

CYBER WORLD

2023
No.68

**A business field expanding
75 million kilometers away from Earth**



Special feature

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#Multi-taskingmachine

#5-axismachine

#CNCturningcenter

#Resinprocessing

#Japan

[Special feature]

*From Earth
to Universe:*

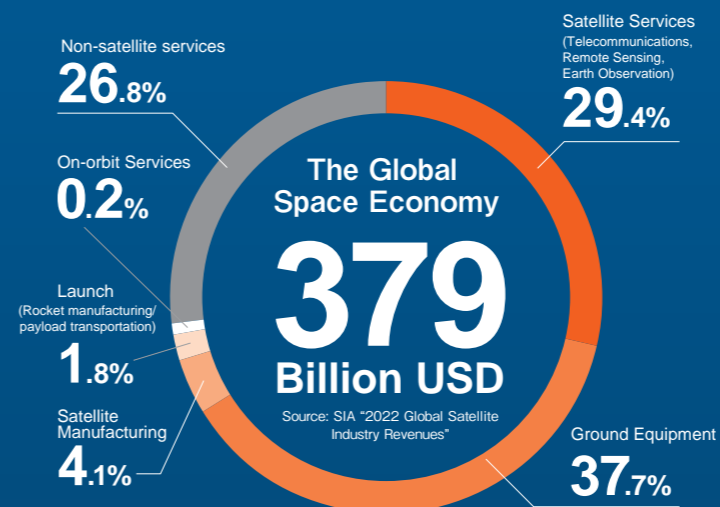
Manufacturing the Cosmic Connection

Space industry shifts from science to business

Approximately half a century has passed since humans first ventured into space in 1961. The space industry, which has long centered on scientific exploration, is now at a major turning point. The space industry is undergoing a shift from state-led projects to private sector projects, and the range of applications is expanding due to the progress of digitalization and IoT throughout the industry. It is a field that continues to develop and grow across industries, for example, satellite data is used to predict the growth of crops, to explore schools of fish in the ocean, and to autonomous driving technology for cars and ships.



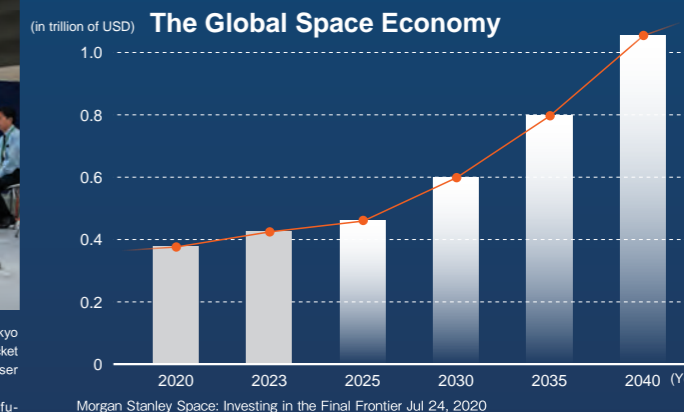
The space industry includes not only rockets and satellites, but also ground equipment such as antennas that receive satellite data and services that use data.



A model of the H3 rocket and lightning tower displayed at the Metal Forming Fair Tokyo (MF-TOKYO) 2023 Mazak booth. The lightning tower is a facility to protect the rocket from lightning strikes, and parts of this model are processed using Mazak's laser processing machine.
*The rocket model is specially borrowed with the cooperation of the Gifu-Kakamigahara air and space museum.

The global market will reach 1 trillion USD by 2040

The space business is expected to grow rapidly. According to US Morgan Stanley forecasts, the global space industry market is expected to grow to over 1 trillion USD in 2040, approximately three times the current amount. Since the 2000s, start-ups involved in space business have emerged one after another, and private sector-led space development is accelerating around the world. The decline in the cost of space use is also a boost, and space use is expected to continue to expand through private demand in addition to public demand.



100 km Sub-orbital 2,000 km Low earth orbit 36,000 km Mid-earth orbit 380,000 km Moon 75,000,000km Mars

Field of manufacturing connected to space

The needs for parts machining in the space industry are wide-ranging, including not only rocket engines and satellite parts, but also ground equipment such as launch pads and antennas.



ROCKET: The Gateway to Space Access

Rockets are the gateway to space and play a central role in the industry. Most rockets are disposable, with the exception of payloads such as satellites, and high development and manufacturing costs have been an issue. In order to establish low-cost and reliable access to space, rockets that can be recovered and reused for repeated launches have long been envisioned. Currently, this is a field where the private sector continues to enter and make strides, and development is progressing in many countries.

MINIATURIZATION AND MASS PRODUCTION IN SATELLITE MARKET

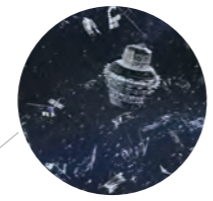
The number of satellites launched in 2022 is approximately 2,400, an increase of approximately 11 times over the past 10 years. Many small satellites have been mass-produced and launched, and progress is being made in satellite network construction and data utilization. With the growth of the market for small satellites, which are frequently launched in large numbers, attention is being focused on the small rockets used to launch these satellites.



