and will continue to provide a reliable infrastructure, a common regulatory regime, and a predictable contractual and legal business environment. All of that is important for commercial companies to succeed.

Commercial companies, on the other hand, innovate by coming up with new applications for existing technologies—including applications that we don't even know we need. The microwave oven didn't come about because somebody said, "I need to microwave my food." You didn't even know you needed one until it existed; the same thing happened with the cell phone.

What we're starting to see today, and what could happen frequently by 2030, is that those roles reverse: commercial companies will start challenging the assumptions that the government makes and investing a lot more in rapid-cycle R&D. The government might then take those commercial investments to a new level. We're already seeing a few examples of that, with the government taking advantage of commercial launch vehicles and commercial investments in low-Earth-orbit satellites, like those we are building in our factory in Merritt Island, Florida.

Tomorrow's space workforce

McKinsey: Obviously, given the heightened interest and activity in space, the industry will need to attract more talent. What does the ideal 2030 space workforce look like, and what needs to happen to make it look that way?

Debra Facktor: I love the fact that young people are still excited about space and want to come into our industry. Many little kids want to become astronauts. I hope that, in schools, we continue to encourage young people to be successful in math, science, and technical fields but also recognize that other fields are needed in the space industry. People who know how to communicate, people who know how to draw up contracts, experts in political science, experts in the arts—these are all important parts of our space ecosystem.

One of the most important things we can do is to continue to invest in talent and encourage young people—especially women and underrepresented minorities—to go into fields like aerospace. There are a number of new fellowships designed to help make the aerospace industry a more diverse and dynamic environment, and the individuals who become alumni of these fellowships are going to change the world. I really want to see space companies and agencies have equal representation of women and minorities.

McKinsey: There's already so much competition in the space sector, and it's only going to intensify. What do you think will differentiate companies by 2030? Will it be technology? Will it be an operating model? Or some combination of those factors?

Debra Facktor: The number one way for a company to differentiate itself is through its culture and how it treats people. The environment you create inside your company is a reflection of the service and product that you deliver to your customers and shareholders. A company can have great technologies but then execute poorly because the culture isn't there. Conversely, a semi-good idea that people think is just so-so—if you put it with the right team that has the passion and ability to innovate—can turn out beyond all expectations.

So I don't think the differentiator will be a particular technology or business model. It's all about the people and the experience. If you have a good experience, regardless of what the product or service is, and the people are enjoying what they do while delivering it, that's what makes for a good company. Companies with a strong, positive, and inclusive culture are the ones that will survive.

Debra Facktor is the head of U.S. Space Systems for Airbus U.S. Space & Defense. **Jess Harrington** is a consultant based in McKinsey's Washington, DC, office.

Comments and opinions expressed by interviewees are their own and do not represent or reflect the opinions, policies, or positions of McKinsey & Company or have its endorsement.

For more from Debra Facktor, see the videos accompanying this article on McKinsey.com.

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February 2022 | Interview

Lockheed Martin's Joe Landon on the emerging space economy

Joe Landon

We may be approaching an age in which companies conduct business in orbit or on the moon, says Lockheed Martin executive Joe Landon.

Joe Landon envisions a new economy developing in space—one that closely mirrors the economy on Earth and requires the same skills. "What the space industry needs is more business talent and more people who understand how to build businesses," he says. As vice president of advanced programs development for Lockheed Martin Space, Landon leads teams that focus on new-business growth, strategy, and R&D for human spaceflight, robotic deep-space exploration, and other space-related activities. He is filling this role at an exciting time for the company, which was recently awarded a NASA contract to develop a first-of-its-kind commercial space station that will facilitate research, plant growth, and astronaut activity in space.

"My job is to predict the future," Landon says, "and the hardest part is figuring out how to position our company in an increasingly competitive market." He recently met with McKinsey's Chris Daehnick to discuss the future of space. The following are edited excerpts of their conversation.

