Inside the Journey of HP ZBook Fury Mobile Workstations to the ISS

Over 100 HP Z Workstations are supporting critical operations onboard the International Space Station.

What does it take to get tech ready for orbit?

A laptop you can buy on Earth is a mission-critical tool 250 miles above it at the International Space Station. How did it get there?

The answer: Two years of relentless testing, reimagined hardware designs, and engineering challenges that would make any IT department's problems seem trivial. When there's no tech support, no replacement parts, and failure could jeopardize scientific breakthroughs worth billions, "good enough" simply doesn't exist.

Since 2014, two more generations of **HP workstations** have undergone rigorous testing to support NASA's work on the ISS. In this latest mission, the **HP ZBook Fury G9 Mobile Workstation** will provide the computational power needed to help push the boundaries of space exploration.

Here's how we got here—and where we're going next.

Two years

of relentless testing, reimagined hardware.

Purpose-built

Mobile workstations for the ISS are **rigorously tested** to withstand the harsh realities of working in space.

The specs that matter in space

Delivering technology to the International Space Station is not as simple as pulling a few laptops off the shelf and loading them onto a rocket. Mobile workstations destined for the ISS must be purpose-built and rigorously tested to withstand the harsh realities of working in space.

Engineers face three critical constraints when designing technology for space.

First, the workstations must handle demanding computational tasks
HP engineers had to configure the G9 to manage the data-heavy work astronauts tackle daily on the ISS—processing scientific data, running experiments, and managing communications with Earth. Reliability is mission-critical: astronauts need systems that adapt to changing scientific objectives, safeguard sensitive data, and deliver unwavering performance across months of continuous operation.

But increased computational power introduces new complexities. Zbook Fury G9 had to offer multiple options for power supplies to support the demanding computational tasks that happen onboard, including as 230W standard AC adapter, 120W AC/DC adapter, and 95Wh battery.

Performance

in the absence of air
for cooling and gravity.

Second, the workstations must function in the unusual office environment of outer space. The G9s have to perform in the absence of the very things laptops are designed to rely on—air for cooling and gravity to keep components in place. Radiation exposure, intense vibrations during launch, extreme temperature fluctuations, and the challenges of cooling in microgravity all have to be accounted for before hardware is cleared for orbit.

Finally, there's the issue of maintenance and repair. There's no IT help desk in space, and life on the ISS doesn't allow for the typical three-year upgrade cycle of consumer technology. Astronauts have to make repairs and do maintenance themselves, so having a supply of reliable, traceable and replaceable parts is necessary to extend the lifecycle of each workstation.

Equipped with

128GB *(4×32GB)* of DDR5 ECC SODIMM memory and multiple NVMe SSDs.

Breakthrough innovations

The ZBook Fury G9s were designed to usher in the next generation of space computing—with enhanced storage, advanced battery technology, and expanded memory capacity. The goal: create a mobile workstation powerful enough to support NASA's increasingly complex missions using learnings from the G2 to introduce improvements in the G9 model.

HP's ZBook Fury G9s are designed to deliver high performance and reliability in extreme environments. Let's run through some technical specs. The HP ZBook Fury G9 is equipped with 128GB *(4×32GB)* of DDR5 ECC SODIMM memory and multiple *(4x2TB)* NVMe SSDs arranged in a Redundant Array of Independent Disks *(RAID)* configuration—dual layers of protection against data loss.

EEC (Error-Correcting Code)

Prevents crashes and data corruption when there's no IT support.

ECC (Error-Correcting Code) memory automatically detects and corrects minor errors in RAM, preventing crashes and silent data corruption during processing—critical safeguards when there's no IT support 250 miles above Earth. RAID protects data at the storage level by mirroring it across multiple drives, ensuring redundancy so that information remains intact even if one drive fails.

Together, ECC keeps data accurate in active memory while RAID ensures it remains safe and accessible on disk—creating a resilient computing system capable of operating reliably for months without intervention.

HP also introduced a NASA-exclusive feature with the ZBook G9 Fury: universal AC/DC power adapters. The ISS runs mainly on DC power, which means the standard AC chargers used in homes and offices on Earth simply won't work there. The G9 mobile workstations include a specially designed AC/DC adapter that functions on both the ISS and Earth.

Safety

Every component of HP's Fury G9 meets NASA's Certification of Flight Readiness—the stamp of approval confirming workstations are safe to launch.

