Systems Design Section
Space Systems Engineering Department
Space Systems Division
Aerospace Systems
Yosuke Ide

Launching Dreams into Space with Meteorology and Mathematics

The Hidden Key Figure Behind the H-IIA Launch Services

MHI began its rocket launch services in 2007 with the H-IIA Launch Vehicle No. 13, setting up a complete system to provide services from rocket development through manufacture to launch. The mission: to deliver satellites and other payloads securely to a target place, on a target date. With Yosuke Ide's assistance, the Space Systems Engineering Department determines orbits and performs other tasks to facilitate this mission. Ide also makes weather-related calls vital to individual launches.

Space Systems Division, Aerospace Systems

The Weatherman Who Helps Launches Succeed

How does Ide feel during a rocket launch? "I just keep silently screaming 'Go! Go! Go!'" The words are simple, but the emotion behind them is strong: after all, calculating rocket trajectories is his job.

"I always feel I'm praying, right up until the satellite has separated at the target location. It takes me a long time to relax."

An eyewitness to the H-IIA launches at Tanegashima Space Center since their privatization, Ide calculated the orbits for flights No. 17 and 21. It's rare for the person in charge of orbital calculations to actually visit the site because, if the launch is postponed, the orbit program needs to be adjusted immediately, back in Nagoya. However, Ide comes to Tanegashima a week before launches for his other important job: that of a meteorologist.

"I'd always dreamed of working at the Tanegashima Space Center, and in my second year after joining the company, I earned my certification as a meteorologist. Weather conditions are one of the trickiest elements in rocket launches, and observing them is another important task that falls to MHI. Some may wonder how much wind and rain could really matter, since we're launching a massive rocket over 50 meters long. However, current rockets are streamlined to the maximum in order to improve acceleration performance while they carry heavy satellites, and it's vital to notice the slightest change in the wind."

Ide's role is to comprehensively examine the rain, wind, clouds and lightning based on data from the Japan Meteorological Agency, and to inform the person in charge of the launch of favorable or unfavorable weather conditions. That person makes several separate "Go/No Go" decisions: before the rocket is taken to the launch pad, before liquid propellant is loaded, and before the countdown begins. Before each decision, Ide is asked for input. "From a cost perspective, it's best to launch on the target date, but we can't afford to have the worst happen because of the weather. The decision to launch or postpone can feel like a huge dilemma. At times like that, I always tell myself, 'Just look at the data with an open mind.' Calm decisions are built on objective data."

In fact, when No. 17 was scheduled to be launched with the Venus Climate Orbiter *Akatsuki* on board, the weather suddenly took a turn for the worse. Just five minutes before liftoff, the launch was postponed. Preparing for another launch would take several days, and the launch window of opportunity was limited by the relative positions of Earth and Venus. Although the situation made Ide conscious of the weight of his own role, he also gained the confidence to tackle any problem that came up.

Proud to Work behind the Scenes

Even as a child, Ide was interested in outer space. He devoured space-themed *manga* and engineering books, and at university, he majored in aerospace engineering. Ide says that those who currently calculate orbits and control attitude are 'unsung heroes.' "But I'm proud to be one. It's best if we don't stand out, if we keep quietly accumulating successful launches."

This modest comment veils unimaginably precise calculations. For No. 17, the target was a pinpoint trajectory from Earth to distant Venus. Launching an object 53 meters long with a weight of 289 tons and only a few kilometers of permissible error is a Herculean task. The solid rocket boosters separate at 2:05 after liftoff, and the payload fairing is jettisoned at 4:25. Accurate impact areas are calculated for all falling objects as well. "Because we're dropping the boosters into the ocean, one after another, absolute safety is vital. We run countless computer simulations and design the trajectory to eliminate all possible risk."

MHI's accumulated expertise is what gets the job done. Roughly 90% of the rocket's weight is propellant, and a vast number of calculations are necessary to keep this object, full of oscillating liquid, on the correct path. "Our generation tends to rely on computers and perform those calculations by brute force. However, the older, more experienced members use a trick called modeling. They take a complicated phenomenon and extract its essence, simplifying it, then run simulations. I've seen them take one of my sprawling formulas and reduce it to just a few lines." Working with these pioneers has further honed Ide's orbit designs.

Large launch complex at Tanegashima Space Center. Located on the shoreline, the center ranks as the most beautiful launch site in the world.

The Cargo: Satellites and Researchers' Dreams

The satellites launched into space have missions ranging from planetary exploration to earth observation. In that sense, MHI Launch Services also carries the dreams of many researchers. Ide and his colleagues work on the front lines to make this service safe and reliable.

Many of the satellite projects in their care have been in the making for ten years or more. In the few minutes between the rockets' launch and the separation of the satellites, those long years of effort pay off. "Three days after No. 17 was postponed," Ide says, "it was successfully launched. After the launch, the project engineer for the *Akatsuki* Orbiter told me, 'The launch vehicle performed an amazing job for us.' I've treasured those words ever since."

As rockets and satellites evolve, orbital calculations will become more advanced, and a spirit of challenge that refuses to be satisfied with the status quo will be vital. "The field of aerospace is a challenge issued by humanity. We're widening our sphere of activity into space." Ide's enthusiasm is bound to add to the limitless possibilities of space development.

Members of the Systems Design Section of the Space Systems Engineering Department responsible for orbits and software design.

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