The 'space for space' economy

Chris Daehnick: As you said, your job is to predict the future. What do you see happening in space in the next ten years or so?

Joe Landon: I think what we're going to see in the future is "space for space." Historically, the term "space economy" has been a bit of a misnomer because all of the value was exchanged between people on Earth. Since the 1960s, the vast majority of activity and investment has been in launching satellites that look down on Earth, or that help us communicate from one place to another on Earth. Those are space-for-Earth services. Now, we're going to start seeing more value being created and exchanged in space, for space.

For example, you could have a spacecraft that gets refueled in space. That's a transaction or activity that doesn't have an anchor on Earth. It's happening between two companies or two spacecraft, either in orbit or maybe on the moon.

Also in the future, I see a world where getting things into space is essentially free of charge. The only thing that will cost money is sending *people* into space because people can't be printed or produced in space. The other things we need in space will be produced there, using resources also found in space. We'll be able to find building materials and everything else we need there. I think there could be a major disruption in the industry because of additive manufacturing and 3-D printing.

Trips to Mars—and beyond

Chris Daehnick: What is the most exciting thing happening in the space business today?

Joe Landon: I'm a little bit biased, but I think it's NASA's Artemis Program, which focuses on exploring the moon and sending humans back there. Lockheed Martin is the primary contractor building the Orion spacecraft for this program. There's tremendous scientific benefit to Earth from the Artemis exploration. NASA and the space industry are laying the foundation to build infrastructure in space and around the moon.

Chris Daehnick: Do you think that there is a near-term possibility for some of the more expansive space ideas, such as human settlements on Mars or orbital space cities?

Joe Landon: I'm optimistic that we will continue to explore and go further. We'll need to figure out what activity will create value, whether that's scientific value or economic value or other opportunities. If we can build more self-sustaining operations and settlements in space, that can be a source of value. But I think it's going to take a lot longer for humans to get to Mars than most people expect. It's not that we won't try; we are actually investing quite a bit to make the systems needed. There has also been extensive exploration beyond the moon, and even beyond Mars, using robotic spacecraft.

But the technical challenges are significant. Getting humans beyond Mars is a real challenge because it's very far. You start having trouble generating power and communicating. There are some technologies that we're developing that can help, and if we can build upon these technologies, I think it will be possible to explore the outer solar system.

Chris Daehnick: Space is a rather unforgiving environment. What are some of the challenges that we have to overcome to enable humans to spend a long time there?

Joe Landon: We need to develop the technology to support a long-term presence in space and long-duration space flights. We also need the consumables required to support life for long periods. We're working on and investing in the propulsion technology required to make trips in space faster. The shorter the trip is, the easier it is to keep the crew comfortable. We're also working on artificial-intelligence systems to help crews manage their time in space and work alongside their spacecraft with limited help from Earth. We want to provide a safe journey for those astronauts.

As you get farther away from Earth, you can't rely on Earth for help. So we need to anticipate and be able to take care of problems in deep space.

Chris Daehnick: Is there any ongoing research to understand how people deal with long-term confinement in a restricted environment?

Joe Landon biography

Vital statistics
Born in 1979 in Bethlehem, PA
Lives in Denver
Married, with 2 children

Education
Embry-Riddle Aeronautical University, BS in engineering physics
University of Southern California, MS in aerospace engineering
Harvard Business School, MBA

Career highlights
Lockheed Martin Space
(2018–present)
Vice president, advanced programs development

Planetary Resources
(2010–18)
Chief financial officer

Space Angels
(2007–18)
Cofounder and chairman

Fast facts
Member of the World Economic Forum's Global Future Council on Space
Associate fellow of the American Institute of Aeronautics and Astronautics
Member of the International Academy of Astronautics

Joe Landon: Sure, there are a number of programs called space analogs—there's the Mars Desert Research Station, in Utah, and a facility in Hawaii called HI-SEAS—where we send crews into confined environments that simulate being on Mars or being on a long-duration space flight.