From the space we visit to the space we stay in

Space travel is beginning to evolve from fantasy to a real business. Plans range from sub-orbital space travel, where weightlessness can be experienced for a few minutes, to stays on the International Space Station, and future space travel to even more distant destinations, such as orbiting the moon.

There is a lot of debris floating around in outer space, such as debris from crushed rockets. Development of robots and other equipment for debris removal and satellite maintenance work is ongoing.



Space exploration and resource development

Expansion into outer space is expected to help procure energy and resources that are becoming depleted on Earth. Specifically, these include rare metals such as titanium, nickel, and platinum, and water that can be used as drinking water or fuel. In 2020, Japan's asteroid explorer "Hayabusa 2" became the world's first probe to successfully bring back samples from an asteroid. In 2022, the lunar surface probe "HAKUTO" completed its mission to enter orbit around the lunar surface. Although not able to land on the moon this time, it continues exploring the lunar surface in the future.



Technology supporting space exploration

The closest celestial body to Earth, the Moon, is 380 thousand kilometers (236,120 miles) away, and the neighboring planet Mars is 75 million kilometers (46.6M miles) away. It is not possible to communicate with Earth in real time. Celestial probes include orbiters that operate in orbit, landers that land on the surface to make fixed-point observations, and rovers that travel on the surface and survey wide areas, all of them must be reliable and autonomous enough to continue operating for long periods without repairs.



Lander observing from the surface

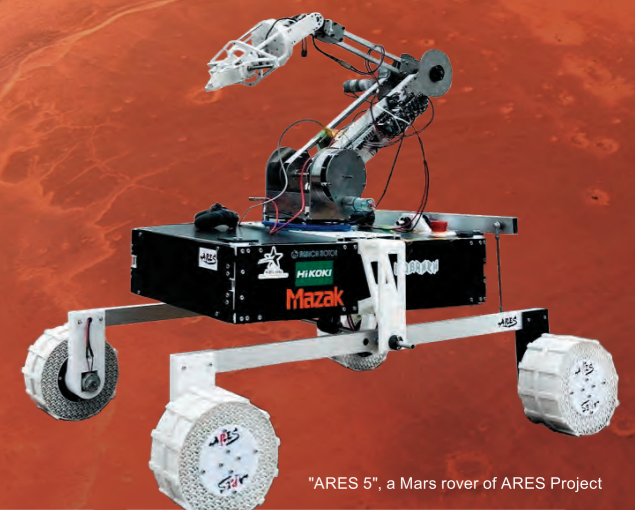


Orbiter observing from orbit

MARS ROVER

Mars is a rocky planet, similar to Earth. Since space exploration began in the 1960s, numerous unmanned probes have been sent for Mars exploration. Among them, rovers, which are self-propelled vehicles, autonomously traverse the surface after landing to collect and analyze soil and rock samples.

Mazak supports the ARES Project, a Japanese student group project that aims to participate in the Mars rover world competition "University Rover Challenge (URC)". "ARES 5", a Mars rover developed by the ARES Project, uses a cycloid decelerator in its arm which was machined by a INTEGREX i-250H S.



"ARES 5", a Mars rover of ARES Project



What is the ARES Project ?

The ARES Project is a student group project aiming to be the first Japanese team to participate in the "University Rover Challenge (URC)", a global student competition for Mars rovers. They are active mainly at Tohoku University and Keio University.

What is URC?

The University Rover Challenge (URC) is a world robotics competition for college students. Held annually in the desert of southern Utah in the United States, the URC challenges student teams to design and build the next generation of Mars rovers.



Cycloid decelerator

A Cycloid decelerator is used in the arm of the rover and enables high torque and high precision movement. It is useful for missions that require delicate movements such as spacecraft maintenance.

The 'eccentric pin' and 'cycloidal gear', the core components of the decelerator, requires the design of a trochoid curve for machining. Through programming support software, Mazak provides easy designing and programming of a trochoid curve simply by inputting specifications, and the machining is done without dedicated tools.



INTEGREX i-250H S





Customer Report Shinkou Mfg Co., Ltd.

Mazak machine that supports the challenge without saying "No"

"Yes, I Can." This is the management philosophy of Shinkou Mfg Co., Ltd. (Minami-ku, Nagoya City, Aichi Prefecture), which handles gaskets and high-performance resin products. What is included is "the spirit of not saying no!" It is a mechanism to remember the feeling of "exerting the maximum effort to meet the customer's request".

Management philosophy written in large letters on the wall surface



Factory Manager Sugano, President Yamada, Senior Managing Director Yamada (from left, first low) and employees



Machining parts for semiconductor manufacturing equipment using a 5-axis machine



Senior Managing Director Shige hito Yamada (left), President Take hito Yamada (center), Factory Manager Kazuhiko Sugano (right)

Think How You Can, Not Why You Can't

The company's predecessor was a limited company established in 1966 by President Yamada's grandfather, who ran an iron factory. The main business was the manufacture of punched products. Since 1987, when the Shinshiro Manufacturing factory was newly established, the scope of business has expanded in accordance with the expansion of the factory. In 2005, the company became a joint-stock company. In 2020, the Shinshiro Manufacturing NC factory was expanded and the business foundation was solidified.