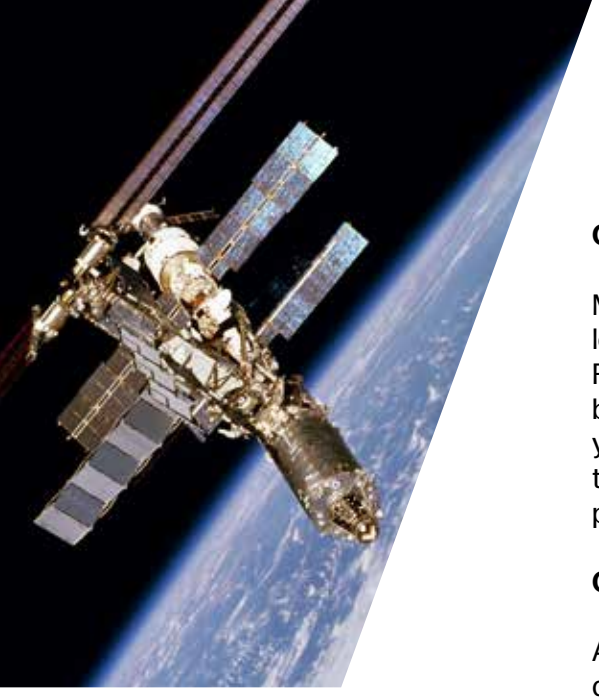
Getting ready for orbit

It took two years of rigorous testing to prepare the HP ZBook Fury G9 mobile workstations for the ISS. Throughout the process, engineers from NASA and HP worked with three priorities in mind: astronaut safety, quality, and compatibility.

Safety: Every detail matters

NASA's number one priority is safety—and the devil is in the details. Consider the LCD touchscreen on a typical mobile workstation. If the screen breaks in orbit, shattered glass doesn't simply fall to the floor; it becomes floating shrapnel in a zero-gravity environment, posing a hazard to astronauts.

HP engineers had to control touch temperature *(how hot the laptop feels on bare skin)* and test to ensure the batteries wouldn't catch fire during launch. Likewise, the cooling fans that prevent laptops from overheating can damage hearing if their volume isn't properly modulated in the enclosed ISS environment. Every component of the Fury G9 had to meet NASA's Certification of Flight Readiness—the final stamp of approval that confirms the workstations are safe to launch.



Compatibility

All HP ZBook Fury G9s components are verified to be compatible with NASA's existing hardware and software, making workstation integration easy .

Quality: Built to endure

Most consumers don't consider their personal safety when shopping for laptops, but everyone cares about quality and reliability. The HP ZBook Fury G9s underwent extensive battery and radiation testing, including bombardment with neutrons in specialized radiation chambers to simulate years of space exposure. This testing ensures the systems can withstand the relentless radiation environment of low Earth orbit without degrading performance or compromising data integrity.

Compatibility: Single-source reliability

All components are verified to be compatible with NASA's existing hardware and software, making it easy to integrate the ZBook Fury G9s with minimal effort.

HP also implemented a single-source supplier strategy for critical components—meaning each part comes from one verified manufacturer. If an issue arises, NASA knows exactly where the component came from and can quickly retest it at very low failure rates. More importantly, HP can maintain spare parts with identical specifications, providing unprecedented quality control and avoiding supply chain vulnerabilities that could jeopardize mission success.

To infinity and beyond

NASA's requirements and design feedback push HP to innovate faster and further than standard market conditions would. NASA's need for technology that is durable, scalable, and long-lasting in extreme environments directly influences the design of HP products available today and those coming in the future.

HP's consumer laptops already undergo rigorous testing for drops, shocks, and extreme temperatures, and the company goes even further for NASA—conducting advanced radiation testing to withstand the harshest conditions imaginable. This approach means HP often exceeds standard specifications, delivering products that perform beyond conventional requirements.

The result: HP customers across government, private sector, and consumer markets benefit from technology on the cutting edge of innovation. HP's collaboration with NASA accelerates progress, ultimately strengthening its broader product line.

Solution at a glance

- HP ZBook Fury
- Intel® Core™ Ultra 9 vPro HX processor
- NVIDIA® RTX PRO Blackwell laptop GPU

What's next for NASA? The International Space Station remains a critical destination for space agencies and astronauts will continue run experiments and collect data onboard for several more years. But the agency has also set its sights on a return to the Moon, with upcoming Artemis missions over the next several years, and eventually, future human missions to Mars. At the same time, HP will continue iterating to push the limits of workstation performance in these environments and take it to even more extremes.

With the right tools in hand, NASA's teams unlock breakthroughs with tools that power performance. HP Z workstations empower NASA to advance science and push the boundaries of human achievement. Here on Earth, HP's secure, innovative solutions can fuel your workforce to achieve growth, fulfillment, and mission success.

Learn more about how workstations are used onboard the ISS in our recent case study and explore how HP is trusted for mission-ready computing from Earth to space.

Imagery courtesy of NASA.