The role of private companies and government agencies

Chris Daehnick: Let's talk about funding. Governments have traditionally funded space ventures, but many private companies are becoming involved in space tourism and other activities. How do you see the role of private companies and the government evolving?

Joe Landon: A lot of private investment is now going into launch vehicles and launch availability. Both government and private industry have benefited greatly from that because it reduces costs and increases the ability to get stuff into space more reliably and more often. A lot of private investment is also going to communications and Earth observation. Having those types of services expand and become more readily available will help everyone. For instance, we might soon have ubiquitous internet connectivity.

For science and space exploration, the government is still going to be the major customer. But government agencies, NASA in particular, are going to make purchases and do business in a more commercial way. We have to adapt to an environment in which NASA will be buying services and expecting companies to develop new product offerings or new businesses. Once a company like ours develops a service for NASA, we can then offer it to other customers, including commercial companies, government agencies, and other national space agencies.

Think about a scientific mission to study the moon. NASA or another agency would not need its own communications link, power, or transportation; it could instead buy those as a service. In fact, NASA has already started to do this for the transport of payloads to the moon. Companies that provide that service for NASA could do the same thing for other customers. This would expand the market and bring in new opportunities.

Chris Daehnick: What does that mean for space companies? Do they need to change the way they do business?

Joe Landon: We have to stop thinking about ourselves as space companies and start thinking about the actual services that we're providing. Space is a place, and we need all kinds of businesses there. We need to think about building a diverse and robust industrial sector in space. Now is the time to start partnering with the leading companies that provide those types of services on Earth and bring the best that we have into space. For example, Lockheed Martin and General Motors are working together to build the next generation of lunar rovers. We've taken the best of Earth transportation to adapt for space.

Big, established companies like Lockheed Martin have to act more like start-ups these days. There's more collaboration between start-ups and established companies now, but also more competition. Overall, I think that's good for the industry.

Chris Daehnick: What would you say to a young person today who is thinking about pursuing a career in space? What should they study?

Joe Landon: We need all kinds of talent in space. Of course, engineers and scientists are needed, but that's just the beginning. Space is just a place—it's a place where you can do business—so we'll need doctors, lawyers, and everything you can imagine in space.

We'll need more people who understand how to build businesses. To build this commercial space economy that we aspire to, we'll need entrepreneurs and people who understand finance, marketing, accounting, and all these fields that aren't typically associated with space but have always been a part of the space sector. Those fields will grow in importance going forward.

Joe Landon is vice president of advanced programs development at Lockheed Martin Space. **Chris Daehnick** is an associate partner in McKinsey's Denver office.

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For more from Joe Landon, see the videos accompanying this article on McKinsey.com.

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December 2021 | Interview

Seeing Earth from space: The power of satellite images

Robbie Schingler

Satellite images don't just show Earth's beauty—they can also help improve society and the global economy, says Planet Labs cofounder Robbie Schingler.

"When you have satellites in space, you can take a picture anywhere in the world, not just in your backyard or region, at any time—and that ability is quite profound and extraordinary," says Robbie Schingler, cofounder and chief strategy officer of satellite-data company Planet Labs. Schingler sees the company as an agent for "democratizing access to information." Its network of nearly 200 satellites takes pictures of Earth daily and has captured more than 1,500 high-resolution images of every part of Earth's land mass since 2017.

Across industries, the information mined from satellite images is already transforming how people work. Consider just a few examples: farmers are improving crop yields by getting clues about disease, pests, and nutrient deficiencies in their fields; governments are gaining insights into forests and vegetation to help them better prevent wildfires; and scientists are monitoring changes to Arctic rivers and glaciers by comparing historical images with current ones.

As cloud computing, AI, and other technologies continue to advance, Schingler believes that satellite imaging will deliver even deeper insights. McKinsey's Chris Daehnick recently spoke with Schingler about the growing trove of satellite data and its future applications. An edited transcript of the conversation follows.