The current product composition (based on sales) is 50% for gaskets for automatic transmission, 25% for high-performance resin products, 15% for plant gaskets, and 10% for polyurethane products. President Yamada sees the expansion of product lineup that go beyond the business at the time of the company's founding as "the result of sales force dedicated to meeting customer needs."

"Our company's strength is that we never say 'no'. This is because we have a deep-rooted habit of thinking as a team about how we can do it, rather than listing reasons why we can't do it," says President Yamada. "If a customer has a problem, we will deliver even one small part. Profitability is disregarded. I believe that the accumulation and trust of our customers has led to our current reputation," said Senior Managing Director Shige hito Yamada.

A factory where successive generations of MAZATROL are active

According to Mr. Yamada, Senior Managing Director, "In order to meet the demands, it is essential to improve technology and develop human resources." The company chose Mazak as a partner that they place great trust in manufacturing. The relationship with Mazak began in 1981 when Chairman Mitsuyoshi, father of President Yamada, introduced an early model of the QUICK TURN, the CNC lathe. "My father had a vision of automating production from the time when there were only general-purpose machines. After careful consideration of the model for that purpose, he decided to adopt the QUICK TURN 10 controlled by the MAZATROL T-1."

Chairman Mitsuyoshi was impressed by the capability of MAZATROL, a conversational CNC system that is much easier to use than conventional systems. Since then, Mazak machines equipped with MAZATROL have been used for the main machining at the manufacturing site. At the Shinshiro Manufacturing NC Factory, which is responsible for resin machining, representative models such as lathes, 5-axis machines, and vertical machining centers are in full operation, centering on multi-tasking machines. "High-performance resins such as fluorine resin are used as a part of cleaning equipment in the semiconductor manufacturing process. We are working to optimize the production system by using different machines according to the types of parts and applications," said Mr. Sugano, factory manager.

Construction of an integrated high-performance resin plant

"Mazak machine tools are valuable in supporting our company's ability to take on challenges and not say 'no' to our customers' requests." President Yamada says about Mazak machines. "The recent success story of 'Yes, I Can.' is the commercialization of acrylic tags. Although this was our first request, we urged the site to take on challenges without fear of failure," said Senior Managing Director Yamada. Sales, which were initially 20,000 to 100,000 yen per month, have now increased to 2 million yen. "When we moved to the Shinshiro Manufacturing factory, there were only a few Mazak machines, but now there are more than 20 of them. As a result of multiple trials and errors not to say 'no', it was increasing."

The shift to EVs, one of the recent revolutions in the automotive industry, is affecting the company as well. As a countermeasure, the company is promoting the expansion of high-performance resin products. They plan to construct a new factory with an integrated production system for high-performance resins, from material manufacturing to machining, next to the Shinshiro Manufacturing NC factory. The completion is scheduled for spring 2025. The introduction of Mazak machines has also been factored in. The slogan for challenging the new business environment is, of course, "Yes, I Can."



Shinkou Mfg Co., Ltd.

Chairman : Mitsuyoshi Yamada
 President : Take hito Yamada
 Senior Managing Director : Shige hito Yamada
 Head office : 1-8-3 Kakegami, Minami-ku, Nagoya, Aichi, Japan
 Number of employees : 200

www.shinkou-ss.com



More than 20 new and old Mazak machines lined up



The world's first conversational CNC system "MAZATROL" has all models from T-1 to SmoothAi



Successive MAZATROL-equipped machines are active

Workpieces machined with Mazak machines

Resin and acrylic products machined by Mazak machines





UTRILLO, Maurice [1883-1955], "The Windmill of Sannois", 1910, Oil on canvas

THE YAMAZAKI MAZAK MUSEUM OF ART
Collection Showcase

The Windmill of Sannois

UTRILLO, Maurice

Utrillo was born in Paris. This work shows the landscape of Sannois northwest of Paris. There were still farm fields and windmills used to grind flour. The landscapes of Utrillo in the 1910s were characterized by gray skies and white walls accented by rusty brown shadows. The overall atmosphere was permeated with melancholy. Since most people can empathize with a sense of loneliness in urban scenes, Utrillo's works of this period, his "white period," have enjoyed a high reputation.



M THE YAMAZAKI MAZAK
MUSEUM OF ART

<https://www.mazak-art.com>

The Yamazaki Mazak Museum of Art was opened in April 2010 in Aoi Higashi-ku, the heart of Nagoya in order to contribute to the creation of a rich regional community through art appreciation and, consequently, to the beauty and culture of Japan and the world. The museum possesses and exhibits paintings showing the course of 300 years of French art spanning from the 18th to the 20th centuries collected by museum founder and first museum director Teruyuki Yamazaki (1928 - 2011), as well as Art Nouveau glasswork, furniture, and more. We look forward to seeing you at the museum.