A trillion-dollar space economy?

Chris Daehnick: I've heard you say that Planet has more than 600 customers around the world. What sorts of insights are Planet's customers getting from satellite data?

Robbie Schingler: Our customers come from many industries, from agriculture to oil and gas, as well as from commodity trading and government—civil, defense, and intelligence agencies. We

are constantly surprised by what our users do with our data. Some of the most surprising things are coming from academic organizations. For instance, researchers thought that a glacial burst, causing a landslide, had occurred in the mountains of India. We are always collecting data, and we had images of the area taken at 30-minute intervals. Looking at them, researchers could tell exactly what changes in the landscape happened over time. Such information can help people understand both risks and preparative measures. We can learn about indicators and warnings and then do something about them.

There are a lot of examples from agriculture, which is our largest market. By adding our data to agriculture platforms, farmers can understand when they should cultivate certain crops, how much fertilizer to apply, and what types of crops are growing. The data also helps them understand supply chain issues. One agricultural customer increased crop productivity by 10 percent by monitoring its entire growing area. That's huge in a commodity market.

Chris Daehnick: People in the space business used to say, "No bucks, no Buck Rogers." A lot of private money is flowing into space-related businesses right now. Your own company, for example, just went public via a special-purpose-acquisition-company merger. Do you think this trend will last? Or are we in a "frothy" environment?

Robbie Schingler: We've heard analysts predict a trillion-dollar space economy, with some estimates going up to $3 trillion. It's phenomenal and it's exciting—but let's also have some realism. The businesses that are going to drive the trillion-dollar space economy are those that have a product or service that appeals to many, many users.

Many opportunities will arise because infrastructure that was once present only on Earth is now going into space. We see that with telecommunications—that trend started in the late 1990s, but what's different today is that companies are already thinking about how to get hundreds of millions of subscribers when developing their business models. That said, I do think it is quite frothy right now. I bet we will see some consolidation in the space industry, with some companies breaking out.

This is a new-frontier economy. Space was once something that only the public sector could do, but with today's technology and entrepreneurs, that's no longer the case. Governments are also recognizing that space products and services have matured. They can see that the industrial base is growing quite substantially, often by bringing in technologies from other sectors, and they want to encourage this shift. The interweaving between the commercial and government sectors will be pivotal; we need to have deep, trust-based, long-term partnerships between the public and private sectors. Governments can also help the space industry by taking steps to shape the market, such as issuing regulations and being really good enterprise customers.

Picturing space in 2030

Chris Daehnick: Say more about the technologies that are advancing the space industry. What technological breakthroughs have we seen recently, and what can we expect in the next decade or two?

Robbie Schingler: A couple of unique technologies have made space ventures more possible. One is reusable rockets—something that the industry has been trying to do for a long time. Hats off to the thousands of people at SpaceX who have made that happen. It's almost like the four-minute mile was run. Many companies are now using reusable rockets in their architecture.

Robbie Schingler biography

Education
Holds an MBA and certificate in international business diplomacy from Georgetown University, an MS in space studies from the International Space University, and a BS in engineering physics from Santa Clara University

Career highlights
Planet Labs
(2011–present)
Cofounder and chief strategy officer

NASA
(2010–11)
Chief of staff, Office of the Chief Technologist

(2010)
Open Government Partnership representative

(2006–10)
Special assistant to the center director, Ames Research Center

Fast facts
Cofounder of the NASA CoLab project, designed to build collaboration between the public and NASA scientists and engineers

2005 US Presidential Management Fellow

On the tech side, cloud computing is allowing companies to create better machine-learning models, and we're beginning to see edge computing and the Internet of Things everywhere, with sensors all over the planet and in space. So the technologies that are changing the economy on Earth are also changing the space economy.

Chris Daehnick: What sorts of economic activity do you think we'll see in space in 2030?

Robbie Schingler: I think our economy will actually include "near space." GPS and positioning, navigation, and timing technology are now ubiquitous. I think that in the next ten years, satellites that take the pulse of the planet will be used for applications that help people on Earth make sense of things, so that we're not surprised, we understand risk, and we get closer to a true-cost global economy. That's something I'm incredibly passionate about.

There will also be regular space travel, without a doubt. We will have more humans land on the moon, and I think that we will have a base or two there. And I bet that we will identify life—it could be a spectral signature of something that shows organic capabilities or the potential for organic capabilities. We might also find life in some of the water worlds in our solar system.

Sustainability on Earth and in space

Chris Daehnick: With more private companies getting into space ventures, space—in particular, low-Earth orbit—will be more crowded. Do you think that will create problems for satellite operators and other space organizations?

Robbie Schingler: It's incumbent upon operators to act responsibly because space is part of the global commons, and we have to manage this resource well. We'll need to put some new systems in place, and the various actors should collaborate to establish rules of the road.

As more organizations venture into space, managing space debris will be a challenge. Right now, the majority of debris in orbit is a result of the first few decades of space activities. There are congested areas—mainly around 700 to 1,200 kilometers in Sun-synchronous orbit—because of space activities in the 1960s and 1970s. Today, thankfully, governments and other operators are more responsible. For instance, launch-vehicle providers ensure that their upper stages are outside congested areas. Satellite operators like Planet that design and build their own satellites design them in a way that doesn't contribute to space debris. We design for sustainability.

Chris Daehnick: How exactly do you do that?

Robbie Schingler: There are many ways in which a company can design for sustainability and be a responsible actor, and it partly depends on where you are operating. For low-Earth orbit, for instance, you want to ensure that you fall well within the US government's guidelines of deorbiting nonoperating satellites within 25 years. But let's be honest: even that is not enough. We need to ensure that operators responsibly deorbit satellites that are nearing their end of life. You should design using materials that allow your satellites to disintegrate in the upper atmosphere, and you should ensure that your operational system has margins so that you're not cutting corners.

Just like in any business on Earth, some actors in the space business will be looking to cut corners. That's why we need regulations and rules of the road. We also need the public to know what is acceptable and unacceptable.

Chris Daehnick: Speaking of sustainability, how can companies use Planet's satellite data to address issues related to climate change, such as extreme weather events?

Robbie Schingler: Space data can help the global community achieve some of the 17 Sustainable Development Goals that the UN General Assembly has set for 2030. Of those, 13 would benefit from Earth-observation information because it provides a system for measuring, reporting, and verification that is unbiased, spatially explicit, and scientifically accurate. Earth-observation data allows policy makers, businesses, civil society, and the media to obtain a common picture of global risks and take preemptive action. Rather than just living on a changing planet, we can help it thrive. We can become planetary stewards. If we collaborate and put our minds together, we can do the extraordinary.

Robbie Schingler is the cofounder and chief strategy officer of Planet Labs. **Chris Daehnick,** an associate partner in McKinsey's Denver office, conducted this interview.

For more from Robbie Schingler, see the videos accompanying this article on McKinsey.com.

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Peter Platzer

February 2022 | Interview

Building a better planet with satellite data

Spire CEO Peter Platzer says the answers to some of Earth's biggest problems can be found in space.

One of the world's largest constellations of satellites is operated not by a government but by a company that's been around for only a decade. Spire Global, founded in 2012 by current CEO Peter Platzer and two colleagues, has more than 100 satellites orbiting just above Earth's atmosphere. Platzer has been interested in space since his teenage years but took a circuitous route to the space industry: after spending a short time at the research organization CERN and at the Max Planck Institute, he worked as a consultant in Asia, attended business school, embarked on a Wall Street career, then went back to graduate school and interned at NASA. "The outcome of my graduate thesis was the starting point of Spire," he says.

Today, Spire—which became a publicly traded company in August 2021—provides space-based data, analytics, and services to about 400 public- and private-sector entities. It has offices in Europe, North America, and Singapore and employs more than 350 people. McKinsey alumnus Jannick Thomsen recently interviewed Platzer about the future of Spire and of the space industry more broadly.

Spire's role in space

Jannick Thomsen: There are a number of companies using satellites to observe Earth. What makes Spire different?

Peter Platzer: I sometimes wish we had different names for satellites. In transportation, everyone knows the difference between an aircraft, a ship, and a car. Even though they all have passengers, engines, and steering wheels, they are very different. The same holds true with satellites: there are what we call talking, looking, and listening satellites.

Talking satellites provide bandwidth and connectivity for telecommunications. Looking satellites, which are probably the most well known and largest part of Earth observation, rely on capturing reflections from the sun on the surface of the Earth. They provide a lot of visual information and great insights about land usage and river outflows, for example, but they only work during the day and when it's not very cloudy.

Spire focuses on listening satellites, which use a broad spectrum of radio frequencies to observe what is happening on Earth. The advantage is that you can use these satellites day and night, 24/7, in any weather conditions, across the entire planet.

Jannick Thomsen: How do the data from Spire's satellites help improve life on Earth?

Peter Platzer: Here's an example. One of the data types that Spire collects is information on weather: temperature, pressure, moisture of the atmosphere, and so on. Weather information is crucial; it affects at least a third of the global economy and 100 percent of the world population. That data is fed into governments' weather prediction models, including those of the European Union and the United States, and the outputs are freely available. You can use this information to see if you need to carry an umbrella or to check driving conditions on the roads. Farmers use it to determine when they should harvest or water crops. In construction, workers could use the data to see if it will be too windy to operate a crane. In rough numbers, I'd say we're improving weather prediction accuracy for a billion people and for countries that contribute about 50 percent of global GDP.

Jannick Thomsen: What are some surprising ways that customers have used Spire's data?

Peter Platzer: A couple of years ago, a huge locust swarm was destroying crops in Africa. By combining our data with other information, such as rainfall levels, we could not just track but predict where the swarm would go. That was an unusual and unexpected use of space-based assets to make a real difference to people on Earth. We replicated this approach a few months later when cicadas were coming out in the United States.

Capturing a niche in the crowded space ecosystem

Jannick Thomsen: Space-based applications were once developed exclusively by governments, but commercial companies are now leading the way. What's behind this change?

Peter Platzer: The capability per kilogram of a satellite has been increasing about tenfold every five years for over two decades. The miniaturization of sensors—along with increases in accuracy, power efficiencies, and processing capabilities—all drive that improvement curve and result in the explosion of use cases for space to solve problems on Earth. It's similar to how Moore's Law helped move computer use and deployment from only governments to the commercial sector.

A secondary reason for commercial growth relates to the availability of launch. Many people are not aware that a rocket goes up somewhere on this planet about every three days. Historically, commercial entities couldn't use rockets to deploy satellite constellations, but that changed in the late 1990s, when technology pioneers replaced sand and water—which was used for ballast on rockets—with secondary payloads. Spire has conducted more than 30 launch campaigns, launching over 150 satellites over the past few years.

Finally, lower launch costs are a factor. Launch costs for large structures have fallen to about half of what they were. That has helped make large-scale structures in space—like mega-constellations, private space stations, and moon outposts—a possibility.

Jannick Thomsen: Indeed, in the past five to ten years, many start-ups have entered the space market. How do you think the space ecosystem will evolve?

Peter Platzer: We can look to the computer industry for some answers, since it is very similar to the space industry. The disruption from mainframe computers to personal computers and, eventually, to the internet is an almost perfect analog to what is happening in the space industry.

Peter Platzer biography

Vital statistics
Born in 1969 in Vienna, Austria
Married, with 2 children

Education
Holds an MBA with highest distinction from Harvard Business School, an MS cum laude from Strasbourg's International Space University, an MS in physics from the Technical University of Vienna, and a diploma from Singularity University

Career highlights
Spire Global
(2012–present)
Founder and CEO

NASA Ames Research Center
(2012)
Nanosatellite research intern

Vegasoul Capital
(2010–11)
Senior portfolio manager

Deutsche Bank
(2007–10)
Director

Rohatyn Group
(2003–07)
Head of quantitative research

Boston Consulting Group
(1997–01)
Strategy consultant

Fast facts
Is a member of the Forbes Technology Council
Serves as a senior career coach at Harvard Business School
Was named one of the White House Champions of Change by President Barack Obama in 2013

We have a few dominant internet players today, but there are almost no companies that don't use the internet and computers. I think that is where the space industry is headed: there will be some large players, but the use of space will be widely distributed because access to it is becoming more regular.

In the 1980s and 1990s, the concept that even a large company would have its own supercomputer was absurd—and now every start-up has a supercomputer. Today, the concept that even large companies would have a private satellite constellation for their own needs is pretty absurd. I think in 15 years it will be commonplace.

Jannick Thomsen: Spire has been successful over the past decade. What advice would you give to another space start-up?

Peter Platzer: If you solve customers' pain points, they're going to be willing to pay for your services. In that respect, I don't think a space business is different from any other business. Don't get excited about a new technology; instead, get excited if your particular technology addresses customer problems better than any other solution.

At Spire, the problems we are solving for customers can only be solved from space. I think that's how space companies can be most successful: focus on problems that can exclusively be solved from space. If they can be solved a different way, don't use space.

What the future holds

Jannick Thomsen: What's an example of something that Spire will be able to do, in ten or 15 years, that it cannot do now?

Peter Platzer: Some estimates suggest that the cost of inaccurate weather predictions is in the $2 trillion to $4 trillion range. That number will increase because of climate change. So, a big part of our mission is to make weather prediction as accurate as Swiss train schedules.

If Spire can be part of giving that capability to humanity—the capability of planning ahead for wildfires, hurricanes, floods—through our data and analytics, we would have a massive impact. We could help humanity adapt to climate change. Many experts believe that space, especially Earth observation, is inexorably connected to humanity's struggle with climate change. I think that's true, since it's only from space that we can monitor the entire Earth 24/7.

Jannick Thomsen: More broadly, what do you think space will be like in 2030? What will people and companies be able to do in space?

Peter Platzer: Let's talk about 2035 instead, since I have a slightly better grasp of what things might be like by then. I think that by then, space will be ubiquitously used to understand, steer, and improve life on Earth, in the same way that the internet is now used for these purposes.

As I said, there's been a tenfold increase in capability per kilogram every five years. If we look ahead 15 years, that's a 1,000-fold increase in capability per kilogram. We'll be able to launch larger and larger structures. As space exploration increases, we will want to build more structures in space and on the moon. In-orbit manufacturing—the ability to build structures in space, perhaps using autonomous robots—is going to be important, and I think we'll start seeing some of that in 15 years.

I believe we will have structures in space that are commercially owned and operated. Some will be for research. Others will be for tourism—maybe a space station, but it won't be as comfortable as a hotel. And we will have some kind of presence on the moon; people might be able to plan weeklong trips to the moon.

By 2035, I believe we will have found life in our solar system. There are a number of very promising locations, and we are at a point where commercial operators can launch a life-seeking mission to Mars or to Venus at a much lower cost than in the past. That changes the game; I believe it will generate more interest. The increase in accessibility makes me hopeful that 15 years from now, we'll all see a short video clip that shows life on another planet.

Peter Platzer is the CEO of Spire Global. **Jannick Thomsen,** an alumnus of McKinsey's New York office, conducted this interview.

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For more from Peter Platzer, see the videos accompanying this article on McKinsey.com.

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